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The Labor Share: A Review of Theory and Evidence

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1 What is the Labor Share

The labor share is defined as the share of value added which is payed out to workers. It is therefore often also called the wage share. Generally it is assumed that value added is produced with capital and labor as input factors so that $Y = F(K, L)$ where Y is value added or output[1], K the capital input, and L labor. The labor share is thus defined as:

$$s_L = \frac{WL}{PY}, \tag{1}$$

W is the wage and P the price of output. The labor share is the nominal wage bill over nominal output or nominal GDP. This fraction is also known as real unit labor costs. Nominal unit labor costs, which play a significant role in monetary economics, are defined as the nominal wage bill over real output: $ULC = \frac{WL}{Y}$.[2]

The labor share is a key indicator for the distribution of income in a country. It shows how much of national income is distributed to labor and how much to capital. With two factors, it follows that the capital share is $s_K = 1 - s_L$. The capital share includes all non-labor income including interest income and economic profit which can be added together and be defined as accounting profit (Mankiw, 2007).

Empirically the labor share is usually defined as total labor compensation or labor costs over nominal GDP or nominal value added. As Krueger (1999) points out, this is not necessarily straightforward. He poses the question how each part of the labor share should be defined. Especially total labor compensation is not clearly defined. Compensation may include other

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[1] In what follows value added and output are taken to mean the same thing.

[2] Cf. Burda and Wyplosz (2009) pp. 291.

benefits, such as stock options, it may or may not include income of self-employed or benefits of retirees such as health care.

Gomme and Rupert (2004) address these issues and define in detail how the US Bureau of Labor Statistics measures the labor share. Labor compensation, WL, is defined here as compensation of employees minus government wages and salaries, compensation of employees of non-profit institutions, private consumption, farm compensation of employees, housing compensation of employees and adjusted for the imputed labor compensation of self-employed. The OECD provides several data sources for labor compensation. In the National Accounts, labor compensation is defined as "Wages and salaries payable in cash or in kind" plus "the value of social contributions payable by employers" (OECD, 2009). This is close to the definition by Burda and Wyplosz (2009). The OECD provided measurement of the labor share adjusts the measure of labor compensation by self-employed which is the total labor costs.

The adjustment of self-employed is a widely discussed topic in the literature. Especially in sectors with a high share of self-employed their income may change the labor share significantly. Krueger (1999) simply attributes two-thirds of proprietors income to wage bill in order to calculate the labor share. The OECD, the US Bureau of Labor Statistics, and the EU KLEMS adjust labor compensation by self-employed by assuming the same average wage of self-employed and employees in the sector. This will lead to measurement errors as in different countries and sectors the wages of employees and self-employed may differ significantly (McKenzie and Brackfield, 2008; Arpaia et al., 2009; Gomme and Rupert, 2004; Timmer et al., 2007).

The definition of value added, PY, is also not immune to differences in measurement. The OECD (2009) defines value added as "as the difference between gross output (at basic prices) and intermediate consumption (at purchasers prices)" which is in detail compensation of employees, gross operating surplus, mixed income, and other taxes on production less subsidies on production. McKenzie and Brackfield (2008) discuss the problem of subtracting all subsidies and adjusting for taxes from the measurement. Gomme and Rupert (2004) discuss further complications in the measurement of value added, such as the government's capital income or a lack of labor income in the housing sector. Corrado et al. (2009) indicate the missing measurements for intangible assets, which should be accounted for in value added and would be attributed to capital income. Also the inclusion for the informal sector is relevant for the measurement of value added and the labor share (Jayadev, 2007; Lübker, 2007). Especially in developing countries, where the informal sector is large, this may play a role.

These definition issues not only affect analyses which cover multiple countries, but also analyses over a longer time frame. Figure 1 shows the labor share in Germany since 1925 as computed by the German statistical office (source: Destatis, National Accounts). Here the share is defined as labor income of employees over GDP which is corrected for taxes and

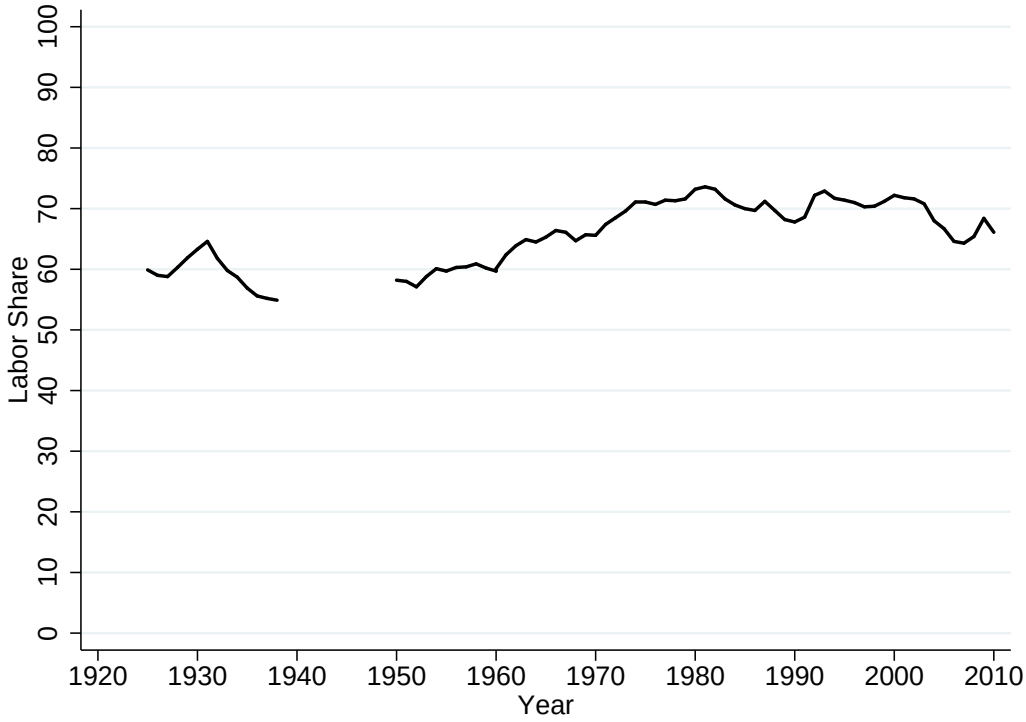

Figure 1: Labor Share in Germany, Source: Destatis

subsidies. The German case shows already problems for a long series. In this case the data around the second world war is missing. The statistical office has, nevertheless, tried to give a harmonized series for data that comes essentially from three different Germanys: Germany before the second world war, West Germany and Germany after reunification. Figure 2 shows the labor share for the US since 1947 in quarterly data from the US Bureau of Labor Statistics as it is described by Gomme and Rupert (2004). This labor share covers the non-farm business sector and is adjusted for self-employed. With the different definitions regarding the labor share, a comparison of the German and the US labor share from both graphs should be only be done with caution.

Due to these difficulties, a common definition of the labor share and its components is necessary for cross-country analyses. For short and medium-run analyses of developed countries the OECD and EU KLEMS offer harmonized datasets also on an industry level. Figure 3 shows harmonized series for six exemplary countries from the AMECO database of the European Commission. This harmonized dataset starts in 1960 compared to the OECD and EUKLEMS which start 10 years later. The labor shares in figure 3 are also adjusted for self-employed. The German and US labor shares differ between the series above and the ones from the AMECO database. Nevertheless the trends are similar. These figures show that in empirical analyses concerning the labor share, the definitions of the share and the data source

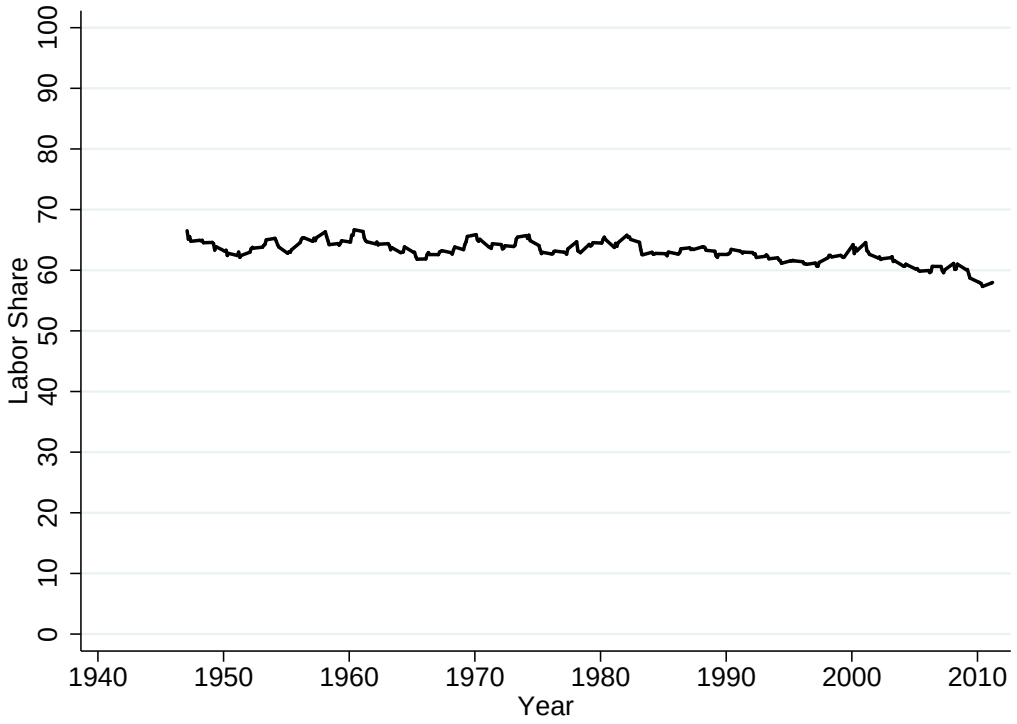

Figure 2: Labor Share in the US, Source: US Bureau of Labor Statistics

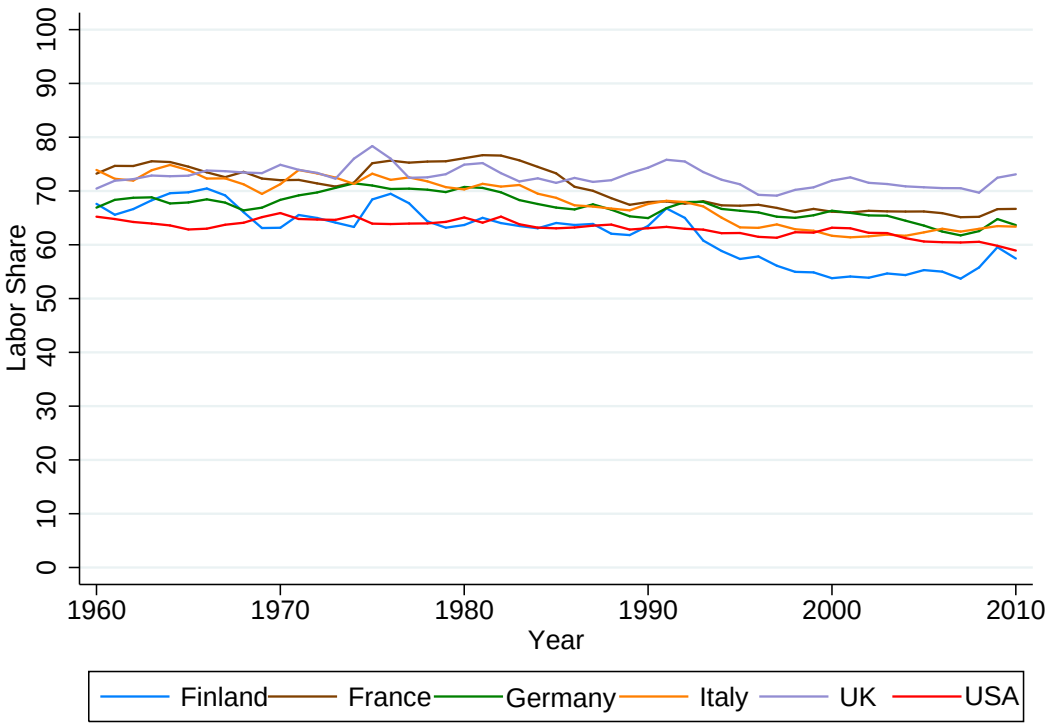

Figure 3: Labor Share in the Selected Developed Countries, Source: AMECO

matter significantly.

2 The Labor Share Across Time and Ideas

The value of the labor share is determined by the level of employment, compensation payed, and the level of value added. These levels are determined at the labor and product markets and are thus subject to the behavior of labor demand, labor supply, and the level of output. In the short-run changes in the labor share depend on the volatility and timing of shifts in compensation and employment compared to total value of output. In the longer-run the level and changes in the labor share depend on the precise production function and the resulting labor demand as well as on the structure of the labor force and thus labor supply. Cobb and Douglas (1928) present their famous production function which has direct implications for the division of national income between workers and capital. Douglas (1976) writes about the interconnection of the theory of production and the issues of distribution:

> "We should not let these minor differences obscure the fact that a substantial degree of equality between k (output elasticity of labor) and $\frac{W}{P}$ (income share of labor) has been attained. That is the central fact, and it both gives further corroboration to the production function and tends to show that the distribution of the product closely conforms to what, in a largely competitive society, we would expect the marginal productivity of labor to produce. Both productivity and distribution therefore, mutually reinforce each other." and "The results of this study lend further corroboration to the accuracy of the production function as a description of manufacturing production and as a determinant of the distribution of the product - which is a separate but allied subject." (Cobb and Douglas, 1928, pp. 912-913).

Under the assumption that the remuneration of work equals the marginal product of labor, the theory of production usually has implications for the nature of the labor share and vice versa. I will address the theories of production and their implications for the labor share. Nevertheless, there are mechanisms which prevent a direct definition of the share from the production function due to the inequality of wages and the marginal product. The academic discussions of the labor share usually departs from observations in the data about the labor share. These empirical facts are then translated in new models of production functions or mechanisms of setting wages and employment. One discussion started at the early 20th century and grew intense in the 1950s and 60s. After ideas from this time became "stylized facts", the evolution of the share became a topic again in the mid 1990s when data began to denote from these facts. In the rest of this review I will address the empirical departures of the discussions and their theoretical conclusions.

3 From Classical to Neo-Classical Ideas on the Labor Share

Most researchers who try to explain the importance of the distribution of income across factors quote Ricardo (1821) who described this as the main problem of Political Economy. In a review on the implications of different economic theories on the distributive shares, Kaldor (1955) compares the ideas of Ricardo, Marx, Keynes, and the Neoclassics (or "Marginalists").[3] Specifically, Kaldor (1955) assesses the theories under the empirical finding of strikingly constant labor shares of national income, which is known also as Bowley's Law.[4] He analyzes the different theories across this notion of constant share:

> "In fact no hypothesis as regards the forces determining distributive shares could be intellectually satisfying unless it succeeds in accounting for the relative stability of these shares in the advanced capitalist economies over the last 100 years or so, despite the phenomenal changes in the techniques of production, in the accumulation of capital relative to labour and in real income per head." (Kaldor, 1955, pp. 83-84).

Discussing of the work by Ricardo and Marx, Kaldor (1955) describes their main ideas on the mechanisms of production, wage setting, and employment. Ricardo and Marx both believed that wages are independent of their marginal product and employment is inelastically supplied. While Ricardo stated that wages are set on a general supply price and the level of employment by the available capital, Marx believed wages to be merely at a subsistence level of the workers and that at all times the supply of workers outnumbered the demand at the given wage level.[5] According to Ricardo the labor share was thus variable and only depending on capital and the economic environment.[6] From Marx's theory it follows that the labor share is falling over time. As wages remain at the subsistence level, output increases through increasing usage of capital per worker. Only if the workers would gain bargaining power, their wages could improve. If these would improve at the same rate as output per worker increases, this would lead at most to a constant share.[7] Kraemer (2010) argues that the labor share was not of central interest to the classical economists and therefore they were not trying to match data on the distribution of income. The neoclassical economists, on the other hand, created their models following empirical findings where the labor share plays a central role.

Compared to the classical theories, neoclassical theory assumes that all factors are remunerated at their marginal product. Important implications from the neoclassical theory on behavior of the labor share were derived by Marshall (1920) in his four laws of derived de-

[3] Kraemer (2010) gives an extensive review of the classic literature concerning the notion of constant labor shares.

[4] Bowley's Law is named after Sir Arthur Lyon Bowley, a British statistician (1869-1957). See Kraemer (2010) and Bronfenbrenner (1971) for a discussion of the notion of "Bowley's Law".

[5] Cf. Kaldor (1955) pp. 84,85,87.

[6] Cf. Kaldor (1955) p.83 and Kraemer (2010) pp.7-8.

[7] Cf. Kaldor (1955) p.88.

mand. These rules describe how changes in prices and volumes of inputs and total output are interconnected with the demand and supply elasticities. Hicks (1932) and Allen (1938) present mathematical formulations of Marshall's laws. A simple presentation of this can be found in the comprehensive discussion of the theory of labor demand by Hamermesh (1993, pp.23-29). He translates this to a simple production function with two inputs: capital and labor, which are both homogeneous. The production function is linear homogeneous which implies constant returns to scale,[8]

$$Y = F(K, L), \tag{2}$$

where Y represents output, K capital, and L labor. Further assumptions are $F_K > 0$, $F_L > 0$, $F_{KK} < 0$, $F_{LL} < 0$, and $F_{K,L} > 0$. Assuming perfect competition with given factor prices r and w and normalizing the output price to one, the firm maximizes profits by

$$max_{K,L} F(K, L) - rK - wL. \tag{3}$$

The first order conditions impose the marginal product of the input factor to be equal to its respective market price,

$$F_K = r, \tag{4}$$

$$F_L = w \tag{5}$$

The elasticity of substitution is defined as:

$$\sigma = \frac{d(K/L)/(K/L)}{d(F_L/F_K)/(F_L/F_K)} \tag{6}$$

In the case of the linear homogeneous production function this is equivalent to:

$$\sigma = \frac{F_L F_K}{F_{LK} Y} \tag{7}$$

The elasticity of substitution states the ease with which the two input factors can be substituted for each other while keeping output constant, or in other words how easily capital and labor can be substituted for one another if the relative input price (which is the marginal rate of substitution in this case) changes.

From these derivations Allen (1938) shows, under the given conditions from above, how the *compensated* or *constant-output labor demand elasticities* and the *uncompensated* or *total labor demand elasticities* can be derived. The compensated labor demand elasticity in the terms of Hamermesh (1993, p.24) is

[8] Cahuc and Zylberberg (2004) analyze labor demand from the cost side of production analogously using the duality of profit maximization and cost minimization. They also include a mark-up from the product market in their analysis.

$$\eta_{LL} = -(1 - s_L)\,\sigma < 0, \tag{8}$$

$$\eta_{LK} = (1 - s_L)\,\sigma > 0. \tag{9}$$

η_{LL} states how much the amount of labor that is demanded by the firm is reduced if wages increase by one percent while output remains constant. The compensated cross-price labor demand elasticity, η_{LK}, analogously describes the change in the amount of labor that is demanded due to a one percent change in the price for capital. The uncompensated demand elasticities, η^*_{LL} and η^*_{LK}, describe how much labor demand changes due to a change in input prices if the input is not adjusted in a way that output remains constant.

$$\eta^*_{LL} = -(1 - s_L)\,\sigma - s_L\eta \tag{10}$$

$$\eta^*_{LK} = (1 - s_L)\,(\sigma - \eta) \tag{11}$$

The change in the demand for labor due to a change in wages thus depends on a substitution and a scale effect. The substitution effect results from the compensated labor demand elasticity. The scale effect comes into play as the price for the output of the firm increases if wages increase relative to share of labor in total production. If the price of the good increases the product demand decreases according to the price elasticity of demand for the product, η. These derivations contain the laws of demand by Marshall (1920) as they are also described by Hicks (1932, p.242): The uncompensated labor demand elasticity is higher (i.e. the change in the amount of labor demanded by the firm due to a change in wages is higher) (1) the higher the price elasticity of demand for the product, η; (2) the higher the elasticity of substitution, σ; (3) the higher the supply elasticity of the other input factor; (4) the higher the labor share, s_L. The first law stems from the scale effect. If the amount of output demanded reacts strongly to price increase which is due to an increase of wages, the amount of labor used in production will be reduced more as less output is produced. Law number two explains that less labor per unit capital will be used in production if the two input factors are closer substitutes if the relative price of labor increases. As the share of labor reflects the total cost of labor in production, the fourth rule reflects the scale effect. If the share of the overall costs is relatively high, a one percent increase in wages will lead to a higher cost increase and thus a higher output price increase. These rules play a great role when explanations for the behavior of the labor share over time are assessed and changes in wages and employment are taken into account.

Cobb and Douglas (1928) developed a theory of production based on observed time series data from American manufacturing which fits well into the Marshall-Hicks-Allen framework. Analyzing the relations of capital and labor input as well as a production index, they found

the data to be matching a homogeneous production function of order one.[9] Cobb and Douglas (1928) employed the function:

$$Y = bL^{\beta}K^{1-\beta}, \tag{12}$$

which has previously been introduced by Knut Wicksell[10]. Y is output, L is labor, and K is capital. They estimated this function, which has been known from then on as the Cobb-Douglas production function, with OLS and find for the data at hand that $b = 1.01$ and $\beta = 3/4$. This function has several special features. The marginal product of labor is $\beta\frac{Y}{L}$ which is again equal to the average product of labor. The elasticity of substitution between labor and capital is constant at one, defined by the sum of β and $1-\beta$. The attribute of linear homogeneity and thus constant returns to scale implies that the revenue of total production can be exactly divided across inputs by their marginal production elasticities. Thus, under perfect competition, the labor share is defined as $s_L^{CD} = \beta$. The constant income share implies that the input ratio will always adjust to the input price ratio in such a way that the income share remains constant. It also means that the wage bill will increase at the same rate as productivity so that the wage bill, the numerator of the labor share, will increase at the same rate as output, the denominator of the share.[11]

Having matched the data to a production function Paul Douglas and his colleagues continued to assess other datasets in order to confirm the validity and somewhat the universality of the linear homogeneous production function. Next to analyzing time series by OLS, Douglas also introduced cross sectional data analysis (Samuelson, 1979). For a whole range of countries, mostly Anglo-Saxon countries, the function $Y = bL^{\beta}K^{j}$ was estimated. Douglas (1976) cites many of these studies where the authors find constant returns to scale so that $\beta + j$ approximately equal one. The estimated production elasticity of labor (β) varied, but was apparently close to the observed labor share. Although Douglas (1976) does not address the causes of the different production elasticities across industries or countries, he already mentions in Cobb and Douglas (1928) the possibility of changing production elasticities across time.

There have been some critics of the Cobb-Douglas function and the finding of constant income shares. Solow (1958a), Denison (1954), and Kravis (1959) discuss the fact that observed income shares on industry level are not necessarily constant. They argue that due to shifts in the weight of the industries within national income the overall labor share remains roughly stable. Solow (1958a) claims that one should not build a theory on the single value of the overall labor share, but should aim at explaining the underlying movements on the

[9] For a lively recount of the "discovery" of the Cobb-Douglas production function and the subsequent discussion see Douglas (1976) and Samuelson (1979), who was a student of Paul Douglas.

[10] Samuelson (1979) explains at length how Douglas has been confused with Wicksell and Wicksteed and that indeed Wicksell should be given credit to introducing this function. Some notes about the Wicksell's and Wicksteed's ideas on the distribution of income can also be found in the appendix of Hicks (1932)

[11] Bronfenbrenner (1971, chapter 16), also a student of Douglas, discusses the Cobb-Douglas function in the light of the Marshall-Hicks laws of demand and statistical evidence intensely and relates it to other theories introduced afterwards.

lower levels of aggregation. Nevertheless Solow employed the Cobb-Douglas function and the notion of constant income shares when he introduced his seminal paper on technical progress (Solow, 1957, 1958b).

Following the criticism and the new concept of the elasticity of substitution, Arrow et al. (1961) introduce a class of production functions which nests the Cobb-Douglas function as well as the Leontief production function (or Walras-Leontief-Harrod-Domar assumption of constant input coefficients, as it is called in Arrow et al. (1961)). The Constant-Elasticity-of-Substitution (CES) functions is defined as follows:

$$Y = \gamma \left[\delta K^{-\rho} + (1-\delta) L^{-\rho}\right]^{-\frac{1}{\rho}}, \tag{13}$$

where Y is again output, L is labor, and K is capital. γ is the efficiency or level parameter, δ the distribution parameter, and ρ the substitution parameter. The Cobb-Douglas production function is nested in it in such a way that $\rho = 0$ implies an elasticity of substitution (σ) of one. Arrow et al. (1961) show that the labor share of the CES function is

$$s_L^{CES} = \frac{wL}{Y} = (1-\delta)^{\sigma} \left(\frac{w}{\gamma}\right)^{1-\sigma}. \tag{14}$$

Estimating a log-linearized version of this for US non-farm production data, Arrow et al. (1961) find an elasticity of substitution smaller than one. Arrow et al. (1961) try to explain why the labor share in some US industries remains constant while there is an observed increase in the capital-labor-ratio and thus an increase in wages. Under the assumption of a unit elasticity of substitution, the input-ratio would always be adjusted to changes in the relative input prices in such a way that the income shares remain constant. With the CES function, Arrow et al. (1961) claim that there are two countervailing effects: first, the labor share should increase, since the relatively increasing input has a decreasing income share if elasticity of substitution is between zero and one. This effect is then offset by neutral technological change which dampens the rise in the labor share and keeps it roughly constant. Defining the parameters it is possible using the CES function to assume movements in technology and relative input prices which affect the labor share in a way that it is constant on the aggregate, but does not necessary demand an elasticity of substitution of one.

Christensen et al. (1973) derive yet another production function, the translog production function. The function build around a production frontier by a second-order logarithmic taylor-approximation of a function $F = f(Y, X) = 0$, where Y is a vector of outputs and X a vector of inputs. Input shares can be easily derived from a translog cost function under specific assumptions. Following the notation from above, (Hamermesh, 1993, pp. 40) presents the translog cost function with multiple inputs as:

$$ln\, C = ln\, Y + a_0 + \sum_i a_i\, ln\, w_i + \frac{1}{2} \sum_i \sum_j b_{ij}\, ln\, w_i ln\, w_j \tag{15}$$

where w_i is the price for input $i = 1, ..., N$

The two factor translog cost function with capital and labor is as follows

$$ln\ C = ln\ Y + a_0 + a_1 ln\ w + (1 - a_1)\, ln\ r + \frac{1}{2} b_1 (ln\ w)^2 + b_1 (ln\ w)(ln\ r) + \frac{1}{2} b_1 (ln\ r)^2$$

Assuming that the cost function is linear homogeneous in the input prices and applying Shepard's Lemma, the labor share is a function of the input prices:

$$s_L^{translog} = a_1 + b_1\ ln\ w + b_2\ ln\ r \tag{16}$$

The translog cost function approach to determine factor shares is often used in cases where there are more than two inputs such as capital, labor, and intermediate inputs as in Adams (1999), or in the analysis of capital and different labor inputs like skilled versus unskilled labor (Berman et al., 1994; Machin and Van Reenen, 1998; Chennells and Van Reenen, 1999; Caroli and Van Reenen, 2001; O'Mahony et al., 2008). Here the distribution of total income among multiple inputs can be easily analyzed. The factor specific input share is then Hamermesh (1993, p. 40):

$$s_i^{translog} = a_i + \sum_{j=1}^{N} b_{ij}\ ln\ w_j,\ i\ =\ 1, ..., N. \tag{17}$$

4 Theory of Growth and the Labor Share

The constancy of income share has played a large role in shaping the ideas about growth and is a fundamental part of neoclassical growth theory pioneered, as mentioned above, by Solow (1958b) and Swan (1956). Jones and Romer (2010) describe the influence of Kaldor (1961) and his so known *Kaldor Facts* on the Solow-Swan neoclassical growth model. The fifth Kaldor Fact states that the income shares are stable which relates to Kaldor's quote of the beginning of the section. This is taken into account by the neoclassical growth model. In this model all quantities grow at the same exponential rate[12] in the steady state and thus the income shares remain constant. Technological progress is typically modeled as being Harrod-neutral in growth models. Uzawa (1961) formulates this kind of growth with a similar functional setup as used above for the labor demand analysis and shows that technical progress must be labor augmenting in the steady-state, and thus Harrod-neutral, in order to keep functional income share constant.[13]

[12] Cf. Jones and Scrimgeour (2004).

[13] Drandakis and Phelps (1966) discuss the necessity of the assumption of a Harrod-neutral growth paths and the constancy of the labor share in the neoclassical growth model. Hahn and Matthews (1964) survey the neoclassical growth theory and the contributions by Uzawa (1961) and Solow (1999) provides a proof. Jones and Scrimgeour (2004) give discussion and interpretation of the Uzawa (1961) work. See Acemoglu (2003b) for a more recent discussion of labor and capital-augmenting technical change and their impacts in the short and long-run on growth.

The analysis above is focused on the available technology and how this determines the labor share. Growth theory includes macroeconomic variables such as investments, savings or consumption in their analysis next to technology. Here it is always important that capital is accumulated while labor is not. Bertola et al. (2006) devote a chapter on the functional income distribution in macroeconomic growth theory.[14] Based on Bertola et al. (2006) Bertoli and Farina (2007) describe recent theories concerning the labor share and empirical work with a focus on growth theory. These articles explain how income shares in the Post-Keynesian growth theory introduced by Harrod and Domar[15] amend aggregate saving such that an equilibrium is reached. In these models the distribution of income is determined by fixed-coefficients-technology, fixed savings rates and exogenous growth rate. The neoclassical growth model by Solow assumes the possibility of changing capital-output ratios. Under exogenous technical progress Bertola et al. (2006) show that the steady-state capital share depends on the rate of technical progress and the savings rate. Furthermore under a constant balanced growth path the income shares remain constant as well while they will be higher under a regime with a higher capital share. Bertola et al. (2006) cites also the newer strand of literature, endogenous economic growth which has strong implications on the distribution of income.[16] The main assumption of this literature is that on the aggregate production level there exist increasing returns to scale. Under these circumstances the sum of the wage bill and the capital bill exceed total output if factors are remunerated by their marginal product. Markets therefore cannot be perfect. Bertola et al. (2006) and Bertoli and Farina (2007) stress that this leaves the opportunity for political interventions into the markets and for non-market processes which determine the distribution of income across factors which differs from the rule of input price equals marginal product. These interventions will influence savings and investment behavior, the growth path and clearly share of labor income of total production.

Young (2010) revisits Solow (1958a) and discusses different long-run dynamics of the labor share on the industry level and the aggregate. He proposes several different growth models which are unbalanced and can thus incorporate different labor share behavior of industries within one economy. The models he proposes have in common that some in industries labor share and/or the relative price of one input increases continuously while the labor share in another industry or the other input's price decreases. The models are such that on the aggregate the labor share remains constant as if to fulfill Kaldor's fact.[17] Similarly Ngai and Pissarides (2007) present a growth model with an aggregate Cobb-Douglas production function, while structural change is taking place on the industry level. Here employment moves across sectors following heterogeneity of TFP across sectors. They show an economy

[14] Chapter 4, "Factor Income Distribution" in Bertola et al. (2006). See also Bertola (2000), chapter 2.2 for a shorter description of the main ideas on functional income distribution and economic growth.

[15] Harrod (1939) and Domar (1946).

[16] See Bertola et al. (2006), p. 79, for a list of articles dealing with this topic or Romer (2001), Chapter 3.

[17] Most prominently Young (2010, pp. 100-101) discusses Kongsamut et al. (2001) and earlier versions of Acemoglu and Guerrieri (2008) and Zuleta and Young (2007).

on a balanced growth path while the employment share changes across industries. Acemoglu and Guerrieri (2008) discuss the validity of constant share under a non-balanced growth path. Here, differences in the sectors are due to differences in the supply of capital and thus differences in the capital-labor ratios. Valentinyi and Herrendorf (2008) determine the capital shares by industry in the US for multi-sector growth models and find differences in the shares across sectors.

Interpreting the labor share in a growth framework always leaves the question of whether the observed data reflects a steady state or a transition phase. This is especially interesting if one also wants to interpret country differences. With country differences under neoclassical growth analysis the countries are either in different stages of the same growth path with the same steady state defined by the capital output ratio or technology differs and the steady state varies between countries. As discussed by Bertola et al. (2006) market interventions under aggregate increasing returns to scale leave differences in institutions as an explanation for differences between countries.

5 The Labor Share Over the Business Cycle

Even though the labor share has traditionally been seen as relatively stable over time, there is also a consensus from business cycle research that the share behaves countercyclically to output. Returning to figure 2, cyclical movements around a trend are observable for the US, especially until the mid 1990s. The analysis by McDonald and Solow (1981) starts with the observation of wages and employment over the business cycle. They observed that wages remain fairly unaffected by business cycle movements while there are changes in employment. Hansen and Prescott (2005) discuss macroeconomic dynamics in the light of countercyclical labor shares in the US between 1954 and 1993. While these detailed observations are mainly based on data of the US, the European Commission (2007) cite detailed business cycle behavior of the labor share for European countries. Countercyclical movements of the share can be confirmed for all countries, but Germany. Choi and Ríos-Rull (2009) and Ríos-Rull and Santaeulàlia-Llopis (2010) summarize the behavior of the labor share in the short-run such that it is relatively volatile, countercyclical, highly persistent, lagging output and overshoots the initial loss after a positive technological shock. A set of papers analyze the movements of the income shares over the cycle in dynamic general equilibrium models and come to the conclusion, similarly to the endogenous growth literature, that there have to be rigidities in the markets which keep prices and volumes from adjusting to shocks immediately and perfectly. Gomme and Greenwood (1995) and Boldrin and Horvath (1995) introduce labor and insurance contracts into the market which enable risk sharing between workers and firms. Young (2004) introduces biased technological change in order to explain the countercyclical behavior of the labor share. These analyses have in common that there is friction in markets or adjustments in the short-run, but in the long-run the labor share remains roughly stable.

Bentolia and Saint-Paul (2003) argue that changes in the product market markups, which occur due to imperfect competition, may cause a cyclical movement of the labor share as they fluctuate over the business cycle. A procyclical markup in the product market may cause countercyclical shifts in the labor share. In several approaches for the analysis of business cycles, wages are not determined by their marginal product, but by a bargaining process. In the search and matching literature this is often done by introducing bargaining of workers and firms over wages and employment (Pissarides, 2000). Choi and Ríos-Rull (2009) introduce a Real Business Cycle Model with search frictions and a non-competitive labor market, where wages and hours are bargained over. These rigidities lead to wages that exceed the marginal product of labor while employment remains fixed due to the search frictions. This leads to a sluggish, countercyclical behavior of the share. Similar to the idea of inducing sticky wages into a model through implicit contracts by Boldrin and Horvath (1995) and Gomme and Greenwood (1995), Reicher (2011) shows how staggered wage setting in a search and matching model can induce a countercyclical labor share. Reicher (2011) suggests that only a subset of workers and firms bargain over wages at each point in time so that wages cannot be adjusted immediately after an increase in productivity. After such an increase prices and productivity go up while there is only a sluggish adjustment of aggregate wages. The labor share is therefore countercyclical. Recent contributions in this literature aim at explaining changes of business cycle movements of the labor share over time. Galí and van Rens (2010) explain the decreasing procyclicality of labor productivity (PY/L) in the US with a reduction in labor market frictions. As this is inversely related to the labor share, it implies a decreasing countercyclical movement of the labor share. This is analyzed in an empirical application by Morin (2011) who explains the decreasing countercyclicality of the labor share with decreasing union power.

6 Medium-Run Changes

As the labor share was mostly believed to follow Kaldor's stylized fact of constant labor shares (Kaldor, 1961), there was only little research on the longer-run movements of the labor share until the mid 1990s. Atkinson (1997) writes on the subject of factor shares: "The share of wages, and whether it is constant or rising or falling, was once a central topic in macroeconomics. As a student in the early 1960s, I listened to debates about different theories of distribution [...]. Now, thirty years later, things seem to have changed, and factor shares are not essential to macroeconomics." (p. 207). Atkinson (1997) continues on and reviews standard macroeconomic textbooks, which mostly quote the constancy of the labor share, and the usage of the E25 JEL-code (aggregate factor distribution) and comes to the conclusion that the topic has been neglected. At the same time, significant movements of the labor share, especially in Continental Europe, started the discussion on the topic again.

Poterba (1998) analyzes the income shares from the late 1950s to 1996. While finding only very little change, which can mostly be attributed to business cycle movements in the labor share, he highlights the differences of labor share movements across G7 countries. In his sample labor shares in Continental Europe decreased since the 1970s while the shares slightly increased in Canada and the UK. Observations by Poterba (1998) and others led to a new discussion trying to understand why labor shares decrease in Continental Europe and why the recent trends seem to vary across developed countries.[18] Taking into account the literature mentioned in the previous parts of this review there are several factors which can lead to a continuous change of the labor share. The first factors could be purely technical: There could be a change in the sectoral composition of the economy which was mentioned in the analysis of the labor share in the short-run or the production technology itself could change over time. As discussed in subsection 4 for the theory on economic growth, technical progress is a crucial determinant of growth and the division of income. Changes in technology could, for example, manifest themselves in changes in the elasticity of substitution between the input factors. These sources of change keep the neoclassical assumption prices equal to marginal costs. Acemoglu (2002a) argues, for example, that firms may invest into creating a technology which is biased towards one input factor if the relative input price of this factor is much lower. If markets are not perfect, as assumed by some endogenous growth theories, profits and markups may be observed in markets. How these are distributed among factors is not fixed. Labor and product market institutions will have an influence on the sharing of economic rents between the factors of production. A change of institutions will therefore most likely influence the labor share. A last factor that is often cited in influencing the labor share is increasing globalization. International trade should lead to a decrease in profits as competition increases but also to factor price equalization if factors and production are mobile and homogeneous across countries. Several studies have investigated individual or combinations of these factors on changes in the functional income distribution and will be reviewed below.

6.1 Sectoral Composition and Technological Change

As mentioned in previous parts of the review several researchers have analyzed the distribution of income by looking deeper into its composition across sectors. Solow (1958a) and recently Young (2010) remarked the stability of the US labor share while the sectoral composition underlying the aggregate distribution is much less constant. Beck (1958) and Denison (1954) discuss the aggregate implication of sectoral movements across the US business cycle. Therefore an obvious explanation for changes in the aggregate labor share in Continental Europe could be sectoral change where industries with traditionally lower labor shares rise in their

[18] Extensive analyses of the behavior of the labor share in EU countries can be found in European Commission (2007) and Arpaia et al. (2009). Rodriguez and Jayadev (2010) and Jayadev (2007) provide evidence of decreasing labor shares around the globe, including developing countries.

share of value added. de Serres et al. (2002) check this hypothesis for five European countries and the US. Adjusting the share of value added they find that most changes in France, Italy, and the US can be accounted for by sectoral change and for Germany they find that the downward trend in the labor share is fully explained by a shift towards industries with lower shares. Their explanation is a structural change where manufacturing accounts for less in aggregate value added while the relative value added in services increase. Garrido Ruiz (2005) similarly estimates the sectoral changes for Spain and also finds it to be the dominant factor for changes in the aggregate labor share. Arpaia et al. (2009) make a shift-share analysis for 15 European countries. Although they find sectoral change to be a significant source of changes in the labor share, they show that the extend to which this holds for individual countries depends also very much on the time frame of interest. In the German case, for example, they find the offsetting effects of sectoral change and within-industry change only until 1995. The largest change afterwards is due to changes in employees' remuneration. Nevertheless, they show that, except for very few cases, sectoral change had a decreasing and significant impact on the labor share in Europe since 1970. Similarly Lawless and Whelan (2011) show that as within-industry changes in employment and labor income are present, structural change cannot be the single answer to the question why the labor share changes its medium run trend in European countries. Therefore other approaches need to explain the within-industry changes.

Lawless and Whelan (2011) suggest that technological change is the driving force behind the decreasing income share of labor in Europe. As stated above, traditionally technological progress which enables long term growth is thought to be labor-augmenting ("'Harrod-neutral"'). Arpaia et al. (2009) argue that one reason for the shift in the income distribution is capital-augmenting technological progress. In their analysis, they also include two kinds of labor: skilled and unskilled workers. In addition to capital-augmenting technological progress they find differences in the elasticity of substitution between the two kinds of labor and capital to be changing the income shares. They follow a common argument that unskilled labor is a substitute to capital while skilled labor and capital are complements. With an increasing capital stock it is not clear whether the positive impact of the complementarity between skilled labor and capital or the substitution with unskilled labor dominates the shift of the labor share. The European Commission (2007) estimate the impact of several possible influences to the labor share on the aggregate level and for individual skill groups. They include two different kinds of capital: fixed capital and usage of information and communication technology (ICT). For both kinds of capital they find complementarity with high and medium-skilled workers and substitutability with low-skilled workers. The overall impact on the labor share is positive for fixed capital while it is insignificant for ICT use.[19] Large positive and significant overall correlations of the labor share and capital are also found by Checchi and

[19]There is a large literature on the impact of technological change on the income distribution with respect to skill. A review can be found in part III of Braun et al. (2009)

Garcia-Penalosa (2010). Guscina (2007) has similar results with respect to capital and ICT and discusses additionally a structural break in 1985 for OECD countries. She claims that it is likely that before the computer revolution technological progress was labor augmenting, but turned to be capital augmenting in 1985. With a shorter dataset Jaumotte and Tytell (2008) can only confirm the differences of the elasticity of substitution by skill and find no significant overall impact of technology on the labor share. Evidence for capital-augmenting technological progress is also found in an empirical study by Bentolia and Saint-Paul (2003).

In these articles technological change happens exogenously. Acemoglu shows in several papers why and how technological change might be directed towards labor or capital saving technology.[20] Similarly to Caballero and Hammour (1998), Acemoglu (2002b) shows in an endogenous growth model how firms employ less labor after a wage shock but cannot lower the labor share in the short run due to the elasticity of substitution. The factor prices invoke technological change which is labor-saving and therefore reduces the labor share. Acemoglu (2003b) introduces another endogenous growth model with endogenous technological change where firms can invest in either capital- or labor-augmenting technological progress. Depending on the elasticity of substitution between capital and labor exogenous shifts in the factor income distribution can have adverse short- and medium-run effects. In the long-run equilibrium, technological progress is always labor-augmenting and the factor shares remain stable.

Blanchard (1997) discusses the possibility of changes in technology to be a driving force for the movements in labor shares. The general argument he poses against this hypothesis is that the developed countries are too similar and close to the technological frontier such that large differences in the evolution of labor share should not be observable. Considering the almost stable labor share in the US and UK there would have to be some other differences than technology that can explain the differences to Continental European in trends. Therefore he argues for a cause connected to institutional settings in Europe which will be addressed next.

6.2 Noncompetitive Wage Determination

Since the 1960s most studies concerning factor shares have been nested in the neoclassical production approaches. Generally it has been assumed that output is attained through a Cobb-Douglas, CES or similar production functions. The literature adopts the view that labor demand is determined by the marginalists' perspective, but wages do not necessarily have to equal labor's marginal product. There can be mechanisms which can set wages above the marginal product, such as union bargaining. Thus, with more general production functions, such as the CES, and through introducing mechanisms which set wages higher compared to the marginal product of labor, different income share movements can be explained.

Blanchard (1997) addresses these facts in combination with unemployment. He looks at the differences and sources of the medium-run movements of the capital share and unemployment

[20] Cf. Acemoglu (2002b), Acemoglu (2003b), or Acemoglu (2003a).

in Continental Europe and Anglo-Saxon countries. While the capital share and unemployment increased in Continental Europe since 1980, they remained relatively stable in the Anglo-Saxon countries. For Europe, Blanchard (1997) discusses an adverse supply shift in the 1970s which is followed by an adverse labor demand shift in the 1980s. While he claims that the adverse supply shift, i.e. higher wages at a given level of unemployment, was due to a productivity slowdown to which wages did not adapt quickly, he examines several potential reasons for the later labor demand shift. He describes the adverse demand shift as decreasing real wages at constant input shares and productivity. The two reasons analyzed are changes in the distribution of rents between labor and capital and labor-saving technological change. Using a model of monopolistic competitive firms, Blanchard (1997) shows how an adverse supply shift can decrease the capital share while raising unemployment and then how an adverse labor demand shift can increase the capital share and the unemployment rate simultaneously.

More precisely, Blanchard (1997) first finds a shift in the relation of relative inputs and relative input prices. A primary reason for a shift in this relationship is a shift in the distribution of rents across labor and capital. He therefore assumes that there are rents and markups in the market. He dismisses the idea of increasing markups in the product market as the competition in Europe has intensified at the time due to increasing trade. He believes that a markup can only come from markups in the labor market and therefore argues that wages are not equal to marginal productivity of labor. Blanchard (1997) describes how changes in labor market institutions, such as a decreasing bargaining power of labor due to decreasing union power, can decrease markups on wages.[21] As another explanation of decreasing markups on wages, Blanchard (1997) mentions that possibly firms reduce labor hoarding (or featherbedding) as unions become less powerful. Firms might have employed so many worker such that the last worker's marginal product lies below his wage. Then a decrease in union power may enable the firms to reduce the excess employment and thus decrease the markup on wages. The second proposal for changes in the relationship between relative wages and input factors is a labor-saving technological change which implies a change in the production function. He questions this proposal as there needs to be a reason why countries with the same distance to the technological frontier, such as Anglo-Saxon and Continental European countries, should adopt fundamentally different production processes. Blanchard (2006) returns to this analysis and still finds the problem to be largely unexplained, although he still argues that changes in labor market institutions are the first candidate explanation. Notably, he is puzzled by the differences in the late evolution of unemployment in countries with the same history of decreasing labor shares since the 1980s, such as France with still high unemployment and the Netherlands with lower unemployment.

There is a large strand of literature exploring different mechanisms how firms and workers negotiate wages. McDonald and Solow (1981) present and model two common approaches:

[21] Blanchard (1997) revers to "efficient bargaining" which was introduced and formalized by McDonald and Solow (1981) and will be explained below.

the right-to-manage model[22] and the efficient-bargaining model[23], which Blanchard (1997) referred to.

In the right-to-manage model the union sets wages subject to maximizing their members total utility and the firm decides on the level of employment accordingly. The firm maximizes its profit subject to the exogenous wage. Thus, the wage-employment pair lies on the firm's labor demand curve. This ensures that the firm employs so many workers such that the workers marginal productivity equals the wage rate. This works analogously to a monopoly in the product market, which sets the price of a product according to the consumers' product-demand function. In figure 4 the labor demand curve is depicted by L^d. Following Cahuc and Zylberberg (2004), pp. 393-405, the wage in the right-to-manage solution solves the following problem:

$$max_w \left[R\left(L^d(w)\right) - wL^d(w)\right]^{1-\gamma} \left[\left(u(w) - u(\overline{w})\right) L^d(w)\right]^{\gamma} \tag{18}$$

w, the wage, solves the Nash-product of the net gains of the firm and of the worker. The firm's surplus is the revenue given labor demand, $L^d(w)$, of the firm at the given wage, $R\left(L^d(w)\right)$, minus the wage bill. The workers gain's are the utility of the worker at the wage w minus the utility the worker would receive from an alternative income at the outside option, $\overline{w}$. The individual utility surplus is multiplied by the amount of workers who are taking part in the bargaining. The Nash-product is weighted by the bargaining power of the worker, γ, and the firm, $1-\gamma$.[24]

McDonald and Solow (1981) show that the wage-employment outcome in the right-to-manage model is not efficient. The firms and the union can improve the outcome by choosing Pareto-superior points in the wage-employment plane. These points are characterized by reaching at least the same revenue level for the firm and a wage-employment pair which reaches a higher indifference curve of the union. The union's utility function and thus its indifference curves depend on its preferences for wages and employment. The Pareto-efficient points that can be reached by bargaining are therefore found on a contract-curve, which is defined as the tangency-points between the isoprofit-curves of the firm and the union's indifference-curves. These points can be found in the model of efficient bargaining, where firms and unions bargain over wages and the level of employment simultaneously. As the wage-employment outcomes are not located on the labor-demand curve any more, the wages are above the workers' marginal product of labor.

In figure 4 the iso-profit curves are the blue lines and the union's indifference-curves are

[22] McDonald and Solow (1981) calls this the Monopolist-Union model while MaCurdy and Pencavel (1986) refer to it as the Labor-Demand-Curve-Equilibrium model.

[23] MaCurdy and Pencavel (1986) refer to it as the Contract-Curve-Equilibrium model.

[24] For an extensive derivation of the labor share under different bargaining regimes under CES production technology, multiple input factors and market rigidities see Arpaia et al. (2009). Checchi and Garcia-Penalosa (2010) derive their predictions for their estimations from a right-to-manage bargaining model over low-skilled wages which they combine with efficiency wages for high-skilled workers.

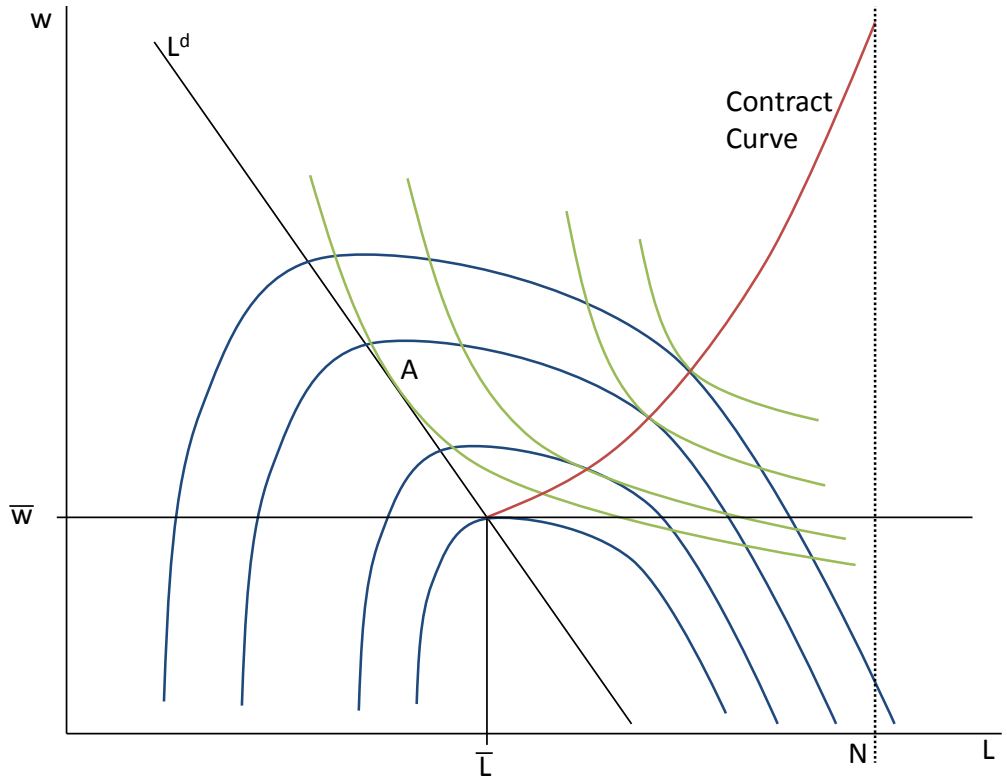

Figure 4: Bargaining in the Labor Market, Source: Based on McDonald and Solow (1981, p. 901)

green. Under the right-to-manage model the bargaining outcome would lie in point A, as this point on the labor demand curve reaches the highest possible indifference curve of the union. The contract curve, the brown line, starts in the point where the labor demand curve offers the wage of the outside option. It then moves to the north-east of the figure to higher indifferent-curves of the union and to lower isoprofit-curves. All points on the contract curve, except $(\overline{w}, \overline{L})$, show a bargaining outcome, where the wage lies above the marginal product of labor.

Cahuc and Zylberberg (2004), pp. 393-405, define the objective function of the efficient bargaining model as

$$max_{w,L} \left[R\left(L\right) - wL\right]^{1-\gamma} \left[\left(u\left(w\right) - u\left(\overline{w}\right)\right) L\right]^{\gamma} \tag{19}$$

A general point in the case for efficient bargaining is, that outcomes off the labor demand curve and on the contract curve can only be reached if there are some kind of quasi-rents or profits that can be bargained over. The further up the wage-employment pair lies on the contract curve (higher indifference-curve for the union) the larger is the share the workers receive from these rents. The highest wage-employment pair that can be reached on the contract curve lies on the zero-profit-curve of the firm. In this case all profits will be allocated

to the workers and beyond this point the firm would have to shut down. How the profit is eventually shared, or how far the bargained outcome is on the contract curve and away from the labor demand curve, depends on the bargaining power of the firm.

Returning to the arguments of Blanchard (1997), the efficient bargaining model shows how firms can be forced by strong unions to employ workers such that the workers' wage exceeds the marginal product of labor. If the bargaining power of workers decreases, the bargained contract would lie closer to the labor demand curve and thus the labor share would decrease. There are some empirical studies for single US industries analyzing how close bargained contracts are to the labor demand curve. Dickens (1995) reviews a range of empirical articles and comes to the conclusion that bargained wages are close to the labor demand curve and are thus close to the marginal product of labor. MaCurdy and Pencavel (1986) find, on the other hand, bargained wages to be on the contract curve for bargains with the International Typographical Union between 1945 to 1973 and see this as a confirmation that the efficient-bargaining model is close to actual negotiations. This is similar to the estimations by Abowd (1989) who finds strong evidence for the efficient bargaining in US collective bargaining agreements between 1976 and 1982. Manning (2010) surveys empirical evidence on bargaining outcomes and quotes the estimated rent-sharing. The estimations rage from close to zero for the rent of the worker to up to 76 percent. Although Manning (2010) discusses several sources for possible inaccuracies for the individual estimations, the results still show that there is room for bargained profits and hints on wage agreements where wages exceed the marginal productivity of labor. This implies that unions may indeed have bargaining power over wages *and* employment and therefore the level of bargaining power has an influence over the size of the labor share.

Bentolia and Saint-Paul (2003) argue that as long as workers are paid by their marginal product there is a direct relationship between the capital-output ratio and the labor share, defined by technical parameters of the labor demand elasticity. In an empirical analysis they estimate which factors could lead to a departure from the direct relationship and induce a gap between the marginal product of labor and real wages. Next to capital-augmenting technological progress they find labor adjustment costs and bargaining power of the workers as significant influences on the development of the labor share in OECD countries on an industry level. Their results on labor market institutions should be taken with care as they are both measured with proxies. Adjustment costs is measured with averages of employment growth by industry and bargaining power by an average over the adjusted conflict rate. Nevertheless, Bentolia and Saint-Paul (2003) reach the conclusion that their results on bargaining power indicates that bargaining tends to follow a right-to-manage model rather than an efficient bargaining allocation.

Some articles combine the influence of technological progress discussed above and labor market institutions on the labor share. Employing a search-model Hornstein et al. (2007) describe the impact of the combination of capital-augmenting technological change and insti-

tutions such as unemployment benefits or firing costs. In their model the institutions enhance the labor-saving technological change and reduce the labor share. Following the model by Hornstein et al. (2007), Ellis and Smith (2010) argue that technological advances and increasing usage of ICT in production improves the bargaining power of the firms in markets where wages are not payed by their marginal product, but are bargained over. Due to higher bargaining power the share of labor income in total output will decrease and find a new stable equilibrium at a lower level. Bental and Demougin (2010) approach the observation of decreasing labor shares with a principal agent framework. In their model technology is Harrod-neutral, but due to exogenously improving ICT the effort of workers is increasingly observable. If workers' effort is unobservable the workers receive a rent in the principal agent framework. The wage is then higher than the marginal product of labor. If effort becomes observable the incentives can be reduced and as monitoring improves wages approach the marginal product of labor. Given the same amount of labor the share of labor in total output therefore decreases. Similar to this, Checchi and Garcia-Penalosa (2010) introduce a derivation of the labor share with two types of workers, where the low-skilled wage is bargained over in right-to-manage framework and high-skilled workers are payed through a contract following incentives from an efficiency-wage model. In the efficiency-wage model the workers wage is set, such that it covers the outside option and that the worker will just not shirk. The efficiency wage is set according to the probability of being caught shirking and the outside option. Beside these two influences, the efficiency-wage model has no implications on the labor share per se. In the model by Checchi and Garcia-Penalosa (2010) the overall labor share is depending on the high-skilled wage and the low-skilled wage and employment. The low-skilled labor outcome is again a function of the production technology, including the elasticities of substitution between capital and both kinds of labor as well as the elasticity of substitution between high and low-skilled work. The overall labor share is consequently a function of the technology and the outside options.

Changes in product market institutions as a driving force for decreasing labor shares is proposed by Azmat et al. (2011). They observed that in several industries, such as manufacturing and network industries, OECD countries have privatized companies and industries in the same time frame the labor share decreased. They develop a model in which a firm receives utility from profits but at the same time from employment itself. A publicly owned firm will weigh employment higher in their objective function than a privately owned firm which is more likely to maximize share holders' profits. Thus a public company will employ more workers at a given wage. Following an empirical investigation Azmat et al. (2011) conclude that reducing entry barriers and thus increasing competition in markets increases the labor share as profit due to markups in the product market decrease. The decline of state control and thus the importance of employment is a countervailing effect and decreases the labor share. Across the OECD they find privatization to account for an average of 20 percent of the decline of the labor share.

Several articles estimate the impact of a whole range of labor market institutions and product market institutions on the labor share in developed countries. Theoretically the sign of the impact is not clear. Institutions designed to increase wages or employment may be successful in increasing the labor share in the short-run, but it may also be an incentive to substitute away from labor. The pace at which substitution is possible would depend on the short- and long-run elasticities of substitution between the input factors. A classical proxy for the bargaining power of workers is union density. In Jaumotte and Tytell (2008), Guscina (2007), and the European Commission (2007) the overall impact of union-density on the labor share is insignificant, while it is not robust in Checchi and Garcia-Penalosa (2010). Decreasing union density therefore seem unlikely to have caused the declining labor share. The European Commission (2007) split their results for different skill levels and find a negative impact of union density on the low skilled wages share and positive impacts on medium and high-skilled wage shares. Although this hints at diverging wages across skill groups, Checchi and Garcia-Penalosa (2010) find classical wage compression when union density is regressed on the 90/10 wage differential. Checchi and Garcia-Penalosa (2010) also include bargaining coordination in their estimation and find strong positive impacts. This indicator for bargaining power thus shows hat higher bargaining power of the worker may indeed increase their share of output. Unemployment benefits seem to have a negative impact on the labor share. The European Commission (2007) finds a strong negative impact on the overall labor share and also significant negative estimates for low- and medium-skilled shares. The estimates of Checchi and Garcia-Penalosa (2010) are also negative, but not robust, while Jaumotte and Tytell (2008) have very small, but significant and negative estimates of unemployment benefits on the wage share. From a theoretical point of view this is surprising as a higher outside option of the worker should increase their share of total income. Here there seems to be a negative employment effect as workers, especially low- and medium-skilled, rather choose unemployment than working for lower wages. The European Commission (2007) shows that a minimum wage has the expected effect of increasing the labor share especially for the low-skilled. With regards to employment protection there seems no consensus in the data. While Guscina (2007) finds a labor share increasing impact, the overall impact described by the European Commission (2007) is negative. Split-up by skill groups the European Commission (2007) shows that employment protection lowers low- and medium-skilled workers labor shares while it increases high-skilled shares. As the results on the impact of labor market institutions vary by policy and dataset there is no general conclusion if labor market liberalization would increase or decrease labor's share of income.

6.3 International Trade

Next to the computer revolution and liberalization of labor and product markets in Europe, international trade picked up over the same time frame. International integration of product and capital markets affect the individual factors of the determinants of the labor share in var-

ious ways. Generally increasing trade should intensify competition and thus should decrease markups and profits. As mentioned by Azmat et al. (2011) and shown by Schneider (2011), the labor share increases with increasing competition on the product market. Industries are affected differently by trade openness. The respective labor share in the industries where profit margins decrease, may affect the aggregate labor share. Trade may therefore influence the sectoral shifts from high-labor share industries to more weight of low-labor share industries in value added which was mentioned above. With regards to within-industry changes of the labor share due to trade, one has to consider the influences of trade on the wage bill. Increasing trade may affect the prices of tradeable input factors such as intermediate goods. Depending on the elasticity of substitution between labor and the respective factor this may increase or decrease labor demand at given domestic wages. Furthermore, firms may offshore or outsource labor intensive production processes to countries with lower wages and consequently decrease domestic labor demand. There are many studies concerning the impact of trade openness on wages[25] or employment/unemployment[26].

Several studies have investigated the impact of trade openness on the overall labor share. Harrison (2002) uses a Nash-Bargaining approach to derive theoretical implications of trade on the labor share. She finds that the domestic labor share should rise if: (1) the foreign wage premium rises, (2) the foreign premium to capital falls, (3) the fixed cost to capital of reallocation rise, (4) the fixed cost to labor of reallocation rise. Estimating the impact of openness on the labor share for developed and developing countries she concludes that government influences, such as government spending and capital controls, increase the labor share, while increasing trade shares, foreign direct investment inflows and exchange rate crises decrease the labor income shares. Including an outside option of the firm to an efficient bargaining approach Jayadev (2007) models the possibility of a firm to reallocate capital to other countries for production. This should have a negative impact on the domestic labor share. He confirms this hypothesis empirically in a large country panel for high- and medium-income countries. In a theoretical model Pica (2010) comes to a similar conclusion. He analyzes the impact of capital market integration on the labor share and lifetime utility in a two country overlapping-generation model. Capital market integration decreases the labor share of income which decreases capital accumulation. The overall impact on workers' labor market outcomes is unclear. Guscina (2007), Jaumotte and Tytell (2008) and the European Commission (2007) show in their empirical analyses that trade openness ($imports + exports/value\,added$) and offshoring decreases the labor share. The estimation results of European Commission (2007) im-

[25] Cf. to Krugman (2008) for a general discussion or Rama (2003) for estimations on the impact of trade liberalization on wages.

[26] Felbermayr et al. (2011) estimates the impact of trade on unemployment and finds openness to be unemployment reducing. Helpman and Itskhoki (2010) create a model where trade openness increases unemployment if labor market rigidities are high and decrease it if the are low. Braun et al. (2009), part II, analyze the interconnection between trade and ICT capital on employment. They show that while trade may cause workers displacement in the short-run it may enhance employment in the long-run. Furthermore the impact of trade on employment depends on the industry

ply that the negative impact of openness is fully absorbed by medium-skilled workers. While high- and low-skilled workers seem unaffected by increasing trade medium-skilled workers' wage bill decreases. Jaumotte and Tytell (2008) find the negative impact of offshoring to be mostly affecting high-skilled sectors, while low-skilled sectors remain unaffected. **?** show a higher risk of unemployment especially for medium-skilled workers due to international outsourcing in a study for Germany.

7 Concluding Remarks

After Atkinson's remarks (Atkinson, 1997) that the interest in the labor share has disappeared, it has suddenly been addressed again by various researchers and analyzed from multiple points of view. This literature review describes the multitude of influences, such as technology, institution, or globalization, which impact the income share of labor over time. The changes are not homogeneous and vary by country, industry and characteristics of the labor force such as skills. Atkinson (2009) discusses the importance of dealing with the factor income shares in a more current article "Factor shares: the principal problem of political economy?" an concludes as follows:

> "There is a great need, particularly at this juncture, to unify the different branches of economics. The link between macro and micro is essential, and economics has suffered from allowing these to go their separate ways. Empirically, the national accounts need to be brought closer to micro-data on households. Theoretically, the aggregate analysis of distribution needs to look at both profits and the wages of heterogeneous workers. Growth theory, macroeconomics, and labour economics are all part of the mix." (Atkinson, 2009, p.15).

These words underline that there is no unifying theory or empirical approach that can simply bring out the underlying nature of factor shares. While one might argue that Kaldor's stylized fact of constant shares holds for the US and the UK, the developments in Europe still question the underlying mechanisms. A stylized fact today should be able to explain the differences in the labor share movements as well. It may be possible to find common ground on the description of the labor share for cyclical short-run movements, but there is less consensus for findings in the longer-run. As the analysis of factor income share is complex there are still many avenues for research, empirical and theoretical, for finding the influences which have a truly significant impact on the functional income distribution.

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