BANK FOR INTERNATIONAL SETTLEMENTS

BIS Working Papers

No 231

The global upward trend in the profit share

By Luci Ellis and Kathryn Smith

Monetary and Economic Department

July 2007

JEL Classification Numbers: E25, L51
Keywords: profit share, technological progress, vintage capital

Abstract

Profits growth has been strong in many developed economies in recent years, and the profit share – the share of factor income going to capital – has been high compared with historical experience. This paper shows that, rather than being a recent phenomenon, profit shares have trended upwards since about the mid 1980s in most developed economies for which comparable data are available. There are a number of possible explanations for this, but not all of them are consistent with a global trend over two decades, nor do they fit cross-country differences in the trend in the profit share.

The preferred explanation advanced in this paper is that ongoing technological progress has increased the rate of obsolescence of capital goods. This induces a greater rate of churn in both capital and jobs, which puts firms in a stronger bargaining position relative to a labour force that now faces more frequent job losses on average. Firms can therefore reap a larger fraction of the economic surplus created by market frictions, which raises the measured profit share. This effect is stronger where labour market institutions are more rigid, consistent with the cross-country pattern in the trends in the profit share. There is also a positive relationship between the size of the trend in the profit share, and the extent of product market regulation. This suggests a role for competition and innovation in driving down high profit margins. These explanations appear to fit the data better than alternatives raised in the literature.

Contents

The global upward trend in the profit share[1]

Luci Ellis and Kathryn Smith[2]

1. Introduction

Strong profit growth has been observed across a range of developed economies in recent years, and it is perceived that the share of factor income going to profits – the return on capital – is particularly high.[3] It is not immediately clear if this might be the result of a change in fundamentals in the goods market, or a sign of some underlying inefficiency, with firms being able to extract increasing economic rents. Such shifts in factor shares could have important macroeconomic implications. For example, future investment might be stronger, if firms seek to take advantage of currently high returns on capital. A reversal of the factor share trends through higher wage growth could be interpreted as adding to inflation pressures, rightly or wrongly. On the other hand, if the rising profit share was the result of widening margins, this could also add to inflation pressures.

This paper presents data that suggest that the profit share is unusually high at present (and the wage share unusually low). In fact, the extent and cross-country scope of this outcome has no precedent over the past 45 years. This has not simply been driven by recent strong global growth. Rather, it appears to be the result of a two-decade upward trend common across a number of countries. We test one likely explanation, namely the increasing use of IT-based capital goods, which have faster rates of obsolescence than other kinds of capital. Hornstein, Krusell and Violante (2002, 2003) show that if capital goods installed at different times embed different technological levels (so-called 'vintage capital'), faster innovation rates will increase churn in the labour market as well. Where there are search frictions in the labour market, this increases firms' bargaining power over the economic surplus, thereby shifting income in favour of profits. The effect is stronger where firms themselves face less competitive pressure, and where certain kinds of labour market rigidities amplify the effect of these changes on equilibrium unemployment rates.

Some of the other factors proposed in the literature seem to be less plausible as explanations of these trends, because they are not global in scope, or their timing does not match the data. Our preferred technology-based explanation has the advantage that it can account for cross-country pattern in the data as well as the common timing. Although a direct empirical test for this mechanism is not feasible with available data, we show that the trend persists after controlling for a number of these alternative explanations. This implies that they

---

[1] The original version of this paper was written in 2005, while the first author was on a staff exchange visit to the European Central Bank's External Developments Division. We would like to thank the staff at the ECB for their hospitality and helpful comments, especially Filippo di Mauro, Marie Diron, Gabe de Bondt, Petra Köhler-Ulbrich and Aidan Meyler. Ana Lima (ECB) provided excellent research assistance. We are also grateful to our colleagues, especially Jacqui Dwyer, Andy Filardo and Marion Kohler, for their helpful suggestions. The views expressed in this paper are those of the authors, and do not represent the views of the BIS, the ECB or of any other current or previous employer. Any remaining errors are the sole responsibility of the authors.

[2] Respectively, Senior Economist, Monetary and Economic Department, Bank for International Settlements, and London School of Economics.

[3] For example, a non-technical presentation of this fact was published in the *Economist*, 10 February 2005.

are unlikely to be the explanation for this particular stylised fact about developments in factor shares, although they may be important influences over shorter time periods or a sub-set of countries. The paper concludes with a brief discussion of the implications of this preferred technology-based explanation for future developments in factor shares.

2. Are profits genuinely high?

The first question to address is whether the perception of high profitability is supported by the data. A broad definition of the economy-wide profit share is needed, to avoid being misled by developments specific to a particular sector or to listed companies. National accounts measures of profits meet this test, if both corporations and unincorporated businesses are included, along with public-sector business enterprises. Otherwise, the data would be distorted by the shifts in the share of unincorporated business in the economy, and by firms switching between the public and private sectors when they are privatised or nationalised.[4] The unincorporated business component of profits must also be adjusted to exclude the fraction representing the labour income of business owners and the self-employed.[5] These unincorporated wages can be inferred by assuming a fixed ratio between average wages and the unobserved average labour income of the self-employed. The wage share can then be grossed up in line with the share of self-employment in total employment, and the profit share reduced accordingly. This is the approach adopted in the European Commission's AMECO (Annual Macroeconomic) database used in this paper and by Meyler (2001), and it is fairly robust to different assumptions about the relative wage.[6] The calculation is shown in Equation (1); UE refers to unincorporated enterprises.

$$\text{Profit share} \equiv \frac{\text{Gross operating surplus} + \text{income}_{\text{UE}} - \text{wages}_{\text{UE}}}{\text{GDP} - \text{net indirect taxes}} = 1 - \text{wage share} \qquad (1)$$

The resulting adjusted profit shares are shown in Figure 1. Profits currently account for a higher share of value added than in the previous couple of decades in a diverse range of countries, including most continental European countries, Japan, Australia, Canada and the United States. All of these countries also show higher profit shares in recent years than in the 1960s, except for Australia and New Zealand. However, as discussed in Appendix A, these two countries' data appear distorted, so it cannot be ruled out that the true profit share is higher than it was in the 1960s in those countries as well. There are only a few countries where the profit share seems to have lacked an upward trend: Belgium, the Netherlands, Portugal, Sweden and the United Kingdom (bottom panel of Figure 1).

---

4 Harvey (2003) and ECB (2004) discuss these measurement issues in more detail. It would also make sense to exclude the surplus attributed to household ownership of dwellings, but these data are not available for all countries. However, available national data suggest that this component is relatively stable as a share of GDP. Hence not excluding it does not change assessments of whether profits have risen or fallen.

5 A decline in the share of self-employment, and thus of unincorporated profits in total income, has been a feature in most developed economies over the past half-century, as agricultural sectors' shares of output have fallen and, in some cases, tax systems have created incentives for small businesses and large partnerships to incorporate. Incidentally, the investment needs of small business imply that households tend to save more out of business income than labour income. Thus shifts of unincorporated enterprises to the corporate sector should reduce the measured household saving ratio, all other things equal.

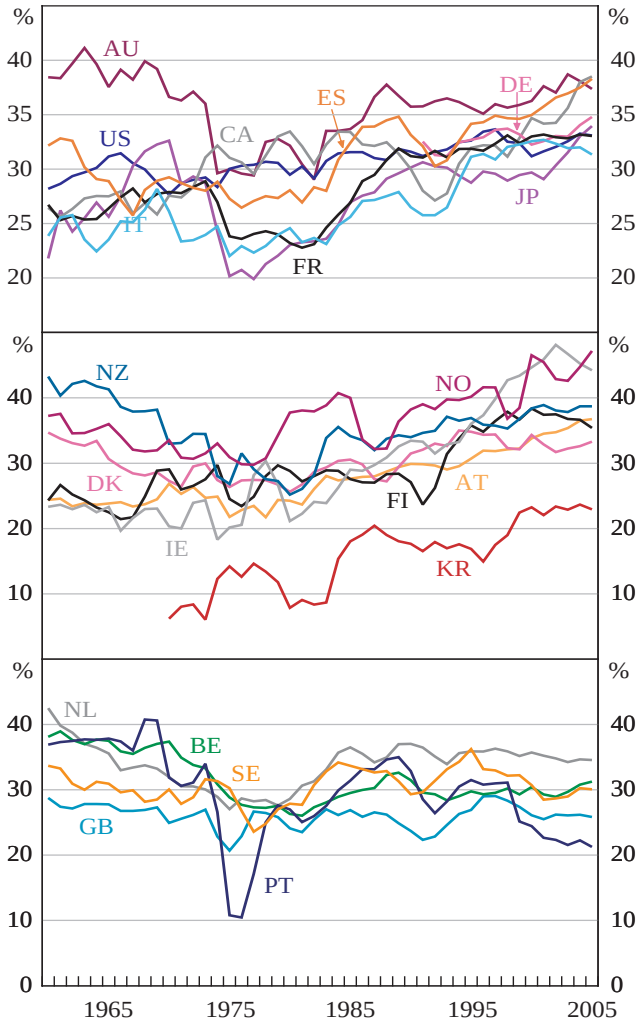
6 An alternative and long-standing rule of thumb involves allocating two-thirds of unincorporated business profits to wages (Johnson (1954); Krueger (1999); Guscina (2006)). This approach has the disadvantage that it implicitly assumes a constant capital-labour ratio through time, which may not be realistic if the sector's industrial composition is changing or if there is technological progress. See Gollin (2002) for more information.

High levels of the profit share are unusually widespread at present. Although profits have in some past years been slightly above average in a wide range of countries, the extent of the margin currently is unprecedented. Since 1960, 2004 was the first year for which at least 14 out of the 20 countries in the sample were more than 2 percentage points above their post-1960 average. Other (essentially equivalent) measures of the common trend in the data show a similar rise beginning in the early to mid 1980s (Figure 2).

Figure 1

Economy-wide profit shares

Ratios to GDP at factor cost; annual data



Source: European Commission; authors' calculations

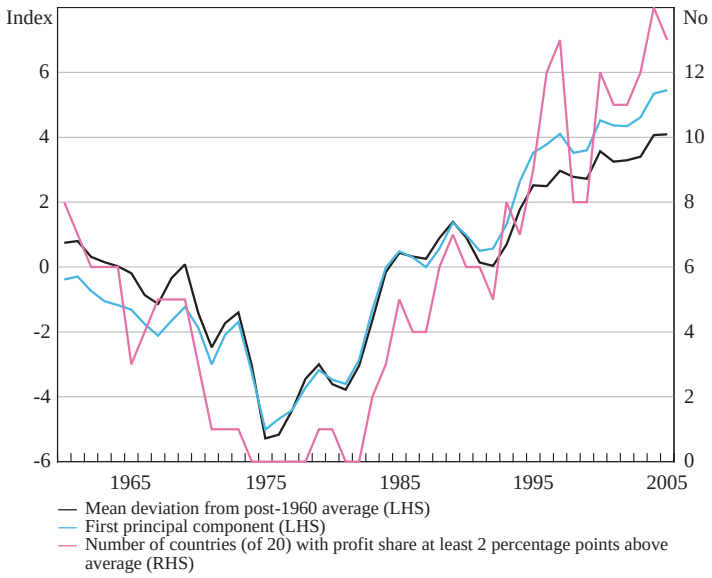
The apparent trends seen in Figures 1 and 2 are more than just a cyclical development. Table 1 below shows the results of simple regressions of the profit share against broken time trends starting in 1985 (1988 for France), output growth, and in a few cases some shift dummies. Even though the models are crude, the post-1980s trend remains significant after controlling for the business cycle. In fact, after accounting for business cycle effects, Belgium and the Netherlands show small and significant positive trends since 1985, even though this had not been apparent from Figure 1. The consistency of the dating of these breaks in trends is also very striking. Although when freely estimated, the break point that maximises the

regression's fit varies from country to country by a couple of years, a 1985 break date provided a reasonably good fit for all countries but France.

Figure 2

Economy-wide profit shares

Various measures of the common trend; annual data



Source: European Commission; authors' calculations

3. Possible causes of high profit shares

Commentary at the national level has attributed the strong profit shares for countries shown in the top two panels of Figure 1 to a variety of possible causes. The global nature of this development, however, suggests that the cause (or group of causes) is also global in scope; a chance confluence of country-specific factors seems implausible. This section examines a number of the suggested causes to see which might be most likely. At the least, this requires that it is globally applicable and fits the time-series facts. We begin with the explanation that satisfies both of these criteria – an increased rate of technological change leading to an endogenous reduction in the bargaining power of labour. We then briefly discuss several other possible causes, including changes in factor prices associated with an expansion in the global labour supply, exogenous shifts in bargaining power from labour towards capital, and macroeconomic factors such as oil prices and the exchange rate.

3.1 Technological developments

This section proposes that the underlying positive trend in the profit share is a result of an increased rate of technological change affecting IT-related capital goods. We discuss a useful model in which this is the case, first proposed by Hornstein, Krusell and Violante (2002, 2003).

Table 1

Simple OLS regression results

Profit share regressed on output growth and simple broken trends

Country	Lags of output variable	(Sum of) Coefficients	p-value on	Coefficient on		p-value on
			Output coefficients	1960–73 dummy	post-1985 trend	post-1985 trend
Australia	0	0.50	0.001	4.81	0.29	0.000
Austria	–1	0.31	0.028	–1.50	0.58	0.000
Belgium	–1	0.23	0.040	6.88	0.10	0.045
Canada	0	0.40	0.029	–4.62	0.18	0.052
Denmark	0	0.50	0.000	–	0.30	0.000
Finland	0	0.70	0.000	–3.42	0.59	0.000
France[1]	0	0.22	0.000	0.13	0.13	0.000
Ireland	0	0.36	0.015	–2.73	1.12	0.000
Italy	0	0.37	0.000	–	0.53	0.000
Japan	0–1	0.74	0.000	–	0.56	0.000
Korea	0	0.28	0.083	–5.92	0.58	0.000
Netherlands	0	0.58	0.015	–	0.23	0.002
NZ[2]	0	0.20	0.004	–0.86	0.23	0.000
Norway	2	–0.88	0.001	–	0.50	0.000
Portugal	0–1	1.43	0.001	–	–0.08	0.580
Spain	0	0.66	0.002	–3.49	0.38	0.000
Sweden	0	0.44	0.065	–	0.08	0.375
UK	0–1	0.80	0.000	–	0.03	0.366
US	0	0.28	0.000	–	0.13	0.000

Notes: Estimation period: 1960–1995 before lag adjustment, except Korea (1970–2005). Dummies for 1960–73 period only included if p-value below 0.05. P-values derived from Newey-West standard errors; p-values of t-statistics for single coefficients, p-values for F-tests for multiple lags. Estimates using output gaps are qualitatively similar but omitted because only shorter runs of data are generally available and output growth usually outperformed gaps as an explanator. [1] French profit share regressed on output growth plus a broken trend with break points at 1974, 1984 and 1988, and a shift dummy from 1985 (coefficient not shown). Thus the coefficient on 1960–74 is for a trend, not a dummy as for the other countries shown here. [2] Broken trend 1960–80 for New Zealand, with coefficient on an extra shift dummy from 1985 not shown.

Although IT goods on their own are a fairly small share of the capital stock, a much larger share embeds IT components. When technological innovation is embodied in the capital stock like this, it improves productivity, but does not necessarily lead to a lasting boost to the profits of the firms producing them. As Shiller (2000) points out, historical experience has shown that the benefits of higher productivity levels are soon captured by consumers via lower prices. What matters instead for the profit share is that information technology's faster rate of innovation allows a faster *rate* of improvement in productivity, albeit at the cost of a faster rate of depreciation and obsolescence. Capital goods containing some IT-related component should therefore be modelled as a form of vintage capital, with newer vintages

being qualitatively different from older ones. If they do not optimally combine with other factors of production in the same way as older vintages, we have the 'putty-clay' specification of capital of Solow (1962) and many others.[7]

Hornstein, Krusell and Violante (2002, 2003) show that a faster rate of innovation and obsolescence of putty-clay capital can raise the profit share if there are search frictions in the labour market. The faster rate of innovation makes new capital goods more attractive to firms relative to their existing capital, and so they want to change their capital and production processes more often than before. But with putty-clay capital, this means more frequent changes in their employment levels to make best use of the new technology. Therefore there is more employment churn *ex ante*, which would reduce the rate of matching between firms and workers. Workers are therefore more likely to lose their jobs and experience a period of unemployment when they do. This increases firms' bargaining power *endogenously*, so they can reap a larger share of the rents that resulted from these search frictions in the first place. A simplified exposition of the Hornstein *et al* model follows.

Production takes place by matching machines (capital) with workers; the underlying production function for a single production unit has Leontief form. Unemployed workers and idle capital are not guaranteed to meet every period. Instead, they are matched together using a standard, constant returns to scale matching function; that is, the rate at which workers meet firms is proportional to the ratio of total vacancies to unemployment. (The rate at which firms meet workers is of course inversely proportional to this ratio.) Workers cannot observe the vintage of capital used by the firm before they are hired, so they cannot direct their search to the firms using the most productive capital and therefore paying the highest wages. Once matched, the worker and firm bargain bilaterally over the proceeds of production. The employment relation is subject to both a firing tax and a hiring subsidy, of equal size, while unemployed workers receive a welfare benefit that provides an outside-option floor to wage bargaining outcomes.

Machines are costly to install, with newer more productive machines relatively more so than older, more obsolete vintages; the cost of installing new vintages is assumed to grow at rate γ. To compensate for this installation cost (I), firms retain the machines until they reach some endogenously determined terminal age ($\bar{a}$), at which point the machine is scrapped and the worker is laid off. At this point, the workers have become too expensive, given the low productivity of the older capital they are working with, for it to be worth them staying with that firm. Their outside option – unemployment with the possibility of finding a better job after a period of search – has become more attractive. Free entry implies that the return to capital over the life of the machine just offsets this installation cost. Firms and workers also part company randomly for other reasons at rate δ.

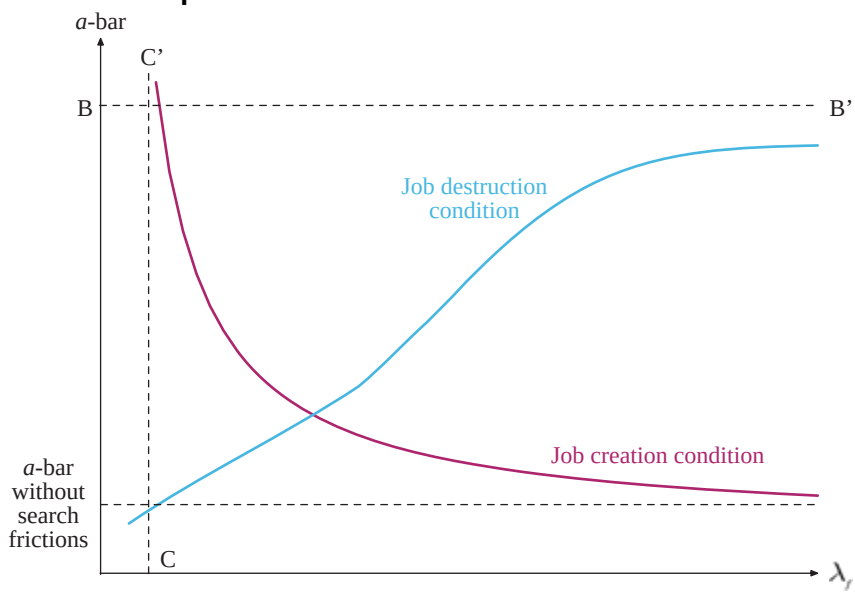
The end result is a pair of static equilibrium conditions, one describing firms' decision to scrap machines (and lay off the associated worker), and one describing the arbitrage condition equalising installation costs with machines' lifetime profits, given free entry. These 'job destruction' and 'job creation' conditions are defined over two endogenous variables – the lifespan of the machine $\bar{a}$ and the rate at which firms meet workers λ_f. Hornstein *et al* show that these two equilibrium conditions can be represented graphically in ($\bar{a}$, λ_f) space, as shown in Figure 3, reproduced from their paper. The equilibrium outcome can be

[7] Putty-clay (as opposed to putty-putty) models involve multiple types of capital that cannot be compared directly; once installed, they can only combine with other productive factors such as labour in fixed proportion. Therefore only the incremental addition to the capital stock can respond to a change in relative factor prices. These models have been in use since at least the 1960s (for example Solow (1962)), and have been labelled as putty-clay since at least the 1970s (for example Gapinski (1973)). Vintage capital models are putty-clay models where the relevant distinction between different types of capital is the date on which the capital was installed.

analysed with respect to the institutional and technical progress parameters that are the focus of our paper. The effects on unemployment from a change in one of the exogenous parameters follow from the fact that unemployment falls with $\bar{a}$ and rises with λ_f.

Figure 3

Equilibrium in the Hornstein et al model



An increase in the rate of technical progress, γ, shifts both the job destruction and job creation curves downwards. It is unambiguous that capital is scrapped faster ($\bar{a}$ falls): its usefulness compared to newer vintages declines more quickly. The overall effect on labour market outcomes and the profit share is ambiguous and depends on the change in λ_f.

Hornstein *et al* show that the outcomes will depend on the extent of frictions in the labour market. If hiring and firing costs are low (that is, employment protection legislation is relatively weak), the profit share might not increase at all. The profit share will, however, increase for economies with relatively stringent regulations. In this case, λ_f increases (the more so the more stringent the regulations) and the life of capital is even shorter (that is, $\bar{a}$ falls by more). The fall in $\bar{a}$ means that workers are more likely to lose their jobs, while the rise in λ_f means that workers are likely to experience a longer period of unemployment. This increases firms' bargaining power endogenously, so they can reap a larger share of the rents arising from these search frictions. The resulting higher profit share can become a trend increase if the affected goods comprise an increasing share of the capital stock, or if the process of adjustment takes time.[8] Because the fall in $\bar{a}$ is greater when employment protection is more stringent, the wage differential between workers in firms with newest-vintage capital, and those with the oldest capital, is also smaller than if labour market protections are relatively weak; that is, wage inequality does not increase much when hiring and firing costs are large.

Hornstein *et al* link these results to the different outcomes in the US and Europe, with the less protected labour market in the US responding to technical progress by increasing wage inequality relatively more than in Europe, and unemployment and the profit share relatively less.[9] This story actually matches the experience of a much broader set of countries. In

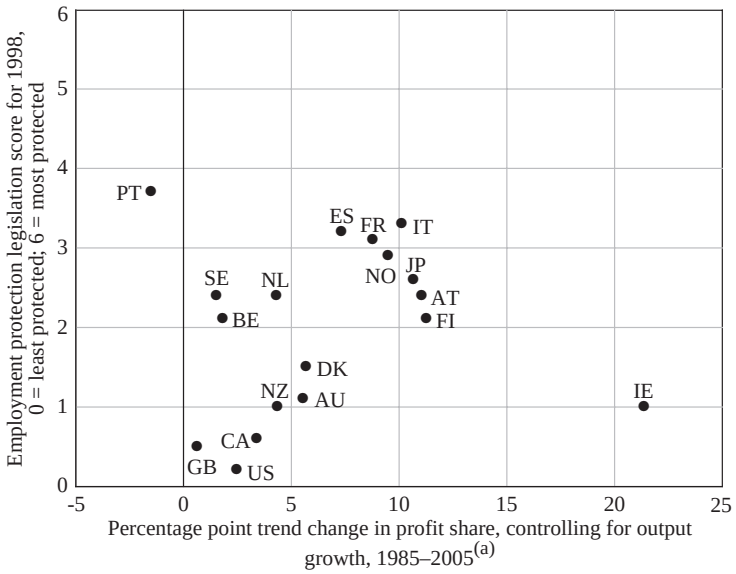
[8] Cadiou, Dées and Laffargue (2003) find a similar result in a more sophisticated general-equilibrium model.

[9] Because it assumes that workers are homogeneous, the Hornstein *et al* model also shows that technical change need not be skill-biased to generate increases in wage inequality. Skill-biased change would nonetheless compound the effect, as would capital-embedded technical progress that also makes human

particular, there is a positive relationship (aside from two outliers) between employment protection regulation and the slope of the trend increase in the profit share in Figure 4, which compares the cumulated post-1980s trends reported in Table 1 (estimated after controlling for output growth) with summary scores for employment protection legislation for 1998 (EPL, see Nicoletti *et al* (2000)); similar patterns apply if scores at other dates are used.

Figure 4

Labour market regulation and change in the profit share



Notes to Figure 4: Employment protection legislation (EPL) from Nicoletti et al (2000). (a) Trend change is time trend coefficient reported in Table 1, multiplied by 19 (years).

Industry-level data on comparable profit share measures are only available for a small number of countries. However, where available, they are broadly consistent with the explanation based on the interaction of technological innovation with labour market institutions, as in Hornstein *et al* (2003), rather than with globalisation or exogenous changes in bargaining power, which we discuss below. In particular, the largest upward trends in profit shares in the United States have occurred in the industries that have made greatest use of IT to reduce inventory and other costs, such as finance, and wholesale and retail trade. In contrast, labour-intensive services industries or highly unionised industries such as manufacturing, in which profits might have been expected to benefit most from an exogenous decline in labour bargaining power, stemming from a legislative change or competition from emerging markets, have generally experienced flat to falling trends in their profit shares.

Product market regulation might play an additional role in determining the extent of the shift in factor shares through this mechanism. As shown in Figure 5, the correlation between such regulation and the size of the trends in the profit share actually looks a little tighter than for the employment protection scores shown in Figure 4 above. In calibrated experiments with their model, Hornstein *et al* find that the larger is the initial set-up cost (I), the steeper the rise

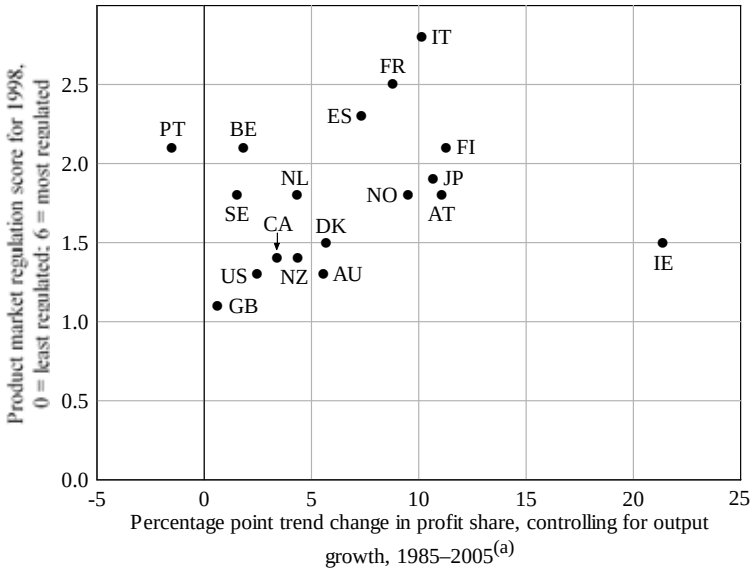
capital obsolete more quickly (Violante (2002)). In contrast, skill-biased technical change on its own can explain the apparent increase in wage inequality, but not the increase in the profit share. Blanchard (1997) attributed the latter to technical progress that was biased against labour in general, rather than against unskilled labour in particular; the Hornstein *et al* model shows how it might be possible to generate such an outcome. See Autor, Levy and Murnane (2003) or Caroli and Van Reenan (2001) for empirical evidence of skill-biased change driving inequality. Card and diNardo (2002) provide a more sceptical view of its relevance for labour market outcomes, and DiNardo and Pischke (1997) show that skill-biased capital goods need not involve IT.

in the profit share for a given increase in the obsolescence rate γ. They relate differences in I to policy differences between the US and some European economies, such as the red tape associated with starting a new business, and suggest that cross-country differences in these regulations could also help explain the differential evolution of profit shares.

An additional aspect of the role of product market regulation not explicitly mentioned by Hornstein *et al* could be that less intensive competition reduces firms' imperative to innovate. Taking full advantage of the productive potential of new capital goods requires organisational change and management resources.[10] This is likely to happen more slowly, if at all, when competitive pressures on firms are weak. In the framework of Hornstein *et al*, the effort required to implement new technologies could also be captured as higher initial installation costs (I) in more regulated markets. This constitutes a barrier to entry for new firms. Incumbent firms would be able to demand a higher share of the rents from search frictions, without having that competed away by new entrants. This effect might even offset the result that capital is scrapped sooner ($\bar{a}$ is lower) in more regulated labour markets, which also tend to be the ones with more product market regulation. In an open-economy context, such barriers to entry might limit the scope for capital mobility to equalise returns to the different productive factors across countries.

Figure 5

Product market regulation and the change in the profit share



Notes to Figure 5: Product market regulation scores are the whole-economy scores from Conway et al (2005). (a) Trend change is time trend coefficient reported in Table 1, multiplied by 19 (years).

3.2. Additional factors

The Hornstein *et al* model is static and – more importantly – a closed-economy model. As such, it cannot on its own account for shorter-term fluctuations in factor shares, or the effects of increasing globalisation. In this section we briefly discuss some of the many other factors that have been cited in earlier work as possibly influencing factor shares, for which we would

[10] Browne and Hellerstein (1997) argue that this might explain sluggish investment in the US in the 1980s and early 1990s. Brynjolfsson and Hitt (2003) present evidence based on firm-level data for this effect for US, as do Dostie and Trépanier (2005) for Canada.

want to control as part of any empirical test of the implications of the Hornstein *et al* model. These factors form the basis of the other explanators included in our regression results.

Expansion in the global (low-wage) labour supply

One often-cited possible cause of the moderation in wages and strength in profits has been the influence of globalisation on trade and production. In particular, the entry of China and Eastern Europe into the global market economy has increased the global supply of low-wage, low-skilled labour, without an equivalent stock of capital for this labour to work with (Phelps (2006)). This may reduce the return to labour in already developed economies, at least until the global capital stock has adjusted to its new equilibrium level. If the fall in the relative price of labour is not fully offset by substitution towards labour, the share of factor income going to labour would fall. This requires the elasticity of substitution between production factors to be below 1, which is the conclusion of the empirical literature (Andersen, Klau and Yndgaard (1999)). The effect could be reinforced if workers in industrialised economies moderate their wage claims for fear that production will be relocated to these emerging centres.

While this is intuitively plausible, there are several ways in which this explanation is inconsistent with the data. First, the entry of these economies into the global market post-dates the start of the uptrend in profit shares in the mid 1980s. Second, it is not clear that the capital-labour ratio is lower in these nations once the labour inputs are measured in efficiency units.[11] Third, if the profit share rose because capital goods had become relatively scarce compared with labour, the relative price of investment goods should rise, but in fact it has fallen markedly over this period, as discussed below. A pure global labour-supply effect also does not explain the cross-country differences in profit share trends, so it cannot be the only factor at work.

In addition, since the extra global labour supply has mainly affected the manufacturing industry, this argument implies that the reduction in wages and increase in developed countries' profit shares should be concentrated in manufacturing. In fact, the limited industry-level data on profit shares suggests that the reverse is true. In the United States, the profit share in manufacturing has trended down over this period, while Australian data since 1990 suggest a flat trend for this industry.[12] The timing and industry patterns are also inconsistent with firms in developed economies shifting production to new manufacturing centres in Asia and Eastern Europe to boost profit margins. If this had driven the rise in the profit share, it would have been concentrated in industries most involved in this offshoring – that is, manufacturing and more recently business services – but the data do not support this.[13]

Exogenous shifts in bargaining power

Conventional microeconomic models generally predict that factor shares are determined by the underlying production technology. For example, if production functions take the well-

---

[11] If it is, it is difficult to reconcile this with the tendency for some of these nations to export capital over the past half-decade or so.

[12] These results are available from the first author on request.

[13] The practice of offshoring underlines the importance of using economy-wide national accounts measures of profits rather than focusing on listed companies or particular firms. If production is sent offshore, both the labour and profit components of value added should cross borders. This would have no implications for the domestic profit share, unless the firms involved were previously less profitable than average. Companies with foreign operations would still report their profits to the share market on a whole-of-business basis, but the repatriated income is a net income flow affecting the current account balance, which is excluded from national accounts measures of profits.

known Cobb-Douglas form, profit maximisation with perfect competition implies that factor shares are in fixed proportion, regardless of the per-unit rates of return. However, if there are market imperfections such as externalities or monopoly power, there may also be some super-normal profits (economic rents). Shifts in bargaining power could result in a reallocation of these rents between the production factors. The Hornstein *et al* model discussed in section 3.1 is an example of a redistribution of the economic surpluses arising from search frictions, in that case brought about by faster technological change. Here we discuss two more possible causes of shifts in bargaining power: changes in labour market institutions, and policy changes that increase the attractiveness of income from capital relative to labour income.

The relative bargaining power of capital over labour is directly affected by the institutions governing the employer–employee relationship. Changes in these could have reduced the relative bargaining power of labour and induced lower wage outcomes than would have otherwise have occurred. Giammarioli *et al* (2002) suggest that the decline in the labour share (increase in the profit share) in continental Europe since the mid 1980s has been a result of labour market deregulation and decline in union membership; growth in labour costs has been particularly restrained in the larger euro area economies in recent years. However, this story is difficult to reconcile with the smaller or absent declines in labour share in countries such as Australia and the UK, which experienced more extensive labour market deregulation over this period (Nicoletti, Scarpetta and Boylaud (2000)). The data in countries that have deregulated most are also inconsistent with Giammarioli *et al*'s alternative scenario, of an initial fall in the labour share being reversed once firms respond to the increased attractiveness of labour by increasing employment.

In a similar vein, Caballero and Hammour (1998) argue that a wage push by organised labour can lead firms to respond by substituting labour with capital. This is intuitively plausible, and the putty-clay specification for capital in their model could explain why the increase in the profit share is not competed away. Although their results do a reasonable job of matching the experience of their country of interest, France, it does less well in explaining global trends. Profit shares have risen the most where such wage pushes did not occur at all, such as Austria, Finland and Norway. In fact, Figure 1 above shows that in some countries where profits spiked down in the 1970s in the face of wage pushes, such as Australia or the UK, the subsequent upswings in the profit share were fairly small or even absent.

It turns out that the correlation between regulation of the labour market and the trend in the profit share works the other way. This can be seen from Figure 4 above, or from looking at the change in the regulation measure shown there. Notwithstanding a couple of obvious outliers, it appears that more regulated labour markets are associated with stronger upward trends in the profit share. This is not consistent with the predictions of Cabellero and Hammour (1998) or Giammarioli *et al* (2002). It might be that lack of flexibility in the labour market allows firms to capture part of the available rents.

Suppose for a moment that labour market deregulation had in fact allowed firms to capture a greater share of factor income, why were such enhanced profit margins not competed away over the medium term (which surely includes the two-decade period examined here)? One reason might be that countries which experienced the largest increase in profit shares also had relatively stringent product market regulations (Figure 5), which enabled margins to remain high. In fact, the relationship between the OECD's measure of overall product market regulation and the estimated profit share trend is stronger and more visually obvious than the one shown in Figure 4 for labour market regulation.

Bargaining outcomes could also be affected by policy changes affecting taxation or financial regulation that increase the attractiveness of income from capital relative to labour income.

While rising income inequality and a higher profit share need not go hand in hand, these redistributive policies could potentially raise both.[14] Income inequality would rise because capital income disproportionately goes to higher income earners. And by raising the relative payoff to firms from bargaining effort, the policy changes might encourage re-allocation of income to profits. Higher relative CEO compensation might also indirectly boost the measured profit share.[15]

These redistributive policies may have been relevant for some countries at particular times, such as in the US in recent years. However, it seems unlikely that they could be the main cause of a global trend in the profit share. Not all countries have experienced the same increases in income inequality and relative CEO compensation as has been observed in the US (Abowd and Bognanno (1995); Murphy (1999)), and those that did may not have all started to do so in the mid 1980s. Also, to the extent that the redistribution takes place via changes to the tax system, changes in redistributive policies in favour of profits are more likely to affect post-tax profits, rather than the pre-tax measure studied here.

Relative price changes

It is unlikely that the shift in factor income to profits resulted from increased use of capital goods in response to their falling relative price. Figure 6 shows that the relative price of investment goods has fallen drastically over this period.[16] But this would only increase capital's share of factor income if the extent of capital deepening exceeded the relative price fall; that is, if the elasticity of substitution is greater than one, which is inconsistent with the empirical evidence. Blanchard (1997) showed that the shifts in factor income were larger than could be explained by shifts in factor use.

Figure 6 shows that larger relative price falls in have in fact been associated with *smaller* trend increases in the profit share. This is not to say, however, that relative price falls have driven the rise in the profit share. Indeed, it may be that product and labour market flexibility, and thus profit share trends, has led to greater adoption of new technologies. This in turn could lead to a reduction in the relative prices shown in Figure 6 since these measures are not based on fixed weights. (In other words, countries that shifted investment spending more strongly to newer, cheaper capital goods would have seen a larger decline in this relative price measure.) This interpretation is in line with Andersen *et al*'s (1999) observation that labour productivity had not risen proportionately with the capital deepening in countries that experienced the greatest increase in profit shares. This might have occurred if firms were unable or unwilling to make the required organisational changes to take advantage of new capital equipment, as discussed earlier.

---

[14] This issue is subject to an ongoing debate, particularly in the United States, with the literature on the recent rise in inequality there drawing parallels with the so-called 'Gilded Age' of the 1920s (for example, Krugman (2002)). However, a conceptually similar profit share measure to the one used in this paper, calculated from the US National Income and Product Accounts, suggests that it was not especially high in 1929, the first available reading. Increased inequality could involve a shift in profits to larger firms and their owners, away from small businesses and the self-employed, leaving the profit share unchanged.

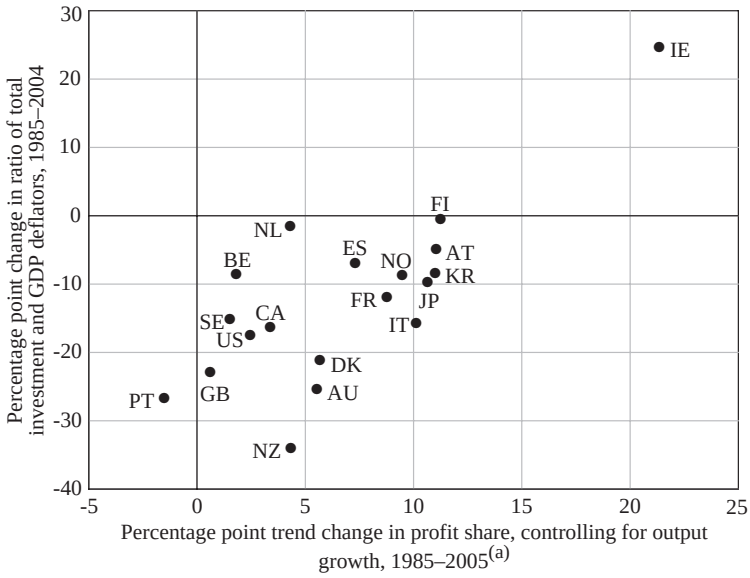
[15] Strictly speaking, CEO pay belongs in labour income, but stock options are not reported as an expense in all countries. Thus they might be included in national accounts measures of profits in those countries. (I am grateful to Jacqui Dwyer for this point. See Moylan (2000) for more information on how this is handled in US statistics.) The treatment of option grants in company accounts is a separate matter; in any case, the recently introduced International Financial Reporting Standards should ensure that in the future, stock options are consistently treated as employee compensation, both in the national accounts and company financial reports.

[16] The figure for Ireland is affected by a recent large run-up in the relative price of investment in buildings and structures; its equipment investment deflator has fallen similarly to other countries. The total investment deflator is shown because the AMECO database does not include complete time series of data for the equipment investment deflator for all countries.

The model of Hornstein *et al* (2003) can also shed some light on the relationship shown in Figure 6. The decline of the relative price of (quality-adjusted) capital goods should reflect the realised rate of technical progress. Within each of the two main clusters of points in Figure 6, it is generally the more regulated economies that experienced the smaller declines in this relative price. Therefore they effectively experienced slower rates of realised increase in productivity compared with the technical progress embodied in the capital goods installed. This would imply that the marginal return to new capital investment (and thus capital's factor income share) is higher than in countries in the lower left quadrant of Figure 6.

Figure 6

Change in relative price of investment goods versus profit share



Shorter-run macroeconomic factors

Finally, there are a number of macroeconomic factors that have previously been found to influence the profit share, and thus should be controlled for when testing other hypotheses about the causes of the longer-run trend. For example, Dombrecht and Moes (1998) and Meyler (2001) show that profits in the euro area are negatively related to oil prices and the exchange rate. However, these changes tend to be temporary and so would be unlikely causes of an upswing over two decades. The high oil prices and appreciation of the euro in recent years would in fact be consistent with a low profit share in the euro area, rather than the observed above-average level. Similarly, it seems unlikely that changes in industrial structure could explain rising aggregate profit shares, since the available industry-level data also generally show rising profitability (Meyler and Sondergaard (2005) – but see De Serres, Scarpetta and De La Maisonneuve (2001) for a contrary view).

Table 1 and previous empirical work show that profits are indeed pro-cyclical. Thus it is important to include some measure of GDP growth as a control in any more detailed econometric results (Krueger (1999); Giammarioli et al (2002)). Pro-cyclicality in the profit share might occur if strong demand conditions allowed firms to raise margins, or if labour market institutions resulted in labour hoarding (and thus lower profits) during downturns (Giammarioli et al (2002). However, it should be noted from the outset that the business cycle cannot explain the presence of the trend. Table 1 above shows that the trend in the profit share exists even after controlling for the business cycle, and Figures 1 and 2 show that it has persisted for too long to be a cyclical development.

4. Econometric results

We examine various panel-data regressions which control for, among other things, the following explanators: GDP growth; oil prices; exchange rates; and the level of the regulation measures through time.[17] We also include a measure of the share of exports from the newly emerging manufacturing economies in total world exports, using IMF data. We believe that this is a better proxy for the effects of globalisation on world labour supply, than the openness to trade of the various existing industrialised countries, as used by Guscina (2006). It is the entry of these countries to the global trading system (along with the threat of outsourcing to them) that is supposed to be reducing the wage share, rather than an intensification of trade amongst countries with similar income levels. In the results below, we show coefficients for the total export share of key emerging markets – China, India and nine of the formerly communist countries in Eastern Europe that have since joined the EU. The resulting series is essentially flat until the late 1990s and rises exponentially thereafter. This is driven by China's exports: coefficients for other variables are not affected if the export series used only covers China, or China plus either India or Eastern Europe but not both.

Data series proxying for our main candidate explanation, the rate of technological progress, are unfortunately not available. The data series that do attempt to capture the effects of technological progress on the capital stock relate to the realised rate of progress, which is endogenous, and are generally also narrowly focussed on IT goods. Our contention is that the range of capital goods affected by this change is much larger than those typically identified as information technology. Therefore instead of measuring this phenomenon directly, we pursue a more indirect method of including a linear trend starting in the mid-1980s, as was the case in the regressions reported in Table 1. If one of the other factors included in the regression were the true cause of the upward trend in the profit share over this period, it would knock out the simple linear trend. If instead the trend stays significant when these other variables are included, they cannot be the cause of the trend. This approach cannot on its own prove the link to technological progress. However, the elimination of other candidate explanations, together with the ability of the Hornstein *et al* model to match the cross-country pattern and other developments in the labour market, should be seen as at least indicative.

The trade share and regulation variables are all very smooth but with trends that emerge at various start dates. Introducing so many trending variables to explain another trend is fraught with collinearity problems. In country-by-country regressions on annual data, it would be hard to know if the results are not spurious. Some sort of pooling across countries is therefore necessary, but a standard panel regression is not strictly appropriate. As would be expected from the variation in trends and other coefficients shown in Table 1, the individual country responses are very heterogeneous. Tests for coefficient homogeneity across countries fail comprehensively for every coefficient in every model we tried. For this reason, the panel results in Table 2 should be interpreted as the averages of a set of heterogeneous individual-country responses, rather than a common coefficient as is normal in panel models.

The first column (a) of Table 2 shows that the positive trend in the profit share since 1985 is still significant after controlling for the business cycle, the real effective exchange rate, oil prices, and the extent of product and labour market regulations. The exchange rate is lagged to avoid endogeneity, but using the contemporaneous value does not alter the results. Our proxy for globalisation, the emerging-economy share of world exports, looks a lot like a trend starting in the late 1990s. Thus it should not be expected to be able to explain a trend in the profit share starting in the 1980s. Indeed, column (b) shows that the time trend remains

[17] We use Blanchard and Wolfers' (1999) method to backcast the EPL scores. See the Appendix for more details. New Zealand is excluded from the estimation because of a lack of the necessary data.

significant while the trade share is clearly not, despite these two series having a correlation coefficient of 0.88. Such a comprehensive rejection leads us to omit the trade share variable from all other models, to avoid any spurious results brought about by excessive collinearity. We interpret the result as implying that competition from emerging market economies is not putting downward pressure on wages in industrial countries to a greater extent than it is squeezing profit margins; of course, it could be doing both in roughly equal measure – thereby changing the inflation process – with no consistent implications for relative factor shares.

Table 2

Fixed-effects models of adjusted profit shares

In percentage points

Model / **Variable**	**(a) Time trend**	**(b) Trade and time trend**	**(c) Full model**	**(d) No regulation on its own**	**(e) Parsim-onious version**	**(f) Without PMR**
GDP growth	0.639 (0.000)	0.639 (0.000)	0.657 (0.000)	0.650 (0.000)	0.706 (0.000)	0.636 (0.000)
PMR	1.362 (0.000)	1.362 (0.000)	–0.131 (0.698)	—	—	—
EPL	0.712 (0.000)	0.710 (0.000)	0.327 (0.051)	—	0.391 (0.016)	0.868 (0.000)
Oil prices	–0.021 (0.005)	–0.021 (0.007)	–0.005 (0.532)	-4×10^{-6} (0.958)	—	–0.026 (0.001)
Real exchange rate	0.060 (0.000)	0.060 (0.000)	0.040 (0.009)	0.038 (0.011)	0.052 (0.001)	0.058 (0.000)
EM export share	—	–0.004 (0.977)	—	—	—	—
Time trend	0.526 (0.000)	0.527 (0.000)	0.121 (0.142)	0.135 (0.002)	0.052 (0.123)	0.326 (0.000)
Time trend × PMR	—	—	0.152 (0.000)	0.161 (0.000)	0.115 (0.000)	—
Time trend × EPL	—	—	–0.097 (0.002)	–0.101 (0.001)	—	–0.007 (0.794)
Within-R^2	0.441	0.441	0.484	0.481	0.468	0.430
Between-R^2	0.044	0.044	0.127	0.092	0.127	0.197

Notes: PMR = product market regulation score, index from 6 (most restrictive) to 0 (least restrictive); EPL = Employment protection legislation score, index from 6 (most protection) to 0 (least protection); EM = emerging markets (China, India and nine EU accession countries). The time trend starts in 1985 and is set to zero prior to that date. Constants are omitted from the table but were positive and significant in all cases. Numbers in parentheses are *p*-values. The Within-R^2 excludes the explanatory power of the constant. See the Appendix for data sources and methods.

The third column (c) shows a more precise test of our argument. By interacting the time trend with the product and labour market regulation scores, we mop up some of the heterogeneity in the trend, and show how its size is related to the extent of regulation, as predicted by the Hornstein *et al* model. The coefficient for the time trend interacted with the product market

regulation score is positive and significant, as would be expected given Figure 5 and the discussion above. The simple time trend is positive but insignificant, while the trend interacted with the labour market regulation score is negative. Because the regulation scores are defined to range between 0 and 6, these terms taken together imply positive net trends for most of the countries; the time trend on its own is just capturing the trend that would occur if both regulation scores had the minimum value of zero. This is consistent with the pattern shown in Figure 5, and the theoretical results of Hornstein *et al*. The higher between-R^2 and the pattern of residuals suggest that this specification is indeed accounting for some of the sample's heterogeneity. Incidentally, including these interacted terms makes the coefficient on oil prices insignificant.

We do not interpret the negative coefficient on the labour market regulation (EPL) interaction term as a rejection of the overall validity of an explanation of the trends in factor shares based on the model of Hornstein *et al*, although it does suggest that the product market regulation part of the story is the more important. The level of this variable has a significant, positive coefficient, although it is lower than when the interaction terms are not included. Given that regulation scores fell for most countries in the sample, it could be that the econometric procedure is having difficulty distinguishing between so many smooth, trending variables. Although the scores have been interpreted as cardinal not ordinal (OECD 2004), the effects of hiring and firing costs described in the model might not be proportional to the scores. Taken literally, these results imply that firms might actually gain when greater security of tenure is provided to employees, perhaps from more moderate wage demands.

Columns (d)–(f) in Table 2 underline the robustness of the estimated positive trend for the economies with more regulated product markets, as shown in Figure 5. Omitting different combinations of regulation scores and their interacted counterparts does not change the result of positive net time trends in profit shares, at least where there are some frictions in the product market, as captured by the regulation variables.

The overall message from these results is consistent with our hypothesis as summarised by Figures 4 and 5: many variables influence factor income shares of particular countries at particular times, but even controlling for these, there is on average an upward trend in the profit share since the mid 1980s, which seems to have been stronger where market frictions are greater. This is broadly in line with the Hornstein *et al* model in the presence of technical progress which has increased the rate of obsolescence of capital goods. The resulting higher *ex ante* rate of churn in employment has endogenously strengthened firms' bargaining power, especially where they themselves face less competitive pressure because of product market regulations, which limit competitive pressures. Over time, they have therefore been able to increase their share of the production surplus. This increase might be larger than the amount required to fund the higher rate of gross investment that is required to keep the capital–labour ratio constant in the face of a higher effective depreciation rate.

A final point from the results of all these models is that, although the positive time trend survives after controlling for the business cycle, the latter is very important over the shorter term. The current interest in factor shares has largely been sparked by the latest upswing, which has a substantial cyclical component. The fact remains, though, that there is a longer-term rising trend in the profit share.

5. Implications of the model for future developments in factor shares

The empirical work reported above identified a two-decade upward trend in the profit share (and by definition, a downward trend in the wage share), the size of which seems to be positively related to the degree of regulation in each country. The preferred explanation advanced in this paper for this is that an increase in the rate of technical progress has increased firms' bargaining power and allowed them to extract more economic rents. The

Hornstein *et al* model on which this explanation is based predicts that this increase in the rate of obsolescence of the capital stock will lead to a permanent upward level shift in the profit share. The rising trend actually observed should therefore probably be interpreted as a transition path to this new level. The increased rate of technological innovation underlying the faster rate of obsolescence reflects the incorporation of a general-purpose technology – information technology – into a wider range of capital goods than those normally considered as IT products. This should be expected to take some time. At some point, the profit share should be expected to stabilise at a new, higher level that depends on the extent of product and labour market regulation. There is no particular reason to assume that the diffusion of these faster-depreciating technologies through the capital stock is already complete, so this stabilisation might be some way off.

The increase and anticipated stabilisation in the profit share go hand-in-hand with an increase in the overall rate of depreciation of the capital stock. However, it should not be concluded from this that the profit share will stabilise at a level that enables gross investment to increase by just enough to keep the net investment rate constant (even assuming that depreciation and thus net profits and investment were correctly measured in the national accounts).[18] The increase in the profit share is a pure reallocation of economic rents, if our explanation is correct, not compensation for extra depreciation. Indeed, gross investment has been relatively weak relative to profits in a number of countries in recent years. This suggests that the increase in the profit share was not a necessary shift to fund extra gross investment.

If current trends continue, the profit share should be expected to stabilise eventually. There are, however, several factors suggested by the model that could drive a future reversal of the current upward trend, perhaps back to levels below those seen at present. The first of these would be a reversal of the increase in the rate of technological innovation. Although capital goods with some IT component have to date become obsolete faster than their purely mechanical predecessors, this need not be true forever. Second, since the ultimate level of the profit share depends on the degree of product and labour market regulation, future changes in these could alter a country's long-run stable factor shares, even reversing the current trend. In particular, further deregulation of labour and especially product markets could reduce the relatively larger trends seen in parts of continental Europe and Japan. Reforms that reduce the barriers to entry for new firms (*I* in the Hornstein *et al* model) or the underlying search frictions in the labour market might be particularly effective in shifting these trends.

Finally, in the shorter term, the cyclical nature of the profit share implies that a macroeconomic downturn would lead to a reasonably large, if temporary, fall in the profit share. Although the underlying upward trend might still persist through such a downswing, it might be difficult to discern for a period, given the size of the cyclical effect identified in our empirical results. The direction of this cyclical relationship implies that such a fall in the profit share, and counterpart increase in the wage share, should not be interpreted as necessarily being inflationary.

---

[18] Although ideally, net profits and investment would capture the effect of increased technical progress, quality change and depreciation are both inferred using a variety of assumptions, which might not keep up with the resulting changes in the rate of obsolescence. For example, Browne and Hellerstein (1997) present an example of the very different inferences that could be made depending on the technical assumptions about depreciation adopted by statistical agencies. Similarly, Whelan (2000) shows that different assessments of the role of IT in productivity growth are implied by different methodologies for estimating the computer capital stock. Tevlin and Whelan (2000) argue that this increased rate of depreciation explains the US investment boom of the 1990s, which was largely restricted to IT-related equipment.

6. Conclusion

In this paper, we have presented both graphical and econometric evidence of one particular stylised fact describing factor income shares in industrialised countries – an upward trend in the profit share that started in the mid-1980s, or equivalently a downward trend in the wage share. This trend is clearly apparent even after controlling for a number of factors that might previously have been thought to have been its cause, including the business cycle, labour market deregulation, and the entry of China and other emerging market economies into the global trading system.

The combination of this trend's timing and its cross-country pattern is consistent with a technological cause: faster innovation increasing the rate of obsolescence in capital goods and the *ex ante* rate of churn in the labour market. This greater churn strengthens firms' bargaining positions and allows them to capture a larger share of factor income. The increase is therefore in essence a reallocation of economic rents – a new equilibrium, but not necessarily an optimum. It could easily be above or below that necessary to offset the faster rate of economic depreciation, while maintaining a constant level of the effective capital-labour ratio.

Ideally, we would want to show that this trend can be explained by some measure of the use of faster-depreciating technologies in capital goods, or the depreciation rates themselves. Unfortunately all the standard measures in this field, such as those from the OECD, relate to information technology and communications goods specifically. Thus they do not adequately capture the fact that IT components are increasingly being embedded in a broader class of capital goods that would not be thought of as IT products, and thereby increasing their rate of obsolescence as well. Nonetheless, the common timing of the trend, its cross-country pattern, and its correlation with other stylised facts about the labour market are all consistent with the Hornstein *et al* model – particularly as it relates to product market regulation – being the most likely explanation of the trend, out of all the possibilities considered here. The cross-country pattern in the magnitudes of these trends has not been well explained in the literature before.

This technological explanation implies that the recent upswing is not part of a cycle. It is not inherently likely to reverse, nor was itself the necessary reversal of an earlier – perhaps unsustainable – shift up in the labour share brought about by a change in workers' bargaining power. Indeed, if our preferred explanation is correct, then the observed shifts in factor shares were simply a redistribution of existing economic rents, which could continue for some time before stabilising, only reversing if the underlying drivers do.

Appendix

A. Data corrections and sources[19]

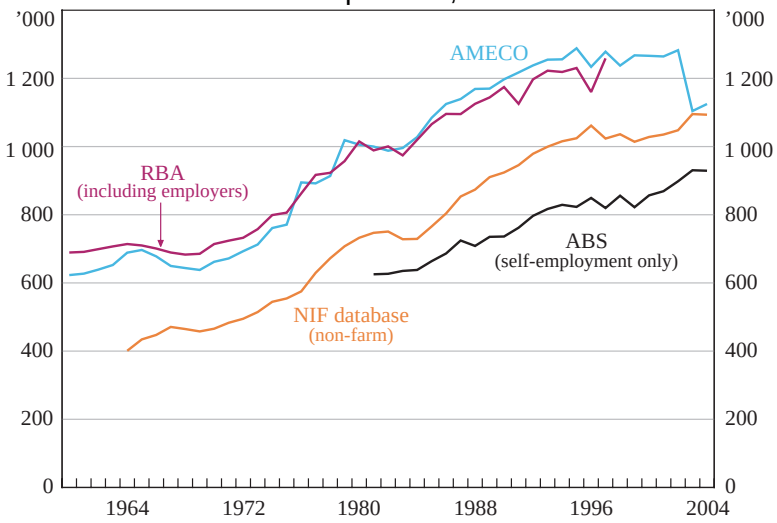
A.1 Profit share data

The self-employment figures for Australia and corresponding profit share adjustment have been corrected to match growth rates in national data on self-employment (see Figure A1). This reduces the adjusted profit share since 2003 by about 1.5 per cent of GDP from that reported in AMECO, but this does not appreciably change the econometric results for Australia. The decline in the self-employment share of total employment in Australia since the 1960s – from about 13 per cent to a little over 10 per cent – is far less marked than the decline in unincorporated profits' share of GDP. We have not made any adjustment for this, so a much larger fraction of unincorporated profits remains after the self-employment adjustment in the 1960s than in recent years. Whatever the reason for this divergence, it suggests that comparisons of recent Australian profit shares with the 1960s should be treated with more than the usual degree of caution necessary for other countries' data.

Figure A1

Measures of self-employment for Australia

Thousands of persons; annual data



Sources: ABS; Australian Treasury; European Commission; RBA Occasional Paper 8.

The self-employment adjustment for New Zealand prior to 1985 is extrapolated based on conservative assumptions by the authors, as employment status data are not available for New Zealand prior to this date. The post-1985 self-employment adjustment for New Zealand in the AMECO data base is larger than would be implied by national data on self-employment and average compensation per employee. This lowers the adjusted profit share compared

[19] We are grateful to John Addison and Jean-Luc Grosso, and Edward Lazear, for providing us with their severance and notice pay datasets, and Ilan Goldfajn and Rodrigo O Valdes for their real effective exchange rate data

with the results that would obtain if the average labour income method used for other countries were applied to New Zealand. We do not correct the AMECO data for this.

Adjusted profits data for Canada are only available on the AMECO database with a lag. We therefore estimated the last two data points for Canada using the growth rates for national accounts total profits, as reported on Statistics Canada's web site.

A.2 Product market regulation

In Figures 4 and 5, we used the economy-wide indicators from Nicoletti *et al* (2000). As these are only available for 1998 and 2003, the results in Tables 2 and 3 use the annual time series of regulation in seven non-manufacturing industries described in Conway and Nicoletti (2006). Its authors note that, as this index is highly correlated with the economy-wide measure of product market regulation for the years where the two overlap, it is arguably a useful time-series proxy for the stance of economy-wide regulation. Data are held constant at their starting and last observed values for the periods 1961–1974 and 2004–2005 respectively.

A.3 Extended employment protection legislation index

We follow Blanchard and Wolfers' (1999) method of backcasting the Employment Protection Legislation (EPL) index to create a long time series for this indicator, but we use slightly different underlying data. In particular, we use the EPL measure and weights from the 2004 rather than the 1999 OECD *Employment Outlook* as the base data. After their last observed values (2003), we hold the score levels constant. We also use Addison and Grosso's (1996) corrected and updated version of Lazear's (1990) dataset on severance and notice pay as proxy data in the backcasting, which has been used in a number of papers by its authors and others. Unlike Blanchard and Wolfers, we start the backcasting from 1984 rather than 1979. We set the pre-1985 values for Denmark and the US to zero; the figures implied by the *Outlook* data for the late 1980s would be constant at a positive level. There are a few missing values in Addison and Grosso's updated dataset but we do not attempt to fill them.

A.4 Oil price

This is calculated as annual averages of quarterly data on US dollar prices of West Texas Intermediate crude oil deflated by the US headline consumer price index.

A.5 Trade shares

These are annual exports data sourced from IMF Balance of Payments statistics. The countries included are China, the Czech Republic, Estonia, Hungary, India, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Bulgaria and pre-separation Czechoslovakia had missing data in the middle of the series and were therefore excluded.

A.6 Real effective exchange rate

From 1974 onwards (1978 for some countries), the annual real effective exchange rate is an average of monthly IMF real effective exchange rates. These are trade-weighted averages of real bilateral rates. The trade weights are fixed (prior to 1990, weights are from trade data over 1980–82; after 1990 weights use trade data covering 1988–90) and incorporate competition from third countries. Nominal bilateral rates are deflated by the headline consumer price index. For 1961–1974 (or 1961–1978, depending on the country), the IMF rates are backcast using the growth in the real effective exchanges rates from Goldfajn and Valdes (1999) over that period. In these series, the nominal bilateral weights are deflated by wholesale or consumer price indices and trade weights (based on trading partners encompassing more than four per cent of trade) are fixed in 1985.

References

Abowd, J and M Bognanno (1995): "International differences in executive and managerial compensation", in R Freeman and L Katz (eds): *Differences and Changes in Wage Structures*, University of Chicago Press, Chicago, pp 67–103.

Addison, J T and J Grosso (1996): "Job security provisions and employment: Revised estimates", *Industrial Relations*, vol 35, no 4, pp 585–603.

Andersen, P S, M Klau and E Yndgaard (1999): "Higher profits and lower capital prices: Is factor allocation optimal?", BIS Working Paper no 65.

Autor, D H, F Levy and R J Murnane (2003): "The skill content of recent technological change: An empirical exploration", *Quarterly Journal of Economics*, vol 118, no 4, pp 1279–1333.

Blanchard, O J (1997): "The medium run", Brookings Papers of Economic Activity, 1997 (2), pp 89–158.

Blanchard, O and J Wolfers (1999): "The role of shocks and institutions in the rise of European unemployment: the aggregate evidence", NBER Working Paper Series No. 7282.

Browne, L E and R Hellerstein (1997): "Are we investing too little?", *New England Economic Review*, November/December 1997, pp 29–50.

Brynjolfsson, E and L M Hitt (2003): "Computing productivity: Firm-level evidence", *Review of Economics and Statistics*, vol 85, no 4, pp 793–808.

Caballero, R J and M L Hammour (1998): "Jobless growth: Appropriability, factor substitution, and unemployment", *Carnegie-Rochester Conference Series on Public Policy,* vol 48, no 1, pp 51–94.

Cadiou, L, S Dées and J-P Laffargue (2003): "A computational general equilibrium model with vintage capital", *Journal of Economic Dynamics and Control*, vol 27, no 11–12, pp 1961–1991.

Card, D and J E DiNardo (2002): "Skill-biased technological change and rising wage inequality: some problems and puzzles", *Journal of Labor Economics*, vol 20, no 4, pp 733–783.

Caroli, E and J Van Reenen (2001): "Skill-biased organizational change? Evidence from a panel of British and French establishments", *Quarterly Journal of Economics*, vol 116, no 4, pp 1449–1492.

Conway, P and G Nicoletti (2006): "Product market regulation in the non-manufacturing sectors of OECD countries: Measurement and Highlights", OECD Economics Department Working Paper no 530.

———, V Janod and G Nicoletti (2005): "Product market regulation in OECD countries: 1998 to 2003", OECD Economics Department Working Paper no 419.

De Serres A, S Scarpetta and C De La Maisonneuve (2001): "Falling Wage Shares in Europe and the United States: How Important is Aggregation Bias?", *Empirica*, vol 28, no 4, pp 375–401.

DiNardo, J E and J-S Pischke (1997): "The returns to computer use revisited: Have pencils changed the wage structure too?", *Quarterly Journal of Economics*, vol 112, no 1, pp 291–303.

Dombrecht, M and P Moes (1998): "Inflation and unemployment in an open economy", *Economic and Financial Modelling*, vol 5, no 2, pp 53–94.

Dostie, B and M Trépanier (2005): “Returns to computer use and organizational practices of the firm”, IZA Discussion Paper no 1541.

European Central Bank (2004): “Measuring and analysing profit developments in the euro area”, ECB *Monthly Bulletin*, January 2004, pp 63–73.

Gapinski, J H (1973): “Putty-clay capital and small-sample properties of neoclassical estimators”, *Journal of Political Economy*, vol 81, no 1, pp 145–157.

Giammarioli, N, J Messina, T Steinberger and C Strozzi (2002): “European labour share dynamics: An institutional perspective”, European University Institute Working Paper ECO 2002/13.

Goldfajn, I and R Valdes (1999): “The aftermath of appreciations”, *Quarterly Journal of Economics*, vol 114, no 1, pp 229–262.

Gollin, D, (2002): “Getting income shares right”, *Journal of Political Economy*, vol 110, no 2, pp 458-474.

Guscina, A (2006): “Effect of globalization on labor’s share in national income”, IMF Working Paper 06/294.

Harvey, R (2003): “Comparability of saving and profit ratios”, OECD Statistics Directorate Paper STD/NAES(2003)18.

Hornstein, A, P Krusell and G L Violante (2002): “Vintage capital as an origin of inequalities”, CEPR Discussion Paper 3596.

——— (2003): “Vintage capital as an origin of inequalities”, mimeo, available at <http://rincewind.iies.su.se/~krusell/wp/hkv_may03.pdf>.

Johnson, D G (1954): “The functional distribution of income in the United States, 1850–1952”, *Review of Economics and Statistics*, vol 35, no 2, pp 175–182.

Krueger, A B (1999): “Measuring labor’s share”, *American Economic Association Papers and Proceedings*, vol 89, no 2, pp 45–51.

Krugman, P (2002): “For richer”, *New York Times Magazine*, 20 October 2002.

Lazear, E P (1990): “Job security provisions and employment”, *Quarterly Journal of Economics*, vol 105, pp 669–726.

Meyler, A (2001): “Profit margins in the Euro Area: A macroeconomic perspective”, mimeo, Central Bank of Ireland.

——— and L Sondergaard (2005): “Profit developments in the Euro Area industrial sector”, mimeo, European Central Bank.

Moylan, C (2000): “Treatment of employee stock options in the U.S. national economic accounts”, Paper presented at the OECD Meeting of National Accounts Experts, September 26–29, 2000, available at: <http://www.bea.gov/papers/pdf/empstop.pdf>.

Murphy, K J (1999): “Executive compensation”, in O Ashenfelter and D Card (eds): *Handbook of Labor Economics*, vol 3B, Elsevier, Amsterdam, pp 2485–2563.

Nicoletti, G, S Scarpetta and O Boylaud (2000): “Summary indicators of product market regulation with an extension to employment protection legislation”, OECD Economics Department Working Paper no 226.

Nicoletti, G and S Scarpetta (2005): “Product market reforms and employment in OECD countries”, OECD Economics Department Working Paper no 472.

OECD (1999): *OECD Employment Outlook 1999*, OECD, Paris.

——— (2004): *OECD Employment Outlook 2004*, OECD, Paris.

Phelps, E S (2006): “Some costs of globalization”, paper presented at ASSA 2006 Conference, January 7.

Shiller, R (2000): *Irrational Exuberance*, Princeton University Press.

Solow, R M (1962): “Substitutions and fixed proportions in the theory of capital”, *Review of Economic Studies*, vol 29, pp 207–218.

Tevlin, S and K Whelan (2000): “Explaining the investment boom of the 1990s”, Federal Reserve Board of Governors Finance and Economics Discussion Series 2000-11.

Violante, G L (2002): “Technological acceleration, skill transferability and the rise in residual inequality”, *Quarterly Journal of Economics*, vol 117, no 1, pp 297–337.

Whelan, K (2000): “Computers, obsolescence and productivity”, Federal Reserve Board of Governors Finance and Economics Discussion Series 2000-06.