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ON LABOUR SHARES IN RECENT DECADES: A SURVEY

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Quaderno n. 57 / dicembre 2009



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“ESEMPLARE FUORI COMMERCIO PER IL DEPOSITO LEGALE AGLI EFFETTI DELLA LEGGE 15  
APRILE 2004, N. 106”

# On Labour Shares In Recent Decades: A Survey<sup>1</sup>

Luciano Boggio<sup>a</sup>

Vincenzo Dall'Aglio<sup>b</sup>

Marco Magnani<sup>b</sup>

<sup>a</sup> *Università Cattolica del Sacro Cuore, Milano*

<sup>b</sup> *Università degli Studi di Parma*

## Abstract

We survey the rich literature studying the behaviour of labor shares in recent decades. To explain their dynamics – the main feature being the decline of European and American shares starting in the 1980s – such literature considers models that use either neoclassical or Leontief-type production functions, with both perfectly competitive markets and monopolistic competition coupled by bargaining between firms and workers. These empirical studies in general have produced results that are scarcely robust. However, they suggest that technical change has a negative and significant impact on the labor share. Evidence for a negative effect of globalization variables is clearly brought out for developing countries, whilst for advanced countries, this effect finds less support. Also, they show that product and labor market regulation issues have mixed effects on the labor share. An alternative to the econometric explanation of labor share is given in the final section.

**Keywords:** Factor shares, functional income distribution.

**JEL Classification:** E24, E25.

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<sup>1</sup> Financial support from Catholic University within the research project "Disuguaglianza dei risultati e disuguaglianza delle opportunità, performance macroeconomica, e politiche pubbliche" (linea D3.2) is gratefully acknowledged.

# 1 Introduction

The functional distribution of income, which in the 1950s and 1960s was the subject of very intense debates, and thereafter fell into relative neglect<sup>2</sup> is well expressed in the following sentence by Mark Blaug: ‘the great mystery of the modern theory of distribution is why anyone regards the *share* of wages and profits as an interesting problem’ (Blaug, 1996, p. 467).<sup>3</sup>

The present research on the income share of wages (and profits) was motivated by the desire to understand some important developments in their behavior, with the belief that the division of national income between labor and non labor incomes still gives a synthetic, though crude, idea of some fundamental dimensions of income distribution. Therefore, it matters to people.

Their behavior is described in detail in this survey, and the relevant literature is surveyed and assessed.

The main fact about the dynamics of European and American total labor shares from 1970 (1977 for US) to 2005 (Figure 1) is a declining trend<sup>4</sup> which started in the 1980s both in the EU15 (-0,2%) and in the US. It is much less severe (-0,08%), with a clear bump centred in 2000 in the latter case (Figure 3), whilst in the former an upward shift in the 1970s is clearly noticeable. In manufacturing, the US labor share dropped much more than the European one, while the reverse is true for the market economy labor share.<sup>5</sup>

As for the theoretical explanations of these and other aspects of the behavior of labor shares, we begin by considering the neoclassical approach, in particular the one-to-one relationship between capital/output ratio and labor share as developed by Bentolila and Saint-Paul (2003) under the assumption of perfectly competitive markets for products and markets. Then models with monopolistic competition in the market for goods and services and with bargaining between firms and workers in the labor market – using either neoclassical or a Leontief-type production function – are presented.

The effects of labor market regulations on labor share, the globalization process and technology-policy interaction are also examined. Unfortunately, in spite of its relevance, a clear theoretical relationship between international trade and labor share movements, going beyond the traditional and hardly satisfying Heckscher-Ohlin theory, turn out difficult to find.

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<sup>2</sup> This fact is well described in Atkinson (2009) p. 4.

<sup>3</sup> Atkinson’s paper is devoted to giving good reasons to assert that such a problem is indeed interesting. According to him (p.5) – following Glyn (2009) – there are three reasons for studying factor shares: “to make a link between incomes at the macroeconomic level (national accounts) and incomes at the level of the household; to help understand inequality in the personal distribution of income; to address the concern of social justice with the fairness of different sources of income.”

<sup>4</sup> A measure of trend (a yearly average percentage change) is obtained by regressing the logarithm of each series with a constant against time.

<sup>5</sup> Many other facts related to the labor shares are described in Section 4.1.

In the final part of the paper, the very diverse results of the empirical studies are surveyed and summarized. We find that technical change has a negative and significant impact on the labor share. Evidence for a negative effect of globalization variables is clearly brought out for developing countries, whilst for advanced countries, this effect finds less support, possibly because of a ten-year lag between the beginning of labor share's declining trend and the rising trend of globalization. Finally, product and labor market regulation issues have mixed effects on the labor share.

In Section 2, labor share measurement problems are discussed, while theories on its determination are analyzed in Section 3. Section 4.1 gives a detailed overview of the main facts concerning labor shares around the world; the results of the empirical studies are surveyed in Section 4.2.

## **2 Measuring the Labor Share**

### **2.1 Measurement Problems**

Measuring labor share is not straightforward despite the definition derived from the theory is quite simple; it is the ratio between employee compensation and value added. Two sets of issues in fact arise: definition and data related issues.

First, there are problems with the notion of employee compensation. What exactly must be included within this definition is unclear as noted by Krueger (1999). A relevant question is posed by the fact that the economic definition of labor share does not coincide with the aggregate income paid out to labor. This variable includes the effects of human capital accumulation; but labor share is properly defined as the share of production which rewards "raw" units of labor<sup>6</sup>. It is thus questionable to use employee compensation in the computation of the labor share.

A second issue involves the definition of employees whose boundaries are unclear. Consider for instance CEOs and business owners: how much of their income should be imputed to capital and how much to labor? Furthermore, some income earned by proprietors (i.e., owners of unincorporated businesses) is labor income, while some represents a return on investments.

Available data also exhibit a number of problems. National Income and Product Accounts (NIPA) which are the main sources of data, adopt different accounting procedures in different countries. Moreover, these procedures respond more to administrative convenience than to

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<sup>6</sup>See Young and Zuleta (2008).

economic rationale. Consequently, relevant issues are discarded by the data collection system and a bias in the measurements of both employee compensation and total value added is introduced. Gollin (2002) argues that most of the observed cross-countries differences in data derive in fact from an incorrect measurement of employee compensation. This depends on a number of factors listed below:

- Self-employment
- Non-wage compensation
- Payments to retirees
- Aggregation
- Government sector and indirect taxes
- Housing sector

Most of the bias in the calculation of employee compensation depends on self-employment. The earnings of self-employed workers which are known as mixed income, vary considerably across countries and are not included in employee compensation. They are falsely considered capital income.

Stock options are the main form of non-wage compensation and usually are not imputed to the labor share either, mostly because national accounts don't keep track of them. Their nature as labor earnings moreover is debated.

Payments to retirees are troublesome for two reasons. One is that the accounting system records delayed labor compensation only when an effective disbursement takes place. This usually happens after the money has been earned. A major example is that of retiree health benefits. A second problem arises with respect to employer contributions to the pension system which are recorded by the NIPA at time of payment, if under- or overfunded defined benefit plans are in place.

Further distortions derive from the aggregation of data from different sectors. As pointed out by De Serres et al. (2001) changes in the sectorial composition of the economy might produce an aggregation bias when labor shares vary significantly across sectors. An observed decline in the aggregate variable, thus, might depend both on increased wage moderation within most sectors or on the growth (decline) of low (high) wage sectors.

The sectorial composition of the economy matters also for the last two points listed above. Government and housing sectors are opposite examples of how difficult it is to separate labor and capital contributions in the national accounts.

In the government sector, there is no capital income and value added is the sum of wage, salary income and fixed capital consumption. Including the government sector in the calculation of total output, biases labor share upwards, because government capital income is missing. Yet,



excluding the government sector raises other problems. The value added absorbed by the government, i.e. indirect taxes less subsidies, should be coherently imputed either to the labor or to the capital share of output, but this apportioning is not easily done.

The NIPA records the rents of owner-occupied housing as capital income and does not impute any labor income. If the housing sector is considered in output calculations, labor share is biased downwards because the labor component of owner-occupied housing is omitted.

Also, the measurement of gross value added is troublesome. The informal economy in fact is a major source of errors. Transactions which are not recorded by the NIPA vary greatly across countries and heavily affect international comparisons. The business cycle moreover affects the size of the informal economy and biases the analyses based on time series.

A more fundamental issue deals with the appropriate income measure to be used in the calculation of the labor share. It is debated whether capital depreciation should be included in total output or not: in the former case, we have gross value added; in the latter, net value added. Net value added might be preferred because depreciation merely compensates owners for the wear and tear of their capital. Nonetheless, intellectual labor is also subject to wear and tear, but its depreciation is not considered in the calculation of net value added. This provides a justification for using gross value added as a measure of actual income.

## **2.2 Proposed Solutions**

Most of the measurement problems pointed out depend on data quality and do not leave much room for possible solutions. For some of them, however, the literature has proposed sensible procedures to adjust actual data. Gollin (2002) for instance discusses different solutions for the problem posed by self employment.

The best approach to the problem is proposed by Young (1995) and entails imputing a notional wage to self-employed workers depending on sector, sex, age, and education. This procedure, however, is troublesome because it requires control over unobservable differences in entrepreneurial ability and relies on detailed micro data. Alternative adjustments have been proposed by Gollin (2002) based on the reported operating surplus of private unincorporated enterprises (OSPUE). Self-employed income coincides with the OSPUE unless the worker is paid a wage by his/her own enterprise or unless individuals incorporate their own enterprises. Three methods are proposed for reallocating OSPUE between labor and capital.

First, a simple procedure treats the OSPUE as labor income and relies on the assumption that self-employed workers supply only labor and no capital. This circumstance is hardly observed

even in developing countries, implying that the labor share is overestimated. The adjusted labor share is defined as follows:

$$(EmployeeCompensation + OSPUE)/(GDP - IndirectTaxes)$$

A second method takes into account both capital and labor income and relies on the assumption that unincorporated enterprises adopt the same mix of labor and capital income as the rest of the economy. The relative factor shares coincide with those of large corporations and of the government sector. The main drawback to this approach is that it treats enterprises which are different in size and structure, and sectors whose number of unincorporated enterprises varies significantly in the same way. This might result in an incorrect apportioning of the OSPUE especially because unincorporated enterprises are usually characterized by higher labor intensity than corporations. The adjusted labor share is defined as follows:

$$(EmployeeCompensation)/(GDP - IndirectTaxes - OSPUE)$$

Third, the most popular correction to data is based on the assumption that the wage of self-employed workers equals the average compensation per employee. The adjusted labor share is defined as follows:

$$(TotalEmployment/Employees) \cdot (EmployeeCompensation)/(ValueAdded)$$

This adjustment allows to account for the different size of self-employment in different countries, but it is reliable only if self-employed workers command the same wages as employees.

Gomme and Rupert (2004) propose a method of categorizing proprietors' income and indirect taxes less subsidies. It relies on a classification of income among:

- Unambiguous labor income (compensation of employees),  $Y^{UL}$ .
- Unambiguous capital income (corporate profits, rental income, net interest income, and depreciation),  $Y^{UK}$ .
- Ambiguous income (proprietors' income plus indirect taxes less subsidies),  $Y^A$ .

Ambiguous income in this approach is apportioned between labor and capital using the same proportions calculated for the remainder of the economy. Let  $a$  (yet undetermined) denote labor's share of income; then, total labor income,  $Y^L$ , is given by:

$$Y^L = Y^{UL} + aY^A$$

Since  $a$  is labor's share of gross value added,  $Y$ , it is the case that:

$$Y^L = aY = a(Y^{UL} + Y^A + Y^{UK})$$

Substituting  $Y^L$  in the first equation and solving  $a$  provides the adjusted labor share:

$$a = \frac{Y^{UL}}{Y^{UL} + Y^{UK}}$$

### 3 Determinants of Labor Share Movements

The present section considers the determinants of labor share dynamics and distinguishes between two different approaches to the problem. The first is based on the definition of the so called *SK* schedule proposed by Bentolila and Saint-Paul (2003) whose analysis relies on the assumption that the production function allows for factor substitution (at least in the long run). The second approach considers the case where capital and labor are strict complement. The literature in this field focuses primarily on the effects of globalization excluding those depending on international trade. International trade of goods and services in fact raises important interpretative issues which need to be discussed in detail. A review of the literature dealing with this last aspect is reported in the final part of this section.

#### 3.1 A Neoclassical Approach to the Analysis of the Labor Share: 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-to-one relation between the labor share and the capital-output ratio under the hypotheses of competitive markets, constant return to scale production function, substitution between factors and labor augmenting technical progress, the so called *SK* schedule. This schedule is particularly useful for the empirical analysis because it links labor share movements to the variations of an observed variable. The relation, moreover, is unaltered by changes in factor prices (wage and rental cost of capital), in quantities and by labor augmenting technical progress. These variations result in movements along the *SK* schedule.

This setup represents a natural benchmark for the characterization of the *long run* equilibrium of the economy, yet relaxing some of the previous assumptions, also allows the study of the short and medium run. Following Blanchard (1997), the *medium run* is characterized by monopolistic competition in the market for goods and services and by the bargaining between firms and workers in the labor market. Firms thus, earn positive profits and have rents which they share with their employees. This means that the price of final goods and services is equal to marginal costs plus a markup, and that the wage rate differs from labor productivity. Factor proportions,

moreover, are varied without incurring any costs. As for the *short run*, it is characterized by adjustment costs and no variations in the capital-output ratio.

According to Bentolilla and Saint Paul (1998, p. 4), what we can learn from analyzing the *SK* schedule is that “[a]ny change in the labor share which shows up as a deviation from that relationship must arise from a shift in labor demand which is not due to real wages, capital accumulation, or labor-augmenting technical progress and, therefore, has to be explained by other factors”<sup>7</sup>... The description of factors that permanently displace the schedule is included in the long run analysis. The role of market imperfections which temporarily put the economy off schedule is investigated when the medium and short run are presented.

### 3.1.1 Long Run Analysis

Let us consider how the *SK* schedule is derived from a general production function  $Y = F(K, L \cdot B)$  where  $Y$  is total output,  $K$  and  $L$  are respectively capital and labor stocks employed in the production process, and  $B$  is labor augmenting technical progress<sup>8</sup>. The constant return to scale property permits the following intensive form:

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

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

Under the assumption that labor is paid its marginal product, the following equality holds:

$$W = B \cdot f'(l)$$

where  $W$  is the wage rate in terms of the unique good of the economy. Labor share is then defined as:

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

Consider now the capital-output ratio:

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

Since the function  $f(l)$  is monotonic, it is also invertible and allows to define  $l$  as a function of  $k$ :

<sup>7</sup> For instance “[...] factors which displace the schedule, such as changes in the price of imported materials or capital-augmenting technical progress, and those which put the economy off the schedule, by changing the gap between the shadow marginal cost of labor and the wage, such as changes in markups of prices over marginal costs, union bargaining power, or labor adjustment costs.”(*ibidem*)

<sup>8</sup> To simplify the matter, we use an aggregate approach. The disaggregated extension used in most empirical work follows in an immediate way by introducing a price-of-goods index.

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

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

$$S_L = h(k) \cdot f'(h(k)) \cdot k$$

defining the *SK* schedule: the labor share  $S_L$  is a one-to-one function of the sole capital-output ratio.

The first derivative of  $S_L(k)$  after some passages, is:

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

where,  $\sigma$ , is the elasticity of substitution between labor and capital<sup>9</sup> whose definition is:

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

The relation between labor share and capital output ratio crucially depends on this elasticity. In particular, assuming  $f''(l) \leq 0$ , if  $|\sigma| \geq 1$ , i.e. if there is low complementarity between capital and labor, the *SK* schedule has a negative slope. When there is strong complementarity and  $|\sigma| < 1$ , the *SK* schedule has a positive slope. Hence, according to this approach, long-run variations in the equilibrium labor share across countries or sectors are explained by different steady state levels of the capital-output ratio combined with different elasticities of substitution between labor and capital.

*For further reference it is important to notice that “the weight of the evidence”<sup>10</sup> suggests a value of  $|\sigma|$  significantly less than 1.*

*A first relevant consequence is that the expected sign of capital-output ratio in regressions should be negative, contrary to what happened in most cases.*

Consider what happens if a shock permanently varies the parameters of the schedule. This is the effect for instance of capital-augmenting technical progress, expressed by parameter  $A$ , which causes the production function to become  $Y = f(K \cdot A, L \cdot B)$ . The reformulated labor share function is then:

<sup>9</sup> See Varian (1984)

<sup>10</sup> According to Chirinko (2008), who reviews the many studies that have attempted to estimate  $\sigma$ , the elasticity of capital-labor substitution, “the weight of the evidence suggests a[n absolute] value of  $\sigma$  in the range of 0.40 – 0.60.” (p.681) Recent studies supporting this conclusion are Klump, McAdam, and Willman (2008), Chirinko, Fazzari, and Meyer (2007) and Smith (2008).

$$S_L(A, k) = h(Ak) \cdot f'(h(Ak)) \cdot Ak$$

Variations in  $A$  shift the  $SK$  schedule. The same effect is obtained if imported intermediate goods,  $I$ , are included in the production function  $Y = f(K, L \cdot B, I)$ . The labor share is no more a sole function of the capital-output ratio, but depends also on the real prices of  $I$ .

### 3.1.2 Medium and Short Run Analysis

In the short and medium run, markets are not perfectly competitive. Firms have market power and apply a markup over marginal production costs. Bargaining between firms and trade unions introduces a wedge between the marginal product of labor and the real wage.

Market power determines the size of rents extracted from consumers. Workers' bargaining power relative to that of employers establish how these rents are distributed between labor and capital. Both aspects affect the labor share size. Only over time, free entry on the goods market drives the markup to zero and restores perfect competition conditions also in the labor market since there are no rents to share between firms and workers.

In this context, it is possible to define a medium run  $SK$  schedule for given levels of firms' market power and of their bargaining power on the labor market. The analysis is based on Blanchard (1997 and 1998) which provides through a simple but effective framework, an exhaustive analysis building on the results of Caballero and Hammour (1998) and of Phelps (1994).

The analysis studies 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  $W$  is set and then firms adjust employment acting as wage-takers. Hence, labor demand can be derived from firms' first order condition:

$$W(1 + \mu) = B \cdot f'(l)$$

Since  $f''(l) < 0$ , the labor demand function has the usual negative slope.

The wage rate is set through an asymmetric Nash bargaining whose outcome is the solution of the following maximization problem where the parameter  $\beta$  defines the relative power of workers with respect to employers:

$$\text{Max}_W \beta \log(V - V^o) + (1 - \beta) \log(\Pi - \Pi^o)$$

subject to:

$$W(1 + \mu) = B \cdot f'(l)$$

which is the optimality condition derived from the next stage where firms decide their employment level.  $V$  is aggregate workers utility,  $\Pi$  stands for firm profits, and the superscript  $o$  denotes the outside option. It is usually assumed that  $\Pi^o = 0$  while  $V - V^o$  is defined as:

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

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

This setup can be summarized using the following labor supply (or offer price) schedule:

$$\frac{W}{B} = g(L, \beta)$$

such that  $g_L > 0$  and  $g_\beta > 0$ . A labor market equilibrium, therefore, is characterized by:

$$\frac{f'(l)}{1 + \mu} = g(L, \beta) = \frac{W}{B}$$

For given values of  $\mu$  it is possible to derive a  $SK$  schedule defining a stable relation between  $S_L$  and  $k$  such that:

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

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

When a labor demand shock changes the value of the markup, the  $SK$  schedule is shifted<sup>11</sup>:

for given  $k$ ,  $\frac{\partial S_L}{\partial \mu} = \left( \frac{-1}{1 + \mu} \cdot S_L \right) < 0$ , a downward shift of the schedule occurs when  $\mu$  increases.

But, the labor market equilibrium requires:

$$f'(l) - (1 + \mu)g(L, \beta) = 0$$

For fixed  $K$ , at any given point  $(L; \beta, \mu)$ , we have:

$$\frac{\partial L}{\partial \mu} = \left( \frac{f''B}{K} - g_L(1 + \mu) \right)^{-1} g(L, \beta) < 0$$

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

$$\frac{\partial k}{\partial \mu} = -\frac{f'}{Kf^2} \frac{\partial L}{\partial \mu} > 0$$

$$\frac{\partial S_L}{\partial \mu} = \frac{\partial S_L}{\partial k} \frac{\partial k}{\partial \mu}$$

$$\text{sgn} \frac{\partial S_L}{\partial \mu} = \text{sgn} \frac{\partial S_L}{\partial k}$$

<sup>11</sup>An analysis of variations in  $\mu$  following labor demand shocks is included in Phelps (1994). More recently Ottaviano et al. (2002) and Melitz and Ottaviano (2008) studied the effects respectively of market concentration and openness to trade over the markup level.

normally positive.

Consider now what happens following a change in the value of  $\beta$ . A rise in worker bargaining power increases  $W$  and decreases the employment level  $L$  until labor market equilibrium is restored: for fixed  $K$ , at any given point  $(L; \beta, \mu)$ ,

$$\frac{\partial L}{\partial \beta} = \left( \frac{f'' B}{K} - (1 + \mu)g_L \right)^{-1} (1 + \mu)g_\beta < 0$$

This variation in factor prices  $W$  is associated with a movement along the  $SK$  schedule towards a higher equilibrium value of  $k$ <sup>12</sup>. The final effect on the labor share depends on the sign of  $\frac{\partial S_L}{\partial k}$ , which normally should be positive.

It is worth mentioning at this stage that this medium run set-up was built by Blanchard in order to explain the joint behavior of unemployment and labor share in Continental Europe since the 1970s. As we noted in the Introduction, the decline of the labor share in Europe was preceded by an upward shift during the 1970s. According to Blanchard (1998, p. 3) “The initial increase in unemployment, from the mid-1970s to the mid-1980s, was mostly due to a failure of wages to adjust to the slowdown in underlying factor productivity growth. The initial effect was to decrease profit rates and capital shares. Over time, the reaction of firms was to reduce capital accumulation and move away from labor, leading to a steady increase in unemployment, and a recovery of the capital share.” This story is considered “familiar, and in its broad outlines, not controversial.”

Actually, if the available evidence on  $\sigma$  can be applied also to Continental Europe since the 1970s, *the story could be correct as far as unemployment is concerned, but not for the behavior of factor shares.*

In real world economies adjustment costs are recognized as major determinants of labor share movement<sup>13</sup>. In this context, they are deemed responsible for movements off the  $SK$  schedule which take place in the short run during the transition between two medium run equilibria. An exhaustive analysis of their effects is provided by the influential work by Caballero and Hammour (1998) which introduces 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:

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

<sup>12</sup>From  $k = \frac{K}{Y} = \frac{1}{f(l)}$ , then  $\frac{\partial k}{\partial \beta} = -\frac{f'}{f^2} \frac{1}{K} \frac{\partial L}{\partial \beta} > 0$ .

<sup>13</sup>See Blanchard (1997 and 1998) and Caballero and Hammour (1998).



This expression can be thought as the envelope of many Leontief production functions which represent the ex-post production possibilities of an individual firm.

In the short run, the capital-labor ratio is fixed and a change in factor proportions is possible only over time when new investments replace old vintage capital. Labor demand thus is inelastic and trade unions are given the opportunity to extract rents from the wage setting process.

A simple way to study this setting involves considering how the markup varies if workers bargaining power changes. Denote with  $\bar{l}$  and  $\bar{L}$  respectively the fixed values of the capital-labor ratio and of labor demand. Define then,  $\mu_{sr}$  as the equilibrium short run level for the markup such

that  $\frac{f'(\bar{l})}{1 + \mu_{sr}} = g(\bar{L}, \beta)$ . This implies:

$$\mu_{sr} = \frac{f'(\bar{l})}{g(\bar{L}, \beta)} - 1$$

As  $\beta$  increases (decreases),  $\mu_{sr}$  must decrease (increase) to restore the equilibrium in the labor market. The equilibrium level for the markup thus does not depend in the short run on the characteristics of the demand for the final goods but is determined in the labor market.

Consider now what happens when a labor supply or a labor demand shock hits the economy if we allow for changes in initial labor supplied and differences from labor demand. The dynamics of the labor share during the transition is described by Blanchard (1997 and 1998), if adjustment costs are characterized by a convex function (which approximates the effects of a putty-clay technology), and if the elasticity of substitution between labor and capital is greater than one.

A labor-supply shock causing  $\beta$  to increase reduces labor supply for any given  $W$ . Since the instantaneous labor demand is vertical, the wage rate increases while the profit rate and  $\mu_{sr}$  decrease. For any  $k$  the labor share increases and the economy moves off the medium run  $SK$  schedule. The shift in the relative price of labor persuades the firms to pay the adjustment costs and to adopt a more capital intensive technology. This reduces workers' appropriation possibilities via a reduction in employment  $L$  allowing a recovery in profits.

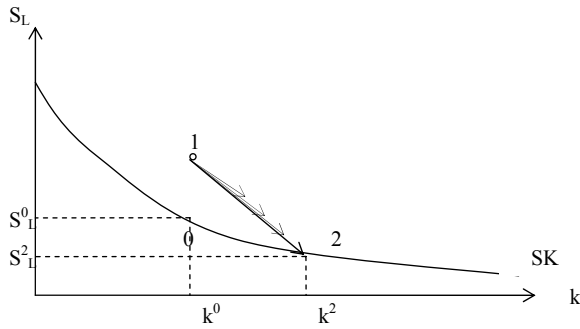
When the capital deepening process is over, the transition ends and the economy is left on the same medium run  $SK$  schedule with a higher capital-output ratio<sup>14</sup>.

This means that if  $|\sigma| < 1$  (as we should expect),  $S_L$  increases, while if  $|\sigma| \geq 1$  the labor share decreases. Opposite effects derive from a reduction in worker bargaining power. The graphs below display the transition from initial to final equilibrium.

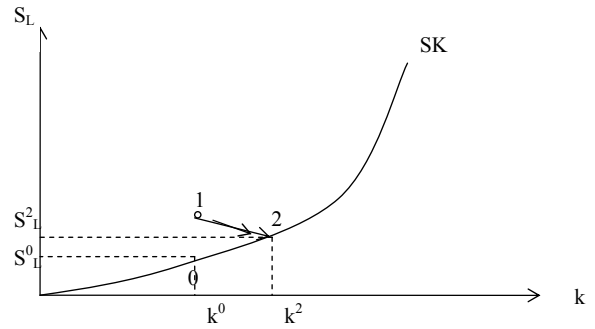
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<sup>14</sup> The final results of this set-up obviously replicate those of the medium-run.

**Figure 1A:  $|\sigma| > 1$ , increase in worker bargaining power**

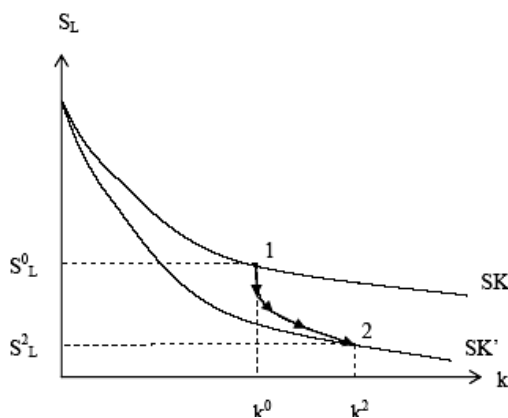


**Figure 1B:  $|\sigma| < 1$ , increase in worker bargaining power**

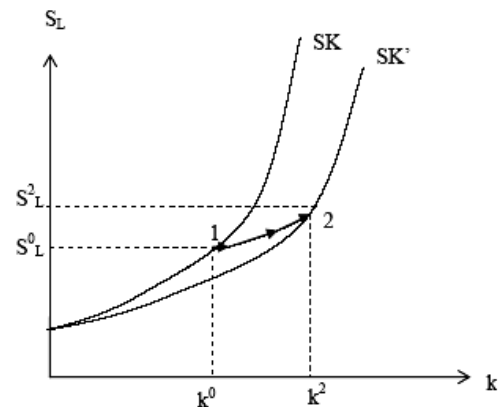


Consider now the case of a shock on labor demand and suppose that  $\mu$  increases. The first effect is a downward shift of the medium run  $SK$  schedule. This implies further that  $\mu_{sr} < \mu$  and firms have the incentive to lower their capital labor ratio in order to reduce rent appropriation by workers. Therefore,  $L$  starts to decrease causing at the same time a decrease in  $l$  and an increase in  $k$ . If  $|\sigma| \geq 1$  during the transition, the increase in unemployment and the decrease in  $l$  cause an increase in the capital share and in the profit rate. The latter element triggers capital accumulation and produces a recovery in employment in the medium run. If  $|\sigma| < 1$ , the decrease in  $l$  triggers capital decumulation and enhances an increase in unemployment. In both cases, the economy ends on a lower  $SK$  schedule with a higher capital-output ratio, and a labor share change that has the sign of  $(1 - |\sigma|)$ . A symmetrical transition process starts when the markup decreases<sup>15</sup>.

**Figure 2A:  $|\sigma| > 1$ , increase in the markup**



**Figure 2B:  $|\sigma| < 1$ , increase in the markup**



<sup>15</sup> Qualitatively similar results are obtained if the putty-clay technology is substituted with different 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 costs introduces a wedge between marginal productivity of labor and the wage which ultimately affects the short run level of the markup. During a recession, the markup is reduced and the  $SK$  schedule temporarily shifts upward, while the opposite occurs during an upswing.

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

The first deals with trade union behavior in the wage setting process. Rowthorn (1999) points out the fact that trade unions are myopic because they do not take into account the effect of wage setting over employment decisions of individual firms. He concludes that their objective function is not well specified.

In his model, based on Layard et al. (1991), trade unions only care about those workers that are considered insiders at the time the bargaining process takes place. This differs with the previous setting where unions maximize the aggregate utility of people who are employed between two rounds of bargaining. A first consequence is that the probability of insider "survival" (i.e. the probability that a worker is not fired by her/his present employer) becomes pivotal in the bargaining process. The results in terms of labor share dynamics, however, do not differ significantly from those obtained in the standard setting if a change in the relative price of productive factors is considered.

The second, concerns the special case of a transition toward a different productive technology, described in a recent paper by Acemoglu (2003), which develops a theoretical model where firms adopt both labor and capital augmenting technologies through R&D expenditures. Firms' decision to invest in innovations which improve the efficiency of either type of factors, depends on the relative prices of capital and labor intensive intermediate goods. The R&D sector generates the relevant adjustment costs.

Under the hypothesis that  $|\sigma| < 1$ , it is possible to characterize a steady state equilibrium where firms invest only in labor augmenting technological change and the value of the labor share is steady. In particular, on a balanced growth path the ratio between labor and capital in efficiency unit is constant and  $\frac{A \cdot K}{B \cdot L} = z$  holds where  $z$  is a positive constant. This is due to the fact that  $A$  does not vary across time while capital and labor in efficiency unit grow at the same rate, implying further that  $l$  and  $k$  are constant.

In this context, capital augmenting technological process is generated only in the transition between different equilibria and produces the expected permanent shift in the  $SK$  schedule. Different perturbations affecting the economy have different effects on labor share dynamics which depend on the type of R&D investments being triggered. This marks a difference with the models considered up until now where adjustment costs only have a temporary effect on the  $SK$  schedule.

In particular, in case of an adverse labor supply shock, the economy moves temporarily along the  $SK$  schedule and then, returns to the initial steady state equilibrium. In the short run, 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 slowing down capital accumulation and providing the incentives for the R&D sector to improve labor stock efficiency. The ratio  $\frac{A \cdot K}{B \cdot L}$  initially jumps because employment is reduced, but immediately after 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.

If a favorable shock hits labor supply, the employment level and the interest rate increase. This supplies the incentives for the R&D sector to invest in new intermediate goods which improve the efficiency of capital stock. Initially, the level of  $k$  drops together with the capital-labor ratio causing a decrease in 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, the growth of the numerator also slows down until it reaches the equilibrium level where labor in efficiency unit and capital stock grow at the same rate. The adjustment process involves a change in  $A$  which shifts the  $SK$  schedule and leaves the economy with a higher employment level and a permanent increase in the equilibrium level of the labor share.

### 3.2 Labor Share Dynamics with Productive Factor Complementarity

The standard neoclassical production function allows the substitution between capital and labor. The adherence of this hypothesis to the conditions of real economies, however, is questioned and suggests the need to analyse in detail also models where factor substitution is not allowed and a  $SK$  schedule cannot be defined.

This strand of literature has mainly focused on labor market regulation which plays a crucial role in income functional distribution specially after the upsurge of new phenomena related to the globalization process. In particular, increased market integration influences firm and consumer behavior and also affects labor share dynamics both directly and indirectly through its interaction with the economy's regulative framework.

An analysis of these factors is made using the general setting introduced by Blanchard and Giavazzi (2003) which describes an economy where monopolistic competition prevails among a

given number of firms which are (randomly) matched with workers. The economy is populated by  $m$  identical firms whose number is fixed in the short run. In the long run, entries of new firms are possible after paying a cost  $c$ , proportional to a firm's output. Firm  $i$  produces the final good  $Y_i$  according to the simple production function  $Y_i = N_i$ , where  $N_i$  is firm employment.

Workers can supply either zero or one unit of labor implying that  $N_i$  measures both total working hours and employment. There are  $L$  workers in the economy. Worker  $j$ 's utility function is given by:

$$V_j = \left[ m^{\frac{1}{\eta}} \sum_{i=1}^m (C_{ij})^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

where  $\eta = \bar{\eta}g(m)$  such that  $g'(m) > 0$  and  $\bar{\eta}$  is constant. This set-up is such that the effect of a larger number of products in equilibrium is shown to work only through the elasticity of substitution between them,  $\eta$ , and thus the demand elasticity for firm  $i$ 's goods.

There are no means of saving and workers spend all their income on consumption. Worker  $j$  earns a labor income equal to  $W_j N_j$  where  $W_j$  is the wage rate and  $N_j$  equals 1 if he/she is employed and 0 otherwise. If worker  $j$  is unemployed he/she receives a variable payment which is a function of the unemployment rate,  $u$ ,  $f(u)$  such that  $f'(u) < 0$ . Nonlabor income  $f(u)P$ , thus decreases in the unemployment rate. Worker  $j$ 's budget constraint then is:

$$\sum_{i=1}^m P_i C_{ij} = W_j N_j + f(u)P(1 - N_j)$$

where  $P_i$  is the price of product  $i$  and  $P$  is a price index defined as follows:

$$P = \frac{1}{m} \left[ \sum_{i=1}^m (P_i)^{1-\eta} \right]^{\frac{1}{1-\eta}}$$

Firms are run by individual entrepreneurs with the same utility function of workers. Income spent for consumption equals the nominal profit earned by firm  $i$ , i.e.:

$$P_i Y_i - W_i N_i = (P_i - W_i) N_i$$

The wage rate paid by firm  $i$  is set every period through bargaining between the entrepreneur and  $\frac{L}{m}$  workers. This is an asymmetric Nash bargaining, where firm  $i$ 's outside option is assumed to be zero and is defined by the following maximization problem:

$$\text{Max}_{W_i, N_i} \beta \log[W_i - Pf(u)]N_i + (1 - \beta) \log(P_i - W_i)N_i$$

This specification corresponds to an efficient bargaining and involves the simultaneous definition of the wage rate and of the employment level. It is possible thus that, if rents are generated in the final goods market where monopolistic competition prevails, stronger workers obtain higher wages without suffering a decrease in employment. In equilibrium, a share  $\beta$  of this rents accrues to firm  $i$ 's employees whose real consumption wage (the wage in terms of the consumption basket),  $W_i/P$ , is:

$$W_i/P = (1-\beta)f(u) + \beta(P_i/P)$$

In the price setting process, firm  $i$ , sets its relative price as:

$$P_i/P = [1 + \mu(m)]f(u)$$

where  $\mu$  is the markup over the reservation wage. The level of  $\mu(m)$  depends on the absolute price elasticity for firm  $i$ 's output which is equal to  $(-\eta)$  and is defined as:

$$\mu(m) = \frac{1}{\bar{\eta}g(m) - 1}$$

implying that  $\mu'(m) < 0$ .

In the general equilibrium for the economy, all firms are identical and  $P_i/P = 1$ , so that:

$$f(u) = \frac{1}{1 + \mu(m)} = 1 - \frac{1}{\bar{\eta}g(m)}$$

Therefore, when the markup increases, unemployment increases as well. Moreover, the following equality must hold:

$$\frac{W}{P} = f(u) + \beta[1 - f(u)]$$

Substituting  $f(u)$  and rearranging the terms gives:

$$\frac{W}{P} = \frac{1}{1 + \mu(m)} + \beta \cdot \frac{\mu(m)}{1 + \mu(m)} = \frac{1 + \beta\mu(m)}{1 + \mu(m)}$$

The size of the labor share thus depends on parameters  $\mu$  and  $\beta$ , and responds to shocks on both the demand for goods and the labor market. A fundamental difference, however, arises between the short and long run because the level of the markup in the latter case is affected also by the total number of firms in the economy.

Blanchard and Giavazzi (2003) focus on a specific class of shocks related to market regulation. Their model, however, is general enough to allow for alternative explanations. In particular, there are three sets of variables which can produce variations in the labor share:

- Globalization / Market integration
- Labor market regulation

- Technology-policy interaction.

Blanchard and Giavazzi (2003) focus on the first two elements and study labor share movements in the long and short run when two different circumstances occur: a reform of the final goods market which produces either higher integration or a reduction in the entry cost faced by potential entrants, and a deregulation of the labor market which reduces workers' bargaining power.

A reform of the final goods market involves a labor demand shock which affects the markup and ultimately the amount of quasi-rents accruing to individual firms for a given level of  $\beta$ . Higher market integration increases competition between domestic and overseas firms and causes a rise in the price elasticity of demand. The parameter  $\bar{\eta}$  increases driving down the equilibrium level of the markup. In the short run this causes a rise in the wage rate, in employment and ultimately in the labor share.

In the long run, however, the equilibrium level of  $\mu$  depends on the entry cost (for given  $\beta$ ). Rents accruing to firms must equal  $c$  in equilibrium due to the free entry condition implying that the number of firms adjusts in order to make the following equality hold:

$$\frac{(1-\beta)\mu(m)}{1+\mu(m)} = c$$

After market deregulation, the number of firms decreases to allow the markup to recover. This causes the labor share to remain unchanged in the long run.

A regulatory intervention that reduces the level of  $c$  however, produces a permanent change in the equilibrium value of  $\mu$ . A permanent increase in the labor share would then follow.

Consider now what happens if labor market deregulation permanently reduces workers' bargaining power and expands firms opportunities to appropriate the quasi-rents generated in the final goods market. In the short run, the wage rate decreases, employment remains constant and labor share shrinks. In the long run, the rise in the profit rate attracts new entrants causing a decrease in  $\mu$ .

The drop in  $\beta$  thus, is completely offset by a lower markup. Total employment, however, increases, as does labor share. A trade-off arises between workers present condition and their future perspectives.

Results qualitatively similar to those produced by a drop in  $\beta$  are obtained if a positive exit option for firms is introduced in the bargaining process. These findings are provided by Jayadev (2007) who adopts a setting based on Mezzetti and Dinopoulos (1991) and focuses on the effects of increased capital mobility.

In this model, capital is again absent and capital mobility is equivalent to firm mobility. The asymmetric Nash bargaining defining the equilibrium wage rate and employment level includes the option to relocate in other countries, a possibility of which firms take advantage if no agreement is reached with workers. The maximization problem is modified accordingly:

$$\text{Max}_{w_i, N_i} \beta \log[(W_i - W_r)^\theta (N_i)^\gamma] + (1 - \beta) \log[(P_i - W_i)N_i - \phi\rho]$$

The parameters  $\theta$  and  $\gamma$  define the weights that trade unions place on employment and wages respectively. The variable  $\rho$  is the return from relocation, and  $\phi \leq 1$  captures the effects of imperfect capital mobility. The chance to migrate enhances the possibilities of the firm to appropriate the rents generated in the final goods market and ultimately reduces labor share<sup>16</sup>. In a slightly different setting where firms detain the right to manage their employment level, Choi (2001) obtains similar results by considering the role of foreign direct investments. FDIs offer more opportunity to increase firm profits abroad and ultimately increase firm bargaining power.

The role of technical progress is investigated by Hornstein et al. (2007) who study the effects of labor-augmenting technical progress when the regulatory framework of the economy produces labor market frictions. This is what they define as technology-policy interaction.

The model combines the assumptions of a Leontief / vintage capital production function and of capital-embodied, labor-augmenting technical progress, with a Diamond - Mortensen - Pissarides matching function for the labor market. In this setting, an increase in the rate of technological obsolescence causes a drop in the labor share through its effects on the Nash bargaining between workers and employers. A reduction in the value of unemployment, i.e. workers' outside option, occurs and simultaneously firms' threat point increases.

Economies characterized by small frictions respond by adjusting the equilibrium wage and the unemployment rate. In economies with sizeable frictions, the adjustment involves mainly quantities causing an increase in the duration of unemployment and a fall in the employment-vacancy ratio. A further effect derives from the age structure of the firms operating in the economy. An increase in the growth rate of technical progress reduces the time span where firms generate profits and shifts the distribution of employment towards younger vintages with smaller labor shares<sup>17</sup>.

### 3.3 International Trade and the Labor Share

<sup>16</sup> This solution requires a constant absolute price elasticity  $\sigma$  as in the standard Dixit-Stiglitz framework.

<sup>17</sup> Firms in their last period have a labor share which equals one.



We shall now consider a crucial determinant of labor share dynamics, i.e. variations in international trade patterns. In spite of its relevance, a clear relationship between international trade and labor share movements is not easily found. Referring to models with increasing returns to scale and imperfect competition or to models which focus on intrafirm differences in productivity and export within industries, we incur in major problems. Quoting Krugman (2008): " 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". Thus, to obtain definite results we shall, confine ourselves to the traditional models of perfectly competitive markets, whatever their merit.

The Heckscher-Ohlin model indeed supplies unambiguous predictions over the determinants of labor share dynamics, if specific hypotheses are introduced. Assuming 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. Increased trade with labor abundant developing countries leads to a decrease in the international price of labor intensive goods and to a reduction in the labor share, as predicted by the Stolper-Samuelson Theorem. The validity of the initial assumption, however, is questioned by many studies starting from Leontief's (1953) seminal contribution.

A wider consensus exists over the statement that developed countries are abundant in human capital and export mainly skill-intensive goods. Less sophisticated goods are imported from developing countries. Several authors studied the effects of fragmentation, offshoring and outsourcing in the production process adopting modified versions of the Heckscher-Ohlin model<sup>18</sup> with the aim of providing a rationale for the observed increase in the wage gap between skilled and unskilled workers. Their results, however, are oftentimes contradictory<sup>19</sup>.

In this context, an increase in international trade causes the labor share of unskilled workers to shrink and that of skilled workers to increase. The net effect on the aggregate labor share thus is ambiguous. As a consequence, a clear insight is not easily derived from these models even though some of them could be re-framed using labor and capital instead. Nonetheless, some results are obtained within the standard Heckscher-Ohlin model, also if the specialization of developed and developing countries are defined in terms of skills.

Consider a simple economy with two sectors, 1 and 2, respectively producing a skill intensive good and a non-skill-intensive good, and two productive factors: skilled ( $s$ ) and unskilled ( $u$ ) labor. International trade leads to the equalization of good prices and more specifically causes the price of skill-intensive good  $p_1$  to increase in developed countries while that of good  $p_2$  to decrease. The reverse happens in developing countries characterized by an abundance of non-skilled workers.

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<sup>18</sup>See for instance, Grossman and Rossi-Hansberg (2006), Arndt (1997), Feenstra and Hanson (1996).

<sup>19</sup>An analysis of this issue is provided by Kohler (2003) whose results help explain the dynamics in the remuneration of different productive factors.

Let us focus now on the adjustments in the labor share of a generic economy due to the effects of international trade. Consider the equations that define the Stolper-Samuelson Theorem<sup>20</sup>. Variations in the world price of each commodity, hence in the unit cost 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. The equations below describe price dynamics, a circumflex over the variable 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 gives the variation in the average wage  $W$  of the economy:

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

Assuming full employment, if  $\hat{p}_1 + \hat{p}_2 < 0$  holds, the aggregate labor share shrinks, if  $\hat{p}_1 + \hat{p}_2 \geq 0$ , the labor share increases.

In developed countries, therefore, 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. In developing countries, in order to have an increase in the labor share, the proportional decrease in the price of the skill-intensive good must be lower than the proportional increase in the price of the other good.

In order to test the reliability of the previous assumptions and of the latter results, a description of the pattern of trade between developed and developing countries is very useful. A recent paper by Krugman (2008) provides an accurate overview of the evolution of trade dividing the last thirty years in three distinct periods.

A good approximation of the international trade pattern in the 70s is a situation where developing countries mainly exported primary and capital-abundant goods, while developed countries specialized in manufactured goods. During the 80s, the share of manufactured goods on total export from developing countries increased and international specialization was 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 the first phase, international trade was characterized by limited volumes and mainly involved countries whose wage gap with developed countries was wide but not extreme. Exports from developing economies moreover mainly involved non-sophisticated goods, i.e. were concentrated in the less skill-intensive sectors.

After the late 90s, a major transformation in the international trade pattern can be observed. Export volumes from developing countries increased steeply and new actors appeared on the scene,

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<sup>20</sup>See Jones and Neary (1984).

China on top of the list, widening the wage gap with developed countries. Furthermore, the sophistication of exported goods increased now also involving skill-intensive sectors, the electronic industry in particular.

This apparently puzzling evidence has given rise to a debate over the true nature of the observed increase in export sophistication of developing countries. A first view supported by Lawrence (2008) considers this information as the evidence of an actual transformation in the pattern of international trade. Krugman (2008) argues on the contrary 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 available data on specialization within industries (in particular vertical specialization), developing countries are taking over labor-intensive portions of skill-intensive sectors. No qualitative change is thus occurring in the pattern of trade between developed and developing economies whose specialization respectively remain in skill-intensive goods and in labor-intensive goods.

Providing a description of the effects of international trade over the labor share is a hard task and requires a considerable simplification of the analysis. Nonetheless, some general conclusions can be drawn based on the description of the trade patterns given by Krugman (2008).

During the 70s, international trade was likely to negatively affect the labor share of developed countries whose abundant factor was capital, while positively that of developing countries. In the following decade, variations in the labor share depended upon the changes in the relative prices of skill-intensive and non-skill-intensive goods. The same relation holds also from more recent dynamics if Krugman's statement regarding the evolution of the trade pattern is deemed correct. In this context the steep increase in the wage gap and in the volumes of trade are likely to negatively affect the labor share of developed countries<sup>21</sup>. If, however, Lawrence's (2008) thesis is adopted, no clear prediction can be derived from the theory.

## **4 Empirical Evidence**

### **4.1 A Brief Overview**

Before attempting an interpretation of the main findings of the recent empirical literature on labor share dynamics, it is useful to consider the evolution of this variable as it emerges from the

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<sup>21</sup> But not necessarily the wage bill, given the likely reduction of surplus labor. Cf. Boggio, 2009.

EU-KLEMS data set. To this aim we provide some figures which display labor share movements both at the aggregate level and for a broad sectoral classification of the gross value added in the most important industrialized countries. By common practice (see Section 2), an adjusted labor share is calculated by imputing a notional wage to the self-employed equal to the average compensation per employee. In order to give a purely indicative measure of the trend, a continuous growth rate is derived regressing the logarithm of each series with a constant and a time trend. The coefficients associated to the latter variable with its standard deviation are reported in Table 1.

Initially, we compared the dynamics of unadjusted and adjusted aggregate labor share in Europe and the U.S. from 1970 (1977 for US) to 2005 (Figure 1). Simple graphic inspection reveals that a declining trend starts in the 1980s both in the EU15 (-0,2%) and in the US, but it is much less severe (-0,08%) and with a clear bump centred in 2000, in the latter case. Adjusted labor shares show clearly the presence of a downward drift and their decline appears steep (-0,4% in EU15 and -0,14% in the US) in both areas. The dynamics in the two regions however, remain quite different.

In order to get rid of the effects of the business cycle<sup>22</sup> and to study the medium run dynamics, we focused on 5-year moving averages for the adjusted labor share. No variations in the observed patterns were recorded (Figure 2). The relative stability of U.S. factor shares is a well known result, noted among others, by Poterba (1997). According to his findings, during the 1990s the rates of return on corporate assets rose while the capital/output ratio declined. Factor shares thus remained quite stable, especially if compared with those of EU countries.

Let us now investigate to what extent a sectoral change can explain the observed decline in the aggregate wage share. Indeed this aspect seems very important to explain such a decline and most of it seems to derive from an increase in the relative size of low labor share sectors compared to the aggregate country value added. A first argument in favor of this interpretation is found comparing the market economy and manufacturing (excluding electrical) labor shares in EU15 and in the US (Figure 3). A picture quite different from that of Figure 1 emerges. In fact, the US manufacturing labor share drops (-0,64%) much more than the European one (-0,17%), which in addition, presents a bump in the first part of the 90s. The reverse is true for the market economy labor share, falling more in the EU15 (-0,3%) than in the US (-0,15%), see Table 1. Services thus play a major role in the diverging patterns of the EU15 and the US, as also confirmed by the country analysis presented below.

A recent paper by Young (2006) points in the same direction, and following the seminal work by Solow (1958), considers the labor shares of 35 US industries. Using data from 1958–1996, by decomposing changes in the time series into the “within-” and “between-industry” and

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<sup>22</sup> Gianmarioli et al. (2002) analyzing EU countries and the US from 1960-1998 find that the labor share varies counter-cyclically.

“covariance” components<sup>23</sup>, reveals that *the stable evolution of US aggregate labor share hides major changes. In particular, the drop in the manufacturing labor share – much larger than the European one – is compensated by the increase in both the share of services in total value-added and their wage share, so that they contribute a 10 percent increase in aggregate labor share.*

According to De Serres et al. (2001) moreover, *the effects of the shifts in the sectoral composition of the economy accounts for a significant portion of the decline in aggregate wage shares of five European countries and of the United States*<sup>24</sup>. The observed downward trend starting in the mid-1980s is partially due to a shift from manufacturing to services; especially the financial, insurance and business services having a relatively low wage share. Similarly, Moral and Genre (2007), decomposing the labor share of the Euro Area using data at a 31 industry level for the period 1980-2004, show that a structural change took place and contributed to the fall in the aggregate labor share. The authors also calculate a counterfactual series resulting from an aggregation of the industry labor shares where corresponding weights are held constant at their 1980 levels. This series presents a less marked decrease again reflecting the increasing importance of low wage share sectors and/or the relative decline of high share sectors.<sup>25</sup>

A further issue that affects the labor share in different industries, but has received little attention in literature, is the relationship between the labor share pattern of manufacturing industries and the evolution of countries’ effective exchange rate, a crucial factor of firms’ competitiveness in globalized markets. Looking at the dynamic of effective exchange rates in Figure 4, a watershed is found in the second part of 1990s, from which a diverging pattern between dollar and euro arises (the dollar /pound exchange rate followed a pattern very close to the dollar/euro one, and afterwards maintained that pattern on average). The initial appreciation of the effective U.S. exchange rate is accompanied by a drop in the manufacturing labor share while the subsequent depreciation of the exchange rate corresponds to a small recovery and to a stabilisation of the trade shares. UE evidence, however, is more ambiguous. It seems quite evident that, as the shift of comparative advantages in the international trade of goods gives rise to winners and losers, also activities such as outsourcing or outward foreign investment could cause net gain or losses for different groups.

Let us explore in more detail the labor share dynamics in seven industrialized countries (USA, UK, Italy, France, Germany, Spain and Japan) and in one newly industrialized country (Korea) adopting a decomposition of the gross value added in Manufacturing (excluding electrical), further disaggregated into its three main subcategories (consumer goods, intermediate goods and investment goods – excluding hightech), Electrical, Market and non Market Services. Figures 5 to

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<sup>23</sup> See also Foster et al. (2001),

<sup>24</sup> Based on that affirmation, the authors warn about the small effect of real wage moderation policies on employment gains and structural unemployment drops, hence their negative impact on labor share.

<sup>25</sup> Confirmed also by the findings of Lawless and Whelan (2007), based on UE data for the period 1979-2001

12 display the corresponding 5-year moving average for each country's labor share (figure 5-12). Table 2 reports the continuous growth rate of each time series (standard error in parenthesis).

Some observations are worth mentioning. First, contrary to conventional wisdom but consistent with previous evidence on exchange rates, the two Anglo-Saxon economies display different labor share dynamics (Figure 5-6). In fact, the fall in the US manufacturing labor share is the steepest in our country sample (-0,64%) while this variable is roughly constant in the UK (Table 2). Moreover, the US negative trend is confirmed also for the consumer (-0,71%) and intermediate goods (-0,78%) sectors, while only in the investment goods sector, labor share appears to be declining (-0,71%) in the UK.

Next, considering countries in the Euro Zone, Italy's manufacturing labor share displays a decline (-0,34%) that is mainly concentrated in the consumer and intermediate goods sectors (-0,48% and -0,45% respectively) see Figure 7. Finally, among other countries, only the labor share of the consumer goods sector in France declines (-0,48%) see Figure 8, while in the remaining cases, manufacturing labor share appears roughly constant or sometimes rising, as in Spain, and in the two Asian economies, Japan and Korea (Figure 9-12). It is striking to find that the declining trend of manufacturing labor share often is heavily affected by its dynamics in the electrical sector, that – we must stress – includes electronics. Almost every country displays a declining trend in this industry, except Germany, UK and Korea. The observed drop is higher than in other manufacturing industries, for example, -1,1% in Italy and -0,8% in the US (Table 2).

The labor share of the service sector, which contributes greatly to the value added of industrialized countries, unambiguously reveals a generalized drop affecting both market and non-market services, with the relevant exception of the US - see above – and the UK (market services). Table 2 displays the fall in the labor shares of the Italian market and non-market service sectors (-0,67% and -0,64%) nearly doubling that experienced in manufacturing. An even steeper decline is recorded in France (-0,73% and -0,77%)<sup>26</sup>.

Azmat et al. (2007) decompose labor share dynamics into 'within' and 'between' industry variations on a sample of eight industrial countries from 1975 to 1998, and find that variations

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<sup>26</sup> The relevance of variations occurring at the industry level is confirmed also by other papers. According to Torrini's (2005a) analysis of the Italian case, from the beginning of the 1990's, the manufacturing capital share shows only a moderate rise deriving from the combined conflicting effects of a modest increase in productivity, more intense competition from abroad, and the wage restraint which followed the 1992 agreements. In the network industry on the contrary, the capital share displays a strong growth, due to privatizations which enhance efficiency without leading to significant declines in a firm's market power.

These findings are confirmed also by Torrini (2005b) who points out that the observed differences among Italian industries, are mainly due to different exposures to international competition. As a result, no industry within the business sector has a fall in profit share higher than manufacturing, while within the non-manufacturing sectors, those of energy, transport and communication, and finance, where privatisation processes were intensified, display a major shift in rent distribution from wages to profits.

Dealing with this issue, Giovannetti and Quintieri (2007) focus on the links between globalization, international specialization, wages and employment in order to explain the main differences between Italy and other industrialized countries. The bulk of the fall in the aggregate labor share, -13% in the period 1977-2003, is due to variations within sectors (6/10) and the rest (4/10) to variations between sectors. It appears that Italian industries in the international markets of traditional goods faced competitors from emerging countries by rising the average value of exported goods. Outsourcing and outward foreign investment however, did not cause an improvement in Italy's sectoral specialization; instead an increase in skilled labor demand is observed for which product upgrading and specific know-how could be likely explanations.

within the manufacturing share of the value added have sizeable effects. There is room, thus, for explaining an important part of the drop in labor share also through industry specific dynamics, particularly in the network industry. By focusing on labor share determinants in industries (electricity/gas, telecommunications, mail and transports), the authors show that privatizations are a major cause of the labor share decline. It appears that the impact of privatizations has more than offset the negative effect on the capital share due to the increase in product markets competition. Finally, as suggested by the results derived from a finer industry disaggregation (Table 2), *variability at the industry level might be a source of the decline in aggregate labor shares as important as country variability*. Lawless and Whelan (2007), using sectoral data from 1979-2002 for sixty sectors and eight countries, show that aggregate changes are coherent with a sector-based explanation more than a country-based one. Two elements work in this direction. First, a (permanent) drop in manufacturing employment in industrial countries is particularly important in sectors more exposed to international competition (OECD 2005, Baldwin 2006).<sup>27</sup> Second, the evidence provided by the IMF (2007), re-inforces the former: “Global Labor Supply” calculated by weighting the working age population in each country by the country’s export share of GDP is now four times greater than in 1980, mainly because of the increasing contribution of China, India and the former USSR.

The effects of FDI on employment dynamics in advanced countries are also studied: firms’ enhanced mobility due to the globalization process represents an effective threat for workers who fear to lose their job, and are forced to accept lower salaries in the bargaining process. The impact of these variables, however, should be modest since FDI flows from North to South are still small (about 4% of Northern domestic investments) as pointed out by Glyn (2006). Moreover, these findings are far from clear-cut<sup>28</sup>.

## 4.2 A Synthesis and an Interpretation of Regression Results

Before presenting the empirical results on labor share dynamics, it is useful to sum up the major features shared by the papers reviewed. Panel regression, even if with different estimation

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<sup>27</sup> The US have recently displayed a decline in service employment - IT sectors included -, increasing the concern about off-shoring activities. However, the evidence for UE countries is mixed (see Giovannetti and Quintieri 2007). According to Baldwin (2006), a crucial role is played by growing international competition between individual workers performing similar tasks in different nations..Hence, the analysis should focus on the degree of “tradability” of services instead of other characteristics such as job skills or educational requirements. Tradability obviously is low for “personal services” in which physical presence and/or face to face proximity with the user is needed.

<sup>28</sup> It appears that during the period from 1983 to 1996, the rise in outward investment in U.S. manufacturing industries caused a reduction in the wage premium that union members shared (Choi, 2001). Harrison and McMillan (2006) find that notwithstanding the overall contraction in US manufacturing employment of multinational firms (both for parents and for affiliate firms), the correlation between employment within multinational firms in the US and abroad is positive when the affiliate is located in high income countries while it becomes negative when the affiliate is located in low income countries. But the findings of Federico and Minerva (2007) on Italy’s outward foreign direct investments (FDI) between 1996 and 2001 for 12 manufacturing industries do not support the conjecture that outward investment is detrimental to local employment growth in the home country.

methods, is the methodology most often used. The most common sample includes industrial countries observed over a time period ranging from 1960s/1970s to the beginning of 2000s. Only a few papers study over a hundred countries – see below. The dependent variables estimated are labor share or its complement to one – the profit share, often adjusted according to the methods described in Section 2. Data is derived from the following data bases: EU-KLEMS, EC-AMECO, OECD STAN and ISDB, UN-NASD and UNIDO. Most of the results concern aggregate labor shares, but few authors focus on data disaggregated by industries (Bentolila and Saint-Paul 2003, Moral and Genre 2007, Hutchinson J. and Persyn D. 2009) or by skills (Daudey and Decreuse 2006, IMF 2007 and Jaumotte F. and Tytell I. (2007), DGE\_EU 2007).

Building on the information derived from the theoretical literature, three main groups of variables are identified representing the main determinants of labor share dynamics: technical progress, globalization, product and labor market regulation. Their actual relevance is assessed on the basis of the findings in current literature. Leaving strictly methodological considerations and variable definitions aside, result robustness is critically tested controlling each paper's availability of average data for multiple periods and instrumented checks.

The rate of technological progress is widely considered as the main factor which contributes to the decline of the labor share, but the evidence for industrial countries is still scant and sometimes indirect. A major drawback is the lack of data which does not allow a direct measurement of the effects of technical progress on capital stock. Equally difficult is the assessment of the impact of interactions between technological advances and capital goods increases, going beyond the information provided by the series of ICT in capital stock. Furthermore, any measurement of the rate of technical progress has to be treated as endogenous. Not surprisingly, a linear time trend is often used as a proxy for the impact of technical progress growth rate on the labor share: its effect is negative and significant when directly estimated (Ellis and Smith, 2007)<sup>29</sup> but very similar evidence is found also when it is adopted as a control variable for more in-depth analyses.

Bentolila and Saint-Paul (2003) - in an influential paper spelling out, as we saw above, the theoretical relationship between capital-output ratio and labor share - study the role of technical progress by means of a disaggregated analysis covering 13 industries and 12 countries over the 1972-93 period. Their findings show that the estimated coefficient of total factor productivity is negative. However, according to their theoretical analysis, if total factor productivity is strictly

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<sup>29</sup> Cf. below what is noted about the findings of Bentolila and Saint-Paul (2003, p. 22), IMF, 2007 and Daudey and Decreuse (2006). Ellis and Smith (2007), by means of the analysis of the profit share in a group of industrial countries (1960-2005), investigate the role of technology by including in their estimates a linear time trend starting in the mid 1980s. This indirect method defines a positive and significant coefficient for the trend in the profit share if certain standard control variables are considered. The coefficient, however, becomes insignificant in the fully-specified model where the interactions between the time trend and product and labor market regulation scores are considered. Among the control variables included in the regression, GDP growth, which is intended to proxy business cycle, has a positive and significant effect on the profit share.



capital augmenting, the associated coefficient must have the same sign of the capital-output ratio; this feature holds for most, but not all sectors. Most importantly, qualitatively similar results are found using a linear trend to approximate technical progress.<sup>30</sup>

In the study of European Commission 2007<sup>31</sup> if ICT variables are included among the regressors and the labor share is disaggregated by skills, technology together with the capital to labor ratio explains the bulk of the decline in the labor share. According to IMF, 2007<sup>32</sup> non-linear effects of ICT are required, because of the non-linearity of learning requirements and robustness improves if the ICT share of investments is used instead of the capital stock, but again the coefficients become insignificant when time trends - whose effects on the labor share are negative - are added.

Moral and Genre (2007) using different proxies for technology<sup>33</sup>, support the view that technical change has a negative and significant impact on labor share.

A complete description of the effects of technology, however, should not overlook the different role played by (lagging) labor productivity on the wage share, before and after the mid 1980s, because its impact is first positive and then negative (Guscina, 2006).<sup>34</sup> These results are robust to the use of average data calculated on different time periods. Therefore, as confirmed in other papers based on Bentolila and Saint-Paul (2003), technical change appears to shift from a labor augmenting type to a capital augmenting one after the mid 1980s.

Dealing with globalization, one wonders if, contrary to the conventional wisdom, trade variables played an important role in explaining the fall in labor share. This remark is particularly surprising because trade series are available for most countries and suffer from less drawbacks than data on technical change. Descriptive statistics on declining labor shares and on trade variables suggest a possible reason why the empirical evidence is so scant; the timing of the change in trends of these two sets of variables is in fact, a major problem. In general terms, the trade share with

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<sup>30</sup> Other studies followed Bentolila and Saint Paul (2003) introducing the capital/output coefficient in their regression. Daudey and Decreuse (2006) focused on data from 11 countries for the 1970-2000 period, they found a negative and significant parameter associated to the capital to output ratio in an aggregate specification. However, the result is not robust to the inclusion of time dummies and of an index of R&D investments, suggesting that time dummies may proxy technical change better than the capital to output ratio. Furthermore, Hutchinson J. and Persyn D. (2009), which unusually estimate a first difference panel OLS with country-industries fixed effects and year dummies for the 1980-2001 period, found the same negative and significant sign for the capital-output ratio log and for total factor productivity coefficients.

<sup>31</sup> European Commission (2007) analyzes the effects of technology for 11 European countries, Japan and USA over the 1960-2006 period; the coefficient of the ICT use log is negative but not significant in the aggregate specification. It turns out statistically significant after disaggregating the labor share by skills. Its coefficient is negative for low-skilled workers and positive for the high-skilled. The coefficient absolute value is greater in the first case. Variations in the log of the capital to labor ratio are always statistically significant, with a positive sign for the labor share of medium and high skilled workers (and also for the total) and a negative sign for that of the low-skilled.

<sup>32</sup> IMF (2007) studies the labor share of 18 countries over the 1982-2002 period (see also Jaumotte F. and Tytell I. (2007) for qualitatively similar results). Adding ICT capital and ICT capital squared among the regressors, it turns out that the effects of technical progress on labor share are non-linear because of the non-linearity of learning requirements. The robustness of ICT coefficients is improved if they are measured as a share of total investments instead of capital stock. Nonetheless, the effect of technology remains negative, and has a smaller impact in advanced sectors. The labor to capital ratio coefficient is positive and significant only in the specification with fixed effects that excludes labor market variables, and has an elasticity of 0,055. But it is not significant in the instrumental variable specification.

<sup>33</sup> Approximated by ICT capital services, R&D investment (%GDP) or number of patents.

<sup>34</sup> To disentangle the effects of technical progress before the globalization/ITC-revolution era and after, in his most sensible estimate, the author splits the time series in two periods using year 1985 as the pivotal date. Before 1985 a 1% increase in lagged productivity per worker increased the labor share by around 0,35 %, while after 1985 there was a 0,24% decrease. Including self-employment, the respective changes in the labor share amount to 0,29% and -0,11%. The effect is even stronger when increases in (current) productivity per worker are considered. The use of lagged productivity and robustness checks (especially realized through the analysis of five period averages) is justified by the role played by technical change in the definition of labor share dynamics.

emerging economies started its upward trend in the 1990s. The positive trend in the profit share, and the corresponding declining trend in the labor share began in the 1980s.

Different results are found using different proxies for openness. Splitting the sample at the mid eighties, as in Guscina (2006), reveals further that the impact of the trade to GDP ratio on the labor share becomes significant and negative only after 1985. Adjusting the labor share to account for self-employment, returns a negative and significant coefficient also in the first period, but causes the ratio of trade to GDP to have a lower impact in the second period.<sup>35</sup> The degree of openness to trade of the euro area with respect to non-EU 15 countries seems not to be robust to alternative specifications in Moral and Genre V. (2007), as well as for the 11 countries considered by Daudey and Decreuse (2006). According to the results of Ellis and Smith (2007), an appreciation in the real effective exchange rate enhances the profit share. Moreover, as expected, the impact of relative export and import prices on labor share are respectively negative and positive (IMF, 2007). The impact of off-shoring on the aggregate labor share is negative and significant. Quite surprisingly, when disaggregating by skills, this result is confirmed for skilled labor only. Immigration moreover, is found to have a negative impact (IMF, 2007).

The empirical evidence concerning product and labor market regulations appears quite inconsistent because, among the independent variables tested, only a few are statistically robust and display the expected sign. In this context, it is worth mentioning that bargaining variables have strong interactions with technical progress proxies as emerges from panel regression results. In fact, the sign and statistical significance of the coefficients often depend on the proxy used for technical change. These findings probably suffer from problems of multicollinearity and endogeneity among independent variables and from a lack of instrumented analysis.

The impact of employment protection on the labor share, when significant, is positive but small in Guscina (2006), while it is positive and significant in all specifications in Moral and Genre (2007). Adopting disaggregation by skills results in a negative and significant effect in all cases for high-skilled labor; whilst it is only barely significant for low-skilled labor (European Commission (2007)). What is more surprising, however, is that in Ellis and Smith (2007) the impact of employment protection legislation on the profit share is positive and significant. Moreover, both European Commission (2007) and IMF (2007) find a negative and significant impact of unemployment benefits on the labor share, although its impact is found small in the second paper. However, the effect of minimum wage legislation on the aggregate labor share is positive and significant in Daudey and Decreuse (2006).

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<sup>35</sup>For a 1% increase in trade openness, the labor share declines 0,14% after 1985. If the self employed are considered, the coefficient turns out to be negative and significant before 1985 (-0,21), with its value decreasing in the second period (-0,17). These results do not provide much support to the argument of a globalization driven reduction of the labor share, coherent with the standard Hecksher-Ohlin explanation.

As for the effects of union density, they are not significant in European Commission (2007), while in Daudey and Decreuse (2006) the impact of the degree of unionization is positive and significant. In Moral and Genre (2007), union density has a positive and significant effect only when using ICT capital services as a proxy of technical change. What is more puzzling however, is that, according to European Commission (2007), its impact becomes negative and significant for low-skilled workers, and positive but not significant for medium and high-skilled agents as well as for the aggregate.

Product market regulations show mixed effects. An increase in its strictness lowers the income share of the high-skilled workers and raises the income share of the low and medium-skilled workers – albeit not very significantly in the case of the medium-skilled workers. The net effect of an increase in the strictness of product market regulation on the aggregate labour income share is positive, but not very significant (European Commission (2007)). In Ellis and Smith (2007) the product market regulation score negatively affects the profit share but its coefficient is not significant. Excluding the terms of interaction the impact becomes positive and statistically significant.

The previous findings concern industrial countries and require to be complemented by more evidence covering a larger sample of countries. This should provide a better description of the impact of globalization variables. In this context, data limits concerning technical change and labor market bargaining force us to mainly focus on the effects of trade variables. Notwithstanding the previous caveat, the following findings are worth being noticed. Descriptive statistics on the labor share of developing countries have recorded a decline over the past three decades. According to Harrison (2002), developing countries experienced a yearly 0.1 point decrease in labor share from 1970 to 1993 and a 0.3 point decrease from 1993 to 1996. For all countries in the sample, however, the main labor share determinant is the rise of capital stock relative to the labor force, interpreted as a proxy for the level of development (Harrison 2002).<sup>36</sup>

Developing countries have become increasingly open to foreign trade and to capital flows over time. The impact of trade openness is negative, as proven by the negative correlation between the share of trade in GDP and labor share, and is magnified in poorer countries (Ortega and Rodriguez 2002, Rodrik 1998, Harrison 2002). A negative impact on labor share is also found for

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<sup>36</sup>In a recent paper (Jayadev, 2007), the GDP per capita log is found to have a positive and significant effect on the labor share. It surprisingly accounts for a large part of the variance of the sample. Ortega and Rodriguez (2002) in their cross-country analysis find that from the beginning of 1990s, a statistically negative correlation between capital share and per capita income exists. These results based on survey data are consistent with the evidence derived from national accounts. Among control variables, drops in government spending are found to have a negative effect on labor share as well as large devaluations in the exchange rate (Lee and Jayadev 2005, Harrison. 2002).

foreign direct investment (Harrison 2002) and for the stock of inward FDI in percentage of GDP for most LDCs (Decreuse B. and Maarek P. 2008).<sup>37</sup>

Rodrik (1997) argues thus, that globalization increases the relative mobility of capital vis-à-vis labor. As the empirical evidence shows, capital account openness deteriorates the labor share because it reduces workers' bargaining power. Its net effect results from the interaction between 'direct effects' such as outsourcing, global production sharing and the threat of capital flight, and 'indirect effects' due to the increase of elasticity in labor demand. As a consequence, the economy faces larger variations in wage and employment when a demand or a productivity shock occurs. Countries without effective capital account restrictions display lower wages (Rodrik 1998). A positive effect on labor share results, however, from capital controls (Lee and Jayadev 2005). In the end, capital mobility in general appears to reduce labor share – except in low-income countries where the positive effect is not significant (Jayadev, 2007).

Some additional evidence for developing countries stresses the relevant role played by the crises that followed the capital account liberalization of the 1990s. Such episodes appear to strengthen the distributional struggle against labor, enhancing the decline in the wage share (Diwan 2001, Onaran 2005).<sup>38</sup>

### 4.3 Concluding Remarks

Let us here try to highlight the main findings of the previous review of econometric works. First, there is evidence showing a negative and significant impact of technical change on labor share; but often qualitatively similar results are found using a linear trend to approximate technical progress.

Second, a negative effect of globalization variables on labor share is clearly brought out for developing countries, whilst it is not as clear for advanced countries since the results' robustness changes if different proxies are used. One possible reason for this paradox is the existence of a ten-

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<sup>37</sup>Foreign direct investments are found to have a negative impact on the labor share (Harrison, 2002). To assess the role played by FDI on income distribution in developing countries, Decreuse. and Maarek (2008) analysed a panel of countries whose GDP per capita was 60% or less than that of the US in 1980. They analysed the impact of the stock of inward FDI in percentage of GDP in the manufacturing sector. Using fixed effects with time dummies and controls for endogeneity and autocorrelation bias as well as different proxies for globalization, a non monotonic relationship is found between the labor share and the ratio of FDI stock to GDP. This supports the hypothesis that two opposing effects derive from *inward* FDI: a negative one due to market power and technological advance and a positive one due to increased competition between firms in the labor market. Nevertheless, the threshold above which labor shares start increasing with FDI is too high to include other countries beyond Hong-Kong, Ireland, Macao, and Singapore. The impact of FDI however, is quite large: an increase of one standard deviation in the ratio of FDI on GDP for a country having a mean value of this ratio implies a fall in the labor share between 4% and 7.5%.

<sup>38</sup>Firstly, Diwan (2001) points out the strong negative impact of exchange rate crises on the labor share, defined as a situation where within a year the nominal exchange rate depreciates by 25%. He warns against the long lasting effects of the decline, after the peak of the crises, which causes the labor share to remain below its average in the following years. This negative effect moreover, appears to be cumulative if crises are repeated, resulting in a permanent drop of the labor share.

Next, Onaran (2005) considers the evolution of the manufacturing wage share in ten developing countries. His results reveal a long lasting effect of crises in all countries which cause a fall in labor share whose magnitude is much larger than the decline in GDP. Contrary to GDP dynamics, in most countries the labor share remains below its previous level after the crisis, even though the expected reduction in unemployment does not occur. These findings seem to confirm that the link between increased capital mobility and stagnation in aggregate demand enhanced by tight fiscal and monetary policies, can shift the bargaining power against labor and produce cycles that increase the frequency of crises.

year lag between the beginning of the declining trend in the labor share and the rising trend of globalization.

Finally, product and labor market regulation issues have mixed effects on the labor share because among the independent variables tested, only a few are statistically robust and display the expected sign. A major problem in this context arises due to the strong interactions of bargaining variables with technical progress proxies.

We also notice the rather surprising fact that unemployment is almost completely absent among the explanatory variables of the labor share used in the econometric works we surveyed<sup>39</sup> in spite of its obvious impact on workers bargaining power, hence on their wage demands and eventually their income share. A reason certainly is that unemployment is itself affected by the wage share. As is well-known, the neoclassical explanation of this causal link is rather simple: given a neoclassical production function, a higher (lower) wage share implies lower (higher) labor demand. But, other possible explanations exist within the context of a Leontief-type production function: first, the rate of accumulation, hence the level of employment, are inversely related to the wage share; second, if imperfect competition prevails on product markets, a wage share increase shifts the optimum to a position where less output is produced and less employment is demanded.

Another fact to be stressed is that a clear explanation of labor share's behavior in OECD countries (see Figure 13), that is rising in the 60s and 70s, and declining afterwards, is difficult to derive from the econometric work surveyed.

In view of these observations, we shall follow a different approach to the problem: taking Blanchard (1998) as a starting point, we shall try to understand the process of interaction through time between unemployment and labor share.

Let us again consider Blanchard's description of the behavior of unemployment and labor share in continental Europe. For the reader's convenience, we will repeat the description, which according to Blanchard (1998, p.3) – is considered “familiar, and in its broad outlines, not controversial”: “[t]he initial increase in unemployment, from the mid-1970s to the mid-1980s, was mostly due to a failure of wages to adjust to the slowdown in underlying factor productivity growth. The initial effect was to decrease profit rates and capital shares. Over time, the reaction of firms was to reduce capital accumulation and move away from labor, leading to a steady increase in unemployment and a recovery of the capital share.”

We objected to the last sentence since Blanchard's (1998) model was based on a neoclassical production function; given that the elasticity of substitution is probably less than 1, the second alleged effect, namely “a recovery of the capital share” cannot take place. But, as noted

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<sup>39</sup> The only paper using unemployment is Daudey and Decreuse (2006) but only as a control variable.

previously, different causal links, expressing the effect of unemployment on wage share, can replace a neoclassical production function.

We suggest that Blanchard's description is useful in understanding what happened to wage shares and unemployment in the whole of OECD countries. To this end, we borrowed Figures 13 and 14 as they are similar to those proposed by Blanchard but refer to the wider group of countries. They lend themselves to the same interpretation given by Blanchard for the smaller group. During the 60s and 70s – in presence of low unemployment – the wage share was rising, but the reaction of firms caused an increase in unemployment that during the 80s reached a much higher level and was maintained afterwards; as a consequence, the wage share since the mid-70s has been declining.

The difficulty of disentangling this two-way simultaneous causation – together with the medium-long term nature of the phenomena – is probably what in our case made the econometric work rather deceiving vis-à-vis the main questions it confronted.

We must also remark that trying to explain labour share behavior without introducing unemployment is almost like playing Hamlet without the Prince. Future research should try to re-establish the full set of the “play's” characters.

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## Tables and Graphs

Table 1

	Total labor share	Total adjusted labor share	Manufacturing adjusted labor share	Market Economy adjusted labor share
EU15	-0.002244 (0.000268)	-0.003605 (0.000220)	-0.001742 (0.000353)	-0.003021 (0.000217)
USA	-0.000799 (0.000284)	-0.001393 (0.000256)	-0.006441 (0.000488)	-0.001530 (0.000357)

Table 2

	Manufacturing	Excluding	Electrical		Electrical	Services	
	Manufacturing adjusted labor share	Consumer adjusted labor share	Intermediate adjusted labor share	Investment adjusted labor share	Electrical adjusted labor share	Market Ser. adjusted labor share	Non-Mkt. Ser. adjusted labor share
USA	-0.006441 (0.000488)	-0.006111 (0.000696)	-0.007764 (0.000762)	-0.003152 (0.000980)	-0.008364 (0.001140)	0.000613 (0.000344)	-0.000167 (0.000182)
UUK	-0.000791 (0.000761)	0.000591 (0.000642)	0.002127 (0.000865)	-0.007111 (0.001161)	0.001504 (0.001565)	0.001697 (0.000825)	-0.004532 (0.000587)
ITA	-0.003384 (0.000585)	-0.004779 (0.000777)	-0.004544 (0.000692)	0.001268 (0.000770)	-0.011191 (0.000892)	-0.006718 (0.000541)	-0.006360 (0.000526)
FRA	-0.000260 (0.000420)	-0.004810 (0.000724)	-0.000314 (0.000447)	0.005114 (0.001411)	-0.000490 (0.000587)	-0.007297 (0.000533)	-0.007712 (0.000525)

GER	0.001459 (0.000514)	0.000602 (0.000464)	-1.61E-05 (0.000743)	0.003077 (0.000574)	0.000830 (0.000607)	-0.003247 (0.000437)	-0.005412 (0.000300)
SPA	0.003339 (0.001192)	0.004166 (0.001146)	0.006433 (0.001464)	-0.005765 (0.001207)	-0.010785 (0.000686)	-0.004514 (0.000357)	0.004180 (0.000757)
JAP	0.001941 (0.000874)	-0.001610 (0.000962)	0.002215 (0.001202)	0.005267 (0.001060)	-0.007112 (0.000990)	-0.001826 (0.001143)	-0.009683 (0.000898)
KOR	0.002810 (0.000951)	0.005270 (0.001548)	-5.16E-05 (0.001032)	0.006578 (0.000739)	3.98E-05 (0.001681)	0.002247 (0.001086)	-0.007402 (0.000853)

Figure 1

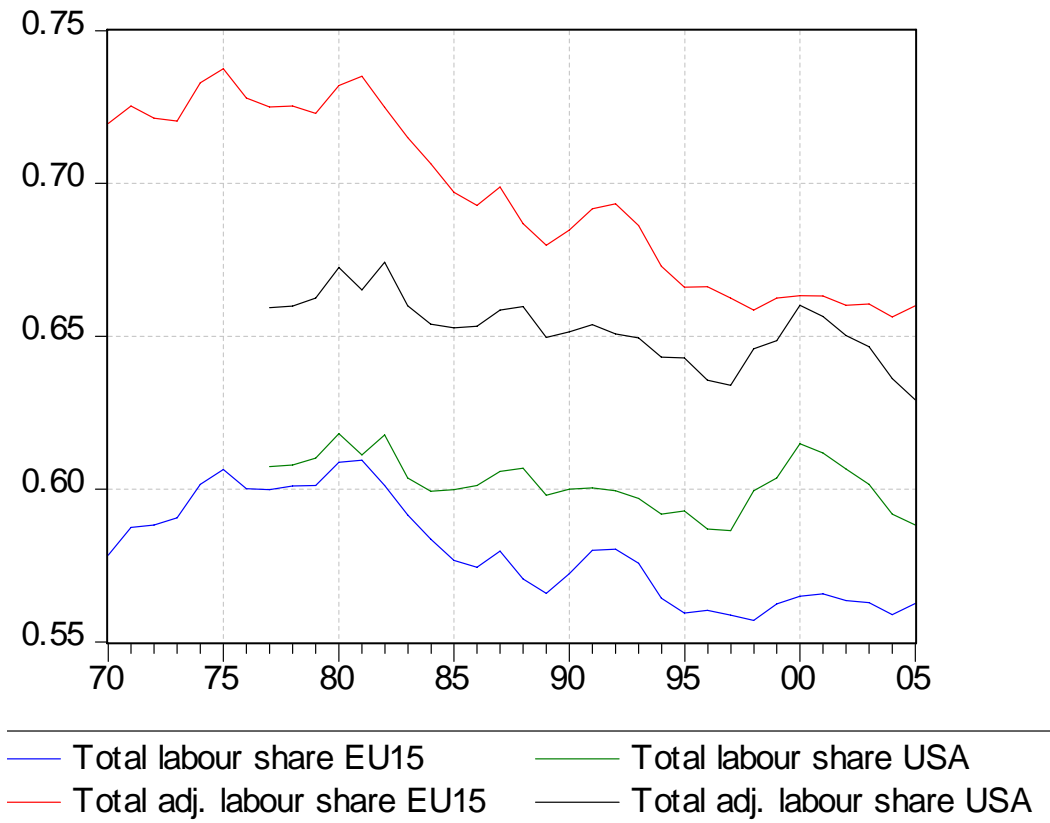


Figure 2

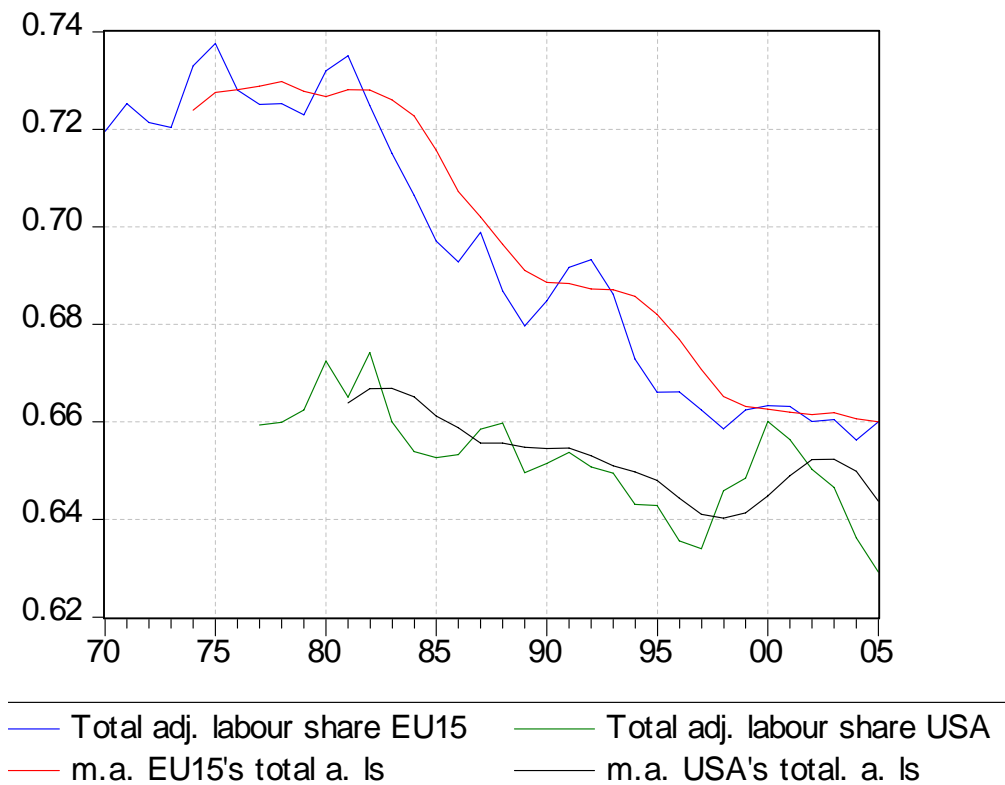




Figure 3

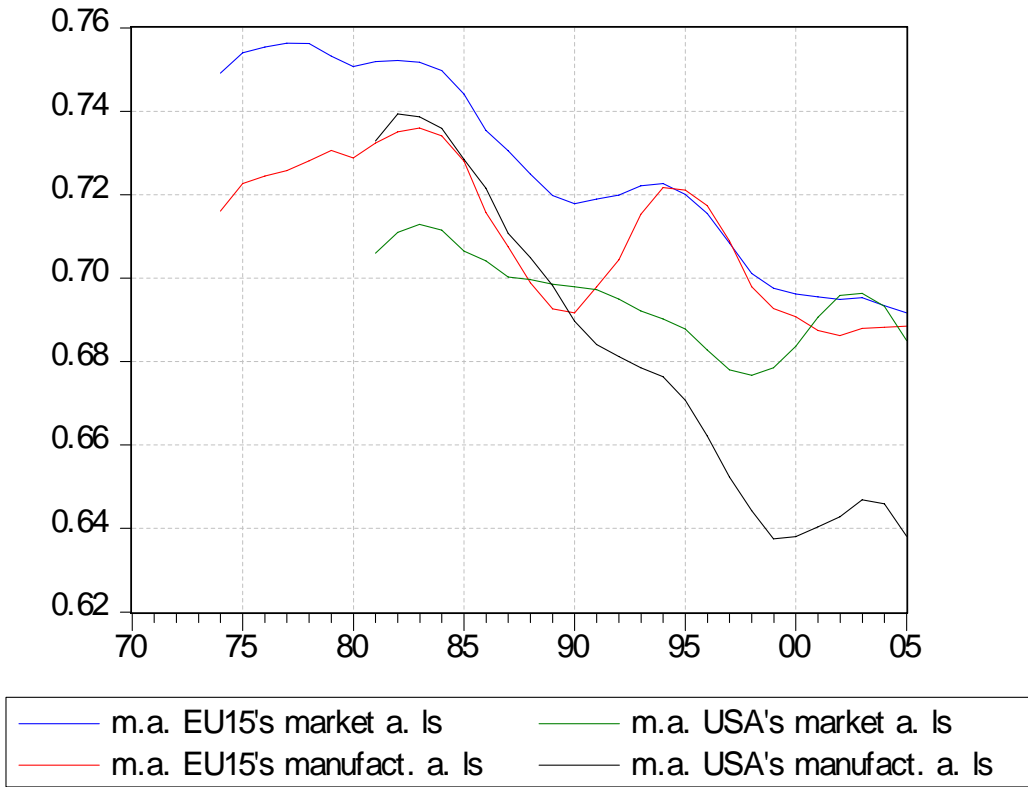
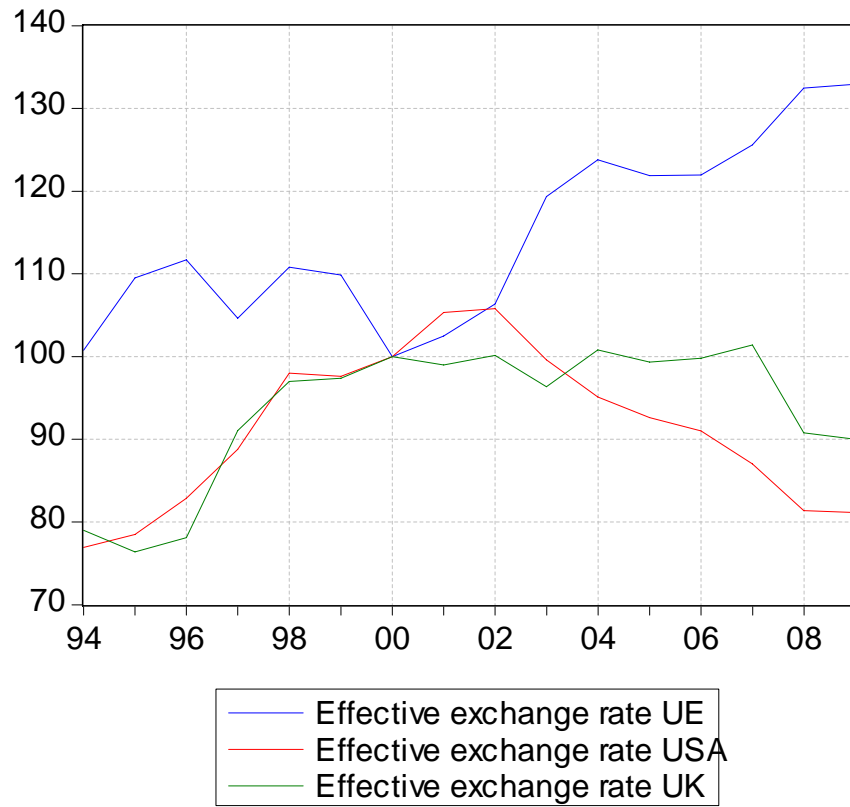


Figure 4



Source: OECD Economic Outlook (2008), 83,1. Effective exchange rates, indices 2000=100, average of daily rates. (estimates 2007-2009)

Figure 5

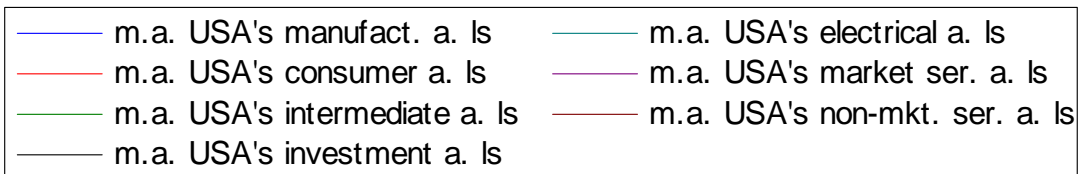
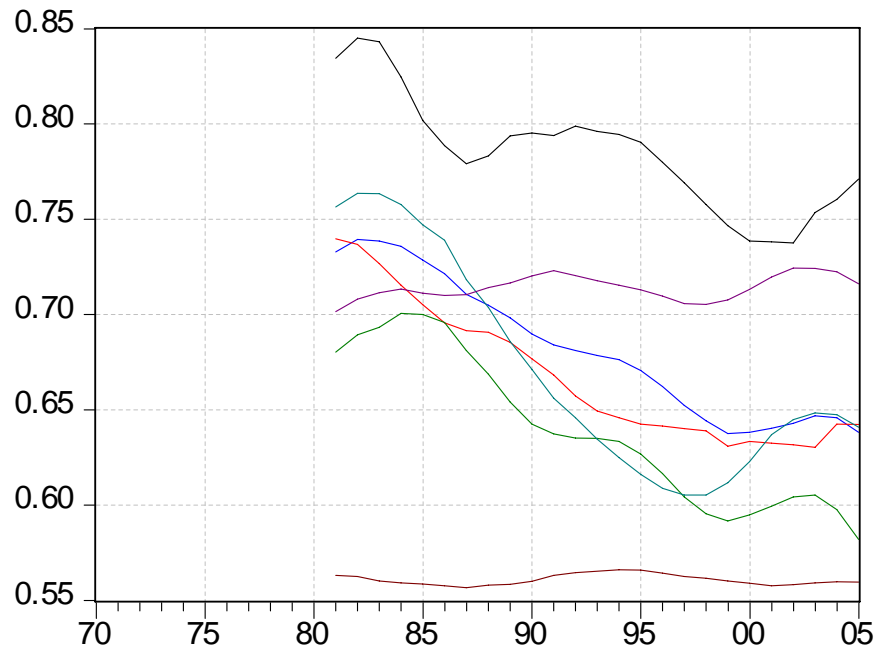


Figure 6

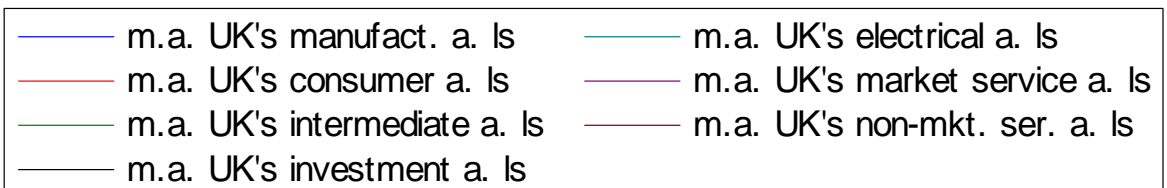
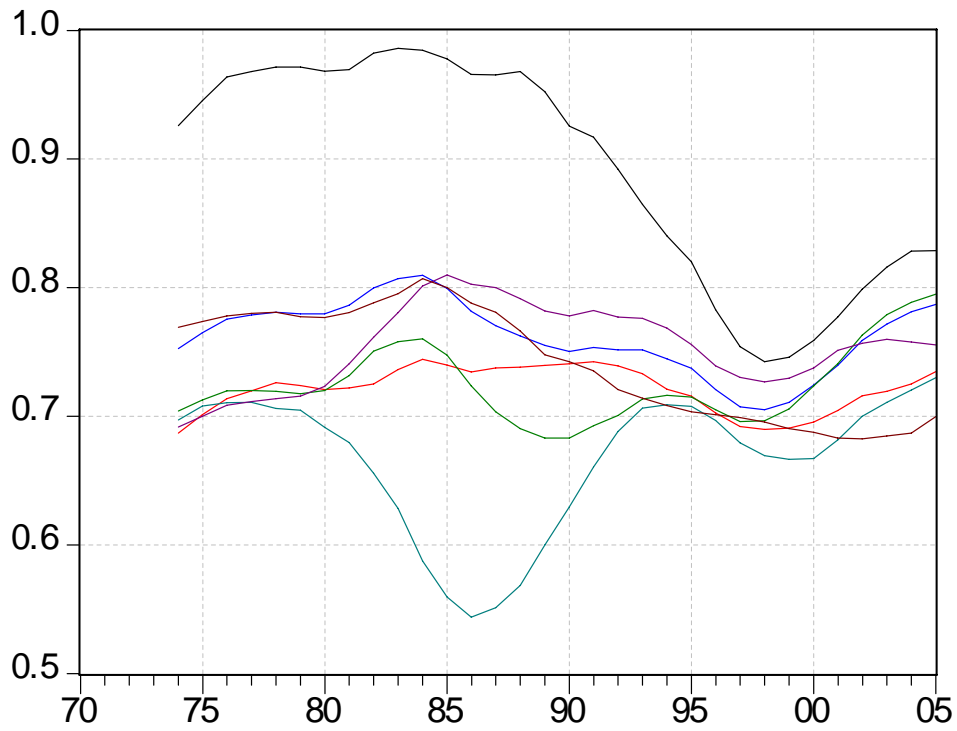


Figure 7

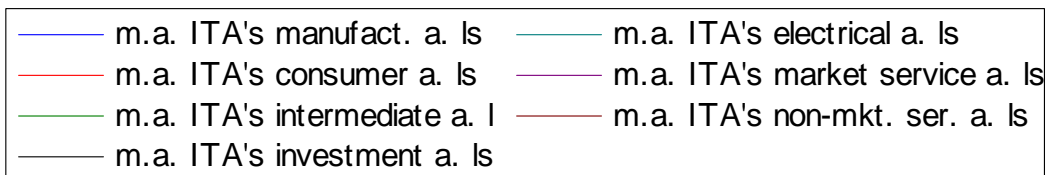
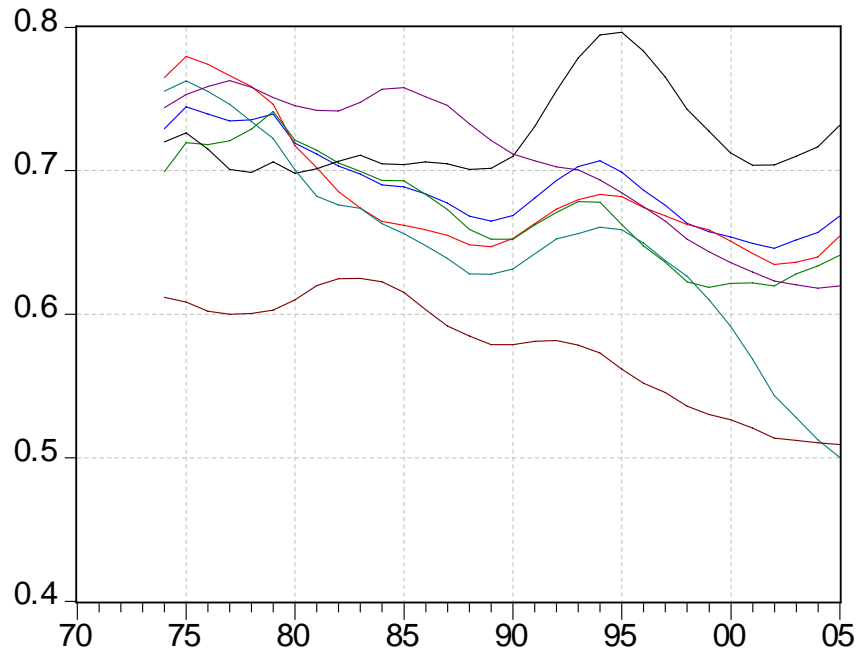
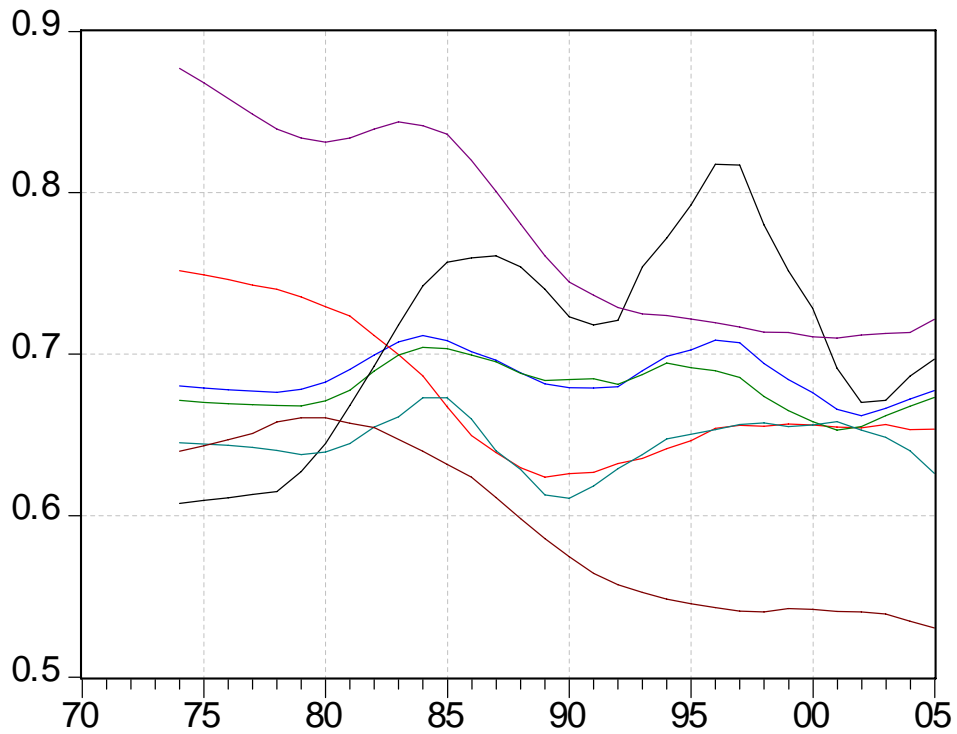
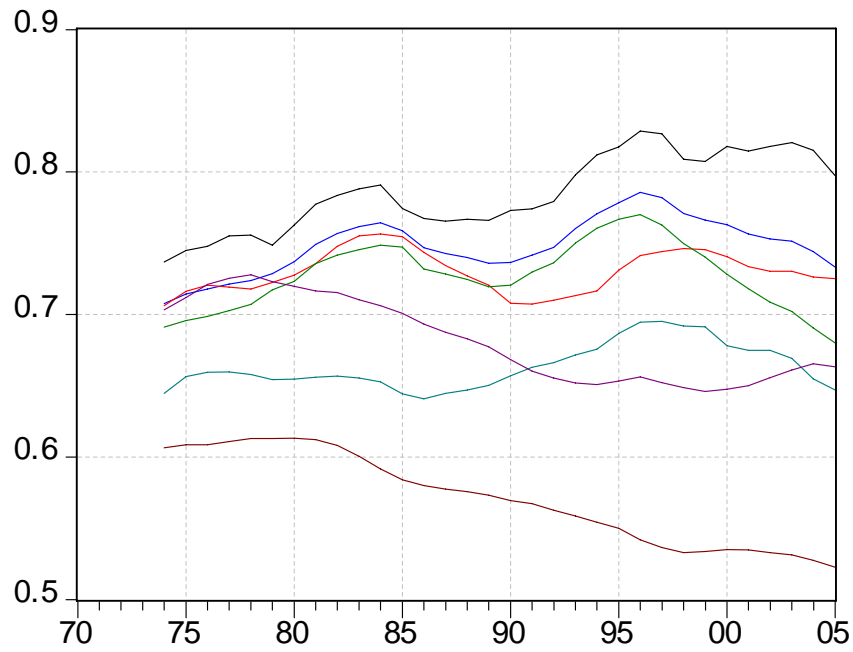


Figure 8



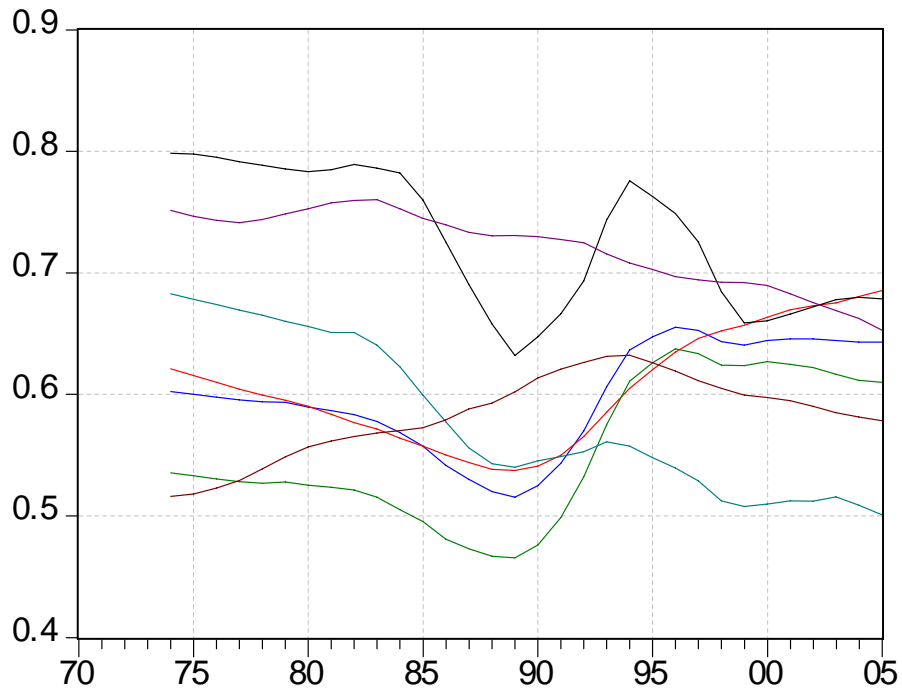
- m.a. FRA's manufact. a. ls
- m.a. FRA's consumer a. ls
- m.a. FRA's intermediate a. ls
- m.a. FRA's investment a. ls
- m.a. FRA's electrical a. ls
- m.a. FRA's market service a. ls
- m.a. FRA's non-mkt. ser. a. ls

Figure 9



- 
- m.a. GER's manufact. a. ls
  - m.a. GER's consumer a. ls
  - m.a. GER's intermediate a. ls
  - m.a. GER's investment a. ls
  - m.a. GER's electrical a. ls
  - m.a. GER's market service a. ls
  - m.a. GER's non-mkt ser. a. ls

Figure 10



- 
- m.a. ESP's manufact. a. ls
  - m.a. ESP's consumer a. ls
  - m.a. ESP's intermediate a. ls
  - m.a. FSP's investment a. ls
  - m.a. ESP's electrical a. ls
  - m.a. ESP's market service a. ls
  - m.a. ESP's non-mkt. ser. a. ls



Figure 11

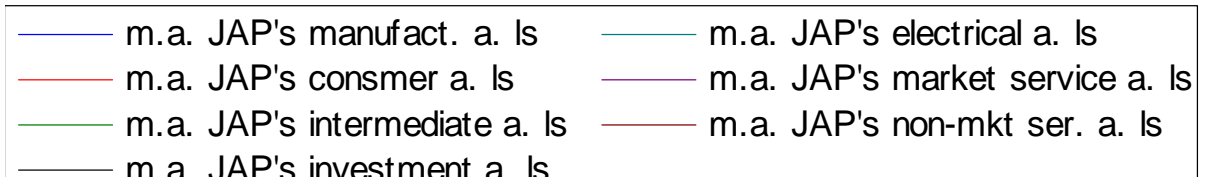
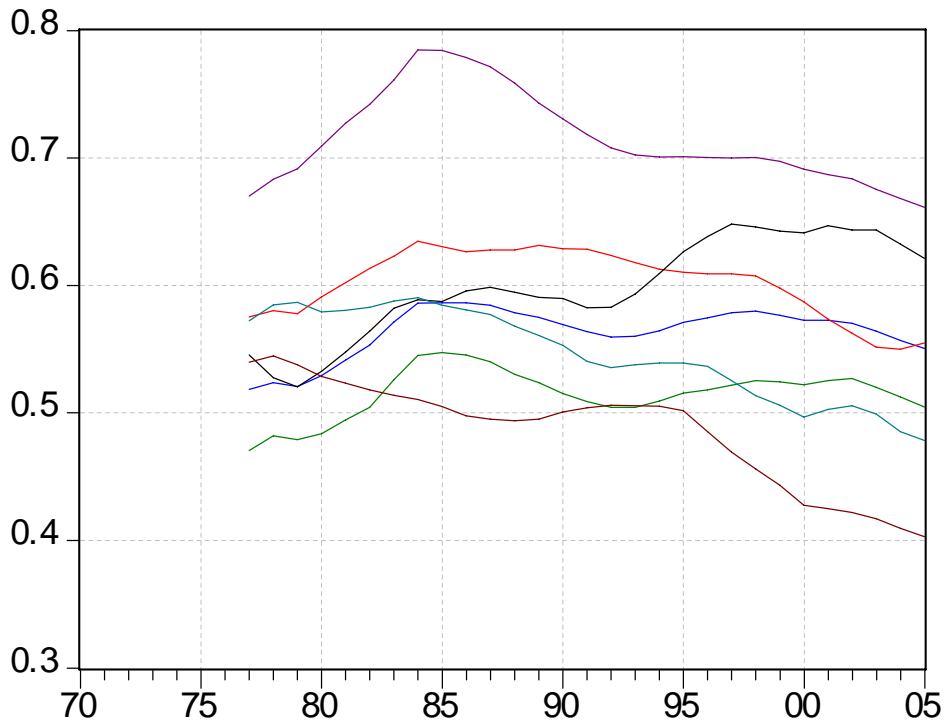
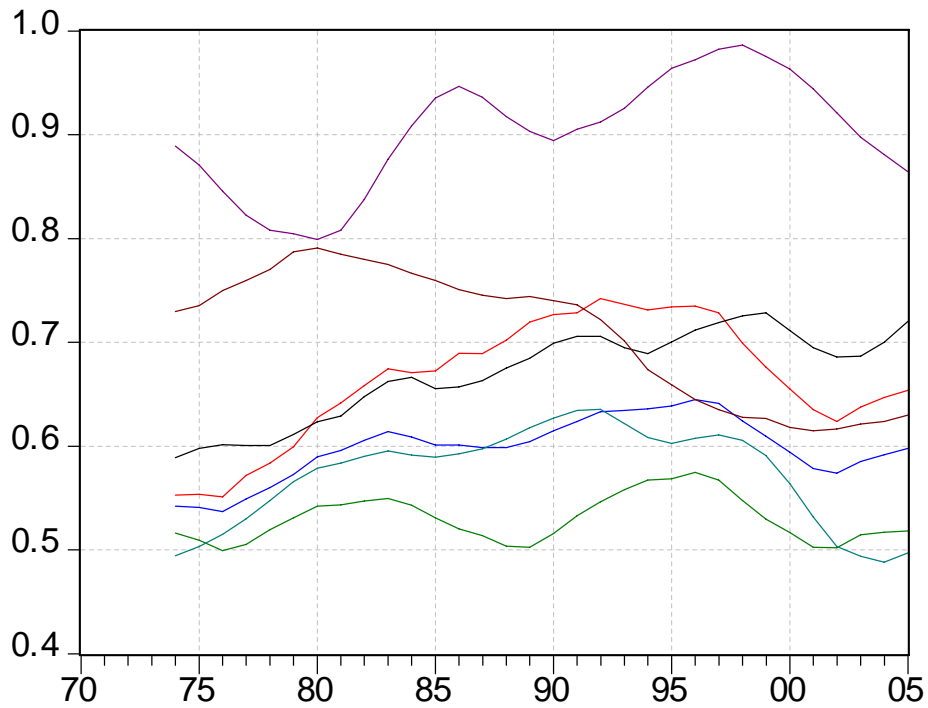
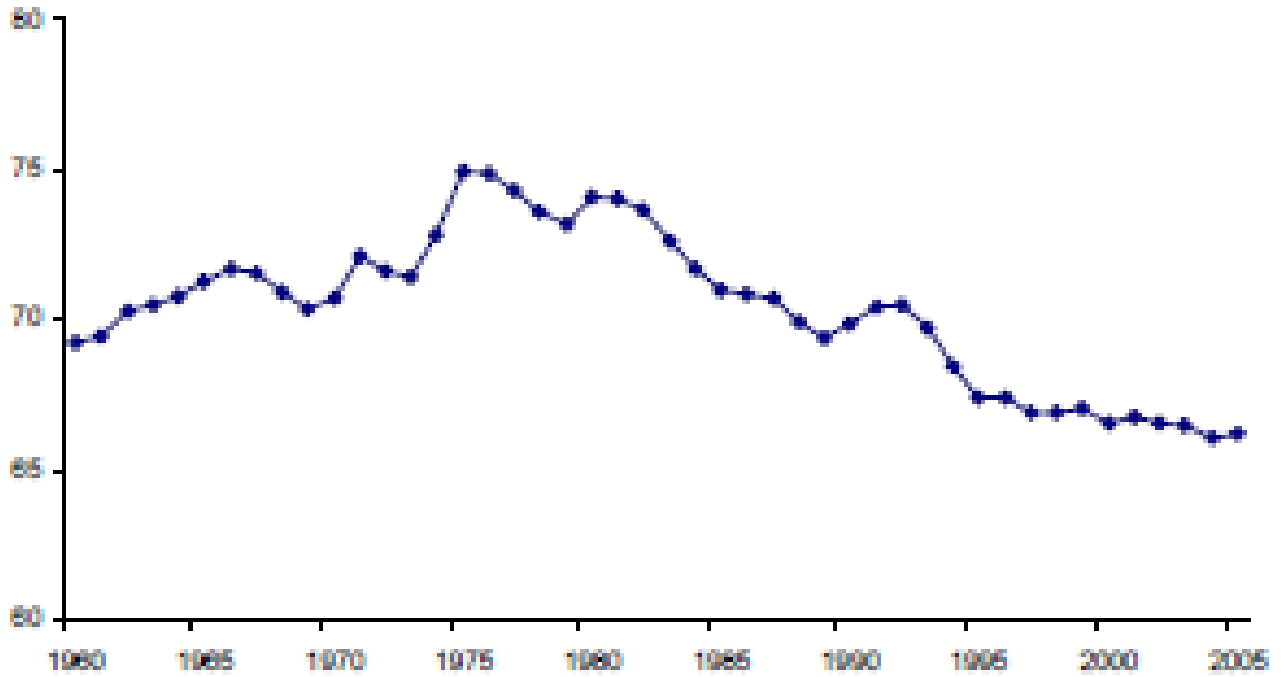


Figure 12



- m.a. KOR's manufact. a. ls
- m.a. KOR's electrical a. ls
- m.a. KOR's consumer a. ls
- m.a. KOR's market service a. ls
- m.a. KOR's intermediate a. ls
- m.a. KOR's non-mkt ser. a. ls
- m.a. KOR's investment a. ls

Figure 13

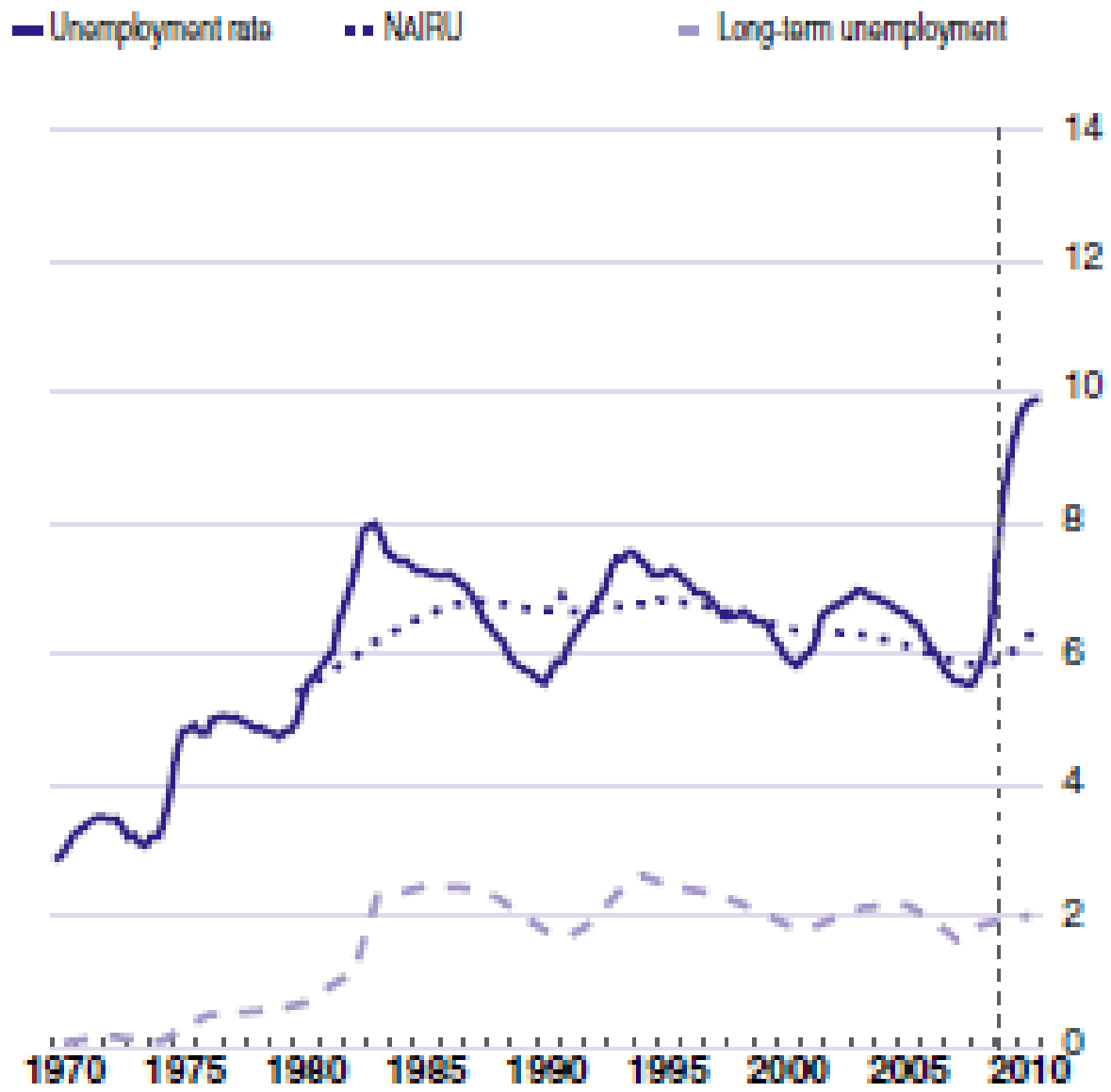


Labour's Share - average of 17 OECD countries 1960-2005(employee compensation adjusted for self-employment as % of GDP)

Source: author's calculations from OECD Economic Outlook Database

From Glyn (2006), p.1

Figure 14



OECD: Unemployment, long-term unemployment and NAIRUs, 1970-2010

Source: OECD Economic Outlook 85 database; OECD calculations.

From OECD (2009), p. 223.

## **Appendix: variable definitions and econometric methods (for Section 4.1)**

Guscina (2006)

Sample: 18 industrial countries (1960-2000- subsample break 1985)

Main Data Set: OECD STAN

Dependent variable: labor share

Dependent variable correction:

*Compensation share in national income*: it includes share of wages and salaries, employer-financed benefits, unemployment insurance, social security, and workmen's compensation in the national income.

*Employment share in national income* also includes self-employment income (Johnson's convention, 1954).

Independent variable:

(1) Labor productivity of total economy – GDP per hour worked, and productivity per worker – GDP to total employment ratio

(2) Openess to trade – ratio of trade to GDP, trade share with developing countries, foreign direct investment to GDP ratio, ratio of capital flows to GDP

(3) Union density – the percentage of unionized workforce, Employment protection (index from 2 – most restrictive to 0 – least restrictive)

Statistical methodology: yearly panel regression with country fixed effect, five year perdioids average, level and first difference.

Daudey and Decreuse (2006)

Sample: eleven OECD countries (1970-2000)

Main Data set: OECD

Dependent variable: labor share

Dependent Variable Correction: Gollin (2002)

Independent variable:

(1) Capital to Output ratio

(2) Degree of openness

(3) Minimum to median wage ratio, union density, the unemployment rate

Statistical methodology: panel regression with country fixed effect and common time dummies, yearly and five-year periods; instrumental variable estimation was used. List of instruments: the capital to output ratio and the unemployment rate are instrumented using their lags; GMM.

IMF (2007) and Jaumotte F. and Tytell I. (2007)

Sample: 18 countries (1982–2002)

Main Data set: OECD STAN, UNIDO

Dependent variable: total, skilled and unskilled labor share (based on the sectoral skill intensity)

Dependent Variable Correction: Gollin (2002).

Independent variable:

(1) share in ICT capital and its squared of total capital stock, (log of) labor to capital ratio

(2) Relative import price (log of), relative export price (log of), offshoring, immigration

(3) Labor tax wedge – the sum of personal income tax and all social security contributions expressed as a percentage of the total labor cost. Unemployment benefit – the average of the unemployment benefit, replacement rates corresponding to multiple incomes, family, and unemployment duration situations.

Statistical methodology: yearly panel regression using country fixed effects. Instrumental variables estimation was used. List of instruments: the share of government consumption in GDP; the consumption tax rate; the (log of) total population; the (log of) export-weighted real GDP of trading partners; the distance-weighted export adjusted employment in the rest of the world (a measure of the global labor supply); and lags of (logs of) relative trade prices, offshoring, and immigration.

Bentolila and Saint-Paul (2003)

Sample: 13 industries and 12 countries (1972-93)

Main Data set: OECD (ISDB)

Dependent variable: labor share

Dependent Variable Correction: Gollin (2002) and, in addition as Johnson (1954)

Independent variable:

(1) Total factor productivity index; Capital to Output ratio

(2) Real price of imported oil

(3) Labor conflict rate (number of strikes and lock-outs to employees in the preceding year ratio);

Employment growth rate

Statistical methodology: yearly unbalanced panel data, both in level and first difference (Arellano and Bover's (1995) system estimator). Instrumental variables estimation was used. List of instruments: lagged independent variables.

European Commission (2007)

Sample: EU-11, Japan and USA (1960-2006)

Main Data set: AMECO, EUKLEMS

Dependent variable: total labor share, low, medium and high-skilled labor share

Dependent Variable Correction: none

Independent variable:

(1) ICT–intensity of production process; Labor to Capital ratio (inverse of)

(2) Openness

(3) Union density, unemployment benefit, Employment protection, labor tax wedge, minimum wage; active labor market policy

Statistical methodology: yearly panel regression.

Ellis and Smith (2007)

Sample: Industrial countries, 1960-2005

Main Data set: EC-AMECO

Dependent variable: profit share

Dependent Variable Correction: Profit share = (Gross Operating Surplus + income of unincorporated enterprise - wages of unincorporated enterprise) / (GDP – indirect taxes).

Independent variables:

(1) Broken linear trends (from 1985) as proxy for technological developments

GDP growth

(2) Emerging markets export share (China, India, nine EU accession countries).

Real effective exchange rate, Oil price

(3) Product market regulation score (index from 6 – most restrictive to 0 – least restrictive)

Employment protection legislation score (index from 6 – most restrictive to 0 – least restrictive)

Statistical methodology: yearly fixed-effect panel annual data regressions

E. Moral and Genre V. (2007)

Sample: Eight Euro Area countries 1970-2004, sectoral

Main Data set: EU KLEMS

Dependent variable: labor share

Dependent Variable Correction: Gollin (2002)

Independent variables:

(1) ICT capital services, R&D investment (%GDP), number of patents, GDP growth.

(2) Trade openness to non-EU15.

(3) Employment protection legislation, Union density.

Statistical methodology: yearly fixed-effect panel annual data regressions

Hutchinson J. and Persyn D. (2009)

Sample: EU countries

Main Data set: EUKLEMS

Dependent variable: labor share

Dependent Variable Correction: Gollin (2002)

Independent variables:

(1) Log of capital/output ratio; log of total factor productivity

(2) Log of intermediate prices; trade openness

(3) Employment growth; log of foreign wages; industries level markups and concentration levels.

Statistical methodology: yearly fixed-effect panel annual data regressions with annual time dummies; standardized coefficient.