Appendix III

Determinants of labour shares

Box A1 Data selection and estimation procedure: An econometric methodology

The methodology employed in the estimation procedure to determine the effects of different variables on labour shares is based on a causal framework that requires four basic steps. The dependent variable (labour income share) and independent variables (internal and external factors) are constructed by combining datasets (Step 1), carefully considering problems of misreporting and endogeneity (Step 2). The determinants of labour income shares are grouped according to the factors in figure 37 (Step 3) and the combination of the determinants (Step 4) underlines the specifications, leading to the estimates in tables A4 and A5.

Step 1: The following information sources were combined to construct the dependent variable and set of independent variables:

- **Dependent variable**: ILO/ILLS database for the construction of the main indicator on wage shares as proxy for labour income shares.
- **Deterministic factors**: AMECO database, OECD database, Chinese National Accounts, UNIDO Industrial Index, World Bank World Development Indicators (WB-WDI), PENN World Tables, EU-KLEMS database.
- **Complementary data** were also drawn direction from the studies of Aleksynska and Schindler (2011), Bassanini and Duval (2006) and Lane and Milesi-Ferretti (2007).

Treatment and nature of the data: The dependent variable and the determinants are estimated on an annual basis for the period 1970–2007 for 71 economies.

Step 2: The dependent variable is *total wage share,* which equals *total wage bill* divided by national income. It is constructed allowing for two adjustments:

- **Adjustment 1 (control for mis-reporting): Income data from the self-employed includes salaries and profits. To avoid overestimating the contribution from the self-employed (by excluding profits), the total wage bill is estimated as the sum of wages from "salaried employees" augmented by an element corresponding to the share of the self-employed in the workforce.Thus, employees act as counterfactuals to what would have been the salaries of the self-employed had they been wage workers (Gollin, 2002).**
- **Adjustment 2 (controlling endogeneity): The total wage bill includes the wages from the public sector closely related to the measure of government consumption (GC). The variable GC is included in the right-hand side of the causal relation to pick up the effect on changes in "total wage share". Thus, the adjusted measure of total wage share has to be further adjusted by subtracting GC from the total wage bill: the second adjustment makes GC (in the right-hand side) exogenous to total wage share (in the left-hand side).**

Box A1 Data selection and estimation procedure (continued)

Apply adjustment 1 and adjustment 2: The final dependent variable is the private sector total wage bill, adjusted for the self-employed, as percentage of national income.

Step 3:The estimating procedure considers five sets of independent factors as key determinants of labour income share:

- **Real GDP growth is included to control for cyclic and structural changes and might effects the secular trend of the share of functional income. Real GDP growth captures within country heterogeneity that varies derministically over time.**
- **Technological progress: industrial share of GDP, agro-fishery share of GDP, average labour productivity and – for developed economies – capital–labour share and ICT–capital shares. In terms of capital–labour share, the measure is used exclusively for advanced economies where the use of average labour productivity does not help capture technological progress due to the homogeneity of average labour productivity between economies and over time. Thus, in the estimates capital–labour share (for advanced economies only) is measured as the value of the total capital services as a ratio of the total number of employees in that sector: it is therefore a measure of average labour productivity with exclusive reference to capital.**
- **Financialization (global financialization): constructed as total external assets plus external liabilities of an economy as share of GDP. This is the standard method followed in the literature to measure the importance of the financial sector for an economy (see European Commission,2007; Rodrick, 1997; Stockhammer, forthcoming).**
- **Globalization: trade openness (total exports and imports as share of GDP) and terms of trade (unit value of exports to unit value of imports).**
- **Government consumption as share of GDP (as proxy for the welfare state).**
- **Labour market institutions: union density, a minimum wage index, unemployment benefits indicators (replacement rates and coverage), advance notice period for unemployment, severance payments and controls for supply-side effects (labour force and population).**

Step 4: The model assumes a static causal relationship between the variables. Estimates are constructed by pooling the data available from an unbalanced panel (71 countries, with at most 37 years of observations from each country) while controlling for individual fixed effects. Accordingly, the model can be expressed as follows:

$$WSAP_{it} = F[FIN_{it}, GLOB_{it}, TECH_{it}, WFST_{it}, LMI_{it}; e_{it}]$$

i; country among n countries
t; time period of observation
e; stochastic shocks

Including or excluding particular sets of variables allows for two distinct sets of specifications:

- **Baseline specification:** ignores labour market institutional variables (LMI) to enable a better understanding of the joint effects of globalization and the bargaining power of employees (table A4)
- **Augmented baseline specification:** allows each of the five variables identified as labour market indicators in Step 3 to enter the baseline specification, leading to new set of estimates (table A5).

Results and interpretation

Table A4 shows estimates for the baseline specification for three groups of countries: all economies (71 economies), industrialized economies (28 OECD economies) and developing economies (9 economies). This distinction is important from both conceptual and practical points of view. High-income OECD economies have more homogeneous labour markets and industrial structures, and have better-quality data over a longer time-span. These conditions allow us to work on an extended model with all of the potential factors without much risk of statistical errors or unreliability (e.g. statistical "noise"). Thus, a full model specification is used for industrialized economies. The impact of globalization is captured by the variables "trade openness" and "terms of trade", where the former measures the exposure to the global market and the latter measures the relative competitiveness of a country in international trade. The impact of "financial globalization" is captured by the sum of external assets and external liabilities in GDP (from Lane and Milesi-Ferretti, 2007). Both government consumption and union density are also included.

However, such an approach is not feasible for developing economies, largely because of the limitations on available data, particularly relating to union density. A different model specification is thus used, including some new variables – share of the industrial sector, share of the agro-forestry and labour productivity – to control for the effects of technological progress and structural change. When all 71 countries are taken together in the regression, the country variations between developed and developing economies are such that industry share, agro-forestry share and labour productivity are considered sufficient to capture the impacts of technology and structural change on the labour income share. However, in the case of developed economies these three variables are too homogeneous and do not identify the heterogeneity in technological gaps between countries in this group. Instead, the variables capital–labour ratio and capital–service ratio are used to capture such gaps when estimating the baseline specification for the 28 OECD high-income countries. Finally, real economic growth is included to control for the short-run business cycle adjustment on wage setting behaviour; the negative sign is consistent with the finding that wages are countercyclical.

All estimates shown in table A4 can be read in terms of the magnitude of the impact (the value of the coefficients) and the direction of the impact (the sign). The estimates confirm the role of technology and globalization in international trade and financial markets in reducing the labour income share in both developed and developing economies. Interestingly, the impact is similar in magnitude irrespective of country grouping. Positive changes in government consumption increase the labour income share in both developed and developing economies. However, the impact is smaller in magnitude when the estimates cover all 71 economies, potentially pointing to the relative variability of government consumption between developed and developing countries as determinant of labour income shares.[49] Likewise, the coefficient for union density (for OECD economies) indicates the positive effect of bargaining power on labour income shares.[50]

Using the estimates based on the 71 countries together, we see that both increasing levels of industrialization and increases in the capital–labour ratio (both measures of capital augmentation through technological progress) have an adverse effect on labour income shares, as expected and consistently with the findings of previous studies on the topic

(IMF, 2007; Kumhof and Rainciere, 2011; IMF 2010; OECD, 2012b).[51] Nevertheless, in the case of developing economies the coefficients for industrialization and labour productivity imply a positive relationship between technological progress and labour income shares. This could be an indicator of the catching-up effect that some of these economies have experienced – at least up to 2007 – as explained in the IMF report on the globalization of labour (IMF, 2007). During the period of catching up, when economies are shifting their emphasis from agricultural to industrial sectors, the resulting tightening of the labour market may push wages up, as labour productivity increases and technology is upgraded. Similar findings have recently been confirmed by other studies (e.g. OECD, 2012b).

The baseline specification can be further augmented to include indicators for labour market institutions (LMIs), i.e. those variables that (in addition to union density) are directly indicative of the strength of the bargaining process in determining the share of income that goes to labour. Table A5 shows the result of running various specifications where each LMI has been added as an additional factor to the baseline specification explained and tabulated in table A4. The reason for adding *each* of the LMI indicators *separately* is twofold. First, given the positive impact of unionization density on labour wage shares, adding independent indicators that are likely to be the cause of unionization allows better understanding of the possible transition mechanisms between unionization (bargaining power) and the labour share of income. Secondly, the LMIs are likely to be highly correlated, so that adding each separately avoids multicollinearity problems in identification of the estimated parameters.

The estimates are based on all 71 economies in the sample. In practice the estimates show that no single variable on its own is causal to change in the labour income share: that is, the variability within each variable between countries means that we cannot detect significance for any one of the LMIs. It must be pointed out that even when the substantive legal provisions remain unchanged (e.g. the level of minimum wages and unemployment benefits), it is still possible for their effectiveness to be reduced as more workers are excluded from their coverage. De facto deregulation has taken place in many countries with a growing number of non-standard workers and the further segmentation of the labour market; this might explain the finding of no significance for LMI variables in table A5. It is important to point out that the LMI variables employed in the present analysis are not new and have been widely used in empirical studies (IMF, 2007; European Commission, 2007; OECD, 2012b);[52] as in this report, the estimates in similar studies are not statistically significant.

In table A4 unionization density had a positive impact on the labour share of income; the lack of unionization in developing economies implies that we cannot identify this variable in the specifications proposed in table A5. In order to understand whether the results in table A5 are the result of poor data quality in developing economies, an alternative specification was run based only on the 28 OECD high-income economies, using all seven LMI variables *simultaneously* and adding the variable "union density". The resulting coefficient did not change the argument: the five variables that control for strength of LMIs were not significant and only "union density" had a positive and significant effect on the determination of the labour share of income. Therefore, it is clear that it is unionization – and not the outcomes that result from unionization – that provides a cushion for falling labour income shares in the presence of globalization and financialization.

Finally, other specifications were tried adding variables that control for possible structural changes such as unemployment rate, the volatility of exchange rates and financial reforms.[53] Increases in unemployment were found to have strong negative impacts on the labour share, which should not come as a surprise given the downward pressure on wages and the weakening of workers' bargaining position in the presence of higher rates of unemployment. Likewise, an increase in the riskiness of international trade (as expressed by volatility in exchange rate) may reduce the labour share: this finding is consistent with some earlier studies (e.g. Jayadev, 2007; IILS, 2011). Finally, financial liberalization has the effect of tilting the functional income distribution from labour to capital. When the credit control index developed by Abiad et al. – which measures liberalization in credit control – is included in the model, the effect is to reduce the labour share (Abiad, Detragiache and Tressel, 2008), a finding that is consistent with the predictions of Obstfeld and Rogoff (Obstfeld and Rogoff, 2009). Similar impacts (albeit of varying significance) are found when the baseline specification includes other indices of financial reform such as credit controls, interest rate controls, entry barriers, privatization, international capital flows and security markets.

Table A4 The factors influencing the adjusted labour income shares

	Dependent variable: Adjusted labour income shares		
Factors	**All economies (28 OECD, 3 non-OECD high-income, 27 emerging, 13 developing)**	**Industrialized economies (28 OECD)**	**Developing economies (9)**
Real GDP growth	-11.2** (2.97)	-16.4** (3.2)	-26.6** (13.0)
Financial globalization [1]	-3.1** (0.59)	-2.4** (0.7)	-5.0 (3.6)
Trade openness	-6.2** (1.40)	-5.9** (1.8)	-5.9** (6.8)
Terms of trade	-4.2** (1.30)	-4.5** (1.8)	••
Government consumption (% of GDP)	0.4** (0.19)	0.9** (0.2)	0.8** (0.4)
Industrial sector (% of GDP)	-0.3** (0.07)	••	0.6** (0.2)
Agro-forestry sector (% of GDP)	-0.1 (0.10)	••	-0.07 (0.2)
Average labour productivity [1]	-2.4 (2.08)	••	23.7** (9.4)
Union density		0.1* (0.06)	
Capital–labour ratio [1]		-7.0* (3.7)	
Capital services (% of GDP) [1]		1.4 (0.9)	
Diagnostics			
Number of observations	1,450	470	101
Adjusted R-square	0.98	0.94	0.99
Durbin–Watson D-statistic	1.72	1.81	2.04

Note: All models employ a fixed effect estimation procedure on the pool panel data. Financial globalization measures external assets plus external liabilities divided by GDP; trade openness measures exports plus imports divided by GDP; terms of trade measures export unit value relative to import unit value; average labour productivity measures PPP-converted GDP per worker at constant prices; government consumption is expressed as % of GDP; industrial sector measures all industrial sectors' added values as percentage of GDP; agro-forestry sector as % of GDP includes the value added by forestry, hunting, fishing, crop cultivation and livestock production; union density measures the proportion of the working population unionized; capital–labour ratio measures total capital services divided by the number of workers; capital services measures information communication and technology investment divided by gross value added.

[1] These variables enter in logarithmic form. ** Indicates significance at the 5% level; * indicates significance at 10% level. Bracketed numbers are standard errors.

Source: ILO estimates (Stockhammer, forthcoming).

Table A5 The impact of external factors on adjusted labour income shares

Baseline specification augmented by each of the following labour market indicators (LMI)	Dependent variable: Adjusted labour income shares All economies (28 OECD, 3 non-OECD high-income, 27 emerging, 13 developing)	No. of observations	No. of variables	Adjusted R-square	Durbin–Watson D-statistic
Minimum wage index	-0.5 (1.7)	718	8	0.97	1.7
Unemployment benefits, replacement rates	-2.5 (1.9)	1,007	8	0.98	1.7
Unemployment benefits, coverage	0.5 (0.8)	878	8	0.98	1.7
Advance notice period after 4 years of service	-1.2 (0.8)	1,026	8	0.98	1.7
Severance pay after 4 years of service	0.1 (0.4)	1,026	8	0.98	1.7
Size of the labour force [1]	5.0 (3.7)	1,242	8	0.98	1.7
Size of the population [1]	-9.7 (6.5)	1,450	8	0.98	1.7

Note: All models employ a fixed effect estimation procedure on the pool unbalanced panel data with information from 1970 to 2007. The minimum wage index measures the ratio between the minimum wage and the mean wage (Kaitz Index).

[1] These variables enter in logarithmic form. ** Indicates significance at the 5% level; * indicates significance at 10% level. Bracketed numbers are standard errors.

Source: ILO estimates (Stockhammer, forthcoming).

Table A6 Description of countries included in the estimation of tables A4 and A5 and box A1

Groups	Individual countries
High-income OECD members (28 countries)	**Criteria: US$12,276 or more income per capita and OECD members** Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, United Kingdom, United States
Non-OECD high-income (31 countries)	**Criteria: US$12,276 or more income per capita** High-income OECD members listed above (28) and Hong Kong, Kuwait and Oman
Upper–middle-income (27 countries)	**Criteria: US$3,976–12,275 income per capita** Algeria, Argentina, Azerbaijan, Belarus, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Iran, Jordan, Latvia, Lithuania, Mauritius, Mexico, Namibia, Panama, Peru, Russia, South Africa, South Korea, Thailand, Tunisia, Turkey, Venezuela
Lower–middle-income (9 countries)	**Criteria: US$1,006–3,975 income per capita** Armenia, Côte d'Ivoire, Egypt, India, Moldova, Mongolia, Nigeria, Philippines, Sri Lanka
Low-income (4 countries)	**Criteria: US$1,005 or below income per capita** Kenya, Kyrgyzstan, Niger, Tanzania

Source: ILO estimates (Stockhammer, forthcoming).

Explaining the decomposition of labour income shares in figure 38

1. Assume a particular specification that links a set of covariates to the wage share (WS) observed for 71 economies (i) for the years 1970 to 2007. These variables are GDP growth, *R*, technology, *TH*, globalization, *G*, financialization, *F*, government consumption, *GC*, and unionization, *U*:

$$ws_{it} = \beta_1 R_{it} + \beta_2 G_{it} + \beta 3 F_{it} + \beta_4 TH_{it} + \beta_5 GC_{it} + \beta_6 U_{it} + residual_{it} + f_i \quad (1)$$

where

i; country, t = time, f_i : fixed effects

2. Run the model to get the coefficients in expression (1). This is done allowing for all observations to enter as if we had a cross section. Once the model is estimated we can interpret expression (1) as follows in expression (2):

Following table A1:
Developed:

$$ws_{it} = -16.4 \times R_{it} - \underbrace{(5.9 \times OPEN_{it} + 4.5 \times TOT)}_{G_{it}} - 2.4 \times F_{it} - 7.0 \times TH_{it} + 0.9 \times GC_{it} + 0.1 \times U_{it} + \hat{e}_{it}$$

where

OPEN: trade openness, TOT: terms of trade (2)

Developing:

$$ws_{it} = -26.6 \times R_{it} - 5.9 \times TOT - 5.0 \times F_{it} + \underbrace{(0.6 \times IND_{it} + 23.7 \times LP_{it} - 0.7 \times AG_{it})}_{TH_{it}} + 0.8 \times GC_{it} + e_{it}$$

wnere

IND: industrial sector, LP: labour productivity,
AG: agricultural production

3. The decomposition as shown in figure 38 is based on specifications and coefficients in expression (2). Let's take 'developed economies' as example:
    1. Select two periods over time: 1990–94 and 2000–04.
    2. For each period estimate the average of each variable (G, F, TH, C and U) as if the average between countries emulates some 'hypothetical' country. The variable 'real GPD growth' has not changed over the two selected periods so that its contribution to the final decomposition is neglible (can be ignored).
    3. Each of the averages is weighted by the corresponding (estimated) coefficient as given in expression (2). For example, F is measured as the logarithm of the sum of external assets and external liabilities: let's say the average of F for all economies and for the period 1990–94 gives a total of 0.04 whereas for the period 2000–04 the average is 1.5. Then, each of these numbers is weighted by the same coefficient value of -2.4.

4. Taking differences between the two weighted values – i.e., (1.5)(-2.4)-(0.06)(-2.4) = -3.3 – shows the contribution of the variable 'financialization' (or global financialization) in figure 38.
5. Doing the same for each of the variables and adding the total provides the "predicted" difference between periods for the wage share. This equals (approximately) -7.1, i.e., between the periods 1990–94 and 2000–04 the wage share has decreased by 7.1 per cent. The same applies to developing economies in the second set of bars for figure 38: in this case the average change in WS for the 'hypothetical' economy in the developing world is -2 per cent.