# Technical appendix I: The wage share

## *Definitions and methods*

The wage share is normally measured by comparing total compensation of employees to gross domestic product (GDP). The so-called "unadjusted" wage share is defined as the total compensation for employees as a percentage of GDP. This is measured as follows:

Unadjusted wage share = Total compensation of employees/GDP

The problem with this method, however, is that the result depends on knowing both the number of employees and their wages (which must be multiplied to obtain the total compensation of employees). This makes interpretation difficult, particularly in the case of long-term series data. For instance, empirical studies that examine the increase in the wage share in the first half of the twentieth century in the United States indicate that much of the increase was attributable to the growth of wage employment rather than to the growth in the level of wages. Hence, it is preferable to define a so-called "adjusted" wage share, which is usually measured as follows:

Adjusted wage share = (Total compensation per employee x Total employment)/GDP

Unfortunately, when comparable consistent time-series data for employment structure are not available, it is impossible to estimate the *adjusted* wage shares. Therefore, in this report we have computed only *unadjusted* shares (presented in panel B of figure 13). This is unfortunate because there is large-scale self-employment in many developing countries. For this reason, great caution is needed in interpreting the data, and a simple cross-country comparison of the absolute levels is discouraged. Due to these limitations, the report concentrates on changes within a relatively short period of time (about ten years) and within, not between, countries.

As more general caveats, the following points need to be noted in interpreting the wage share. First, the compensation of employees conceptually differs from labour income, as some important forms of non-wage compensation may not be included. Second, when the focus is extended to cover the self-employed (and so "labour income" more generally), measurement problems become even more challenging. Some studies have attempted to impute the labour income from self-employment when analysing the wage share. [106] In fact, if we assume that the self-employed command the same wage rate as people who work as employees, the adjusted wage share can be seen as an approximate measure of labour share. However, it is not entirely clear if this is an acceptable approach based on sound empirical evidence. [107]

[106] See, for example, European Commission (2007a).

[107] See, for example, Krueger (1999).

## *Panel regressions*

In order to investigate correlations between *changes* in trade, foreign direct investment (FDI) and the wage share in recent years, we created two panel datasets. The first panel comprises the adjusted wage shares, covering the years 1995–2007, mostly for developed and middle-income countries; the second panel consists of the unadjusted wage shares for the period 1995–2006, mostly for developing nations. Compared with other quantitative methods, the panel regression modelling makes better use of the data and improves estimates by controlling for heteroscedasticity across panels. In the model, GDP growth is also included to take into account its potential relationship with the wage share.

Table A1 shows the results for panel regression on the wage share. The first model demonstrates how the (adjusted) wage share responds to economic growth and the trade share. The second model focuses on the unadjusted wages share, primarily for developing nations. No countries are presented twice in the panels. In addition, we also pooled two datasets in an attempt to assess the overall impacts. This of course involves the risk of pooling together two non-comparable indicators. However, we are interested only in changes over time within countries, which reduces such a risk quite considerably.

The results show that economic development and the wage share moved in different directions over the past ten years. Overall, a 1 per cent annual growth in GDP is associated with a 0.047 per cent decrease in the wage share. This negative correlation is particularly strong in the case of the unadjusted wage share (developing countries).

**Table A1 Panel regression results on the change in wage share**

| | Model I (adjusted wage share) coefficient | Model II (unadjusted wage share) coefficient | Model III (pooled data) coefficient |
|---|---|---|---|
| Constant | -0.047 (0.082) | 0.249** (0.127) | 0.014 (0.065) |
| Annual change in GDP | -0.043* (0.025) | -0.071*** (0.026) | -0.047*** (0.017) |
| Annual change in trade ratio | -0.049*** (0.01) | -0.048*** (0.013) | -0.05*** (0.008) |
| Annual change in FDI ratio | -0.013 (0.012) | 0.027 (0.028) | -0.002 (0.010) |
| Observations | 370 | 233 | 603 |
| Panels | 36 | 28 | 64 |
| Wald chi $^2$ | 41.31 | 22.61 | 60.61 |

Notes: ***, ** and * denote that the parameter is significant at 1%, 5% and 10% levels, respectively; standard errors in brackets.
FGLS is used to estimate panel-data models; trade ratio refers to the proportion of trade (import + export) volume in GDP; FDI ratio indicates the proportion of FDI (net inflow) in GDP. All the original data are from the World Bank's World Development IndicatorsI; GDP is measured at constant prices; the original data are from IMF's World Economic Outlook Database. For further details on the dataset, see Statistical Appendix.

It is shown in table A1 that, for all three models, the coefficients for the trade ratio variable also have significant negative values, which indicates that growing trade share as a percentage of GDP may have contributed to the decline in wage share in the past decade. In our pooled model we find that every 1 per cent increase in the ratio of trade (imports + exports) to GDP is associated with a 0.05 per cent decrease in the wage share. Surprisingly, the magnitude of the response of wage share to the changes in trade ratio is almost the same across the three models. By contrast, the results for the FDI ratio are mixed, yet no significant findings are observed. It must also be pointed out that we did not control for the possible influence of technology on the wage share. If technological progress is associated with rising trade share, there is a possibility that the effects of trade and technology could be difficult to disentangle.

## Technical appendix II: Institutions and inequality

Collective bargaining is known to be an effective tool for compressing wage differentials in the case of industrialized countries. Less is known about the statistical effect of minimum wages on differences in wage inequality across countries. We therefore ran the following simple panel regressions. We see in table A2 that collective bargaining is associated with less overall wage inequality (D9/D1) and also less inequality in the bottom half of the labour market (D5/D1). Minimum wages by contrast are associated with less wage inequality in the lower part of the labour market (D5/D1) but, somewhat surprisingly, with higher overall inequality (D9/D1). This may point to some reverse causality, whereby countries with higher overall inequality also tend to use minimum wages more vigorously. At the same time, estimation results tend to be sensitive to changes in model specification. However, the negative relationship between trade and the wage share, as reported earlier, remains significant and strong, even if these institutional factors are taken into account.

The possible correlations between the wage share and institutional factors have been discussed in recent international reports.[108] These reports give some empirical support to this linkage in the case of industrialized countries. Using the statistical strategy that we applied for wage inequality, a series of statistical analyses (both panel and cross-section) was undertaken on our new data on the wage share, which were far more extensive than the existing dataset. We found that while both collective bargaining coverage and minimum wages are positively correlated with the wage share, the coefficients are not statistically significant (full details are not reported here but are available upon request from travail@ilo.org). At the same time, estimation results tend to be sensitive to changes in model specification. However, the negative relationship between trade ratio and the wage share, as reported earlier, remains significant and strong, even if these institutional factors are taken into account.

[108] European Commission (2007a); European Commission (2007b); IMF (2007a); IMF (2007b); OECD (2007).

## Table A2 Wage inequality and institutional factors

| Dependent variable | Independent variable | Model I | Model II | Model III |
|---|---|---|---|---|
| D9/DI ratio | Constant | 6.414***<br>(0.097) | 6.513***<br>(0.143) | 6.570***<br>(0.150) |
| | Annual GDP per capita growth | | -0.015<br>(0.018) | -0.027<br>(0.019) |
| | Annual change in trade ratio | | | 0.008<br>(0.007) |
| | Annual change in FDI ratio | | | -0.010<br>(0.012) |
| | Collective bargaining coverage<br>(=1 if the coverage>30 %) | -2.277***<br>(0.110) | -2.43***<br>(0.124) | -2.571***<br>(0.131) |
| | Ratio of MW to AW<br>(=1 if the ratio>=0.4) | 0.641***<br>(0.176) | 0.629***<br>(0.182) | 0.689***<br>(0.185) |
| | No. of observations | 225 | 225 | 220 |
| | Panels | 28 | 28 | 28 |
| D5/DI ratio | Constant | 2.716***<br>(0.055) | 2.769***<br>(0.063) | 2.772***<br>(0.064) |
| | Annual GDP per capita growth | | -0.017*<br>(0.010) | -0.012<br>(0.011) |
| | Annual change in trade ratio | | | -0.001<br>(0.005) |
| | Annual change in FDI ratio | | | 0.001<br>(0.004) |
| | Collective bargaining coverage<br>(=1 if the coverage>30 %) | -0.538***<br>(0.069) | -0.548***<br>(0.069) | -0.636***<br>(0.068) |
| | Ratio of MW to AW<br>(=1 if the ratio>=0.4) | -0.169**<br>(0.073) | -0.173**<br>(0.073) | -0.093<br>(0.074) |
| | No. of observations | 214 | 214 | 209 |
| | Panels | 27 | 27 | 27 |

Notes: ***,** and * denote that the parameter is significant at 1%, 5% and 10% levels, respectively; standard errors in parentheses.
FGLS is used to estimate panel-data model; Model I only takes into account institutional factors, i.e. collective bargaining coverage and ratio of minimum wage (MW) to average wage (AW), which are specified as dummy variables. In Model II, both GDP per capita growth and institutional factors are included. Model III is a full model including changes in trade and FDI ratios. Trade ratio refers to the proportion of trade (import + export) volume in GDP; FDI ratio indicates the proportion of FDI (net inflow) in GDP; annual GDP per capita growth, trade ratio and FDI ratio are from World Bank's World Development Indicators database. For further details on the dataset, see Statistical Appendix.

# References

Ackah, C. 2008. "Wage trends and wage policy in Ghana", unpublished report prepared for the ILO.

Aidt, T.; Tzannatos, Z. 2002. *Unions and collective bargaining: Economic effects in a global environment* (Washington, DC, World Bank).

Alvarado, J.B. 2008. "Salarios y políticas salariales en el Perú", paper prepared for the ILO *Global Wage Report*, mimeo (Geneva, ILO).

Anderson, E. 2005. "Openness and inequality in developing countries: A review of theory and recent evidence", in *World Development*, Vol. 33, No. 7, pp. 1045–1063.

Asian Development Bank (ADB). 2007. *Key Indicators 2007: Inequality in Asia* (Manila, ADB).

Autor, D.; Katz, L.; Kearney, M. 2006. "The polarization of the US labour market", NBER Working Paper No. 11986 (Cambridge, MA, National Bureau of Economic Research).

Baccaro, L.; Simoni, M. 2007. "Centralized wage bargaining and the Celtic Tiger phenomenon" in *Industrial Relations*, Vol. 26, No. 3, pp. 426–455.

Berg, J. 2004. "Technology v. trade v. social institutions: Understanding rising wage inequality in the Chilean cosmetics industry", in W. Milberg (ed.): *Labour and the globalisation of production: Causes and consequences of industrial upgrading* (Basingstoke, UK, Palgrave Macmillan).

Berg, J.; Kucera, D. (eds). (2008). *In defence of labour market institutions: Cultivating justice in the developing world* (Geneva, ILO and New York, Palgrave Macmillan).

Bertola, F.; Blau, F.; Kahn, L. 2002. "Comparative analysis of labour market outcomes: Lessons for the US from international long run evidence", in A. Krueger; R. Solow (eds): *The roaring nineties: Can full employment be sustained?* (New York, Russell Sage and Century Foundations), pp. 159-218.

Bhorat, H.; Goga, S. 2008. "Wage formation and wage trends in South Africa", paper prepared for the ILO *Global Wage Report*, mimeo (Geneva, ILO).

Blanchflower, D.; Bryson, A. 2002. "Changes over time in union relative wage effects in the UK and the US revisited", NBER Working Paper No. 9395 (Cambridge, MA, National Bureau of Economic Research).

Blau, F.; Kahn, L. 1996. "Wage structure and gender earnings differentials: An international comparison", in *Economica* (supplement), Vol. 63, pp. S29–S62.

—. 1999. "The effect of wage inequality and female labour supply on the gender pay gap: A cross-country analysis, 1985 to 1994", working paper (Ithaca, NY, Cornell University).

Braunstein, E.; Brenner, M. 2007. "Foreign direct investment and gendered wages in urban China", in *Feminist Economics*, Vol. 13, Nos 3 & 4, pp. 213–237.

Cahuc, P.; Zylberberg, A. 2004. *Labor economics* (Cambridge, MA, MIT Press)

Card, A.; Krueger, D. 1995. *Myth and measurement* (Princeton, NY, Princeton University Press).

Cazes, S.; Nesporova, A. 2007. *Flexicurity: A relevant approach in Central and Eastern Europe* (Geneva, ILO).

Chaudhuri, S.; Ravallion, M. 2007. "Partially awakened giants: Uneven growth in China and India", in A. Winters; S. Yusuf (eds): *Dancing with giants: China, India and the global economy* (Washington, DC, World Bank).

Council of Europe. 2008. *Economic migration, social cohesion and development: towards an integrated approach*, report prepared for the 8th Council of Europe Conference of Ministries Responsible for Migration Affairs, Kiev, 4–5 Sep.

Cunningham, W. 2007. *Minimum wages and social policy: Lessons from developing countries* (Washington, DC, World Bank).

Dedecca, C.S. 2008. "A evolução recente dos salários no Brasil", paper prepared for the ILO *Global Wage Report*, mimeo (Geneva, ILO).

Dickens, W. et al. 2007. "How wages change: Micro evidence from the International Wage Flexibility Project", in *Journal of Economic Perspectives*, Vol. 21, No. 2, pp. 195-214.

Dustmann, C.; Frattini, T.; Preston, I. 2007a. *A study of migrant workers and the enforcement issues that arise*, Report to the Low Pay Commission, Jan.

—; Ludstreck, J.; Schoenberg, U. 2007b. "Revisiting the German wage structure", IZA Working Paper No. 2685 (Bonn, Institute for the Study of Labor).

European Commission. 2007a. *Labour market and wage developments in 2006* (Brussels).

—. 2007b. "The labour income share in the European Union", in *Employment in Europe* (Brussels).

European Industrial Relations Observatory (EIRO). 2002. "Collective bargaining coverage and extension procedures". Available at: http://www.eurofound.europa.eu/eiro/2002/12/study/tn0212102s.htm [6 Sep. 2008].

Eyraud, F.; Saget, C. 2005. *The fundamentals of minimum wage fixing* (Geneva, ILO).

—; Vaughan-Whitehead, D. (eds). 2007. *The evolving world of work in the enlarged EU – Progress and vulnerability* (Geneva, ILO).

Ferreira, F.; Ravallion, M. 2008. "Global poverty and inequality: A review of the evidence", World Bank Policy Research Working Paper No. 4623 (Washington, DC, World Bank).

Flanagan, R. 2006. *Globalization and labor conditions: Working conditions and worker rights in a global economy* (New York, Oxford University Press).

Freeman, R. 2007. "Labor market institutions around the world", NBER Working Paper No. 13242 (Cambridge, MA, National Bureau of Economic Research).

—; Oostendorp, R. 2001. "The occupational wages around the World data file", in *International Labour Review*, Vol. 140, No. 4, pp. 380–401.

Ghellab, Y.; Vaughan-Whitehead, D. (eds). 2003. *Sectoral social dialogue in future EU Member States: The weakest link* (Budapest, ILO and European Commission).

Gibbons, R. 2005. "What is economic sociology and should any economists care?", in *Journal of Economic Perspectives*, Vol. 19, No. 1, pp. 3–7.

Goldberg, K.; Pavcnik, N. 2007. "Distributional effects of globalization in developing countries", in *Journal of Economic Literature*, Vol. XLV, pp. 39–82.

Granovetter, M. 2005. "The impact of social structure on economic outcomes", in *Journal of Economic Perspectives*, Vol. 19, No. 1, pp. 33–50.

Gupta, N. 2002. "Gender, pay and development: A cross-country analysis", in *Labour and Management in Development*, Vol. 3, No. 2, pp. 1–19.

Hall, R. 2007. "The first year of Work Choices: Industrial relations in Australia in 2006", in *Journal of Industrial Relations*, Vol. 49, pp. 307–309.

Hirsch, B. 2006. "*Emerging labor market institutions for the twenty-first century*, by Freeman R., Hersch J., and L. Mishel", book review, in *Industrial and Labor Relations Review*, Vol. 60, No. 2, Article 81.

—. 2008. "Sluggish institutions in a dynamic world: Can unions and industrial competition coexist?", in *Journal of Economic Perspectives*, Vol. 22, No. 1, pp. 153–176.

International Food Policy Research Institute (IFPRI). 2008. *High food price: The what, who, and how of proposed policy action*, Policy Brief, May. Available at: www.ifpri.org [22 Sep. 2008].

International Labour Office (ILO). 2002. "News: Latin America and the Caribbean", in 2002 *Labour Overview* (Lima, ILO Regional Office).

—. 2004. *Towards a fair deal for migrant workers in the global economy*, International Labour Conference, 92nd Session, Geneva, 2004 (Geneva).

—. 2007. ESP paper GB/298.11 (rev.), Mar. (Geneva).

—. 2008. *Key Indicators of the Labour Market*, 5th ed. (Geneva).

International Monetary Fund (IMF). 2007a. "The globalization of labor", in *World Economic Outlook: Spillovers and cycles in the global economy* (April 2008) (Washington, DC).

—. 2007b. "Globalization and inequality", in *World Economic Outlook: Globalization and inequality* (October 2008) (Washington, DC).

International Trade Union Confederation (ITUC). 2008. *The global pay gap* (Brussels).

Jansen, M.; Lee, E. 2007. *Trade and employment: Challenges for policy research* (World Trade Organisation and International Labour Office, Geneva).

Kahyarara, G. 2008. "Wages in Tanzanian labour market', paper prepared for the ILO *Global Wage Report*, mimeo (Geneva, ILO).

Keynes, J.M. 1999 [1936]. *General theory of employment, interest and money* (Basingstoke, UK, Palgrave Macmillan).

Krueger, A. 1999. "Measuring labor's share", in *American Economic Review*, Vol. 89, pp. 45–51.

Kunze, A. 2003. "Gender differences in entry wages and early career wages", in *Annales d'Economie et de Statistique*, Nos 71 & 72, pp. 245–265.

Kuznets, S. 1955. "Economic growth and income inequality", in *American Economic Review*, Vol. XLV, pp. 1–28.

Layard, R. 2006. "Happiness and public policy: A challenge to the profession", in *The Economic Journal*, Vol. 116, March, pp. C24–C33.

—; Nickell, S.; Jackman, R. 1991. *Unemployment: Macroeconomic performance and the labour market* (Oxford, Oxford University Press).

Lee, S.; Eyraud, F. (eds). 2008. *Globalization, flexibilization and working conditions in Asia and the Pacific* (Geneva, ILO and Oxford, Chandos).

Lemieux, T. 2007. "The changing nature of wage inequality", NBER Working Paper No. 13523 (Cambridge, MA, National Bureau of Economic Research).

Lemos S. 2004. "The effect of the minimum wage on prices", IZA Discussion Paper No. 1072 (Bonn, Institute for the Study of Labor).

—. 2007. "Minimum wage effect across the private and public sectors in Brazil", in *Journal of Development Studies*, Vol. 43, No. 4, pp. 700–720.

Liu, A.Y.C. 2004. "Gender wage gap in Vietnam: 1993 to 1998", in *Journal of Comparative Economics*, Vol. 32, No.3, pp. 586–596.

Luebker, M. 2007. "Labour shares", ILO Technical Brief No. 1 (Geneva, ILO).

Machin, S. 2008. "An appraisal of economic research on wage inequality", in *Labour*, Vol. 22, Special issue, pp. 7–26.

Majid, N. 2004. "What is the effect of trade openness on wages?", ILO Employment Strategy Papers No. 18 (Geneva, ILO).

Manning, C. 2003. *Monopsony in motion: Imperfect competition in labor markets* (Princeton, NJ, Princeton University Press).

Marginson, P.; Sisson, K. 2004. *European integration and industrial relations: Multilevel governance in the making* (Basingstoke, UK, Palgrave Macmillan).

Neumark, D. 2008. "Alternative labor market policies to increase economic self-sufficiency", IZA Discussion Paper No. 3355 (Bonn, Institute for the Study of Labor).

Organisation for Economic Co-operation and Development (OECD). 2002. *Measuring the non-observed economy: A handbook* (Paris, OECD, IMF, ILO and CIS Stat).

—. 2004. *Employment Outlook* (Paris).

—. 2007. *Employment Outlook* (Paris).

Organisation for Economic Co-operation and Development/Food and Agriculture Organization (OECD-FAO). 2008. *Agricultural Outlook 2008–2017* (Paris).

Oostendorp, R. 2004. *Globalization and the gender wage gap*, World Bank Policy Research Working Paper (Washington, DC, World Bank).

—. 2005. "The standardized ILO October Inquiry 1983–2003", mimeo (Amsterdam, Free University).

Pay Equity Task Force. 2004. *Pay equity: A new approach to a fundamental right*, Final Report (Ottawa). Available at: www.payequityreview.gc.ca [9 Sep. 2008].

Piketty, T.; Saez, E. 2007. "How progressive is the US federal tax system? A historical and international perspective", in *Journal of Economic Perspectives*, Vol. 21, No. 1, pp. 3–24.

Plantenga, J.; Remery, C. 2006. *The gender pay gap: Origins and policy responses – A comparative review of thirty European countries*, report prepared for the European Commission, Brussels.

Riveros, L.A. 1994. *Chile's structural adjustment: Relevant policy lessons for Latin America*, FOCAL Working Paper No. FC1995-9 (Toronto, University of Toronto).

Rodgers, J.; Rubery, J. 2003. "The minimum wage as a tool to combat discrimination and promote gender equality", in *International Labour Review*, Vol. 142, No. 4. pp. 543–556.

Rodrik, D. 1999. "Democracies pay higher wages", in *Quarterly Journal of Economics*, Vol. 114, No. 3, pp. 707–738.

Rubery, J. 2003. *Pay equity, minimum wage and equality at work*, Declaration Working Paper 19 (Geneva, ILO).

—; Grimshaw, D.; Figueiredo, H. 2005. "How to close the gender pay gap in Europe: Towards the gender mainstreaming of pay policy", in *Industrial Relations Journal*, Vol. 36, No. 3, pp. 184–213.

Saget, C. 2006. "Wage fixing in the informal economy: Evidence from Brazil, India, Indonesia, and South Africa", ILO Working Paper, Conditions of Work and Employment Series No.16 (Geneva, ILO).

—. 2008. "Fixing minimum wage levels in developing countries: Common failures and remedies", in *International Labour Review*, Vol. 147, No. 1, pp. 25–42.

Seguino, S.; Grown, C. 2006. "Gender equity and globalization: Macroeconomic policy for developing countries", in *Journal of International development*, Vol. 18, pp. 1–24.

Squire, L.; Suthiwart-Narueput, S. 1997. "The impact of labor market regulations", in *The World Bank Economic Review*, Vol. 11, No. 1, pp. 119–144.

Statistical Committee of the Commonwealth of Independent States. 2007. *Official statistics of the countries of the Commonwealth of Independent States* (CD-Rom) (Moscow).

Stockhammer, E. 2008. "Wage flexibility or wage coordination? Economic policy implications of the wage-led demand regime in the Euro area", Political Economic Research Institute Working Paper No. 160 (Amherst, MA, University of Massachusetts).

Traxler, F.; Blaschke, S.; Kittel, B. 2001. *National labour relations in internationalised markets. A comparative study of institutions, change and performance* (Oxford, Oxford University Press).

Tzannatos, Z. 2008. “The impact of trade unions: What do economists say?”, in J. Berg; D. Kucera (eds): *In defence of labour market institutions: Cultivating justice in the developing world* (Geneva, ILO and New York, Palgrave Macmillan), pp. 150–191.

—; Aidt, T. 2008. “Unions and microeconomic performance: A look at what matters for economists (and employers)”, in *International Labour Review*, Vol. 145, No. 4, pp. 257–278.

United Nations Development Programme (UNDP). International Poverty Centre. 2007. *Poverty in focus: The challenge of inequality* (Brasilia).

Visser, J. 2006. “Union membership statistics in 24 countries”, in *Monthly Labour Review*, Vol. 129, No. 1, pp. 38–49.

World Bank. 2007. *Armenia labor market dynamics* (Washington, DC).