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FOREWORD

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Public social expenditure accounts for 25 per cent of GDP, or even more in some countries. That expenditure on this scale has some effect on growth seems very likely, but the direction of the effect is disputed by different schools of thought. Using new data sources and panel data econometric techniques, this paper sheds new light on the issue. Evidence is found in favour of the proposition that more social expenditure reduces growth. However, "active" social spending, including active labour market policies, make work pay policies and spending on family services, appears to have the opposite effect and may be growth-enhancing.

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SOCIAL PROTECTION AND GROWTH

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INTRODUCTION

Much discussion of social protection systems is dominated by supposed tradeoffs between the goals of growth and equity. Allusion is often made to the “affordability” of social programmes and to the effect on individual incentives to work and save. Equity, be it in terms of access to social services or the final distribution of income, is usually viewed as having a cost in terms of foregone output, which some argue is a price well worth paying, but others disagree.

This way of considering possible links between equity and growth can be misleading. Is it the distribution of income *per se* which is affecting growth, or is it the *policies* put in place to achieve an equitable distribution of income which are most important? In fact, there are plausible theories about how the distribution of income itself can affect growth, both positively and negatively, without acting through the intermediary of social protection. Once one considers *policies* designed to achieve equity goals, the permutations become even more complex. Regardless of whether the policies achieve an objective of narrowing the distribution of income (and in practice this is rarely their main objective), they can have very different effects on the allocation of resources in an economy and therefore on growth.

The purpose of this paper is to clarify the empirical evidence about what might be the tradeoffs, if any, between policies designed to achieve equity goals and growth.¹ The paper starts by looking at theories and existing evidence about the effects of income distribution and social protection on growth. New data sources on both income distribution and social expenditure, which have been developed by the OECD, are used to generate new estimates of these effects. These data represent a notable improvement upon those used in prior studies and permit the use of powerful panel-data estimation techniques which have proved valuable in generating insights about the impact of other government policies on growth (Bassanini and Scarpetta, 2001).

THEORIES

The impact of greater inequality on growth is theoretically indeterminate, since it is relatively easy to think of cases where it could be either beneficial or damaging. The same can be said for social protection expenditures.

When might inequality be good for growth?

In a closed economy, the greater is the amount of savings, the lower is the cost of capital and the greater is the rate of investment, and hence the greater is the rate of growth.² Because the rich have a higher savings ratio than the poor, it follows that the more unequally is national income distributed, the greater will be the aggregate savings rate, and hence the greater will be the investment and growth rate (Lewis, 1954; Kaldor, 1956, 1957; and Stiglitz, 1969). Income *redistribution* would retard growth.

Similarly, if the wage distribution is artificially condensed (*e.g.* by minimum wage legislation or centralised wage bargaining), the result is to reduce the incentive to invest in those qualifications which would qualify someone for high productivity jobs. In these circumstances, greater inequality could promote growth.

When might inequality be bad for growth?

Financial markets suffer from some well-known market failures when it comes to financing investments by those without assets other than their own labour. Hence capital markets may not make funds available to poorer households even when rates of return (both private and social) are high, because there is no asset which can be reclaimed by a bank (or other financial service provider) in the event of a non-performing loan. Hence a wide income distribution may be associated with lower lending and investment than in an economy with a narrower distribution of final income, as put forward by Saint Paul and Verdier (1992), Galor and Zeira (1993) or Perotti (1993).

A wide income distribution may cause social and political unrest, which in turn discourages economic activity and investment, and hence slows growth. This line of argument has been used particularly in the case of Latin America to draw a link being between inequality and radical shifts in government policy and even in the form of government. The consequences may include support for confiscatory policies, including uncompensated land reform, excessive regulation, and even a tolerance of petty corruption. Inequality can also lead to tolerance of socially disruptive behaviour – crime, strikes, riots, but including in the most extreme form, support for insurgency, separatist movements, and tolerance of drug barons (Perotti, 1992, 1994 and 1996).

When might social protection be bad for growth?

If benefit systems discourage people from working, the amount of labour supplied in the economy is lowered, so reducing the level of output and, in some circumstances, the level of capital investment and hence growth. If social provisions discourage people from saving, then unless public saving rises by an equivalent amount there is a reduction in the capital available for reinvestment. Furthermore,

the taxes necessary to finance social protection may reduce the return to innovation. The classic evocation of these arguments is that of Mirrlees (1971).

In reviewing the experience of the Scandinavian approach to social protection, Lindbeck (1975) argues that the universality of the Scandinavian welfare state has “politicised” the return to economic activity, so encouraged people to pursue material gain through the political process – by passing redistributive legislation – rather than through economic activity. The result is, over time, a loss of entrepreneurial and innovative capacity.

When might social protection be good for growth?

The welfare-enhancing role of social security in a economy where annuity markets are absent (see, for instance, Hubbard and Judd, 1987) and individuals face borrowing constraints (as in Imrohoroglu *et al.*, 1995) may be important. In those circumstances, a system of social security is good for overall welfare, because it enables people to get insurance against risks which the private sector finds hard to pool and manage – sickness, unemployment, etc. In addition, and of more obvious relevance to the topic of this paper, such insurance enables individuals to take more risks in their economic behaviour, because they are insured (to some extent) against failure. Assuming that there is a positive relationship between the riskiness of a project and its expected rate of return, the insurance afforded by social protection may foster growth (Ahmad *et al.*, 1991).

A number of additional considerations suggest that social protection can be good for growth. Examples of the sorts of arguments that are made include: that social protection may lead to a more cohesive society, better able to take “difficult” political and economic decisions, so promoting structural adjustment; that social protection prevents a group or class of society falling so far behind the “mainstream” that they are unable to participate in the market economy, causing permanent loss of potential output; that keeping children out of poverty may have long-term benefits on their social and intellectual development, etc. Indeed, references to social protection as being a “social investment” or “productive factor”, have become increasingly commonplace in official communiqués and statements about the objectives of social protection systems.

In practical terms, a focus on social protection as investment is particularly associated with an emphasis on “employment-oriented social policies” and altering the balance between active and passive social expenditures towards a greater emphasis on the former rather than the latter. These concepts can be defined as follows:

- *Active* policies are introduced in order to encourage increased employment by the beneficiaries of such spending.
- *Passive* policies are pure transfers of consumption from one group in society to another, either in the form of cash transfers or services.

If active measures successfully increase the quantity of labour supplied in the economy, they will promote growth. In other words, to the extent that this latter mechanism is important, the more active spending in the total of social spending, the more positive or less negative should be the effects on growth. This approach is in keeping with that of Bassanini and Scarpetta, 2001, who suggested that while there was empirical evidence for taxes being bad for growth, certain categories of public expenditure – in particular, public investment – could have positive effects.

How might inequality and social protection be linked

A group of theories based around the political economy of redistribution assume that “the median voter” makes an assessment of potential gains in personal or household income from voting for redistribution.³ Of course, unless income is completely evenly distributed, the median voter will always have an income less than the mean income of the country. The fact that the majority does not always vote for redistribution presumably reflects the assessment of the median voter that the costs in lost output following redistribution offset any gains in his or her personal or household income. The more that the mean exceeds the income of the median voter, however, the more likely is the voter to believe that the financial rewards from redistribution can exceed any loss of income due to reduced economic activity. If the amount of redistribution which takes place in a country is a response to the set of preferences of voters which in turn reflects the level of inequality, then the links between social protection and growth cannot be separated from the relationship between inequality and social protection. In other words, more social protection may reduce growth, but voters decided on that level of social protection because of the degree of inequality in their country.

The most widely-known empirical test of whether a wide income distribution is associated with slower growth because of policies to promote redistribution is that of Persson and Tabellini (1994). They used historical data going back to 1830 for a group of countries which subsequently became members of the OECD, and more recent data going back to 1945 for a broader range of countries. They find evidence from both groups of countries that a wider income distribution led to slower growth because voters (where voting existed) adopted policies to narrow the income distribution but which had the side effect of slowing growth. Alesina and Rodrik (1994) also argue that their estimates support this view.

Milanovic (1999) provided evidence that the wider is the distribution of income inequality *before* taxes and transfers, the greater is the extent of redistribution, as measured by the share gain and the Gini coefficient, though the effects are much smaller once pension expenditures are excluded.⁴ Kristov and Lindert (1992) find that the bigger is the gap between the rich and the middle classes, the more redistribution

takes place, but that a wider gap between the middle and the bottom of the income distribution reduces redistribution.

What have previous studies found?

From the mid-1980s to the mid-1990s, a number of studies found that *social protection increased* growth, including those of Cashin (1994), Castles and Dowrick (1990), Korpi (1985), McCallum and Blais (1987) and Perotti (1992, 1994). The interpretation given by Perotti emphasises the importance of imperfect capital markets and political instability. These results have been contradicted by Gwartney *et al.* (1998), Hansson and Henrekson (1994), Atkinson (1999), Nördstrom (1992) and Weede (1986, 1991). No empirical estimates separating active from passive social expenditure have been included in a growth equation. The annex summarises evidence from empirical studies of income distribution and social protection.

From the early 1990s onwards, there was a growing consensus amongst academic economists that increasing *income inequality* was bad for growth (see Perotti 1996 for a survey and more evidence). However, more recently, doubt has been cast upon some of these empirical claims. In particular, Forbes (2000) argues that the estimation techniques that were used in the first series of attempts by researchers to look at links between inequality and growth were flawed. Poor countries have wide income distributions, rich countries much less so. The earlier studies, which often used a cross-sectional OLS approach, were, in effect, asserting that narrowing the income distribution would move a country towards the richer group. But when looking at countries over time (*i.e.* using panel estimation techniques), allowing for the identification of the effects of income distribution independently of country-specific effects, Forbes found that a narrower income distribution in any one country was associated with lower, not higher growth. Much the same criticism can be made about some of those studies referred to above which claim to have identified a positive causal effect between social protection expenditure and growth. The cross-sectional association that they demonstrate, between greater social expenditure and growth, is effectively equivalent to observing that rich nations have welfare states but poor countries do not, a statement which is true but which says nothing about whether social protection causes more rapid growth.

THE EMPIRICAL APPROACH

Although the theories underlying attempts to test empirically links between inequality, social protection and growth are sometimes complicated, in practice estimation has nearly always involved taking a simple model of the causes of growth, and augmenting it with measures of inequality and social protection. The empirical approach taken in this paper is in this tradition: it takes the most commonly-used

model of growth, and examines whether developments in social spending and income inequality might explain some of what the basic model leaves unexplained. Hence, this paper can be seen as reproducing the methodology adopted by many previous studies. However, as will be described in more detail below, this study makes use of better data than previous studies.

Most analyses of the causes of growth have used an empirical model proposed by Solow (1956) and Swan (1956) which is based on a constant returns to scale production function with two inputs: labour and capital. More recently, Mankiw, Romer and Weil (1992) – henceforth, MRW – augmented this model by adding human capital as a third factor of production. The MRW model has become the benchmark for most empirical work analysing the determinants of economic growth (Bassanini and Scarpetta, 2002), with growth in GDP per working-age population being modelled as a function of:

- The investment in physical capital (more investment means more capital assets per worker, so more growth).
- The growth rate of the working age population (more population growth means slower growth in income per capita, *given* the level of physical capital).
- The level of human capital (more human capital means greater efficiency in using physical capital).
- Income at the beginning of a period (the poorer is a country, the more rapidly is it likely to grow, because poorer countries can copy technologies from richer countries without having to develop new techniques themselves. For this reason, it is referred to as being the “catch-up” variable).

Those studies which look at the links between inequality or social protection and growth add measures of inequality or government spending on transfers as independent variables in a more or less *ad hoc* manner (Temple, 1999). Because the MRW growth model is the most common model in the empirical work on growth, its choice ensures that any differences between the empirical work of this paper and that of the majority of studies is not due to the particular specification of the underlying model. However, this study employs *panel data*, unlike many other (particularly early) studies of the links between social protection and growth. This permits greater precision in estimates and avoids some of the spurious inferences from cross-sectional correlations, referred to above.

Although this approach is widely used, it has some underlying problems. One difficulty lies in specifying the appropriate list of regressors to include in the model. From a theoretical point of view, virtually any variable which affects any part of economic activity can plausibly be argued to have an effect on growth. In practice, it is necessary to select a modest number of regressors which appear to be most important. Unfortunately, it is difficult to discern which variables are most important since growth can be found to be correlated with pretty much anything

and everything (see Sala-i-Martin, 1997a and 1997b). Consequently, it is difficult to construct a case for preferring a specification which shows that one set of variables are important over any other and there is a very real problem of omitted variable bias. This study does not make any pretence of overcoming this problem.

Furthermore, as pointed out by Caselli *et al.* (1996), most empirical studies suffer from at least one of the following estimation problems:

- Omitted variable bias may be exacerbated because the growth model includes a lagged dependent variable (the “catch-up” variable). In a dynamic specification, such as this, serial correlation in the error term – which may result from the omission of a relevant regressor – can result in unreliable coefficient estimates;
- Endogeneity is a general problem in analysis of growth since many of the determinants of growth are, in turn, arguably affected by the rate of growth (*e.g.* investment is often thought to be related to expected growth). Endogeneity may be even more of a concern when considering the effects of social protection expenditure, because the demand for social protection appears to be strongly linked with the average income level of the population (see below).

A trade-off is often encountered in seeking to minimise these potential sources of bias in the estimates. For example, most of the research trying to defeat the problems associated with omitted variables turns a blind eye to the endogeneity problem, or *vice versa*. Three main estimation techniques are used in this paper, all of which have their advantages and disadvantages.

- *Fixed Effects* models compute estimates from differences in variables within countries across time. On the assumption that individual effects are correlated over time, but are unrelated to other regressors, this corrects for endogeneity problems. Unfortunately, because lagged income enters the MRW approach, this assumption is difficult to maintain if the model is estimated using annual data. By splitting the period of analysis into ten-year sub-periods and then using sub-period average values for all variables except for the lagged dependent variable, for which *beginning* of the period values are used, serial correlation is, at the very least, much reduced (Caselli *et al.*, 1996; Forbes, 2000). However, the number of observations is also correspondingly reduced and, as pointed out by Temple (1999), omitted variable bias remains a problem.
- *The Pooled Mean Group* (PMG) approach (Pesaran *et al.*, 1999, Bassanini *et al.*, 2001) avoids averaging data, so permits much greater precision in estimates. It nevertheless limits problems of serial correlation by explicitly modelling short term dynamics (by adding first differences of the independent variables), which are allowed to vary across countries, as well as long-run effects, which

are constrained to be equal across countries. Nevertheless, omitted variable bias potentially remains an issue.

- The GMM-IV estimator (Arellano and Bond, 1991) is run in first differences and all possible lagged values of the independent variables are used as instruments. The differencing removes the omitted variable bias, and using instrumental variables corrects for the endogeneity of the explanatory variables. This makes it an attractive estimation technique when looking at the causes of growth (Caselli, 1996; Temple, 1999; Forbes, 2000). However, the approach was developed for microdata, and its theoretical foundations do assume that there is a large sample of observations. Where this is not the case (as in this study) there is a risk that the lagged dependent variable bias (leading in particular to a downward bias in estimated coefficients) is serious (Bassanini *et al.* 2001).

No single technique can guarantee to eliminate all econometric problems. As discussed in Arjona *et al.* (2001), the fixed effects estimator gave less precise results than either of the other techniques. Consequently, this paper reports estimates from the PMG and GMM-IV approaches in preference to the fixed effects estimator (though see Arjona *et al.* 2001 for a more complete set of results). More confidence can be placed in results which are consistently found using both estimators, which take such different approaches in controlling for estimation difficulties, than if only one approach gives a particular result. However, the PMG and GMM estimators both require annual data, while comparative income distribution data is only available in ten-yearly intervals. Thus, the fixed effects estimator is used when this variable is included in the model.

DATA

The growth equation is estimated using an annual sample of 21 OECD countries running over the period 1970 to 1998. The choice of this period and set of countries reflects a trade-off between the number of countries included and the time period available. This core data-set – and indeed much of the theoretical approach underlying this study – is drawn from Bassanini *et al.* (2001).

Social expenditures are taken from the OECD social expenditure database (SOCX) which has a definition broad enough to incorporate active labour market policies and health expenditures, as well as cash income transfers and social services, including child care. SOCX permits a more detailed assessment of the effects of social policy on income distribution and growth than has been generally attempted in the past. For example, it becomes possible to identify spending on the working age population and the whole population separately, and active and passive social spending.

Box 1. Core variables used in the empirical analysis

- *Dependent variable*: Annual average growth rate of real GDP per working-age person (aged 15 to 64), expressed in 1993 Purchasing Power Parities.

Baseline variables

- *Catch-up*: lagged real GDP per working-age population (aged 15 to 64), expressed in 1993 Purchasing Power Parities.
- *Investment*: real private non-residential fixed capital formation to real GDP.
- *Human capital*: average number of years of schooling of the population aged 25 to 64. This variable is drawn from the De la Fuente and Doménech (2000) dataset as adapted by Bassanini and Scarpetta (2001).
- *Population growth*: annual average rate of growth of the working-age population (aged 15 to 64).

Note: All variables come from the OECD Analytical database (ADB), unless otherwise specified.

SOCX itself covers the period 1980-1997 for all the OECD countries other than those of central Europe and the other new OECD members (Korea and Mexico). An alternative data source exists for the period 1970-1980. This data (OECD, 1994), matches relatively closely the data included in SOCX in aggregate, but does not permit a disaggregation of the data.⁵ Because the data was collected using a different methodology from SOCX, there is a risk that it is less reliable. For that reason, when undertaking the empirical estimates described below, tests were carried out to see if excluding the 1970s affected the results. In no case did any significant variable become insignificant, or vice versa, suggesting that the long time period data can indeed be used with some confidence.

TRENDS IN INCOME DISTRIBUTION AND TOTAL PUBLIC SOCIAL EXPENDITURE

As shown in Förster (2000) and summarised in Förster and Pearson (2002), the distribution of final income among households became more unequal in most, but by no means all, OECD countries between the mid-1980s and the mid-1990s. Over a longer time period, it is harder to discern a general trend. However, in one significant

respect, there has been a trend which is general across nearly all OECD countries: an increase in market income (*i.e.* wages and income from capital, before taxes and social benefits) inequality. This holds true regardless of whether the whole population is considered, or just those of working-age.

Since 1970, social expenditure (including health but excluding education) in OECD countries has increased by around 10 percentage points of GDP on average. This growth has not been confined to any one region of the OECD, though it has been perhaps a little less rapid in the non-European OECD countries. The European region has social expenditures which are significantly in excess of those of non-European countries. The non-European country with the highest total public social expenditure – New Zealand – has a spending to GDP ratio which is lower than all but four European countries in 1997.

Within each country or regional grouping of countries, changes in the level of social spending are positively correlated with GDP per capita (Figure 1). One way of interpreting such a relationship is that the income elasticity of demand for social expenditure exceeds unity – the richer we are, the greater the share of our income we are prepared to spend in order to protect our health, our standard of living in retirement, or our current consumption levels, were we to lose our livelihood through unemployment or sickness.⁶ However, this relationship does not hold *across* countries or regional groupings, with expenditures in Japan and the United States,⁷ for example, being well below the level that a European country with their level of GDP per capita would be expected to have. Nevertheless, the strong correlation between GDP per capita and social expenditure within regional groupings does suggest a need to control for reverse causality in any study of empirical effects of social expenditure on growth.

One complication in looking at the effects of social protection expenditure on growth is that countries target expenditure on quite different groups, reflecting quite explicit differences in the goals of the system. Whereas some countries place redistribution (from rich to poor, but also across different social and demographic groups) at the core of their programmes, the focus in others is on helping individuals and families redistribute their resources over their lifecycle. As a result, the aggregate amount of money which can be classified as being “social” may be a rather poor proxy for the amount of redistribution from rich to poor which is taking place. Some of the various theories described above as to how social protection might affect growth clearly are referring not so much to the aggregate amount of social expenditure, but rather to the effects of social expenditure in altering incentives. Recent OECD work on income distribution (see Förster and Pearson, 2002) has developed a measure of how much net redistribution is performed by tax/transfer systems, as indicated by the increase in the share of total income received by the bottom half of the income distribution due to taxes and transfers. Table 1 shows how this variable has changed over the time period covered in the study.

Figure 1. **Public social expenditure and GDP per capita**
1960-97

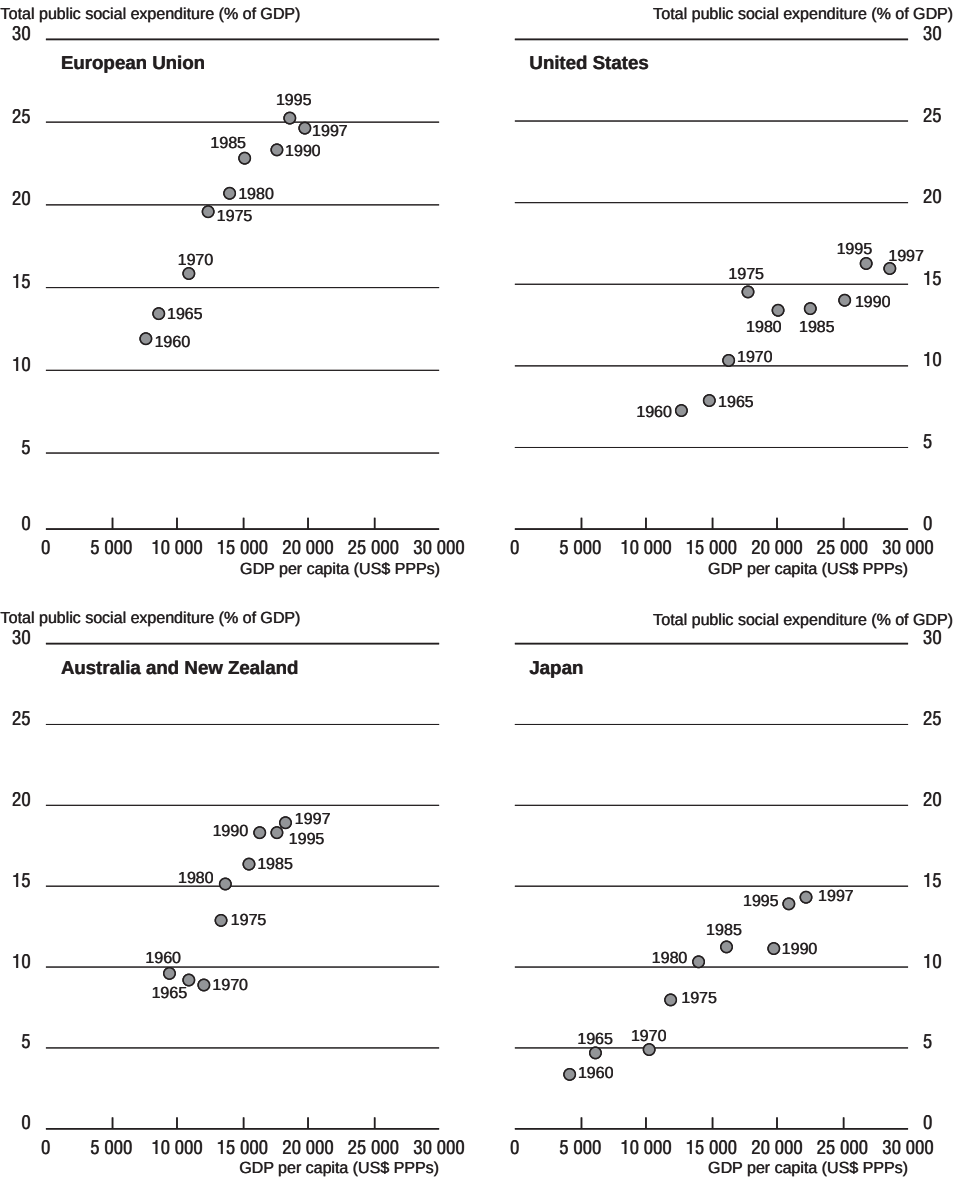


Table 1. **Share-gains of the bottom half of the income distribution**¹
Working-age population

	1970s	1980s	1990s
Australia	0.02	0.05	0.08
Belgium	..	..	0.11
Canada	0.04	0.05	0.06
Denmark	..	0.05	0.08
Finland	0.05	0.06	0.09
France	..	0.05	0.06
Germany	..	0.04	0.04
Greece	0.00	0.01	0.02
Hungary	..	0.08	0.10
Ireland	..	0.09	0.10
Italy	..	0.04	0.05
Netherlands	0.04	0.07	0.07
Norway	..	0.04	0.06
Sweden	0.06	0.05	0.08
Turkey	..	0.01	0.01
United Kingdom	0.04	0.07	0.07
United States	0.04	0.04	0.04

.. Data not available

1. See text for definitions.

Source: OECD questionnaire on income distribution.

As is apparent from Table 1, the changes in share gains over time have been very substantial. For example, in the 1970s, the share of *final* income of the bottom half of the distribution of incomes in the working age population was just 2 per cent more than their share of *market* income in Australia. By the 1990s, the difference was 8 per cent more. Increases (albeit, usually less rapid) have taken place in other countries. The net effect of taxes and transfers has been to redistribute more income to the lower half of the income distribution, either because more is now spent on social protection, or because benefits are more targeted than previously.

Trends in spending on active social policies

Whilst a clear definition of social spending being either entirely active or passive is very appealing, reality is not so obliging. Most social programmes are *not* unambiguously one thing or the other. They may be mainly active, with passive elements (a labour market programme, which also provides income support and may re-qualify the recipient for unemployment insurance); they may be mainly passive, with active elements (a cash transfer programme, which has job-search requirements). As most social programmes lie between the two extremes of activity

and passivity, any classification of them into active spending or passive spending is arbitrary, to some degree.

The narrowest possible interpretation of “active” social spending is to focus on active labour market policies. These are designed, broadly, to help jobless persons find and retain paid employment. They may include training programmes; help with job-search activity; rehabilitation services for disabled workers; and wage subsidies.⁸ Spending on active labour market programmes as a percentage of GDP remain relatively low, only recently approaching 1 per cent of GDP on average (Table 2). Expenditure is significantly higher in Nordic countries, France, Germany and New Zealand. In subsequent estimations, reference is also made to a broader measure of active social expenditure, which includes those programmes which seek to increase labour supply through reducing barriers to participation, including family support expenditures such as childcare, and also those measures which “make work pay” (Pearson and Scarpetta, 2001).⁹ Expenditure on such policies has been on an upward trajectory, but not a particularly strong one (Arjona *et al.* 2001).

EMPIRICAL ESTIMATES

The baseline models

As described above, the empirical approach followed in this paper is to treat annual data for the various OECD countries as a panel data set. Before discussing the estimated effects of social protection on growth it is first worth describing how the various approaches to estimating growth equations compare with each other when the basic MRW model is estimated (and presented in the first column of the tables below). As in Bassanini and Scarpetta (2001), the PMG estimator (as used in Table 3 for example) gives statistically significant coefficients of the sign predicted by theory (positive in the case of human capital and physical investment; negative in the case of “catch-up” and population growth). Much the same is true for the GMM-IV estimates (as used in Table 5 for example), though in this case the physical investment variable is insignificant. The GMM-IV estimator also permits a number of diagnostic tests about whether serial correlation is present, and this is confirmed as not being a problem. On the other hand, the fixed-effects model with data averaged over ten year periods performs much less well (Arjona *et al.*, 2001). Although estimated coefficients have the predicted sign, and the equation overall explains a statistically-significant part of the variation in growth rates across countries and over time, only the catch-up variable is estimated sufficiently precisely to have the degree of confidence usually considered necessary. This reflects the absence of a sufficient number of observations. Accordingly, the following sections do not present estimates of the effects of social protection on growth generated using this technique.

Table 2. **Spending on active labour market policies, 1980-97**
Percentage of GDP

	1980	1985 ¹	1990	1995	1997
Australia	..	0.4	0.3	0.8	0.5
Austria	..	0.3	0.3	0.4	0.5
Belgium	..	1.3	1.2	1.4	1.2
Canada	0.3	0.7	0.5	0.6	0.5
Czech Republic	..	..	..	0.1	0.1
Denmark	0.4	0.9	1.1	1.9	1.7
Finland	1.0	0.9	1.0	1.5	1.5
France	0.5	0.7	0.8	1.3	1.4
Germany	..	0.9	1.1	1.3	1.2
Greece	..	0.2	0.4	0.4	0.4
Iceland	..	..	..	0.1	0.1
Ireland	..	1.5	1.4	1.6	1.6
Italy	..	..	..	1.1	1.0
Japan	..	0.1	0.1	0.1	0.1
Korea	..	..	0.1	0.1	0.1
Luxembourg	0.3	0.5	0.3	0.2	0.3
Mexico	..	0.0	0.0	0.1	0.1
Netherlands	0.7	1.0	1.1	1.3	1.4
New Zealand	0.6	0.9	0.9	0.7	0.7
Norway	..	0.6	0.9	1.3	1.0
Poland	..	..	..	0.4	0.5
Portugal	..	0.4	0.6	0.8	0.7
Spain	0.2	0.3	0.9	0.8	0.6
Sweden	1.2	2.2	1.7	2.4	2.1
Switzerland	0.1	0.2	0.2	0.5	0.8
Turkey	..	0.1	0.0	0.0	0.1
United Kingdom	0.8	0.7	0.6	0.4	0.4
United States	0.2	0.1	0.2	0.2	0.2
OECD ²	..	0.6	0.7	0.9	0.8
European Union ³	..	0.8	0.9	1.1	1.1

.. Data not available.

1. 1986 for Portugal and Turkey; 1987 for Japan and Mexico.

2. Excluding the Czech Republic, Iceland, Italy, Korea and Poland.

3. Excluding Italy.

Source: OECD (2000).

Social protection spending and growth

The rest of this article focuses on the hypotheses that social protection expenditure affects growth. Table 3 adds the various possible ways of measuring total social expenditure to the basic MRW model. Column (1) of the first panel gives the results for the baseline model calculated using the Pooled Mean Group

Table 3. **The effects of aggregate social expenditure on growth**
 Dependent variable: growth rate of real GDP per working age population in 1993 PPPs

	Annual data – Pooled mean group estimations ¹				
	Entire population			Working age population	
	(1)	(2)	(3)	(4)	(5)
	Baseline	SOCX	(SOCX-Health)	SOCX	(SOCX-Health)
Catch-up	-0.085 [5.52]**	-0.147 [-4.14]**	-0.151 [4.36]**	-0.112 [2.25]**	-0.126 [2.35]**
Population growth	-15.505 [5.74]**	-2.834 [-2.89]**	-2.811 [2.78]**	-6.789 [9.44]**	-6.604 [8.66]**
Investment	0.200 [3.65]**	0.345 [9.54]**	0.319 [9.82]**	0.242 [6.94]**	0.256 [7.48]**
Human capital	0.857 [5.96]**	1.280 [11.66]**	1.240 [11.70]**	1.780 [23.51]**	1.723 [23.21]**
Social expenditure	– –	-0.134 [-2.57]**	-0.090 [2.14]**	-0.099 [2.52]**	-0.037 [1.56]
Constant	0.674 [5.66]**	0.981 [4.40]**	1.007 [4.60]**	0.635 [2.30]**	0.702 [2.42]**
Observations	533 (1970-1998)	533 (1970-1998)	533 (1970-1998)	340 (1980-1998)	340 (1980-1998)
Log likelihood	1 563	1 603	1 601	1 127	1 122
Countries	21	21	21	20	20

1. All PMG estimations include short-run dynamics. The figures presented in this table are the long-run coefficients.
 Source: OECD.

estimation approach; column (2) presents the estimated coefficients when the equation is augmented by total social expenditure, column (3) shows the results using the same measure, adjusted to exclude expenditure on health. Columns (4) and (5) exclude expenditure on the elderly, where it can be separately identified, on the grounds that it might influence incentives somewhat differently from expenditures on the working age population.¹⁰

The models perform well and the basic growth model variables are individually significant with the expected sign. However, there is some instability in coefficients (*e.g.* that on population growth), which does suggest that individual results need to be interpreted with some caution. That said, the coefficient on total spending on social protection is negative and significant. If health expenditure is excluded in the measure of expenditure, the coefficient falls to two-thirds of the value found for total social spending. Excluding expenditure on the elderly also reduces the coefficients.¹¹

The results suggest that social protection has a moderate effect on GDP in the long term. Partial elasticities suggest that an increase in spending from approximately 18.5 per cent of GDP (the mean over the whole period considered) to 19.5 per cent of

Box 2. Income distribution and growth

The focus of the paper is on the effects of *social protection* on growth. However, one of the key purposes of social protection spending may be to reduce income inequality, making it necessary to understand whether income distribution and growth are causally linked. Table 4 shows estimates of the effects of income distribution on growth. Because of the absence of annual data, a fixed-effects model has to be used to generate estimates. The various measures of inequality* which are added to the baseline MRW equation all have a positive coefficient, suggesting that inequality is associated with higher growth, but only in the case of the squared coefficient of variation does the coefficient approach statistical significance. However, addition of any inequality measure makes the equation highly unstable, with very large changes in the value of other coefficients and in many cases the equations as a whole become statistically insignificant. Arjona *et al.* (2001) report similar conclusions based on estimates which focus solely on the inequality of the working age population, and when looking at the distribution of *market* income inequality (*i.e.* inequality before taxes and transfers) rather than final income inequality. Finding no robust evidence of a link between inequality and growth is not the same as establishing that there is no link, of course, but given that the quality of data used in this study was significantly better than that which has generally been used in similar such studies, the absence of any significant relationship is suggestive.

Table 4. **The effects of final income distribution (entire population) on growth**

Dependent variable: growth rate of real GDP per working age population
in 1993 PPPs Ten-year periods – Fixed-effect estimations¹

	(1)	(2)	(3)	(4)	(5)
	Baseline	Gini	SCV	MLD	P9/P1
Catch-up	-0.360 [2.89]**	-0.265 [1.39]	-0.224 [1.06]	-0.378 [1.11]	-0.242 [1.24]
Population growth	-0.300 [0.49]	0.486 [0.56]	0.017 [0.02]	1.174 [1.16]	0.407 [0.47]
Investment	0.039 [0.33]	0.056 [0.31]	0.015 [0.08]	0.371 [1.33]	0.040 [0.22]
Human capital	0.290 [0.94]	0.209 [0.38]	-0.070 [0.12]	0.740 [0.86]	0.221 [0.40]
Inequality	–	0.428 [1.59]	0.205 [2.12]*	0.066 [0.43]	0.288 [1.61]
Constant	3.020 [2.92]**	0.755 [0.46]	2.778 [1.58]	1.204 [0.64]	0.280 [0.16]
Observations	62	43	40	32	40
Countries	21	18	17	14	18
R-squared	0.43	0.37	0.35	0.36	0.33
F-test	7.02**	2.35+	1.93	1.47	2.37+

1. All inequality variables are after tax/transfer and include the entire population.

Source: OECD.

Box 2. Income distribution and growth (cont.)

However, looking for a *direct* influence from income distribution on growth is not the only way in which developments in the two variables are connected. As noted above, several theorists (*e.g.* Persson and Tabellini, 1994) have argued that a narrow distribution of market income is good for growth because it reduces the demand for redistribution which is damages growth. As Rodrik (1998) says: "While equality is good for growth – if equality is inherited or as a result of historical or exogenous factors – policies that aim at achieving more equality are bad for growth".

The evidence presented in Arjona *et al.* (2001) suggests that if the Gini coefficient on market income increased from 0.42 to 0.43, the associated rise in social expenditure would eventually be of the order of 2 per cent of GDP, and this in turn is associated with lower levels of GDP. However, this is not strong evidence in favour of the arguments outlined above, as other interpretations of the results are possible. In particular, more social expenditure may *substitute* for market income. For example, if there is a reasonably generous publicly-provided pension, individuals will not accumulate private wealth to finance their retirement (see OECD, 1998, 2000a). Similarly, high rates of benefit payments may cause behaviour to change which leads to fewer people in work. In each case, market income inequality will increase.

* Inequality can be measured in a number of different ways, each of which can be interpreted as giving different weights to different parts of the income distribution. For example, the Gini coefficient is more sensitive to the middle of the distribution; the SCV to both ends of the distribution, and the MLD to the bottom of the distribution.

GDP would reduce GDP in the long term by 0.7 per cent.¹² This can be compared with the effects of other variables on GDP: a 1 per cent of GDP increase in investment would increase GDP by 1.3 per cent; and an increase of one year in the average years of schooling in the working-age population would increase long-run GDP by over 6 percentage.¹³

One way of interpreting these results is that the effect on growth is not from social protection *per se*, but from taxation. In other words, as social protection spending increases, so does taxation, and it is taxation which reduces growth, rather than social expenditure reducing growth directly. There are a number of studies which have looked at the effects of taxation on growth. Generally, they find that the tax to GDP ratio negatively affects output – more taxation, less growth

(see, for example, Bassanini *et al.*, 2001), though of course in any particular case the effects of taxes on growth depend on their initial level and on how they are levied.

Yet even if there were *no* effects on output from social expenditure, but the financing of social expenditure reduced growth, it would still be reasonable to assert that the social expenditure *caused* the increase in taxation and reduction in growth, as increased social spending accounts for most (if not all) of the increase in tax pressure in OECD countries since the mid 1960s. In other words, it is just as likely that the studies which find an effect from taxation on growth may in fact be picking up an effect from social protection expenditure as *vice versa* – because it is not possible to have social protection expenditure without an assumption of increased taxation either now or in the future, it is not really possible to separate a tax effect from a social expenditure effect.¹⁴

Evidence is inconclusive about whether it is the level of social expenditure or the amount of redistribution which might have the greatest effects on growth. Arjona *et al.* (2001) tested whether a measure of net redistribution – the share-gain of the bottom half of the income distribution, both in general and when looking just at the working-age population – had a significant effect on growth.¹⁵ Because income distribution data is only available at decade-wide intervals, the model had to be estimated using the fixed-effects regression technique on a sample of ten-year periods. Although the signs on the share-gain variables were negative – as would be expected were redistribution to harm growth – diagnostic tests reject the hypothesis that the coefficients explain a statistically significant amount of the variation in growth rates across time and countries, regardless of whether including the share-gain for the working-age or the entire population. Furthermore, it is not entirely possible to separate the effects of social protection expenditure on growth from the interactions between income distribution and growth. Box 2 contains some discussion of this difficult area.

Active and passive social expenditure

The hypothesis tested in this section is that some part of social expenditure, broadly conforming to the “active” definition outlined above can be defined and found to have a statistically different effect on growth from other forms of social expenditure.

One form of active social spending – active labour market policies – can only be identified in the OECD SOCX database for the period 1984-1997. Column 2 of Table 5 includes both active (the narrow ALMP definition) and non-active (total social spending minus ALMP) variables as regressors in the same regression. In addition, GMM-IV estimation is also used in columns 3 and 4.

There is a positive significant coefficient for active social spending and a negative significant coefficient for non-active spending in column 2. The sensitivity of

Table 5. The effects of active social policies on growth
 Dependent variable: growth rate of real GDP per working age population in 1993 PPPs

	Annual data – Pooled Mean Group estimations ¹				GMM-IV estimations	
	(1)	(2)	(2a)	(2b)	(3)	(4)
	Baseline	Active and non-active	Active and non-active (2, excluding spending on elderly)	Active and non-active (2b excluding health)	Baseline	Active and non-active
Catch-up	-0.220 [2.54]**	-0.299 [4.44]**	-0.316 [4.33]**	-0.335 [4.27]**	-0.150 [29.00]**	-0.241 [4.08]**
Population growth	4.056 [6.53]**	3.230 [4.91]**	3.969 [5.83]**	4.264 [5.51]**	-0.565 [7.02]**	-0.623 [4.26]**
Investment	0.202 [9.00]**	0.151 [6.28]**	0.211 [8.47]**	0.160 [6.18]**	-0.002 [0.14]	-0.046 [0.71]
Human capital	1.647 [20.62]**	2.468 [32.91]**	2.547 [32.10]**	2.266 [33.60]**	0.256 [3.42]**	0.618 [1.41]
Active spending	–	0.065 [10.00]**	0.078 [10.57]**	0.067 [8.77]**	–	0.018 [2.07]**
Non-active spending	–	-0.426 [13.06]**	-0.351 [12.81]**	-0.249 [12.80]**	–	-0.103 [2.21]**
Constant	1.315 [2.56]**	1.554 [4.52]**	1.398 [4.35]**	1.617 [4.29]**		
Observations	204 (1984-1997)	204 (1984-1997)	204 (1984-1997)	204 (1984-1997)	518 (1970-1998)	244 (1980-1997)
Log likelihood	688	613	610	605		
Wald-test					99.52**	72.18**
Sargan test					20.69	17.35
m2 statistic					-3.051**	-0.934
Countries	17	17	17	17	21	19

1. PMG estimations of models (1) – (3) include short-run dynamics. The long-run coefficients are reported in this table. Model (4) is estimated as a partial adjustment model.

2. Total social spending-active spending including ALMPs.

Source: OECD.

these results to different definitions of non-active spending are explored in columns 2a and 2b. The coefficient on active spending remains unchanged in sign, level and significance. Excluding spending on cash transfers to the elderly reduces the negative coefficient on non-active spending, and also excluding health spending reduces it even further. However, it remains significant. The reliability of these results is confirmed by estimating the same model specifications using the GMM-IV technique (column 4).¹⁶ A positive significant coefficient is obtained for active spending, and a negative significant coefficient on other social spending.

The most reasonable interpretation of the estimates is that not only are the effects of the two sorts of spending significantly different, they have significant effects in the opposite direction to each other. More *passive* spending may be associated with a poor growth performance, but more *active* spending is associated with higher output. This result appears broadly to be supported by the two different econometric techniques used (which take a different approach to dealing with the various statistical problems).

The estimates suggest that increasing active spending from 0.63 per cent of GDP (the average over the period and countries covered) to 0.73 per cent of GDP would increase long run GDP by nearly 1 per cent. The “passive” estimate (in reality, total social spending minus active spending) suggests that an increase from 20.7 to 20.8 per cent of GDP would reduce long run GDP by 0.2 per cent. The effect of active spending on GDP in particular seems very large. Much caution needs to be used when interpreting results which are so dramatic, and factors such as diminishing marginal returns to additional active spending have to be taken very seriously when attempting to use such figures to draw policy conclusions.

Evaluations of ALMPs have given “mixed” results about their effectiveness in promoting employment (*e.g.* Martin, 2000). Do these results provide evidence that in fact the ALMPs have been effective? The answer depends on what is meant by “effective”. What is found is that increased spending on active policies increases output. If increased employment were to be the mechanism by which active spending promoted growth, it might be expected that there would be a clear impact on intermediate variables. For example, the employment to population ratio might be expected to rise in the presence of a high rate of “active” spending. Existing microeconomic evidence on the effectiveness of ALMPs suggest that it would be surprising were such an impact of active social spending on labour force participation rates to be found.

There may be alternative explanations of why such a high parameter is found on the “active” spending variable. For example, high active spending may be an indicator that a government has undertaken other growth-enhancing reforms and what is being identified may not be so much an effect from active spending, but rather the impact of an entire policy stance. Alternatively, it is possible that active policies may be relatively ineffective in creating net increases in employment for those who benefit from them, but relatively effective in increasing effective labour supply by keeping groups at the margin of the labour market in touch with the world of work, with more general beneficial effects on growth rates. Unfortunately, it is not possible to prove or disprove such hypotheses with the aggregated data utilised in this study. The most reasonable interpretation of the results is that this study provides some evidence that active spending might be good for growth, but that further evidence is required before such an assertion can be made with confidence.

CONCLUSIONS

Recent decades have witnessed important changes in income distribution and social expenditures in OECD countries. When looking at income distribution data, the most striking fact is that there has been an increase in market income inequality (almost) everywhere in the OECD. Partly as a result of efforts to limit changes in the final income distribution, there has been a long-run trend towards greater social expenditure, lasting at least up until the early 1990s. However, since then any growth in social expenditure as a percentage of GDP appears to have stabilised.

These changes in income distribution and social protection expenditures are not trivial. This paper has had as its goal the objective of evaluating whether there was any evidence that these changes altered the rate of growth in the economy.

This study found no evidence that the level of income inequality affects GDP one way or another. By contrast, the balance of evidence is that more social protection expenditure reduces output, although the effect is not large. In interpreting this result, the suggestion that different sorts of social expenditure have different effects on growth proves to be important. The estimates in this study suggest that more “active” spending (*i.e.* social spending which attempts to change the distribution of market income by promoting the labour market participation of part of the population that would have lower-than-normal market incomes) is associated with higher growth, whereas other social spending is associated with lower growth.

These findings were obtained by applying the best statistical methods identified in previous studies to superior data, including the most reliable data on OECD countries which are available not just on social protection and income distribution, but also on investment, GDP growth and human capital investment. This makes them the best available estimates of the impacts of inequality and social expenditures on growth, but does not necessarily make them good. In particular, it is not possible to say whether these findings are subject to serious omitted variable bias. The models estimated here exclude a number of potentially important influences on growth, for example, indicators of entrepreneurial environment, innovation, quality of education, R&D, macro-economic stability, openness to trade, geographical position, religious affiliation, etc. The tentative conclusions given above are based on estimates which do not take into account all these other factors that we think might be important.

Finally, it should be noted that the estimates presented here are of the effects of *marginal* changes. To the extent that the estimates presented are considered reliable,

they suggest that a bit more active spending is likely to be good for growth, and a bit more passive spending bad for growth. It cannot be concluded that, say, a doubling of active spending would still be good for growth and a halving of passive spending still bad for growth. Common-sense suggests that the former might well result in wasteful spending, and the latter lead to political instability due to resentment at an “unfair” distribution of final income.

NOTES

1. This paper summarises some of the main results from a longer study conducted by the authors, Arjona *et al.* (2001).
2. The increase in the growth rate due to a higher savings rate is only temporary in the basic neo-classical growth model (Swan, 1956, Solow, 1956), but can be permanent in some other formulations (Romer, 1986, 1990).
3. In many economic models of democracy, the behaviour of the median voter is the key in determining government policy.
4. These results are consistent with the theoretical findings of Tabellini (2000) and Casamatta *et al.* (2000), among others, in which the greater the inequality of pre-tax income within each generation (and the proportion of elderly people in the population), the larger the size of social security expenditures.
5. It does not, however, include data for Iceland, Luxembourg, Portugal, Spain or Turkey, or any of the new OECD member countries (the Czech Republic, Hungary, Korea, Mexico, Poland, Slovakia).
6. There are other possible explanations. Because a significant part of social expenditure relates to services which are not traded internationally, Baumol or Balassa-Samuelson effects may be significant. As productivity increases in the provision of public services are limited, but wages must match those in the traded sector, an ever greater proportion of GDP must be devoted to maintaining a given level of social services.
7. Spending in Japan and the United States tends to be lower than the European average in each of the main categories of spending – on cash transfers to the elderly, unemployment, disability, etc.
8. This may be the narrowest possible definition, but even so it is not without problems. As noted by Martin, (2000), some active measures are really passive ones in disguise.
9. There is no generally-accepted definition of make work pay policies. Furthermore, many of them are delivered via the tax system, rather than the benefit system. This complicates the generation of a making work pay expenditure variable. As a result of only partially being able to overcome these problems, the measure used probably underestimates the expenditures or revenues forgone in countries which deliver making-work pay transfers to the employer via payroll tax reductions.
10. These models have also been estimated on a sample excluding the 1990s, reflecting the fact that the baseline model gives much less satisfactory results when the 1990s are included, and on a sample excluding the 1970s, in recognition of the fact that data from the 1970s comes from a slightly different data source and might not be as reliable. The results obtained over either of the shorter periods were generally not significantly different from those obtained over the long period time periods (Arjona *et al.* 2001).

11. The GMM-IV estimation approach (which should be effective in overcoming endogeneity problems) was also used to test the effects of social expenditure on growth. However, diagnostic statistics suggest that there may be serial correlation, so the GMM results are unreliable in this particular case and are not presented.
12. A 1 percentage point increase in spending takes several years to have its full-scale impact on GDP, during which time the growth rate is temporarily increased.
13. The results in this paragraph are obtained from the estimates of total social spending estimated over the full time period, using the PMG model. All effects are calculated at the mean.
14. Regardless of which interpretation is correct, including a measure of tax pressure in the equation does not alter the interpretation or the coefficient on social expenditure, and that on tax pressure is insignificant (Arjona *et al.*, 2001).
15. These variables capture how the income share of the bottom half of the distribution of market income increases due to taxes and transfers. In computing these share gains, it is necessary to define them across the same set of people.
16. The model is well specified and both tests for serial correlation (the Sargan test and the m2 statistic) indicate its absence.

Annex. Studies on the link between economic growth, income inequality and social protection

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Alesina and Rodrik (1994)	Period: 1960-1985 and 1970-1985. Method: OLS and 2SLS. Samples: High-quality and low quality samples, 46 and 70 countries. Includes OECD countries and developing countries <i>Sources:</i> some existing data sets, see Fields (1993).	Average per capita growth rate of GDP over the period 1960-1985.	Per capita GDP level in 1960. Primary school enrolment rates in 1960. Gini coefficient of income inequality, in 1960. Gini coefficient of land distribution in 1960. Democracy dummy.	The more unequal the distribution of resources is, the lower is the rate of economic growth. This link is explained by redistributive politics. Significant and negative coefficients are obtained for both Gini variables.
Cashin (1994)	Period: 1971-88 (sub-periods 71-75, 76-80, 81-85). Method: Time-series cross-section estimation using OLS and GiV with one-factor error structure for panel estimation (group dummy variables). Sample: 92 country observations, on 23 developed countries. <i>Data sources:</i> IFS, World Tables, GFS, Summers and Heston and OECD LFS data.	Rate of growth of real GDP per worker.	Average value of change in the stock of public capital as a share of GDP. Natural logarithm of real GDP per worker in 1985 prices. Average rate of social security and welfare expenditure to GDP. Average rate of secondary school enrolment. Average value of each sup-period's current revenue. Average share of total population over 65. Average level of GDP of each sub-period. Average value of each sub-period's interest rate. Average value of CPI in each sub-period.	Increased government spending on those items which enter private production functions enhances economic growth. Example of such spending include transfer payments and public investment. Both of these generate positive externalities raising private investment and growth. Positive and significant coefficients on social security spending. Positive and borderline significant on public investment.
Castles and Dowrick (1990)	Period: 1960-1985 Method: Pooled time-series cross-section. OLS (endogeneity is tested) Sample: 18 OECD countries. <i>Sources:</i> OECD <i>Historical Statistics</i> and <i>National Accounts</i> .	Real per capita GDP.	OECD social expenditure (excluding health and education)	Positive coefficients but not significant (if controlling). With no control: irregular signs and not-significant.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Devarajan <i>et al.</i> (1993)	Period: 1970-1990. Method: OLS. Sample: 69 countries. Sources: IMF GFS.	Moving average of per capital real GDP.	Continental dummy variables. Current net of interest public expenditure over total expenditure. Capital expenditure over total expenditure. Defence expenditure over total expenditure. Health expenditure over total expenditure. Education expenditure over total expenditure. Transportation and communication expenditure over total expenditure. Premium in the parallel market for foreign exchange. Terms of trade, interest rate shocks.	Investigating the relationship between the composition of public expenditure and growth, the authors claimed that a change in the policy mix in favour of productive activities can lead to a higher rate of growth of the economy. The results explained, however, that only current expenditure and some categories of health and education expenditure seemed to play a relevant role, with positive and significant coefficients.
Easterly and Rebelo (1993)	Period: 1970-88 (and 1870-1988). Method: OLS. Cross-section regressions. Sample: 125 (28 countries for the historical estimation), including developed and developing. Sources: Summers and Heston (1991), Barro and Wolf (1989), GFS, IFS and Easterly <i>et al.</i> (1993).	Growth rate of per capita GDP. Ratio of private investment to GDP	Government expenditure in agriculture, education, health, housing, infrastructure, industry. All as a share of GDP. Investment by general government and public enterprises. Marginal income tax rate. 1960: GDP per capita, primary enrolment and secondary education enrolment rates. 1970-1985: assassinations per million, revolution and coups, war casualties per capita. Ratio of individual income to personal income. Ratio of domestic taxes over (consumption and investment).	1) The share of public investment in infrastructure is correlated with growth. 2) Budget surplus is also correlated with growth and investment. 3) The link between most other fiscal variables and growth is statistically fragile. 4) High levels of income inequality prior to 1970 were associated with higher levels of public spending in education 70-88.
Gwartney, Lawson and Holcombe (1998)	Period: 1960-1996 and 1980-1995. Method: OLS regression. Sample: 23 OECD countries. Sources: OECD <i>Historical Statistics</i> and OECD <i>Economic Outlook</i> .	Investment as share of GDP Annual rate of growth real GDP	Share of government expenditure in GDP at the beginning of period and change in government expenditure during the period Investment as a percentage of GDP Property rights* Standard deviation of the inflation rate Change in years of schooling 80-95* *: controls for pooled OECD and developing sample	Excessively large government expenditure has reduced economic growth. There is a strong negative relationship between: 1) size of government and GDP growth and, 2) increases in government expenditure and GDP growth.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Hansson and Henrekson (1994)	Period: 1970-87. Method: Cross-country and cross-industry OLS, controlling for investment and employment. Sample: 14 OECD countries. <i>Sources:</i> OECD <i>Historical Statistics</i> .	Real private output in 14 industries.	OECD social security transfers/GDP	Negative and significant effect for sub-period 1965-82.
Keefer and Knack (1995a)	Period: 1960-1985. Method: OLS. Sample: developing countries.	Gini. Land Gini. Income of the 3rd quintile of the income distribution.	GDP shares of social security, welfare, government transfers, taxes, expenditures and consumption. Share of public employment.	Consistent signs but generally not significant for the relationships between Gini coefficients or -Q3 and redistribution.
Keefer and Knack (1995b)	Period: 1960-1985. Method: OLS. Sample: developing countries. <i>Sources:</i> Data from International Country Risk Guide (ICRG) and the Business Environmental Risk Intelligence (BERI).	GDP growth 1960-1985. Average ratio of real private investment to GDP over the period 1970-85.	Initial GDP level in 1960. Secondary and primary school enrolment rates in 1960. Share of government consumption in GDP. Frequencies of coups and assassinations. Magnitude of deviation of SH investment deflator from mean.	Property rights are found to have a larger impact on investment and growth than has previously been found. Rates of convergence to US level incomes increase when property rights are included in the regressions.
Korpi (1985)	Period: 1950-73. Method: Time series and cross-section estimated by unweighted OLS measuring total effects and controlling for the share of agricultural labour force. Sample: 17 OECD countries. <i>Sources:</i> ILO Social Expenditure.	Real per capita GDP	ILO Social expenditure/GDP	Positive and significant coefficients.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Kristov and Lindert (1992)	Period: 1960-1981. Method: Pooled time-series and cross-section. OLS (with Prais-Winsten transformation) and GLS (analysis of the simultaneity bias). Sample: 19 OECD countries. <i>Sources:</i> OECD <i>Historical Statistics</i> , OECD <i>Labour Force Statistics</i> , Summers and Heston (1988), OECD <i>National Accounts</i> .	Social transfers (pensions and other social transfers) over GDP	Logarithm of the unemployment rate Logarithm of the share of population aged 65+ Logarithm of real GDP per capita Logarithm of CPI over GDP deflator. Logarithm of change in direct taxes over GDP. Growth rate of GDP per capita. Logarithm ratio of top quintile to middle quintile income. Logarithm ratio of middle quintile to lower quintile income.	The elasticities of real per capita GDP are significant and positive (government spending is a luxury good). Higher rates of growth weaken the will to help the poor (displays a negative and significant coefficient). Age structure and unemployment affect social transfers (significant and positive coefficients). Price-elastic demand for real social transfers (coefficient less than unity but bigger than zero). Progressive transfers are raised by a wider income gap between top and middle and lowered by a wider gap between middle and low. Pension spending is reduced by a widening of distance between top and middle.
Landau (1985)	Period: 1952-76. Method: Pooled time series and cross-section. Estimated using IV corrected for heteroskedasticity. Sample: 16 OECD countries. <i>Sources:</i> OECD <i>National Accounts</i> .	Real per capita GDP growth	Government Transfers/GDP	Positive but non-significant effects, whether using OLS or IV and regardless of including population weights or not.
Lindert (1996)	Period: 1960-1981. Method: OLS. Sample: 19 OECD countries. <i>Sources:</i> OECD Social Expenditure database, IMF GFS and OECD <i>National Accounts</i> .	Logarithm of the ratio of 5th to 3rd quintile of the income distribution. Logarithm of the ratio of 3rd to 1st quintile of the income distribution.	Shares in GDP of social security expenditure, welfare, unemployment, health and total transfers.	Consistent and mostly significant relationship for the tax/transfer variables and consistent sign. "The dead-weight costs of spending, and the taxes behind it, fail to show the predicted upward spiral." The further the middle pre-fisc income ranks from the poor, the lower the political tendency to spend on any major type of social programme.
McCallum and Blais (1987)	Period: 1960-83. Method: OLS. Pooled time-series and cross-section analysis. Sample: 17 OECD countries. <i>Sources:</i> OECD <i>Historical Statistics</i> . Method: IV with controls for employment growth.	Real GDP	OECD Social Security Transfers/GDP	Positive and significant coefficients.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Milanovic (1999)	Period: Four 'waves' of data, mid-70s, mid-80s, early 90s and late 90s. Sample: 24 democracies and 79 observations. Method: OLS. Sources: LIS data-set.	Share of the bottom half in the income distribution. Share of the bottom quintile in the income distribution. Share of total disposable income received by the bottom half or bottom 20 per cent. Gini coefficient. Middle class gain generated by moving from factor to disposable income. Using: factor income, factor P income (factor income plus pension transfers), disposable income.	Gini for factor incomes. Share of persons older than 65. Share of total factor income received by the 5th and 6th decile of the population.	Greater <i>factor</i> inequality is associated with greater gains of the poor and the very poor, through more redistribution. The age variable is not significant. The Gini coefficient has the expected sign and is significant. Depending on the sample used, the gains may be fairly large for the very poor. Redistribution fully compensates for the differences which might exist between the countries at the factor income level. It is greater in societies starting from a more unequal position. The effects of redistribution become less important if pensions are taken out of transfers and treated as factor income. There is no evidence that the median-voter hypothesis describes collective choice.
Nördstrom (1992)	Period: 1979-89. Method: Modelling the total effect using OLS. Cross section. Sample: 14 OECD countries. Sources: OECD <i>National Accounts</i> .	Real GDP growth	Other current transfers item in OECD <i>National Accounts</i> .	Negative and significant coefficients for different specifications.
Perotti (1992)	Period: 1960-85 and 1970-85. Sample: 72 countries. Method: OLS two-equation model in which the endogenous variables are investment and a variable of socio-political instability. Krasker-Welsch robust estimates for 1970-1985. 3SLS for 1970-85. 2SLS for 1970-85. Sources: Alesina-Rodrik and Persson-Tabellini data-sets.	GDP growth, 60-75 and 60-85. Ratio of real private domestic investment to real GDP. Ratio of gross real public investment to real GDP. Nominal government transfer payments as ratio to nominal GDP.	GDP. Primary and secondary school enrolment rates. Share of third and fifth quintiles of the population. Deviation of PPP value from sample mean. Urban population as share of total. Share of population older than 65. Number of revolutions and coups per year. Number of government crises per year. Dummy: government is made up of coalition. Number of political demonstrations against the government. Number of political strikes. Index of political stability.	Government transfers seem to have a positive effect on growth. This finding, obtained by estimating a structural model complements the work of Devarajan <i>et al.</i> (1993) and Sala-i-Martin (1992). Income inequality fuels social discontent, increasing socio-political instability, uncertainty in the politico-economic environment and reduces investment and economic growth. Income inequality and economic growth are inversely related. Socio-political instability is measured using a composite index of political unrest.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Perotti (1994)	Period: 1960-85 and 1970-85. Sample: 72 countries. Method: OLS and 2SLS. Sources: Alesina-Rodrik and Persson-Tabellini data-sets.	Investment to GDP ratio. Share of government transfers in GDP. Measure of socio-political instability.	Degree of imperfection of capital markets (loan-to-value payment of mortgages in 1960). A measure of equality in the distribution of income in 1960 (share of two bottom quintiles). Primary school enrolment ratio. Deviation of PPP from sample mean. Number of revolutions and coups. Investment to GDP ratio. Share of government transfers in GDP. GDP. Share of 65+ over total population.	The results cast doubts on the empirical validity of the endogenous fiscal policy explanation of the relation between income distribution and investment, while the imperfect capital market approach and the political instability explanation receive more convincing support. There is a positive relationship between redistribution and economic growth, sometimes significant. Political instability has a negative and significant effect on investment. When the share of the middle class increases, so does investment (a positive and significant coefficient is found).
Perotti (1996)	Period: 1960-1985. Sample: 67 countries. Method: OLS, Krasker-Welsch robust estimates, WLS, 2SLS and IV. Sources: Perotti (1992, 1994), Persson and Tabellini (1994), Gastil (various years) and Barro and Lee (1993).	Average yearly growth of GDP per capita. Average marginal tax between 1970-1985. Socio-political instability. Net fertility rate, average of 1965 and 1985 values. Female secondary school enrolment ratio.	Share in income of the 3rd and 4th quintiles, 1960. Share in income of the 3rd quintile, in 1960. GDP per capita in 1960. Average years of secondary schooling, in 1960. PPP value of the investment deflator, relative to US, in 1960. Average share of government expenditure on SS, W health and housing, education in GDP, 70-85. Labour taxation, income taxation in GDP. Average marginal tax rate. Urbanisation rate. Share of population older than 65. Education enrolment ratios. Net fertility rate. Life expectancy at birth. Share of population belonging to an ethnic group.	Strong empirical support linking income distribution to socio-political instability and to the education/fertility decision. Borrowing constraints and investment in human capital also received support by the data. There is less support for explanations on the effects of income distribution on fiscal policy.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Persson and Tabellini (1994)	Period: 1960-1985. Sample: cross section of 13 OECD countries. Method: total effect is measured using unweighted IV estimation. Sources: OECD Social Expenditure series.	Real per capita GDP growth	OECD Social Expenditure over GDP (transfers are measured as the sum of pension payments, unemployment benefits/compensation and other social expenditure)	Negative non-significant coefficients.
Sala-i-Martin (1992)	Sample: 74 countries. Method: OLS. Source: Summers and Heston.	Average annual growth rate of per capita GDP taken from Summers and Heston.	Logarithm of initial per capita GDP. Public investment as a share of GDP. Public transfers (share of social security expenditure over GDP). Investment share in GDP.	Positive and significant coefficient of the regression of growth on public transfers and investment. Transfers to the poor, minimum wages, minimum working-age requirements and other types of public welfare serve to keep workers possessing low human capital out of the labour force.
Vanhoudt (1997)	Period: 1985 (to 1991 when possible). Sample: 13 to 15 countries OECD countries (depending on the dependent variable chosen). Method: OLS cross-section regressions. Sources: Deininger and Squire's (1996) dataset on inequality, the Penn World Tables (PWT5.6), OECD <i>Science and Technology Indicators</i> , OECD <i>Job Study</i> , and OECD <i>Employment Outlook</i> .	Log of Gini. Log of quintile 1's income share Log of quintile 5's income share Log of quintile 5's to 1's income share	Log of average investment share in physical capital, 65-91. Log of average investment share in R&D, 75-85. Log of average growth rate of labour force, 85-91. Log of average share of GDP financing ALMPs, 85-91. Log of average share of GDP financing PLMPs, 85-91. Log of average share of GDP (ALMPs + PLMPs). Percentage change in tax wedge, 85-91.	Spending on LMPs does not have a significant effect on the Gini coefficient but it does affect other measures of inequality. Spending on ALMPs significantly improves the income share at the bottom at the expense of the top. The tax wedge has a significant effect on inequality in all the estimated regressions.
Weede (1986)	Period: 1960-1982. Sample: OECD. Method: pooled time series and cross-section. OLS. Total effect, controlling for share of labour force in agriculture. Sources: OECD <i>Historical Statistics</i> .	Real GDP. Real per capita GDP.	OECD social security transfers/GDP.	Negative coefficients with strong effects.

Annex. Studies on the link between economic growth, income inequality and social protection (cont.)

Authors	Period, method, sample and data sources	Dependent variables	Independent variables	Results
Weede (1991)	Period: 1960-1985. Sample: 19 OECD countries. Method: pooled time series and cross-section. Total effect, controlling for share of labour force in agriculture and length of democratic period. OLS. Sources: OECD Historical Statistics.	Real GDP Per capita GDP Per worker GDP	OECD social security transfers/GDP.	Relatively strong negative effects.

Source: OECD.

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PRODUCTION AND USE OF ICT: A SECTORAL PERSPECTIVE ON PRODUCTIVITY GROWTH IN THE OECD AREA

Dirk Pilat, Frank Lee and Bart van Ark

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INTRODUCTION

The strong growth performance of the United States over the 1990s and the uneven performance of other OECD economies have led to new attention for the sources of growth in OECD economies. Studies over the past few years (Scarpetta, *et al.*, 2000; Gust and Marquez, 2000; OECD, 2001a) have demonstrated that there is no single factor that explains divergence in growth performance. Rather, OECD countries that improved performance in the 1990s were generally able to draw more people into employment, increase investment, and improve multifactor productivity (MFP) growth.

Information and communications technology (ICT) plays two roles in this process, first by contributing heavily to the increase in overall investment and thus to capital deepening, second by contributing to MFP growth. The role of ICT investment in growth performance is confirmed by a range of empirical studies, for both the United States and several other OECD countries (*e.g.* Colechia and Schreyer, 2001; Jorgenson, 2001; Van Ark, *et al.* 2002a). The strength of ICT investment is commonly attributed to rapid technological progress and strong competitive pressure in the production of ICT goods and services, which have contributed to a steep decline in ICT prices. This price fall, together with the growing scope for application of ICT, has encouraged investment in ICT, at times shifting investment away from other assets.

The contribution that ICT has made to MFP growth is more controversial. Some studies for the United States have argued that the pick-up in MFP in the second half of the 1990s was primarily due to technological progress in the *production* of ICT goods and services (Gordon, 2000). Technological progress at Intel, for instance, has enabled the amount of transistors packed on a microprocessor to double every 18 months since 1965, and even more rapidly so between 1995 and 1999. The relative importance of the ICT-producing sector in different countries, and its growth over time, might thus be one factor contributing to the differences in growth performance that have been observed in several OECD countries in recent years. An empirical examination of this issue is the first goal of this paper.

If the rise in MFP due to ICT were little more than a reflection of rapid technological progress in the production of computers, semi-conductors and related products and services, there would be no effects of ICT on MFP in countries that are not already producers of ICT. For ICT to have benefits on MFP in countries that

do not produce ICT goods, it needs to have productivity impacts linked to its use in the production process. Some studies for the United States have attributed a substantial part of the pick-up in US MFP growth to ICT-using sectors, notably services (Baily, 2002; Triplett and Bosworth, 2002). This would mark a change with the past, as the productivity record of many services sectors has often been poor. The application of ICT may have allowed some of these sectors to strengthen productivity performance, at least in some countries. The second issue addressed in this paper is therefore an empirical, cross-country examination of productivity growth in the ICT-using sectors, notably services.

Since estimates of MFP growth at the sectoral level can only be derived for a few OECD countries, the paper will first examine the contribution of ICT-producing and ICT-using sectors to labour productivity growth. Attention will also be given to the measurement problems that complicate productivity analysis in ICT-producing and ICT-using sectors. The final section examines the contribution of ICT-producing and ICT-using sectors to MFP growth and draws some conclusions.

GROWTH AND PRODUCTIVITY PERFORMANCE IN ICT-PRODUCING AND ICT-USING INDUSTRIES

The ICT-producing sector

The ICT producing-sector, as defined by the OECD (Box 1), accounts for only a small share of the economy. Its share in business employment ranges from between 3.7 per cent (in Portugal) to 10.9 per cent (in Finland) (OECD, 2002a). Its share in value added is slightly larger, showing that it has an above-average level of labour productivity, and ranges from 4.9 per cent in Greece, to 16.5 per cent in Ireland of business sector value added (Figure 1). ICT manufacturing is typically only a small part of this total and ranges between 1.3 and 13.8 per cent of manufacturing employment, and between 1.5 and 21.5 per cent of manufacturing value added. Finland and Ireland have the largest ICT manufacturing sectors, followed by Korea. New Zealand, Spain and Australia, in contrast, have only a small sector producing manufactured ICT goods (OECD, 2002a).

The relative size of the service part of the ICT sector also varies considerably across countries, with Germany, Japan, Korea and Mexico having a relatively small ICT service sector. Some of this variation is linked to the telecommunications sector, which is very large in Portugal and the Czech Republic, and quite small in Mexico, Korea and Italy. Another part is linked to computer and related services, the sector that accounts for much of the production of software. This sector is particularly large in Ireland, Sweden and Belgium (OECD, 2002a).

Box 1. OECD definition of ICT-producing industries

In 1998, OECD countries reached agreement on an industry-based definition of the ICT sector based on International Standard Industry Classification (ISIC) Revision 3. The principles are the following: for manufacturing industries, the products of an industry must be intended to fulfil the function of information processing and communication including transmission and display, or must use electronic processing to detect, measure and/or record physical phenomena or control a physical process. For services industries, the products must be intended to enable the function of information processing and communication by electronic means. The following industries were included:

Manufacturing

- 3000 Manufacture of office, accounting and computing machinery.
- 3130 Manufacture of insulated wire and cable.
- 3210 Manufacture of electronic valves and tubes and other electronic components.
- 3220 Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy.
- 3230 Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods.
- 3312 Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment.
- 3313 Manufacture of industrial process control equipment.

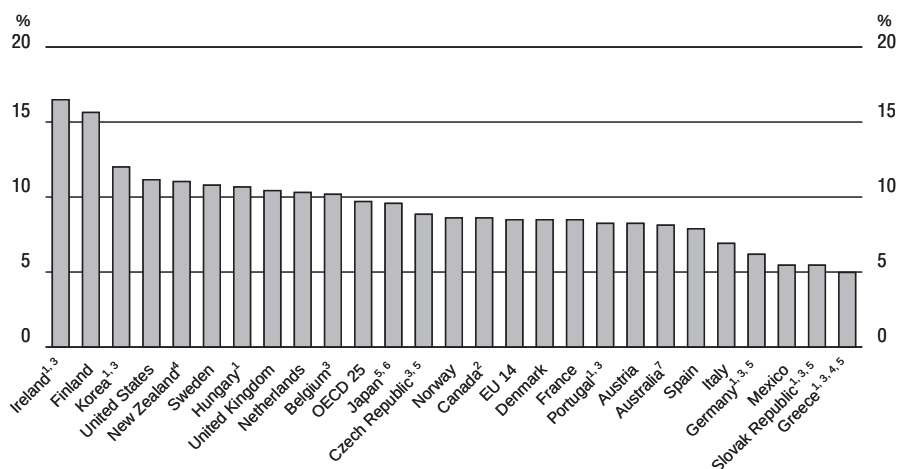
Services

- 5150 Wholesale of machinery, equipment and supplies.
- 7123 Renting of office machinery and equipment (including computers).
- 6420 Telecommunications.
- 7200 Computer and related activities (hardware consultancy, software consultancy and supply, data processing, database activities, maintenance and repair of office, accounting and computing machinery, other).

Source: OECD (2002a).

Figure 1. The share of the ICT sector in the economy

Share of the ICT sector in value added of the non-agricultural business sector, 2000



1. 1999.
2. 1998.
3. Excludes rental of ICT (ISIC 7123).
4. Includes postal services.
5. Excludes ICT wholesale (ISIC 5150).
6. Includes only part of computer-related activities.
7. 2000-2001.

Source: OECD (2002), *Measuring the Information Economy*, www.oecd.org/sti/measuring-infoeconomy, Paris.

While the ICT-producing sector is relatively small, it can make a relatively large contribution to growth and productivity performance if it grows more rapidly than the remainder of the economy. Bivariate correlations point to a positive correlation between the size of the ICT manufacturing sector and MFP growth, but this is mainly due to the position of Finland and Ireland (OECD, 2001a).¹ A positive correlation should be expected, since the ICT manufacturing sector typically has very high rates of technological progress and MFP growth. However, some countries with a relatively small ICT sector, such as Australia, have also experienced high MFP growth, suggesting that a large ICT sector is not a necessary condition for improvements in MFP growth.²

Measuring growth in the ICT-producing sector

Examining the role of ICT-producing sectors in economic growth is heavily influenced by measurement problems, both regarding outputs and inputs. The key measurement problem for the manufacturing of ICT goods on both the output

and input side concerns prices, in particular how to statistically capture significant quality improvements associated with technological advances in goods such as computers and semi-conductors. The use of hedonic deflators is generally considered as the best way to address these problems (Box 2; OECD, 2002b).³

The measurement of output in the telecommunications industry also raises problems. Some countries use consumer price indexes of phone rates to deflate value added; others use physical quantity indexes of calls, telexes, and other services to measure volume changes in output; and some countries use a composite index of producer price indices for relevant components (OECD, 1996). Most of these methods do not address key measurement problems in this sector, *i.e.* quality change, adjustment for new products and services, the separation of goods and services, and increased price differentiation. A recent overview of price measures for telecommunications services still shows a considerable variety in approaches across the OECD (OECD, 2000a).

Measurement in the third component of the ICT-producing sector, the computer services industry, also raises certain problems. This sector includes difficult-to-measure services, such as hardware and software consultancy services, and maintenance and repair of computer equipment, but also includes several activities where quality has changed rapidly over time and hedonic deflators may be needed. These include the development, production and supply of customised and non-customised software, as well as data processing and database activities. Currently, the United States is among the few countries that applies hedonic methods to estimate price indices for pre-packaged software (OECD, 2000b).⁴

The methodological differences highlighted above affect cross-country comparisons of productivity. Adjusting for these differences is no simple task, as it is not clear, *a priori*, to what extent differences in output and value added deflators for these industries are due to measurement (*e.g.* the use of hedonic deflators) or to differences in industrial specialisation. However, countries that produce computers and semi-conductors, but that apply conventional deflators (*e.g.* Korea), are likely to underestimate output and productivity growth in this industry (see Annex I). Recent work (Van Ark, *et al.*, 2002b) has applied US deflators to the measurement of output in ICT manufacturing in other countries. This demonstrates the potential size and significance of the problem, although it may overstate growth in the ICT-producing sector of certain countries that are less specialised than the United States in producing ICT goods characterised by very rapid price declines. Clearly, more work on the development of appropriate hedonic deflators in each country is warranted.

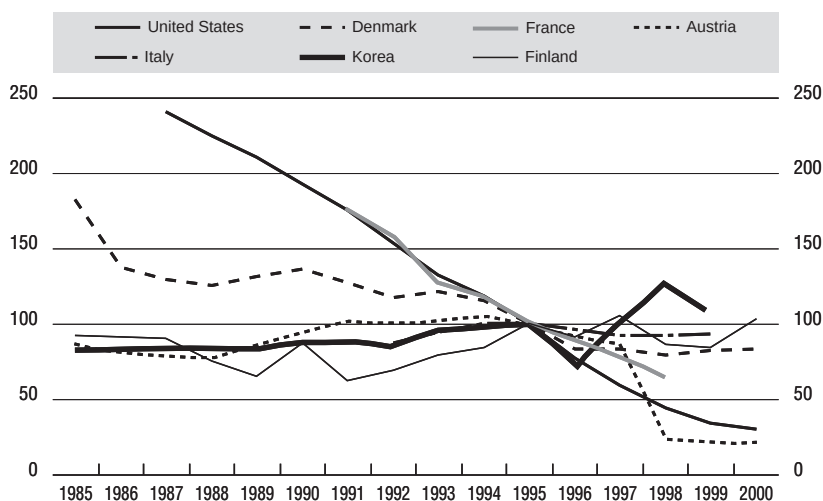
Labour productivity growth in ICT-producing industries

The contribution of the ICT-producing sector to recent growth performance reflects the productivity performance of the different ICT-related industries and

Box 2. The use of hedonic deflators in the ICT-producing sector

Several countries currently use hedonic methods to deflate output in the computer industry (*e.g.* Canada, Denmark, France, Sweden and the United States). The production price deflator for the computer industry (ISIC Rev 3, Division 30) is shown in Figure 2.* It shows a very rapid decline in production price indices for France and the United States, and a gradual decline in Denmark since 1984, but relatively little change in some other countries. These differences may partly reflect the use of a hedonic deflator in both France and the United States, the use of an exchange rate adjusted US hedonic deflator by Denmark, and the use of conventional deflators in the other countries.

Figure 2. Producer price indexes for the computer industry, 1995 = 100



Source: OECD calculations on the basis of the STAN database.

Adjusting for these methodological differences in computer deflators for the purpose of a cross-country comparison is difficult, however, since there are considerable cross-country differences in industrial specialisation. Only few OECD countries produce computers, where price falls have been very rapid; many only produce peripheral equipment, such as computer terminals. Similar differences in industry composition exist in Radio, Television and Communication Equipment (ISIC 32), which includes the semi-conductor industry. The differences in the composition of

Box 2. The use of hedonic deflators in the ICT-producing sector (cont.)

output are typically larger than in computer investment, where standardised approaches have been applied (*e.g.* Colecchia and Schreyer, 2001). Annex I shows some sensitivity analysis for the impact of different price indexes on output growth (see also Wyckoff, 1995).

* Production price indices for Canada are not available from the OECD STAN database.

their weight in the economy (see Annex 2). The OECD STAN database provides helpful information in this regard. While it does not cover all components of the ICT sector separately, the role of key industries has been examined.⁵

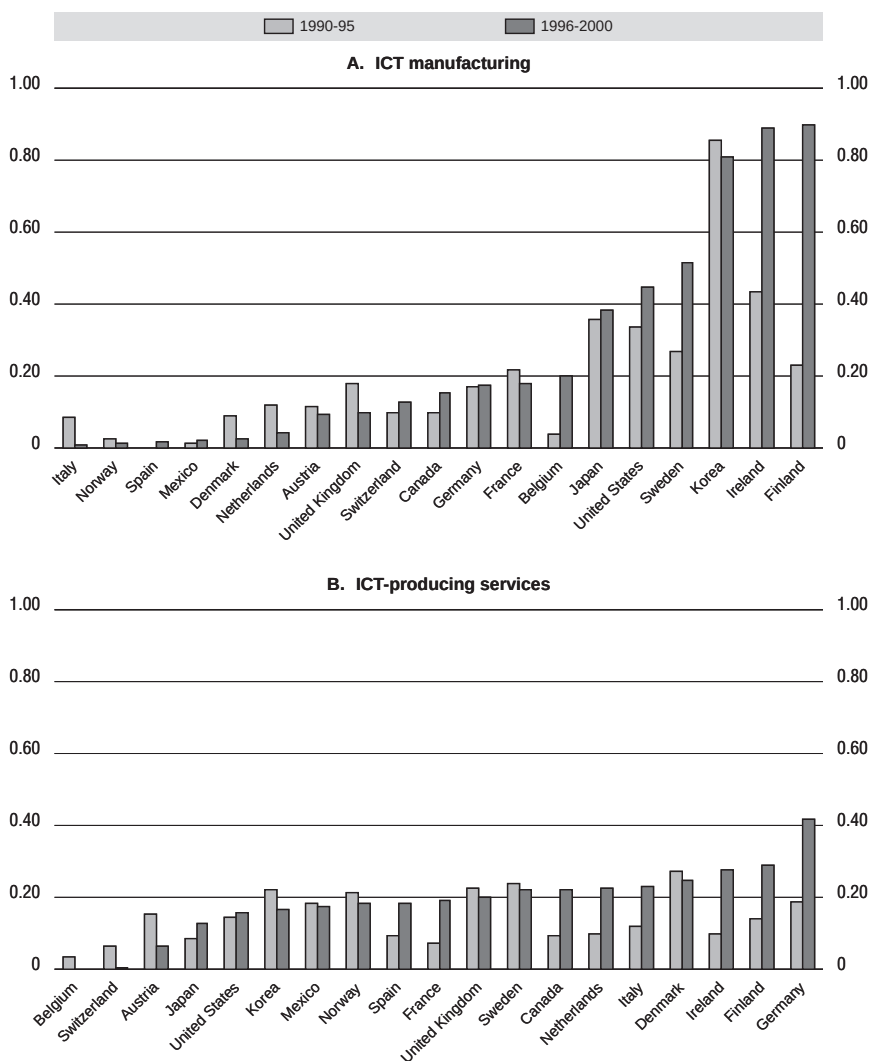
Figure 3a shows the contribution of ICT manufacturing to labour productivity growth over the 1990s, distinguishing between the first and second half of the decade.⁶ In most OECD countries, the contribution of ICT manufacturing to overall labour productivity growth has risen over the 1990s. This can primarily be attributed to more rapid technological progress in the production of certain ICT goods, such as semi-conductors, which has contributed to more rapid price declines and thus to higher growth in volumes (Jorgenson, 2001).⁷ ICT manufacturing made the largest contributions to aggregate labour productivity growth in Finland, Ireland and Korea, with close to 1 percentage point of aggregate labour productivity growth in the 1995-2000 period being due to ICT manufacturing.

The ICT-producing services sector (telecommunications and computer services) plays a smaller role in aggregate labour productivity growth, although it is also characterised by rapid improvements (Figure 3b). In part, rapid productivity growth is linked to the liberalisation of telecommunications markets and the high speed of technological change in this market. The contribution of this sector to overall labour productivity growth increased in several countries over the 1990s, notably in Finland, Germany and the Netherlands. Some of the growth in ICT-producing services is due to the emergence of the computer services industry, which has accompanied the diffusion of ICT in OECD countries.

Figure 3 suggests that the ICT sector is indeed an important driver of growth and productivity in a few OECD countries. But in most countries, the contribution of this sector to overall productivity growth is quite small, although it has typically increased over the 1990s.⁸ This result is linked to differences in specialisation. Only

Figure 3. **Contribution of ICT-producing industries to aggregate labour productivity growth**

Total economy, value added per person employed, annual average contribution in percentage points



Note: 1991-1995 for Germany; 1992-95 for Italy and 1993-1995 for Korea; 1996-98 for Japan, Korea, Spain and Sweden, 1996-99 for France, Germany and the United Kingdom; 1996-2001 for Austria, Finland, Italy and the United States. *Source:* Estimates on the basis of the OECD STAN database and data underlying Van Ark, *et al.* (2002b). See Annex tables for detail.

few OECD countries are specialised in those parts of ICT sector that are characterised by very rapid technological progress, *e.g.* the production of semi-conductors and electronic computers. Much of the production of this type of ICT hardware is highly concentrated, because of its large economies of scale and high entry costs. Establishing a new semi-conductor plant cost some USD 100 million in the early 1980s, but as much as USD 1.2 billion in 1999 (United States Council of Economic Advisors, 2001). In other words, only a few countries will have the necessary comparative advantages to succeed in producing these types of ICT products. This may not necessarily be a problem for countries that do not produce such goods to the extent that a substantial part of the benefits of ICT production accrue to importing countries and to users, as these can benefit from investment and consumer goods characterised by rapid price declines.

Does ICT use increase productivity growth?

Much of the current interest in ICT's potential impact on growth is not linked to the ICT-producing sector, but to the potential benefits arising from its use in the production process elsewhere in the economy. The use of ICT could have several impacts on productivity. For example, it might help more productive firms gain market share. In addition, the use of ICT may help firms expand their product range, customise the services offered, or respond better to client demand; in short, to innovate. Moreover, ICT may help reduce inefficiency in the use of capital and labour, *e.g.* by reducing inventories. All these effects might lead to higher productivity growth.

Investment in ICT might also have benefits going beyond those accruing to investors in ICT. For instance, the diffusion of ICT may help establish networks, which produce greater benefits (the so-called spillover effects) the more customers or firms are connected to the network. Moreover, the spread of ICT may reduce transaction costs, which could lead to a more efficient matching of supply and demand, and enable the growth of new markets. Increased use of ICT may also lead to greater efficiency in the creation of knowledge. Where such spillovers exist, they raise overall MFP growth (Bartelsman and Hinloopen, 2002). Studies at the firm level (for example Brynjolfsson and Hitt, 2000) indeed point to spillovers from ICT capital, but it has generally been difficult to confirm these results at more aggregate levels of analysis (Box 3).

One way to examine the role of ICT use in more detail is by focusing on those sectors that are the most intensive users of ICT. If the use of ICT is having effects on MFP growth, it is likely that heavy users would be the first sectors to experience such effects. Although computers may appear to be everywhere, the use of ICT is actually highly concentrated in the services sector and in a few manufacturing sectors (McGuckin and Stiroh, 2001).

Box 3. The productivity paradox – has it been solved?

The Solow paradox, attributed to economist Robert Solow who once observed that computers are everywhere except in the productivity data, was appropriate during much of the 1980s and early 1990s, when the rapid diffusion of computing technology seemed to have little impact on productivity growth (Solow, 1987). Many studies in the 1970s and 1980s showed negative or zero impacts of investment in ICT on productivity. Many of these focused on labour productivity, which made the findings surprising as investment in ICT adds to the productive capital stock and should thus, in principle, contribute to labour productivity growth. Later studies did find some evidence of a positive impact of ICT on labour productivity. Some also found evidence that ICT capital had larger impacts on labour productivity than other types of capital, suggesting that there might be spillovers from ICT investment.

Studies over the past decade have pointed to several factors that contributed to the productivity paradox. First, some of the benefits of ICT were not picked up in the productivity statistics (Triplett, 1999). This is mainly a problem in the service sector, where most ICT investment occurs. For instance, the improved convenience of financial services due to automatic teller machines (ATMs) is only counted as an improvement in the quality of financial services in some OECD countries. Similar problems exist for other activities such as insurance, business services and health services. ICT may have aggravated the problems of measuring productivity, as it allows greater customisation, differentiation and innovation in the services provided, most of which is difficult to capture in statistical surveys. Progress towards improved measurement has been made in some sectors and some OECD countries, but this remains an important problem in examining the impact of ICT on performance.

A second reason is that the benefits of ICT use might have taken a considerable time to emerge, as did the impacts of other key technologies, such as electricity. The diffusion of new technologies is often slow and firms can take a long time to adjust to them, *e.g.* in changing organisational arrangements, upgrading the workforce or inventing and implementing effective business processes. Moreover, assuming ICT raises MFP in part via the networks it provides, it takes time to build networks that are sufficiently large to have an effect on the economy. ICT has diffused very rapidly in many OECD countries in the 1990s and many recent empirical studies find a larger impact of ICT on economic performance than studies that were carried out with data for the 1970s or 1980s.

A third reason is that many early studies that attempted to capture the impact of ICT at the firm level were based on relatively small samples, drawn from private sources. If the initial impact of ICT on performance was small, such studies might find little evidence, as it would easily get lost in the econometric “noise”. It is also possible that such samples were not representative of the total population. Moreover, several studies have suggested that the impact of ICT on economic performance may differ between activities, which implies that a sectoral distinction

Box 3. The productivity paradox – has it been solved? (cont.)

in the analysis is important. More recent studies based on large samples of (official) data and covering several industries are therefore more likely to find an impact of ICT than earlier studies. In addition, early studies used a wide variation of data on ICT and ICT diffusion, often of unknown quality. Much progress has been made in recent years in measuring ICT investment and the diffusion of ICT technologies, implying that the range of available data is broader, more robust and statistically more sound than previous data.

Empirical evidence on ICT use by industry is available for several countries, based on capital flow matrices and capital stock estimates. US capital flow data for 1992, for instance, show that certain manufacturing industries (*e.g.* printing and publishing, electronic equipment, instruments) as well as transport services, wholesale trade, finance, insurance and business services, are the largest relative investors in ICT equipment (BEA, 1998; Figure 4). These results are broadly confirmed for Canada, the Netherlands and the United Kingdom.

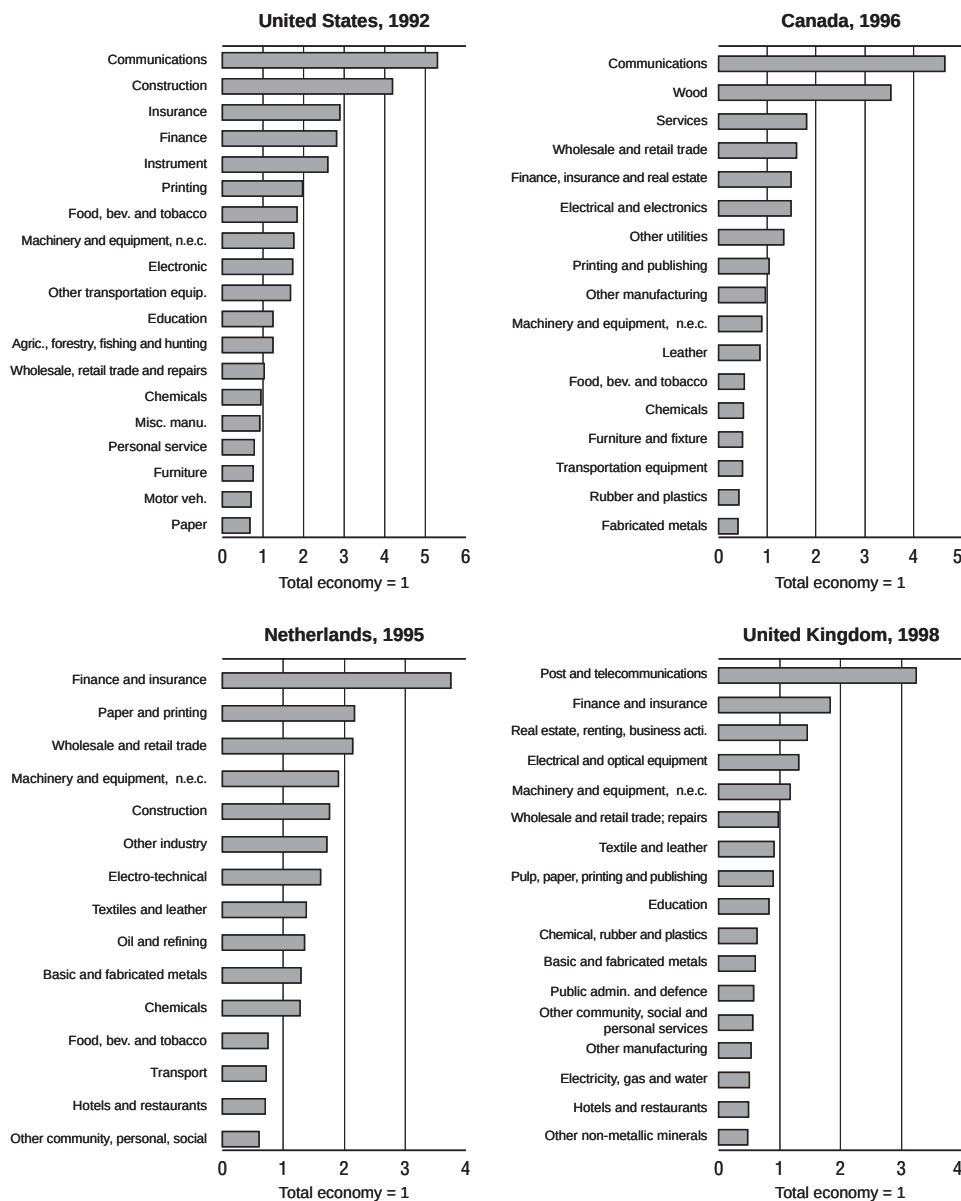
Several studies have focused on those industries that are intensive users of ICT (Stiroh, 2001; Van Ark, *et al.*, 2002b). Examining the performance of these sectors over time and comparing it with sectors of the economy that do not make intensive use of ICT, can help point to the role of ICT use in strengthening productivity growth.⁹

Labour productivity growth in ICT-using industries

In several of the sectors that are important users of ICT, output and productivity are hard to measure (Box 4). These measurement problems may obscure actual productivity gains (Gullickson and Harper, 1999). The STAN database distinguishes several of the ICT-using industries that were mentioned above, notably wholesale and retail trade, finance, insurance and business services. For the discussion here, the focus is primarily on these services, which are all intensive users of ICT. Figure 5 shows the contribution of the key ICT-using services to aggregate labour productivity growth over the 1990s.

Figure 5 suggests small improvements in the contribution of ICT-using services in Finland and Sweden, and substantial increases in Ireland and Mexico (where it reflects a rebound of very poor productivity performance in the first half

Figure 4. Relative investment in ICT by economic activity



Source: OECD calculations based on the data from the Bureau of Economic Analysis, Statistics Canada, CPB Netherlands Bureau for Economic Analysis, UK Office of National Statistics.

Box 4. Measurement of productivity in ICT-using services

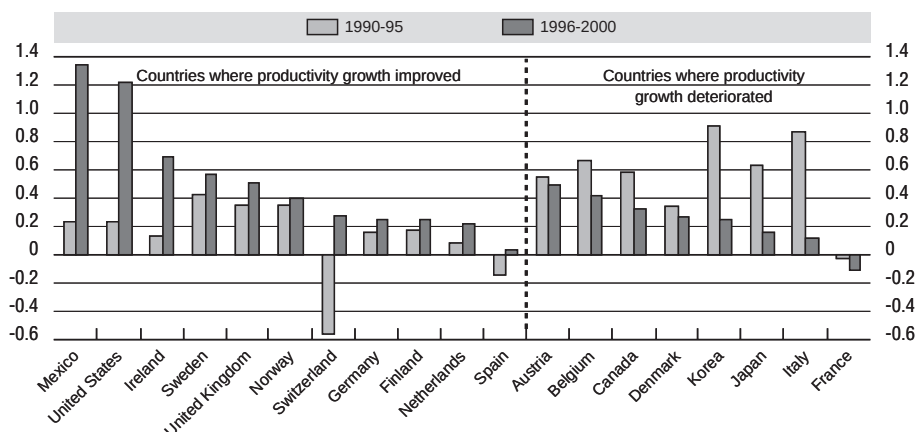
For several parts of the services sector, output is difficult to measure (Dean, 1999). There is little agreement, for example, on the output of banking, insurance, medical care and retailing. In addition, it is difficult to separate service output from the consumer's role in eliciting the output. For example, output of the education sector is partly due to the efforts made by students themselves. Such difficulties indicate that the volume and price of services – and changes in their quality – are harder to measure than those of goods. In addition, some services are not sold in the market, so that it is hard to establish prices. In practice, these constraints mean that output in some services is measured on the basis of relatively simple indicators. Several series are deflated by wages or consumer prices or extrapolated from changes in employment, sometimes with explicit adjustment for assumed labour productivity changes. Given these difficulties, adjusting for quality is even more difficult.

With better measurement, potential productivity gains may become visible. Fixler and Zieschang (1999), for example, derive new output measures for the US financial services industry (depository institutions). They introduce quality adjustments to capture the effects of improved service characteristics, such as easier and more convenient transactions, *e.g.* use of ATMs, and better intermediation. Their output index grows by 7.4 per cent a year between 1977 and 1994, well above the official measure for this sector of only 1.3 per cent a year on average. The recent revisions of GDP growth for the United States also incorporate improved estimates of banking output, notably on the real value of non-priced banking services, which better capture productivity growth in this industry.

While some new approaches to measurement in these sectors are being developed (Triplett and Bosworth, 2000), only few countries have thus far made substantial changes in their official statistics to improve measurement. The measurement problems can be seen clearly in the official productivity statistics for several countries, with several service industries showing negative MFP growth over a prolonged period.

of the 1990s). The United States has experienced the strongest improvement in labour productivity growth in ICT-using services over the 1990s, which is due to more rapid labour productivity growth in wholesale and retail trade, and in financial services (notably securities). In Switzerland, ICT-using services made a strong negative contribution to productivity growth in the first half of the 1990s, while France and Spain experienced small negative contributions during the second half of the 1990s.¹⁰

Figure 5. **Contribution of ICT-using services to aggregate labour productivity growth**
Total economy, value added per person employed, annual average contribution
in percentage points



Note: See Figure 3 for period coverage.

Source: Estimates on the basis of the OECD STAN database and data underlying Van Ark, *et al.* (2002b). See Annex tables for detail.

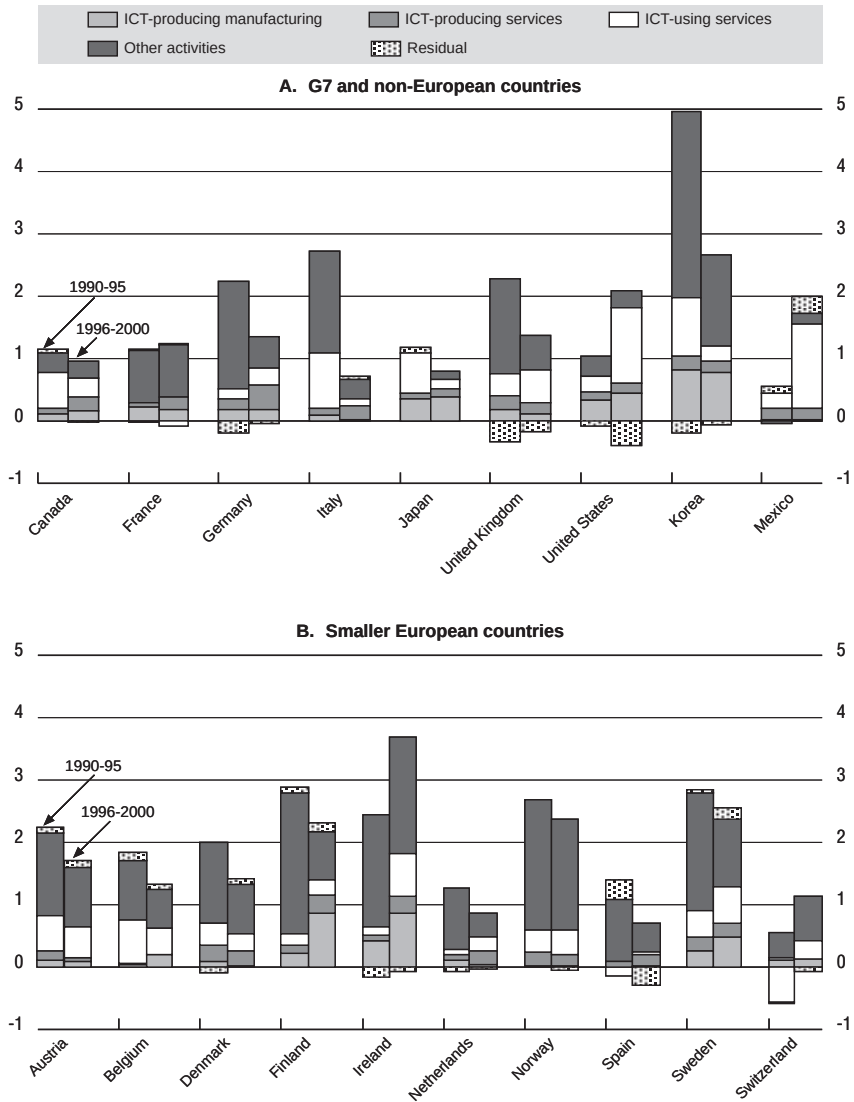
The impact of ICT use and production on aggregate productivity growth

From the examination above it is possible to determine how productivity growth in ICT-producing and ICT-using sectors have contributed to aggregate productivity growth in OECD countries. The contribution of ICT-producing, ICT-using industries and other activities to aggregate labour productivity growth is shown in Figure 6. Among the G7 countries, the United States is the only one that has experienced a marked improvement in labour productivity growth over the 1990s. Both ICT-producing and ICT-using industries contributed to the improvement in labour productivity growth, with the ICT-using sector accounting for the bulk of the pick-up in labour productivity in the second half of the 1990s.¹¹

In the other G7 countries, the ICT-producing sector provided a slightly stronger contribution to labour productivity growth in the second half of the 1990s, but the contribution of ICT-using industries was small and declined in several countries over the 1990s. Among the other OECD countries, the growing contribution of the ICT-producing sector to labour aggregate productivity growth in the 1990s is also visible, in particular in Finland, Ireland and Korea. The ICT-using industries experienced no strong pick-up in labour productivity growth in the 1990s, however, France, Ireland and Mexico being exceptions.

Figure 6. **Contributions to aggregate labour productivity growth, 1990-1995 and 1996-2000**

Total economy, annual average contributions to total value added per person employed, in percentage points



Source: Estimates based on the OECD STAN database and data underlying Van Ark, *et al.* (2002b). See Annex tables for detail.

THE CONTRIBUTION OF ICT PRODUCTION AND USE TO MFP GROWTH

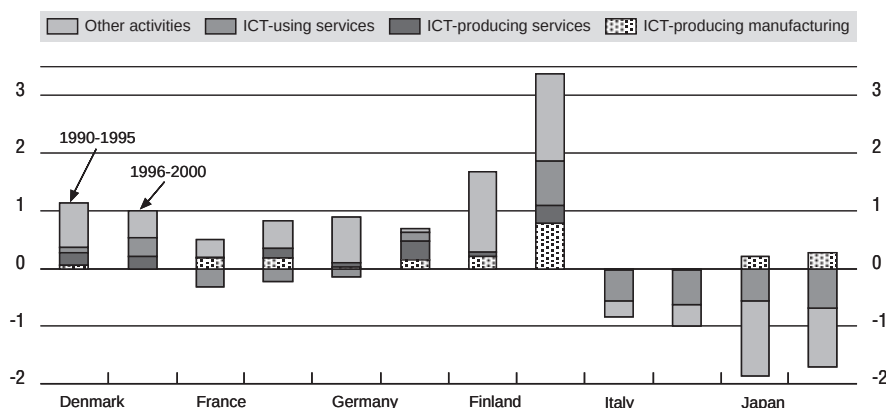
Stronger growth in labour productivity in ICT-producing and ICT-using industries could simply be due to capital deepening. Estimates of MFP growth adjust for this factor. Breaking aggregate MFP growth down in its sectoral contributions can help show whether changes in MFP growth should be attributed to ICT producing sectors, to ICT-using sectors, or to other sectors. Figure 7 shows the contribution of all activities to aggregate MFP growth for the six countries for which estimates of capital stock at the industry level were available in the OECD STAN database. It shows that the ICT-producing sector provided an important contribution to the acceleration in productivity growth in Finland, with both ICT-producing manufacturing and ICT-producing services providing a strong contribution. In Germany, the contribution of ICT production to MFP growth also increased over the 1990s, confirming rapid technological progress in this sector. In France, ICT-producing services provided a strong contribution to productivity growth in the second half of the 1990.

In ICT-using services, the MFP estimates point to growing contributions to aggregate productivity in Denmark and Germany, and to a substantial improvement in Finland. In the other countries, MFP growth in the ICT-using services was negative over the 1990s.

The OECD STAN database does not yet include capital stock for the United States, which implies that MFP estimates for the United States can not be derived

Figure 7. **Contributions of key sectors to MFP growth, 1990-95 and 1996-2000**

Total economy, contributions to annual average growth rates, in percentage points



1. Estimates are based on official estimates of capital stock and sector-specific labour shares (adjusted for self-employment). No adjustment is made for capital services, due to lack of relevant information at the industry-level.
Source: Estimates on the basis of the OECD STAN database.

Table 1. **Accounting for the acceleration in US productivity growth
in the non-farm business sector**
1995-2000 minus 1973-1995 (percentage points per year)

	Oliner-Sichel (2002), 1974-1990 versus 1996-2001	Gordon (2002), 1972-95 versus 1995-2000	US Council of Economic Advisors (2001)	Jorgenson, Ho and Stiroh (2002)
Output per hour	0.89	1.44	1.39	0.92
Cycle	n.a.	0.40	n.a.	n.a.
Trend	0.89	1.04	1.39	0.92
Contributions from:				
Capital services	0.40	0.37	0.44	0.52
IT capital	0.56	0.60	0.59	0.44
Other capital	-0.17	-0.23	-0.15	0.08
Labour quality	0.03	0.01	0.04	-0.11
MFP growth	0.46	0.52	0.91	0.51
Computer sector	0.47	0.30	0.18	0.27
Other MFP	-0.01	0.22	0.72	0.24

Source: Gordon (2002); Jorgenson, Ho and Stiroh (2002); Oliner and Sichel (2002) updated from estimates received from Dan Sichel; Council of Economic Advisors (2001) as updated in Baily (2002).

from this source. Several studies provide estimates of the sectoral contributions to US MFP growth, however (Table 1). The results show considerable variation. Oliner and Sichel (2002) found no contribution of non-ICT producing industries to MFP growth; Gordon (2002) and Jorgenson, Ho and Stiroh (2002) found a relatively small contribution, while Baily (2002) and the US Council of Economic Advisors (2001) found a much more substantive contribution.¹²

The problem with some of the studies presented in Table 1 (*e.g.* Oliner and Sichel, 2002 and Gordon, 2002) is that all non-ICT producing sectors are combined, and the contribution of the non ICT-producing sector to aggregate MFP growth is calculated as a residual. More detailed examination for the United States suggests that this residual is indeed small, but typically made up of a positive contribution from wholesale and retail trade and financial services to MFP growth, and a negative contribution of other service sectors. For example, Triplett and Bosworth (2002) find a relatively strong pick-up in MFP growth in certain parts of the US service sector. They estimated that MFP growth in wholesale trade accelerated from 1.1 per cent annually to 2.4 per cent annually from 1987-1995 to 1995-2000. In retail trade, the jump was from 0.4 per cent annually to 3.0 per cent, and in securities the acceleration was from 2.9 per cent to 11.2 per cent. Combined with the relatively large weight of these sectors in the economy, this would translate into a considerable contribution to aggregate MFP growth of these ICT-using services.

There is therefore some evidence of strong MFP growth in the United States in ICT-using services. More detailed studies suggest how these productivity changes due to ICT use in the United States could be interpreted. First, a considerable part of the pick-up in productivity growth can be attributed to retail trade, where firms such as Walmart used innovative practices, such as the appropriate use of ICT, to gain market share from its competitors (McKinsey, 2001). The larger market share for Walmart and other productive firms raised average productivity and also forced Walmart's competitors to improve their own performance. Among the other ICT-using services, securities accounts also for a large part of the pick-up in productivity growth in the 1990s. Its strong performance has been attributed to a combination of buoyant financial markets (*i.e.* large trading volumes), effective use of ICT (mainly in automating trading processes) and stronger competition (McKinsey, 2001; Baily, 2002). These impacts of ICT on MFP are therefore primarily due to efficient use of labour and capital linked to the use of ICT in the production process. They are not necessarily due to network effects, where one firms' use of ICT has positive spillovers on the economy as a whole.

Spillover effects may also play a role, however, as ICT investment started earlier, and was stronger, in the United States than in most OECD countries (Colecchia and Schreyer, 2001; Van Ark, *et al.*, 2002a). Moreover, previous OECD work has pointed out that the US economy might be able to achieve greater benefits from ICT since it got its fundamentals right before many other OECD countries (OECD, 2001a). Indeed, the United States may have benefited first from ICT investment ahead of other OECD countries, as it already had a high level of competition in the 1980s, which it strengthened through regulatory reforms in the 1980s and 1990s. For example, early and far-reaching liberalisation of the telecommunications sector boosted competition in dynamic segments of the ICT market. The combination of sound macroeconomic policies, well-functioning institutions and markets, and a competitive economic environment may thus be at the core of the US success. A recent study by Gust and Marquez (2002) confirms these results and attributes relatively low investment in ICT in European countries partly to restrictive labour and product market regulations that have prevented firms from getting sufficient returns from their investment.

The United States is not the only country where ICT use may already have had impacts on MFP growth. Studies for Australia (Parham, *et al.*, 2001; Simon and Wardrop, 2001), suggest that a range of structural reforms have been important in driving the strong uptake of ICT by firms and have enabled these investments to be used in ways that generate productivity gains. This is particularly evident in wholesale and retail trade and in financial intermediation, where most of the Australian productivity gains in the second half of the 1990s have occurred.¹³

In sum, the United States and Australia are almost the only OECD countries where there is evidence at the sectoral level that ICT use can strengthen labour

productivity and MFP growth. For most other OECD countries, there is little evidence that ICT-using industries are experiencing an improvement in labour productivity growth, let alone any change in MFP growth. Further improvements in labour and product markets, as well as a focus on policies to seize the benefits from ICT may be required in these countries before ICT will clearly show up in the productivity statistics.

NOTES

1. The available data are still somewhat too limited to permit regression analysis on the link between the size of the ICT sector and aggregate performance.
2. See Productivity Commission (1999) and Parham, *et al.* (2001) for an extensive discussion of the factors driving MFP growth in Australia.
3. Hedonic deflators for the output of ICT manufacturing are not the only measurement problem in this sector. Measuring input prices for these industries is also complicated, and requires detailed input-output tables as well as hedonic deflators for certain inputs, such as semi-conductors.
4. US price indexes for other types of software, *i.e.* custom-made and own-account, are of the conventional type and do not adjust for quality change.
5. The analysis here focuses on ISIC 30-33 (Office and computing machinery; Electrical machinery and apparatus; Radio, television and communication equipment; and Medical, precision and optical instruments) for ICT manufacturing, and ISIC 64 (Post and telecommunications) and ISIC 72 (Computer services) for ICT services. These sectors are often available from detailed national accounts. More detailed breakdowns, as demanded by the OECD definition of the ICT sector, create some problems in particular in estimating output and value added in constant prices. Data for wholesale of ICT equipment (ISIC 5150) and renting of ICT equipment (ISIC 7123) are also not available from STAN. Van Ark, *et al.* (2002b) provide more detailed estimates and discuss the methodological problems involved.
6. The productivity measurement in the paper follows the procedures outlined in OECD's Productivity Manual (OECD, 2001b). Since value added is more widely available in the STAN database than production, productivity measurement is based on value added. An industry's contribution to aggregate labour productivity growth is calculated as the difference between its contribution to the growth of total value added and its contribution to the growth of total labour input. See Annex 2 for details.
7. Aizcorbe (2002) shows that part of the decline in the prices of Intel chips over the 1990s can be attributed to a decline in Intel's mark-ups, which points to stronger competition in the production of chips.
8. Van Ark, *et al.* (2002b) show that this conclusion also holds up when US hedonic price indexes are applied to ICT production in other OECD countries.
9. A more rigorous method would be to examine the link between ICT use and productivity performance through econometric methods, *e.g.* panel estimation across countries. Unfortunately, the data to engage in such work are still too limited as only few countries provide the relevant ICT data by industry.

10. Poor measurement of output in the financial sector (banking, insurance and financial services) may be one factor driving this result. An OECD taskforce is currently working to improve output measurement in the banking sector.
11. The “residual” shown in Figure 6 is due to aggregation effects. It is typically small.
12. The differences between the various US studies are partly due to the data sources and methodology used, as well as the timing of various studies.
13. At the time of writing, Australia is not yet included in the OECD STAN database.

Annex I

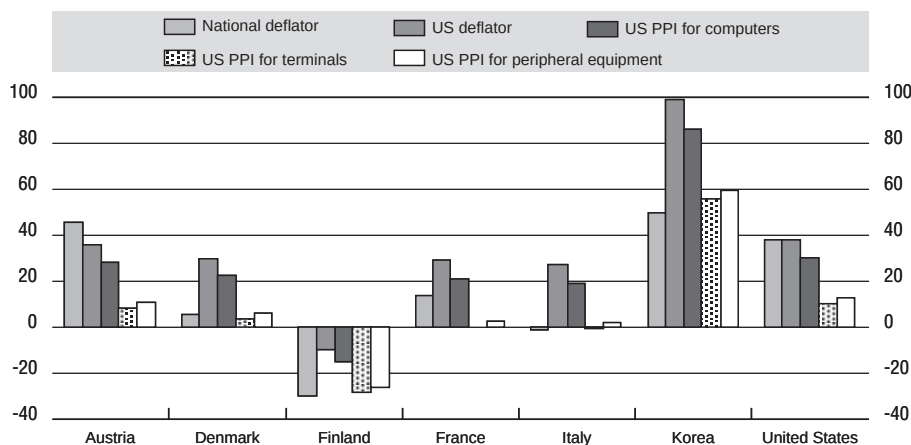
SENSITIVITY OF PRODUCTION GROWTH IN THE COMPUTER INDUSTRY TO PRICE INDEXES

The main paper argued that differences in industrial specialisation might limit the scope for application of the hedonic price index for the US computer industry to other countries. If certain countries only produce peripheral equipment or computer terminals, the US producer price index for the computer industry as a whole may not be appropriate, since the US index is heavily influenced by products where price declines are much more rapid, such as electronic computers. To illustrate this, Figure A1 shows average production growth in seven OECD countries, using five different producer price deflators, namely the deflator used in national statistics for ISIC 30 (Office, accounting and computer machinery), the US deflator for this industry, and the detailed PPIs for computers, computer terminals and peripheral equipment.

The graph illustrates the sensitivity of production growth to price deflators. In Austria, the price index used in the national accounts already adjusts for the sharp fall in computer prices.

Figure A1. **Growth of production in office, accounting and computer machinery, 1996-2000**

Annual average growth rates, in per cent



Source: OECD calculations based on STAN database, US PPI deflators from BLS, www.bls.gov.

In Denmark, the particular hedonics index that is used is quite close to the US PPIs for computer terminals or for peripheral equipment. The Italian result also mirrors the US PPI for these two industries. In Finland, use of the US PPI for the entire computer industry would understate the sharp fall in production, whereas the French hedonic deflator for ISIC 30 leads to slower growth than the US deflator for this industry. In Korea, the national deflator falls even slower than the US PPI for computer terminals, leading to a lower estimate of growth rates.

All of this shows that industrial specialisation matters. Hedonic price indexes for computer equipment are in general more appropriate for the computer-producing industry than conventional deflators, but they should be adjusted to the industry in question. The Danish hedonic deflator appears appropriate for a country that primarily produces peripheral equipment. Moreover, the conventional deflator used by the Italian Statistical Office may also be appropriate. Applying the US deflator would substantially overestimate production growth in these countries. This implies that further work is needed in statistical offices to develop appropriate hedonic indexes for the computer industry in each individual country.

Annex II

MEASURING LABOUR PRODUCTIVITY AND MULTIFACTOR PRODUCTIVITY

The productivity measurement in the paper follows the procedures outlined in OECD's *Productivity Manual* (OECD, 2001b). Since value added is more widely available in the STAN database than production, productivity measurement in this paper is based on value added. The value-added based measure of labour productivity by industry (π^j) is given by the relation $\pi^j = \hat{V}A^j - \hat{L}^j$. $\hat{V}A^j$ denotes the rate of change of real value-added in industry j

and $\hat{L}^j$ the rate of change of labour input. The aggregate rate of change in value added is a share-weighted average of the industry-specific rate of change of value-added where weights reflect the current-price share of each industry in value-added:

$$\hat{V}A = \sum_j s_{VA}^j \cdot \hat{V}A^j, \text{ where } s_{VA}^j = \frac{P_{VA}^j VA^j}{P_{VA} VA}, P_{VA} VA = \sum_j P_{VA}^j VA^j$$

On the input side, aggregation of industry-level labour input is achieved by weighting the growth rates of hours worked by industry with each industry's share in total labour compensation.

$$\hat{L} = \sum_j s_L^j \cdot \hat{L}^j, \text{ where } s_L^j = \frac{w^j L^j}{wL}, wL = \sum_j w^j L^j$$

Aggregate labour productivity growth is defined as the difference between aggregate growth in value-added and aggregate growth in labour input:

$$\Pi = \sum_j (s_{VA}^j \hat{V}A^j - s_L^j \hat{L}^j)$$

An industry's contribution to aggregate labour productivity growth is $s_{VA}^j \hat{V}A^j - s_L^j \hat{L}^j$, or the difference between its contribution to total value-added and to total labour input. If $s_{VA}^j = s_L^j$, total labour productivity growth is a simple weighted average of industry-specific labour productivity growth.

Multifactor productivity growth, on the basis of value added, is computed as the difference between the rate of growth of deflated value-added and the rate of growth of the primary factor inputs. It is straightforward to aggregate industry-level productivity growth to an economy-wide measure. Aggregation weights are simply each industry's current price share in total value-added.

Source: OECD (2001b).

Annex Table 1. **Contributions to labour productivity growth by industry, 1990-1995¹**

Contributions to value added per person engaged, in percentage point per year

	ISIC Rev. 3	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Ireland	Italy	Japan	Korea	Mexico	Netherlands	Norway	Spain	Sweden	Switzerland	UK	US
Total economy	01-99	2.32	1.91	1.19	1.99	3.01	1.17	2.10	2.39	2.83	1.20	4.94	0.51	1.24	2.79	1.30	2.95	-0.03	2.02	0.97
ICT-producing manufacturing	30-33	0.12	0.04	0.10	0.09	0.23	0.22	0.17	0.43	0.08	0.36	0.85	0.01	0.12	0.03	..	0.27	0.10	0.18	0.33
Office, accounting and comp. mach.	30	0.00	..	0.02	0.02	0.01	0.07	0.05	0.28	0.01	..	0.04	0.02	..	0.00	..	0.01	0.00	..	..
Electrical machinery, nec	31	0.04	..	0.01	0.04	0.04	0.06	0.03	0.12	..	..	0.04	-0.01	..	0.01	..	0.03	0.00	..	..
Radio, TV and comm. equipment	32	0.06	..	0.03	0.01	0.19	0.09	0.07	..	..	..	0.75	0.01	..	0.01	..	0.19	0.03	..	..
Medical, precision and optical instr.	33	0.02	..	0.04	0.02	0.00	-0.01	0.03	0.03	0.02	0.00	0.05	..	..	0.00	..	0.04	0.06	..	0.00
ICT-producing services	64+72	0.15	0.04	0.09	0.27	0.14	0.07	0.19	0.10	0.12	0.08	0.22	0.19	0.10	0.21	0.09	0.24	0.06	0.23	0.14
Post and telecommunications	64	0.14	0.04	0.07	0.12	0.15	0.04	0.17	0.07	0.11	0.08	0.22	0.19	0.10	0.22	0.09	0.18	0.09	0.17	0.14
Computer services	72	0.02	..	0.03	0.15	-0.01	0.04	0.02	0.03	0.01	..	..	..	..	0.00	..	0.05	-0.03	0.05	..
ICT-using services	50-74	0.59	0.70	0.61	0.37	0.19	-0.02	0.17	0.15	0.92	0.67	0.96	0.25	0.09	0.37	-0.15	0.45	-0.58	0.37	0.24
Wholesale and retail trade, repairs	50-52	0.15	0.24	0.22	0.36	0.21	0.16	0.07	-0.04	0.57	0.31	0.10	-0.33	0.02	0.38	0.06	0.42	-0.15	0.15	0.25
Financial intermediation	65-67	0.23	..	0.34	-0.07	-0.06	-0.02	0.06	0.33	0.25	-0.04	0.44	0.27	-0.03	-0.08	-0.18	0.10	-0.06	0.13	0.12
Financ. interm, excl. insur./pens.	65	0.24	..	0.27	-0.07	-0.05	-0.07	0.05	0.21	0.18	..	..	..	..	-0.10	..	0.10	-0.12	0.09	0.06
Insurance and pension funding	66	0.00	..	0.07	-0.01	-0.01	0.00	0.03	0.09	0.03	..	..	..	..	0.01	..	..	0.08	0.05	0.02
Activities related to fin. int.	67	0.00	..	..	0.02	0.00	0.04	-0.01	0.04	0.04	..	..	..	..	0.00	..	..	-0.02	0.01	0.01
Renting of m. and eq., other buss. act.	71-74	0.21	..	0.06	0.22	0.04	-0.13	0.04	-0.15	0.11	0.41	0.41	0.30	0.10	0.08	-0.03	-0.07	-0.37	0.18	-0.10
Renting of mach. and equipm.	71	0.07	..	..	0.07	-0.01	-0.01	0.04	0.01	..	..	..	..	..	0.03	..	-0.04	0.00	0.03	..
Research and development	73	0.02	..	0.03	0.00	0.00	-0.02	0.00	-0.03	..	..	..	..	..	0.00	..	0.00	-0.01	0.01	..
Other business activities	74	0.10	..	0.03	-0.01	0.05	-0.12	-0.01	-0.13	0.11	..	..	..	..	0.05	..	-0.03	-0.36	0.03	..

Annex Table 1. **Contributions to labour productivity growth by industry, 1990-1995¹** (cont.)

Contributions to value added per person engaged, in percentage point per year

	ISIC Rev. 3	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Ireland	Italy	Japan	Korea	Mexico	Netherlands	Norway	Spain	Sweden	Switzerland	UK	US
Other activities		1.38	1.04	0.31	1.35	2.35	0.89	1.79	1.87	1.78	0.02	3.96	-0.04	1.13	2.20	1.04	1.95	0.41	1.77	0.68
Agriculture, forestry, fishing	01-05	0.31	0.07	0.03	0.24	0.41	0.19	0.19	0.52	0.39	0.08	0.82	0.12	0.19	0.31	0.04	0.07	-0.02	0.03	0.01
Mining and quarrying	10-14	-0.01	0.01	0.15	0.05	0.02		0.09	0.07	0.02	0.00	0.08	0.08	0.06	1.38	0.05	0.01	-0.01	0.27	0.05
Non-ICT manufacturing	15-29, 34-37	0.68	0.52	0.31	0.31	0.90	0.61	1.03	1.77	0.84	0.13	2.61	0.50	0.59	0.12	0.46	0.91	0.52	0.81	0.56
Electricity, gas and water	40-41	0.06	0.08	0.07	0.10	0.10	0.02	0.07	0.11	0.08	0.07	0.21	0.01	0.06	0.07	0.05	0.02	0.16	0.18	0.06
Construction	45	0.18	-0.03	-0.07	-0.04	0.12	0.06	-0.10	-0.08	0.01	-0.09	0.32	-0.21	-0.05	0.18	0.14	0.15	-0.12	0.14	0.00
Hotels and restaurants	55	-0.03	0.00	0.04	0.02	0.11	-0.15	-0.09	-0.26	-0.01		-0.19	-0.11	-0.01	-0.04	0.07	0.05	-0.18	-0.05	0.01
Transport and storage	60-63	0.01	0.08	0.06	0.14	0.25	0.04	0.19	0.17	0.26	-0.09	0.21	-0.07	0.15	0.36	0.15	-0.02	-0.14	0.13	0.06
Real estate	70	0.15	..	..	0.06	0.35	0.16	0.32	-0.03	0.12	0.32	..	..	..	0.12	0.15	0.29	0.28	-0.05	0.23
Comm., social, pers. services	75-99	0.03	0.32	-0.28	0.47	0.10	-0.04	0.10	-0.41	0.08	-0.40	-0.09	-0.37	0.14	-0.30	-0.06	0.47	-0.09	0.32	-0.30
Sum of sectors		2.23	1.82	1.12	2.08	2.91	1.16	2.31	2.55	2.90	1.13	6.00	0.40	1.43	2.81	0.98	2.90	-0.01	2.55	1.40
Residual		0.09	0.10	0.07	-0.09	0.10	0.01	-0.21	-0.16	-0.07	0.07	-1.06	0.11	-0.19	-0.02	0.32	0.05	-0.02	-0.53	-0.43

1. 1991-95 for Germany; 1992-95 for Italy and 1993-95 for Korea.

Source: OECD STAN database and data underlying Van Ark, *et al.* (2002b).

Annex Table 2. **Contributions to labour productivity growth by industry, 1996-2000¹**

Contributions to value added per person engaged, in percentage point per year

	ISIC Rev. 3	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Ireland	Italy	Japan	Korea	Mexico	Netherlands	Norway	Spain	Sweden	Switzerland	UK	US
Total economy	01-99	1.78	1.39	0.94	1.47	2.41	1.18	1.34	3.76	0.74	0.83	2.70	2.07	0.89	2.41	0.44	2.67	1.10	1.21	1.74
ICT-producing manufacturing	30-33	0.09	0.20	0.15	0.03	0.90	0.18	0.17	0.89	0.01	0.38	0.81	0.02	0.04	0.01	0.02	0.51	0.13	0.10	0.45
Office, accounting and comp. mach.	30	0.03	..	0.00	0.01	0.00	0.04	0.04	0.37	0.00	..	0.09	..	..	0.00	0.00	0.01	0.01	0.07	..
Electrical machinery, nec	31	0.05	..	0.05	-0.01	0.05	0.01	0.06	0.36	..	..	-0.10	..	..	0.01	0.02	0.01	0.10	..	..
Radio, TV and comm. equipment	32	-0.01	..	0.05	0.00	0.85	0.11	0.06	..	..	..	0.71	..	..	0.01	0.00	0.43	0.00	..	..
Medical, precision and optical instr.	33	0.01	..	0.05	0.02	0.01	0.01	0.02	0.18	0.00	0.02	-0.02	..	..	-0.01	0.00	0.07	0.02	-0.03	-0.01
ICT-producing services	64+72	0.06	..	0.22	0.25	0.29	0.19	0.42	0.28	0.23	0.13	0.17	0.17	0.23	0.18	0.18	0.22	0.01	0.20	0.16
Post and telecommunications	64	0.09	..	0.21	0.17	0.36	0.20	0.31	-0.03	0.19	0.13	0.17	0.17	0.27	0.18	0.19	0.18	0.04	0.23	0.16
Computer services	72	-0.02	..	0.01	0.08	-0.07	-0.01	0.11	0.31	0.04	..	..	..	-0.04	0.00	0.00	0.05	-0.04	-0.03	..
ICT-using services		0.52	0.44	0.34	0.28	0.26	-0.11	0.27	0.73	0.13	0.17	0.27	1.41	0.23	0.42	0.04	0.60	0.29	0.54	1.29
Wholesale and retail trade, repairs	50-52	0.20	-0.05	0.14	0.16	0.18	0.02	-0.01	0.25	0.05	-0.10	-0.04	1.01	0.32	0.39	0.09	0.40	-0.08	0.10	0.92
Financial intermediation	65-67	0.20	0.22	0.22	0.15	0.21	-0.07	0.30	0.03	0.12	0.08	0.09	0.19	0.01	-0.05	0.00	0.24	0.56	0.12	0.43
Financ. interm. excl. insur./pens.	65	0.20	..	0.22	0.11	0.18	-0.05	0.30	0.03	0.15	..	..	..	-0.01	-0.05	0.03	0.24	0.50	0.12	0.21
Insurance and pension funding	66	0.04	..	0.00	0.08	0.00	-0.01	-0.02	0.00	0.00	..	..	..	0.00	0.00	-0.06	..	0.05	0.00	0.01
Activities related to fin. int.	67	-0.01	..	..	-0.03	0.04	0.00	0.02	0.00	-0.01	..	..	..	0.03	0.00	0.03	..	0.01	0.00	0.19
Renting of m. and eq., other buss. act.	71-74	0.10	0.28	-0.02	0.05	-0.18	-0.07	0.10	0.45	-0.02	0.19	0.21	0.21	-0.15	0.08	-0.06	-0.04	-0.18	0.28	-0.05
Renting of mach. and equipm.	71	0.07	..	..	0.00	0.01	0.03	0.10	0.04	..	..	..	..	0.07	0.03	0.01	-0.01	0.00	0.02	..
Research and development	73	0.00	..	0.00	0.00	-0.01	-0.01	0.00	-0.02	..	..	..	..	-0.02	0.00	0.00	0.00	-0.02	-0.03	..
Other business activities	74	0.04	..	-0.03	-0.04	-0.13	-0.08	-0.11	0.43	-0.01	..	..	..	-0.21	0.05	-0.11	-0.03	-0.16	0.32	..

Annex Table 2. **Contributions to labour productivity growth by industry, 1996-2000¹** (cont.)

Contributions to value added per person engaged, in percentage point per year

ISIC Rev. 3		Austria	Belgium	Canada	Denmark	Finland	France	Germany	Ireland	Italy	Japan	Korea	Mexico	Netherlands	Norway	Spain	Sweden	Switzerland	UK	US
Other activities		0.98	0.66	0.26	0.82	0.81	0.88	0.54	1.93	0.31	0.53	1.53	0.18	0.41	1.84	0.49	1.14	0.74	0.58	0.27
Agriculture, forestry, fishing	01-05	0.16	0.05	0.14	0.15	0.19	0.14	0.09	0.24	0.09	0.03	0.10	0.07	0.04	0.22	0.24	0.09	-0.12	-0.02	0.07
Mining and quarrying	10-14	0.01	0.00	0.02	0.21	0.00	..	0.03	0.01	-0.01	0.01	-0.02	0.04	-0.03	1.40	0.00	0.00	0.01	0.03	-0.01
Non-ICT manufacturing	15-29, 34-37	0.69	0.55	0.31	0.31	0.36	0.43	0.11	2.84	0.21	0.59	1.04	0.52	0.35	0.06	0.01	0.41	0.64	0.13	0.09
Electricity, gas and water	40-41	0.09	0.14	0.04	-0.03	0.08	0.09	0.08	0.09	0.06	0.13	0.19	0.00	0.04	0.02	0.15	0.01	-0.01	0.10	-0.01
Construction	45	0.13	0.07	0.02	0.00	-0.12	-0.10	0.11	-0.38	0.01	-0.40	0.61	-0.37	-0.04	0.06	-0.12	0.00	0.02	-0.11	-0.06
Hotels and restaurants	55	0.06	0.01	-0.06	-0.03	-0.04	-0.03	-0.10	-0.24	-0.04	..	-0.16	0.07	0.02	-0.06	0.00	0.04	0.04	-0.01	-0.01
Transport and storage	60-63	0.08	0.13	0.06	0.22	0.14	0.12	0.12	-0.05	-0.04	-0.04	0.30	0.24	0.11	0.44	0.20	0.15	0.10	0.08	0.01
Real estate	70	0.12	..	..	0.19	0.34	0.20	0.21	0.04	0.07	0.40	..	..	0.17	0.05	0.04	0.11	0.30	0.30	0.32
Comm., social, pers. services	75-99	-0.36	-0.29	-0.28	-0.19	-0.13	0.05	-0.11	-0.62	-0.05	-0.19	-0.53	-0.39	-0.24	-0.34	-0.03	0.33	-0.22	0.08	-0.14
Sum of sectors		1.65	1.29	0.97	1.37	2.27	1.15	1.40	3.83	0.68	1.21	2.77	1.78	0.91	2.47	0.74	2.48	1.17	1.41	2.16
Residual		0.12	0.10	-0.04	0.09	0.14	0.04	-0.05	-0.07	0.06	-0.38	-0.07	0.28	-0.02	-0.06	-0.30	0.19	-0.07	-0.20	-0.42

1. 1996-98 for Japan, Korea, Spain and Sweden; 1996-99 for France, Germany and the United Kingdom; 1996-2001 for Austria, Finland, Italy and the United States.

Source: OECD STAN database and data underlying Van Ark, *et al.* (2002b).

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COMPETITION AND EFFICIENCY IN PUBLICLY FUNDED SERVICES

Jens Lundsgaard

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INTRODUCTION

Expenditure on services like public administration, law enforcement, defence, infrastructure, and the wider range of education, health care and social services like childcare and long-term care for elderly and disabled, jointly constitute one-fifth to one-third of GDP in OECD countries, and much of this is publicly funded based on general taxation or mandatory insurance contributions. Well beyond the classical examples of truly collective services such as defence, there are sound welfare-economic motives, including insurance market failures, credit constraints and human capital spillover to society at large, for ensuring the provision of services such as compulsory education by public funding. These motives, however, do not always necessitate provision via traditional public sector institutions. Changing the management system within the public sector or introducing competition and involving a broader range of suppliers may often improve service provision and cost efficiency.

The purpose of this article is to review to what extent and how OECD countries have opened the provision of different publicly funded services to competition. The picture that emerges is that OECD countries use quite different arrangements – there is no “one way” of providing publicly funded services – but the use of contracting-out and combinations of user choice models is growing. What arrangements are found appropriate depends heavily on service characteristics, and advancing the understanding of detailed regulatory issues is as important for competition in publicly funded services as it has been in network utilities.¹

The article first sets out an analytical framework identifying the inherent incentive and efficiency issues associated with information asymmetries between government as a principal and the agents supplying publicly funded services. These issues may be addressed via performance-related funding, benchmarking, contracting-out and voucher schemes which allow users to choose among suppliers while maintaining public funding. The article also examines the empirical literature on competitive tendering and contracting of technical and support services and on user choice in different areas. Against this background, the arrangements applied by OECD countries in major service areas is reviewed, including education, childcare, long-term care for elderly and disabled, and employment service; it also reviews the use of contracting for technical and support functions, and for private finance of infrastructure investments. Core health care is left aside, as it involves a set of particular issues requiring an analysis of its own.

ALTERNATIVE WAYS OF PROVIDING PUBLICLY FUNDED SERVICES

Turning public funding into service provision involves a basic principal-agent relationship: How can government as a *principal* best organise service provision in order to align the incentives facing service-supplying *agents* to the objectives underlying public funding? In other words, what funding allocation formulas, rules on competition and user choice, ownership forms and management instruments are best equipped to:

- i) transform broader policy goals into a clear demand for what services to supply (where, when, to whom) and operational objectives in day-to-day activities, and
- ii) ensure that the actual economic incentives facing institutions and their employees reward work effort and management leading to improved service provision and cost efficiency?

The heart of the problem is that most publicly funded services are relatively complex and characterised by strong information asymmetries. Therefore, it is not feasible – or prohibitively costly – to give detailed instructions for service provision under all imaginable circumstances and to perfectly monitor compliance with such a complete contract or set of instructions. In practice, principals are forced to allow agents considerable flexibility, and to substitute for the inability to monitor activities in detail by optimising the incentives faced by agents – such as by funding based on observable outcomes and performance measures or via competition. The character of information asymmetries and the appropriate incentive mechanisms depend on service characteristics.

- Services used by individuals like education and care for children, elderly and disabled, are typically “soft” in the sense that service outcomes can be difficult to quantify. Service provision also has to respond to individual needs, and involve a unique interaction between the persons providing and using the service. The services to be provided can therefore only be specified in broad terms, and it is inherently hard to monitor activities and performance. Consequently, it is hard for the principal to know whether agents are operating efficiently. Allowing individual choice among alternative service suppliers may mitigate this problem by delegating part of the role as principal from government to users. Provided that users base their choice on criteria that are consistent with the objectives underlying public funding, it may create clearer demand signals. And to the extent that intangible service aspects and quality may be experienced, the competition to attract users entails incentives to improve service provision and cost efficiency.
- Services like defence, police and public administration can be particularly hard to describe and expose to economic incentives. This is notably so for defence

and some public administration functions like policy advice to governments, because although their purpose can be described in broad terms (like defending the country and maintaining security; preparing policy reforms and legislation), the observable measures of outcomes and performance are few, lack comparisons and contain considerable noise from circumstances outside the control of agents. Moreover, for functions like policing and judicial acts that require discretion and involve authority and legally binding decisions for individual citizens, too-strong economic incentives might compromise basic civil rights. But parts of these services may lend themselves more easily to specification and stronger economic incentives such as the preparation of a particular policy report or standardised administrative procedures.

- For technical services like waste collection and road construction, the principal can have full knowledge about what works are needed, and the realisation of works and their quality is relatively easily observable. Therefore, the information asymmetry concerns only the difficulty for the principal to monitor the detailed operations of the agent while undertaking the work. Consequently, the principal-agent relationship can be resolved by strong economic incentives linked to the supply of specified services, such as the competition among for-profit private firms for a public procurement contract. Like with subcontracting in the private sector.

In the following, the main alternatives to traditionally organised public production are described with regard to their applicability, advantages and disadvantages, and main design issues.²

Internal contracts with government agencies, benchmarking and performance-related pay

Within the framework of government agencies serving fixed user constituencies, stipulating internal performance contracts may clarify what goals and outcomes should be achieved by government agencies and institutions. Simultaneously expanding the institutional autonomy on how to achieve these goals can improve performance by giving more room for innovation and by limiting political interference in the detailed operations of government agencies.

The inherent information asymmetry nevertheless remains between government and service suppliers, as to the true resources required to fulfil policy objectives. In fact, agencies may gain by concealing the true level of necessary costs in order to avoid funding being tightened in the future.

Benchmarking of activities and performance across agencies can improve performance assessment and go some way towards mimicking competition. For instance, comparing police departments in different districts can facilitate performance measurement by reducing the statistical noise from common changes such

as in crime rates. Making comparisons available may generate internal processes that help managers identify where their departments differ and could improve. Moreover, the career concerns of managers imply an economic incentive via promotions and future job opportunities even when performance measures are not linked to current pay – notably if benchmarking results are transparent and visible also to alternative employers.

More flexible individual pay involving bonuses and other performance-related elements or fixed-term employment contracts instead of permanent ones may give employees a share in the gains from improved efficiency and help transform incentives at agency level into improved operations. However, it is crucial to balance the reward across different aspects of work, and not to discourage teamwork and activities that produce better results in the longer run.

Competitive tendering and contracting

Service provision can be opened to competition by specifying and announcing service requirements, calling for tenders and contracting with the supplier submitting the most favourable bid for some fixed term. Penalty clauses for non-compliance can also be built into the contract. For this type of competition to be effective, services and quality must be carefully specified and the information made public so as to facilitate entry from potential new suppliers. Indeed, the distinguishing feature of competitive tendering, compared with intra-governmental contracts and grants earmarked for specific non-profit organisations, is the openness of market access, supported by a transparent procedure for selecting the contractor. In-house teams can be allowed to submit bids. However, this requires very transparent separation of units within government agencies to avoid cross-subsidisation, and rules on cost calculations and auditing to ensure a credible and neutral competitive tendering process.

Sub-contracting for support functions like cleaning, administrative functions, computer services, legal services, etc. may allow economies of scale and specialisation to be realised – reflecting better use of specialised equipment as well as better management of human resources within an organisation focused on the competencies needed for the particular support function. Sub-contracting can be to a publicly-owned entity exclusively, such as a public real estate holder or a public IT service supplier. However, support functions may often be easier to define and more marketable than final services. Therefore, sub-contracting via competitive tendering can expose these elements to competition, even if final services are delivered by a public monopoly.

Empirical studies document that appropriate use of competitive tendering and contracting can raise efficiency and thereby allow a constant quality of service to be provided at lower costs, especially for technical services like garbage collection and cleaning (see Box 1). Reduced employment plays some role in achieving economies,

Box 1. Studies of competitive tendering and contracting for technical services

The savings obtained through competitive tendering and contracting have been documented in a series of studies using large data samples and econometric techniques to test the significance of results. While covering a broad range of countries and time periods, these systematic quantitative studies typically cover only a limited range of technical services, in particular waste collection and cleaning (see Lundsgaard, 2002 for a listing of the results from these studies). Case studies are reviewed here, but can be useful for indicating best practices of how to implement contracting and competitive tendering (see OECD, 1997).

The estimated cost savings vary strongly across studies, with the majority showing positive savings and some concentration in the range of 10-30 per cent. Savings may also vary over time reflecting changes in market concentration and contractor interest (see Milne, 1997), as fewer bidders is found to imply higher price in procurement auctions, as would be expected (see Gomez-Lobo and Szymanski, 2001). There is some evidence that private contractors have underestimated the actual costs and submitted non-viable low bids in early tendering rounds, or conversely, prices can fall over time once the frictions sometimes caused by interest groups when contracting is introduced have dissipated (see Reimer, 1999). Cost savings from competitive tendering and contracting may stem from both the introduction of competition and the involvement of private ownership. The relative importance can be difficult to assess, as most studies do not clearly distinguish between different ways of choosing the supplier, *i.e.* whether or not a formal competitive tendering procedure was carried out prior to contracting. A cautious statement would be that competition seems to be a stronger driver of efficiency gains than private ownership, as concluded in the survey by Domberger and Jensen (1997) and by others.

Sceptics of competitive tendering have argued that cost savings may simply correspond to lower service quality. Indeed, cases occur where inappropriate contractual specification results in declining standards. The systematic empirical studies, however, find that *a given level and quality* of service can be provided at lower costs using competitive tendering. Domberger, Hall and Li (1995) find that tendered private school cleaning is significantly less expensive than non-tendered public school cleaning, while at the same time quality is rated equivalent or significantly better by an independent team of controllers examining the schools. Christoffersen, Paldam and Würtz (1999) are able to include the actual quality specifications used in school cleaning contracts as a control variable and still find cost savings of 24-29 per cent from contracting-out.

Some studies try to explain the origin of the observed savings. Reorganisation of work activities and production units matter, as Christoffersen, Paldam and Würtz (1999) find that private suppliers are better able to realise economies of scale in school cleaning. Moreover, private suppliers tend to substitute among inputs towards more capital, as found by Walsh (1991), but simply raising effort or productivity with a

**Box 1. Studies of competitive tendering and contracting
for technical services (cont.)**

given input-combination may contribute more to savings as found by Cubbin, Domberger and Meadowcroft (1987). Consequently, reduced employment may contribute substantially to savings in cases of overstaffing, in line with the finding of Szymanski (1996) that local authorities with above average employment and wages in waste collection prior to competitive tendering gained the largest cost savings. Lower wages and less favourable work conditions do play a role, as found by Eskott and Whitfield (1995), as does a shift towards employing the least qualified personnel capable of doing the job (see Stevens, 1984). Finally, some savings may derive from cheaper procurement of non-labour inputs, as Ohlsson (1996) finds that public sector enterprises pay 10-15 per cent more than private firms for similar garbage trucks.

Few studies have specifically tried to assess the size of transaction costs. Walsh and Davis (1993) find that on average the costs for local authorities of preparing for competitive tendering of cleaning, waste collection, catering and maintenance of vehicles and grounds amount to 1.8 per cent of total contract value, and the Audit Commission (1995) finds that monitoring costs rarely exceed 3-4 per cent. Nelson (1997) finds that variation in transaction costs reflecting varying complexity of service needs can explain why some local governments choose a larger share of in-house production than others.

as private contractors have more flexibility and tend to substitute towards other inputs. And, depending on the initial level, reductions in wages or less favourable work conditions may also contribute to savings. If, however, avoiding changes in wages is considered a central policy goal, this can be specified as a contractual term.³

The openness of competitive tendering to new entrants makes it a stronger mechanism than benchmarking for revealing the true level of necessary costs. When benchmarking public agencies serving separate user constituencies, differences in performance can reflect either differences in productivity or local conditions for which the agency is not responsible. It can thus be difficult for outsiders to ascertain what the efficiency differences are, and consequently politically difficult to implement changes when faced with protests from interest groups. In a competitive tendering process, by contrast, bids relate to the same tasks under the same conditions, with entering contractors being ready to take over operations and continue service operations.

A drawback is that the efficiency gains from stronger performance incentives come with a transaction cost, associated with specifying contract terms, monitoring

compliance and eventually changing supplier. To avoid disputes with an external service supplier, notions such as “roughly the same standard as usual” must be translated into precise contractual terms. This can be both time consuming and costly, especially until public managers have gained experience and standardised specifications have evolved.

Where large-scale investment is needed, jointly contracting for the design, construction, maintenance and operation of facilities such as a highway may facilitate a life-cycle perspective on cost efficiency. The complexity and long-term character of these so-called public private partnerships (PPPs), however, creates a set of complications and reduces their effectiveness as monitoring instruments, as analysed in Lundsgaard (2002).

Vouchers and user choice among public and private service suppliers

Allowing users individually to choose among alternative suppliers is another way of opening service provision to competition. Choice can be restricted to public institutions with each one receiving funding as a function of the number of users, as in the case of some school choice programmes. Alternatively, users can be given a more explicit claim on public funding *via* a voucher allowing them to “spend” it only for a particular service, but with a wide range of potential suppliers – making markets open to entry. In practice, explicit voucher schemes with physical coupons are very rare, but OECD countries use a set of arrangements that function in a similar way, including per-user subsidies for private nursing homes, income-dependent benefits earmarked for the purchase of childcare in approved centres and tax credits for documented private school fees. All of these arrangements allow users to choose among different suppliers of publicly funded services. Equity of access and the resulting intensity of competition, however, depends on whether public funding per user is equalised across public and private suppliers.

There is less empirical evidence on the effects of user choice on efficiency, costs and other outcomes than for competitive tendering and contracting. Still, the available empirical material indicates that across the different service areas covered in this article, user choice raises attention to individual needs and creates incentives to improve efficiency for each supplier separately, provided that competition is effective. However, a number of effects interacting between suppliers affect the system’s equilibrium and overall cost efficiency, and competition to attract users may raise the total level of demand, service provision and public expenditure. Consequently, whether in practice delegating the monitoring role to users via individual choice of supplier can improve service provision depends on how regulation controls these potential problems. The discussion below reviews these effects which are summarised in Table 1.

Table 1. **Potential effects of user choice**

	Compulsory education	Post-compulsory education	Child care	Long-term care for elderly and disabled	Employment services
<i>User choice raises attention to individual needs and creates incentives to improve efficiency for each supplier separately ...</i>					
Raise attention to individual needs	+	+	+	+	+
Promote efficiency of each supplier separately	+	+	+	+	+
<i>... provided that competition is effective, ...</i>					
Some users not being motivated or capable of assessing service offers even with access to published professional evaluations	?		?	–	–
Local monopolies	?			?	
<i>... but a number of effects interacting between suppliers affect the system's equilibrium and overall cost efficiency ...</i>					
"Cream skimming"	?	?	?	?	–
Risk of undesirable sorting of users	–				
Reduced economies of scale from a larger number and variety of suppliers, and from lower capacity utilisation	–	–	–	–	–
Positive spill-over among suppliers from innovation	+	+	+	+	+
Higher wage costs as a result of weakened monopsony	–				
<i>... and competition to attract users may raise the total level of demand, service provision and public expenditure</i>					
Risk of excessive demand and service provision		–		–	–

Note: The potential effect listed in this table can of course only be roughly indicative: A "+" indicates a potential gain or a condition facilitating user choice. A "–" indicates a potential drawback or a condition making user choice less applicable. A "?" indicates less certain effects that may depend on specific local circumstances.

Source: OECD.

User choice raises attention to individual needs and creates incentives to improve efficiency for each supplier separately...

Learning outcomes are typically found to improve when schools are exposed to competition, management is more attentive to cost efficiency, teachers work more diligently with more intensive learning processes and parents get more involved. In childcare and long-term care there are few empirical studies, but still evidence that user choice increases flexibility and that suppliers do respond to the economic incentives from funding mechanisms. While there are no fully consistent differences in the relative cost-efficiency between public, non-profit and for-profit service suppliers, informal care like family-based childcare is found to be cheaper than formal services (Box 2). In combination with per-user funding, user choice may also promote a more flexible reallocation of capacity towards areas with growing demand.

... provided that competition is effective,...

The effectiveness of competition hinges on the capability and interest of users to evaluate services and choose the best, and on the degree of market power which suppliers can exercise. Firstly, even if many users are *capable of making a choice* among alternative suppliers – listening to the experience of others and drawing on published professional evaluations – some users are not. A frail elderly person with no relatives may have difficulties comparing offers from different residential institutions and may be unable to guard her/his own interests. Some procedures for approving suppliers may therefore be needed to ensure a minimum level of quality for all users. Ultimately, if many users are passive, and do not evaluate offers from different suppliers, competition is only effective if ensured through the process of approving suppliers. This is important in the provision of employment services, as some job-seekers receiving assistance may lack motivation. Secondly, *local monopolies* can be strong for example in compulsory education in rural areas because of transportation costs, and shifting from one school to another generally entails considerable sunk costs, impeding competition even if parents make an active and informed choice of school. This calls for both regulation of charges paid by users and procedures for approving service suppliers. Alternatively, where services and quality can be assessed by professionals, competitive tendering and contracting with one supplier for a defined geographical area may entail more effective competition than the alternative of user choice.

... but a number of effects interacting between suppliers affect the system's equilibrium and overall cost efficiency...

If users are very different, some requiring more resources than others, and this is not reflected in differential funding rates, problems of “cream skimming” may

arise with suppliers trying to select “easy” users and avoid “difficult” ones such as very frail elderly needing extra care in nursing homes. Suppliers may advertise and shape their activities in order to segment the market in ways that do not support the economies of specialisation and increased attention to differing individual needs that are considered a major benefit from individual choice. Or suppliers may devote excessive resources to screening and interviewing potential users. While rational from each supplier's perspective, engaging excessively in such activities is wasteful from an overall economic perspective. Conversely, offering premium services to users, for whom the public funding exceeds the costs of standard services, does not imply an efficiency loss but merely a transfer.

Avoiding cream skimming requires cautious attention and regulation. Having not just one per-user funding rate but several rates depending on individual characteristics can remove the incentive for cream skimming, provided that the relevant user characteristics are not subtle aspects such as personal attitude that may be observable to the supplier when encountering users, but insufficiently verifiable to be included in a funding formula. Alternatively, rules such as preventing suppliers from rejecting potential users can limit cream skimming even if the incentive remains. In practice, also human and moral concerns by suppliers, be they public, non-profit institutions or private firms, work to counterbalance cream skimming.

In compulsory education, *undesirable sorting of users* requires particular attention so that it does not become a serious problem. Because there are direct positive spillovers among students motivating and learning from each other within peers, the potential problem of cream skimming is amplified as schools selecting better motivated and qualified students become more attractive from the perspective of parents wanting their children to be in a fertile learning environment (Box 2). Preventing these dynamics from creating a socially undesirable sorting of users, may require stronger regulation than the basic form of cream skimming.

With users being allowed to choose individually among suppliers it can be harder to exploit *economies of scale*. In the absence of entry barriers, suppliers are likely to have more spare capacity than, for example, public schools based on strict zoning where capacity needs are easily predictable and class size and organisation can easily be planned. Notice, that a similar problem does not exist when contracting for the operation of a public facility.

Having a diversity of competing suppliers is likely to produce more *innovation* both in terms of service content, processes and work organisation, creating a positive spillover, as others learn from innovative suppliers.

For specialised professions, *competition to attract qualified personnel may drive up wages* for a given level of employment. Where the public sector is the sole employer of particular professions – such as teachers – it may have sufficient market power to

depress wages (Box 2). This monopsony position is weakened if new independent suppliers are allowed to establish and grow within a voucher system, but not because of user choice per se, as it is also weakened by flexible individual pay in public institutions serving fixed user constituencies. But the break-up of market power is more pronounced when suppliers are exposed to stronger economic incentives from competition to attract users and possibly for-profit ownership. However, attention to recruitment may result in a better allocation of the work force and clearer individual performance incentives raising labour productivity, and the question is then how far this can match the higher wage costs associated with a given employment.⁴

Apart from making vouchers available, government can have an important role to play in facilitating adjustment of capacity. Vouchers can be considered a demand-side instrument in the sense that instead of organising the supply of services directly, government subsidises demand, letting the individual receiving the voucher establish the contractual relation with a supplier. Still, accompanying policy initiatives on the supply side can be essential to ensure that changes in the volume of voucher subsidies results in changes in capacity and services supplied rather than changes in price. Supply side initiatives should address entry and exit barriers such as in construction of housing in the case of rent vouchers.⁵ Consequently, voucher schemes may be introduced gradually to facilitate establishment and expansion of suppliers.

... and competition to attract users may raise the total level of demand, service provision and public expenditure

Allowing users to choose among suppliers may increase supply efficiency, but may also reinforce the upward pressure on demand resulting from public funding. An improved and more diverse service supply, with more aggressive marketing, could mean that competition increases the number of service users, increasing budget pressures.⁶ In areas like compulsory education this would not apply since service coverage is at 100 per cent, but it could have a strong effect on post-compulsory education and long-term care for elderly. In the latter case this would call for clear procedures for individual need assessment by a separate agency to determine eligibility before users and suppliers interact. Also, fixing the public subsidy per user (at a level reflecting their individual characteristics) as in voucher schemes while allowing users to top-up with additional payments can be a way of cutting off excess demand, since users carry the full marginal costs. For services such as home care for elderly, this can work well, but for services with tendencies to local natural monopoly, there is a trade-off between letting users carry the marginal costs in order to balance excess demand and fixing prices paid by users in order to avoid monopoly pricing. If supplier-induced demand is deemed to be strong, governments may have recourse to capacity controls, including the number

of service licences and restrictions on the training of professionals.⁷ Capacity constraints creating excess demand, however, weaken the effect of user choice, as suppliers do not need to compete by offering improved service in order to attract users. Strong economic incentives like embodied in for-profit ownership may be harmful under such circumstances, and ultimately the alternative of contracted suppliers serving fixed user constituencies may therefore be preferable.

Effects of ownership

What range of suppliers to involve – notably whether to involve private firms or only non-profit and/or public institutions – is not a simple issue. By involving privately owned firms as suppliers, government essentially delegates part of its role of principal to the owners and management of the firm as their scope for taking out a profit creates a strong incentive to monitor and reorganise operations towards increased cost efficiency. On the other hand, if competition is limited, the strong economic incentives stemming from the profit motive could lead to rent extraction, and if important service aspects are hard to observe or experience for users, the profit motive could be counterproductive by diverting attention away from such aspects. In practice, however, concerns about reputation may mitigate or even mute such counterproductive incentives. When entering a market for publicly funded services, firms may incur considerable sunk costs since several years of learning are often required before becoming profitable. Firms can only recoup this investment by continuing operations and maintaining a reputation for high quality, and avoiding neglect of weak users leading to negative press stories can therefore be a key element of business strategy for a profit optimising firm. Moreover, the weight of reputation concerns can be increased by publishing quality evaluations or facilitating exchange of information among users, and by requiring recurrent approval by authorities based on these evaluations. Similarly, allowing firms to operate several service facilities, such as a chain of childcare facilities, magnifies the loss of reputation from poor quality in one facility.

Alternatively, involving only non-profit institutions can in a similar way shift the balance of short and long run incentives. That is so since in non-profit institutions surplus can be enjoyed by management and employees only as less workload, nice working conditions and to some extent maybe higher salaries. Enjoying these benefits requires continued operations. Being prevented from extracting surplus as profit also works as a commitment making non-profit institutions more attractive for employees with an altruistic motive. The other side of the coin, is that management of non-profit institutions have only limited incentives to implement unpopular decisions even if it could improve services and attract more users. Incentives to implement such decisions are strong however, if facing falling revenues and having to lay off staff. Relying on non-profit institutions instead of private firms as service suppliers is, therefore, advantageous where competition is limited, reputation effects cannot work well *and*

Box 2. Studies of user choice and competition in primary and secondary education, childcare and long-term care

School choice in primary and secondary education

The effects of school choice are complex and difficult to assess because learning depends not only on what schools provide, but just as much on the motivation and support parents provide their children and on the interaction of peers as students learn from each other. Therefore, giving parents an option of choosing a school outside their neighbourhood may affect learning outcomes not only through the changed incentives faced by schools, but also because students from different backgrounds are grouped differently in schools.

Across OECD countries, students in private schools typically achieve better results than students at public schools, as shown by the PISA study (OECD, 2001b) based on standardised tests of reading literacy among 15-year-olds. This is so, notably for private schools funded by tuition fees, but for a number of OECD countries the difference is significant also for private schools funded by government subsidies. In parallel, however, students in private schools on average come from more advantaged socio-economic background, notably in private schools funded by tuition fees. And empirical studies give mixed answers as to whether the better achievements at private schools are simply explained by the differences in student intake or whether indeed similar groups of students learn more in private schools. Studies include Gamoran (1996), Goldhaber (1996), Evans and Schwab (1995) and Neal (1997) analysing test scores and high school graduation rates for the United States, and Greene et al. (1999), Rouse (1998) and Witte (2000) being able to compare students winning private school voucher with a control group of students applying for but not winning vouchers and therefore in public schools, supposedly having the same degree of motivation and support from home.

Another type of studies find that public schools improve when exposed to competition. Hoxby (2000a) finds that in American cities with many separate public school districts implying mutual competition for residents, students in public schools achieve better test scores, complete more post compulsory education and earn more at age 32, while average school expenditure is lower. Dee (1998) finds that students in public schools are less likely to drop out in areas of the United States where the share of private schools is high, after controlling for socio-economic factors influencing drop out rates. And a number of American studies find that public school test scores improve where exposed to competition from private schools, as summarised by Teske and Schneider (2001). Similarly for Sweden, Bergström and Sandström (2001) concludes that students in public schools achieve better overall examination results and better results in the standardised math test in areas where public schools are exposed to competition from a large fraction of private schools. The empirical literature also sheds light on the mechanisms through which competition among schools may be a source of improved learning outcomes:

- *The operational freedom of non-government schools and competition may provide incentives to improve school performance.* Based on a questionnaire among managers of Danish

Box 2. Studies of user choice and competition in primary and secondary education, childcare and long-term care (cont.)

- upper secondary schools providing professional skills and teacher training colleges, the Ministry of Education (1998) finds that the change from state institutions to independent trusts and the introduction of funding per student has made the management style more professional and business-like, put focus on users and made the internal allocation of resources more responsive to needs. Likewise, the PISA study (OECD, 2001b) finds that 15-year-olds on average perform better in countries where schools have autonomy in areas like budget allocations within the school and where schools and teachers have at least some responsibility for deciding which courses are offered and for determining course content. Finally, school choice is found by Rapp (2000) to make teachers work more diligently.
- *Parents are forced to get more involved in the learning process of their children when having to choose school.* Based on interviews in New York and New Jersey, Schneider *et al.* (1997) conclude that parents of children attending public schools in districts allowing choice engage in more school-related discussion in the local community, are more likely to trust teachers, and are more involved in parent-teacher associations and voluntary activities. Similar results have been found by a set of studies summarised by Teske and Schneider (2001).
- *Schools exposed to competition have more intensive learning processes and maintain a more disciplined environment.* Hoxby (1999) finds that parental choice among public school districts enhances the share of students taking advanced courses during their upper secondary programmes and the average time spend on homework, and makes public schools maintain a more disciplined environment. All of these factors are found by the PISA study to contribute to student achievements (OECD, 2001b).

Conversely, the public employer may lose the monopsony power in the labour market for teachers, and Vedder and Hall (2000) find that salaries for teachers in public schools are higher in school districts where public schools are exposed to competition from private schools.

School choice may affect the composition of student peers at different schools, but in ways that are very different depending the design of funding mechanisms and other regulation. In public school systems based on assignment of students to the school nearest to their home, students are in reality sorted across schools according to the ethnic and socio-economic characteristics of different neighbourhoods. And parents who can afford it have the option of school choice through their choice of residence. The outcome of extending the range of school choice options by introducing explicit programmes may be an expansion of existing gaps between successful and unsuccessful schools. Such a tendency is found by Ladd and Fiske (2001) for urban areas in New Zealand, but even in 2000, ten years after the introduction of choice among public schools in New Zealand, the variation in reading literacy of 15-year-olds between schools, as measured by the PISA study is among the lowest in OECD countries and by far the most variation

Box 2. Studies of user choice and competition in primary and secondary education, childcare and long-term care (cont.)

is within schools as pointed out by Rae (2002). In some dimensions students groups may become less segregated, and private schools in the United States are on average more racially and ethnically integrated than public schools, as observed by Greene (1998). Often, school choice results in sorting of students by parental involvement and motivation, as Teske and Schneider (2001) conclude. The available empirical studies do not warrant a conclusion that school choice necessarily entails sorting of students, as such tendencies may be balanced by developing appropriate regulatory and funding arrangements – but indeed, the need for carefully designed programmes is underscored. Also, it is difficult to ascertain empirically whether sorting and larger variation in learning outcomes entail an efficiency loss in terms of lower average outcomes or possibly a gain such as by better matching of course contents with student abilities. Hoxby (2000b) finds that an exogenous change of 1 unit in peers' reading scores raises a student's own score by 0.15-0.4 units but with little evidence that peer effects are generally non-linear. This implies that changes in composition of students across schools can have relatively strong effects on the distribution of learning outcomes but is likely to be neutral in terms of efficiency. On the other hand, Schleicher (2002) finds some indication from the PISA-study that OECD countries with less variation between schools in the reading literacy score for 15-year-olds and countries in which family background impacts little on student performance, tend to achieve a higher average score. But in any case, social preferences may be strong: either against sorting and inequalities in learning outcomes or against imposing negative peer-effects on individual students by preventing parents from choosing another school.

User choice and competition in childcare and long-term care

There are too few studies of childcare and long-term care to fully disentangle generic effects from exposure to competition, individual choice, funding mechanisms, ownership and various entry and operational regulations. However, two tentative conclusions are that individual user choice increases flexibility and attention to user needs, and that incentives from funding mechanisms matter more than ownership for cost efficiency.

Studying the US military's employer-sponsored childcare, Zellman and Gates (2002) find no cost difference between childcare centres operated by the Department of Defence versus by outside contractors, but family-based childcare is found to have considerably lower costs.

For long-term care Bengtsson and Rønnev (1996) show that combinations of contracting and user choice have been instrumental in achieving a more flexible system and to some extent lower costs in the Netherlands and Sweden. Focusing on home care, Tilly *et al.* (2000) find that giving elderly and disabled the option of employing a person as carer themselves increased satisfaction as users had more influence on their daily life. For nursing homes in Switzerland, Crivelli *et al.* (2002) find

Box 2. Studies of user choice and competition in primary and secondary education, childcare and long-term care (cont.)

some variation in cost efficiency with many nursing homes operating at a sub-optimal small scale, but the study finds no systematic explanation for these differences from ownership type, whether private for-profit, non-profit or public.

Experience from nursing homes in the United States shows how entry regulation and funding mechanisms affect competition and cream skimming. In order to contain public costs under the Medicaid programme, most states adopted a certificate-of-need regulation constraining capacity expansions in all nursing homes whether accommodating publicly or privately funded residents. Consequently, waiting lists became common, and as private residents were willing to pay more than the Medicare rate, publicly funded applicants could have difficulties getting access – notably if very frail and resource demanding. Empirical studies, however, also find that this cream skimming has been forestalled and performance improved by funding mechanisms reflecting individual health characteristics and rewarding desirable outcomes, as summarised by Norton (2000).

where there is little to gain from continuous restructuring. Eventually, allowing public institutions, non-profit institution and private firms to all offer services in competition creates a platform for a natural selection process, determining the appropriate form of ownership. And involving some private firms as suppliers may make competition more dynamic, as they are more likely than public agencies and private non-profit institutions to seek an aggressive expansion of their activities.

PATTERNS OF SERVICE PROVISION IN OECD COUNTRIES

Countries vary considerably with respect to *how* they provide services, and the different patterns of service provision are reviewed in this section. There is a general lack of internationally comparable data for publicly funded services. A notable difficulty is that competition is complex to measure, and this article therefore relies on data for the share of public *versus* private institutions, funding flows and descriptions of allowances, voucher schemes, etc. Focusing on publicly funded services, the section reviews education, childcare, long-term care for elderly and disabled, employment service, outsourcing of support functions and contracting, including public private partnerships with private finance of investments.

Education

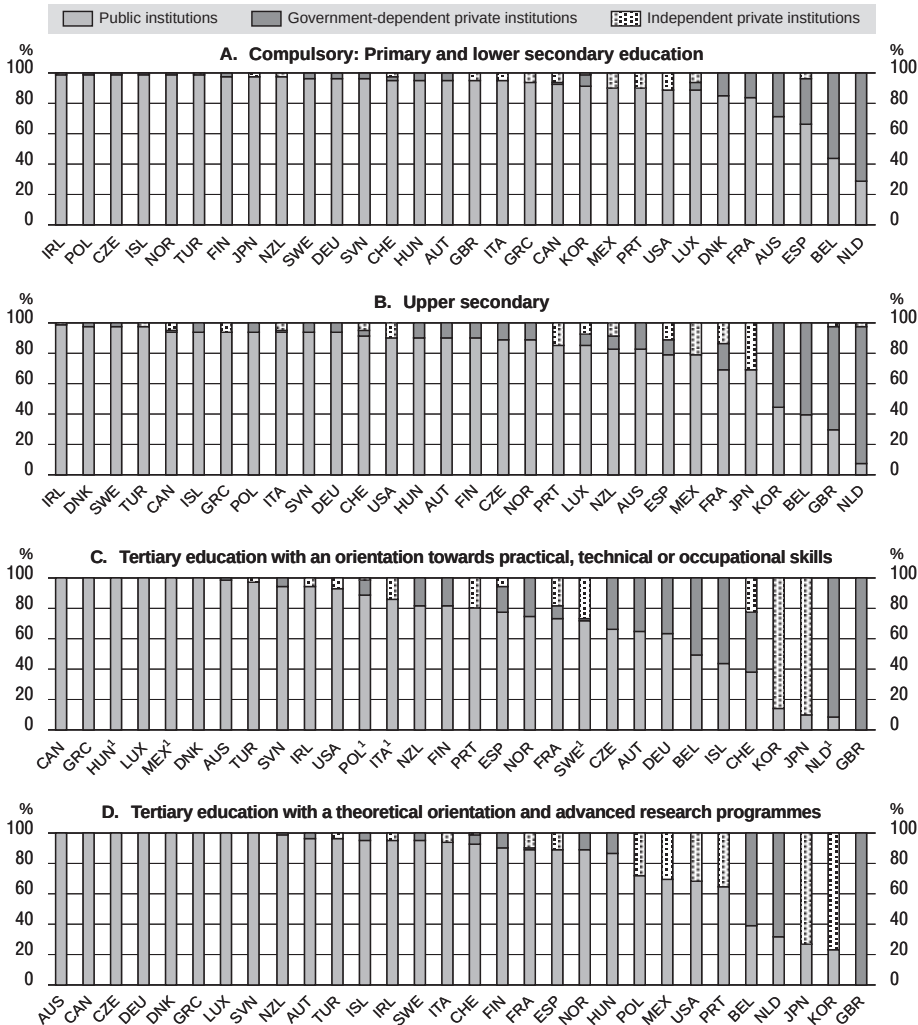
In most OECD countries, the majority of education institutions are public, but typically the share of private institutions increases with the level of education and the degree of orientation towards specific professional skills. Among the private institutions, some can be classified as government-dependent in the sense that more than half of their costs are covered by public funding, while others are financially independent as they rely mostly on funding from tuition fees and other private sources. In broad terms, government-dependent private institutions are mainly found in Europe, while independent private institutions are found to a large extent in Japan and Korea and to some extent in North America (Figure 1). Direct and indirect public spending on educational institutions varies across OECD countries in the range 3-7 per cent of GDP.

Compulsory education

For cultural and historical reasons, many countries have traditionally offered parents a choice between public schools and private schools receiving partial public funding – resembling a voucher scheme.⁸ The level of public funding for private schools ranges from nothing in the United States, through little or moderate financial support in the United Kingdom, Italy, Greece and Portugal, to substantial grants in Norway, Finland, Sweden, Germany, Austria, Denmark, France, Australia, Spain, Belgium and the Netherlands. In the latter group of six countries, private schools accommodate more than one out of seven enrolled in compulsory education (see Figure 1, panel A). These arrangements imply some competition between schools, but having evolved in response to other concerns, they are often designed in ways that limit the resulting competition. First, where the public funding which users can take along when choosing a private school is less than that provided to public schools, there is not a level playing field. Second, as a precondition for receiving public funding, governments have often required private schools to have similar facilities and apply similar student-teacher ratios, staffing rules and management systems as the public school sector. Applying such input controls limits operational flexibility and reduces the potential gains from competition.

Recent reforms aimed more clearly at introducing competition by allowing parents a choice among public schools have taken place in a number of countries, although in practice competition is limited by capacity constraints and lack of mobility across school districts. In the United States, private school vouchers have been introduced to expand choices for low-income families and expose public schools to competition, but so far only on a limited scale. In Sweden, competition has been strengthened, partly by ensuring that private schools have the same level of public funding as public schools and partly by allowing a broader range of schools to be established, including some operated by private firms (Box 3). These different

Figure 1. **Public and private education institutions, 2000**
Share of students enrolled



Note: Education institutions are classified as either public or private according to whether a public agency or a private entity has the ultimate power to make decisions concerning the institution's affairs. Private education institutions include self-contained non-profit institutions, institutions controlled by churches and trade unions, and institutions run as private business firms. A private education institution is classified to be government-dependent if more than 50 per cent of its core funding is received from government.

1. In Hungary, Mexico, Poland, Italy, Sweden and the Netherlands this category accounts for less than five per cent of total enrolment in tertiary education, and the relative share of public and private should therefore be interpreted with caution.

Source: OECD Education Database 2002.

Box 3. School choice in the United States, the Netherlands and Sweden

Although attending the local public school is by far the most common pattern in the **United States**, a range of new choice programmes have been introduced in primary and secondary education over recent decades. *Magnet schools* are ethnically and socially-integrated schools, attracting students from different neighbourhoods by offering distinctive, improved education programmes based on above-average public funding. With 3 per cent of total school enrolment, magnet schools represent the most common form of public school choice. Allowing parents an *inter-district* choice among public schools is growing more common but still involves less than 1 per cent of students. *Charter schools* are publicly funded non-government entities recruiting students from a wide catchment area and currently cater for 1-2 per cent of total enrolment. *Vouchers* represent a subsidy to low-income families paying part of the tuition fees at private schools. In total only 0.2 per cent of students receive school vouchers, and the majority of these vouchers is funded from private sources. *Tax credits for private schooling* operate in a similar fashion and cover 0.1 per cent of students. Consequently, unsubsidised *private schools charging tuition* still represent the main form of school choice not associated with change of residence, as for half a century private tuition charging schools have covered a stable share of around 11 per cent of primary and secondary school enrolment. Most private schools have a religious affiliation and as a national average, expenditures per pupil amount to only half of those in public schools. Finally, the number of children *schooled at home* has grown rapidly to a current level estimated at 1-3 per cent.

The **Netherlands** has a well-established and extensive system of public and private schools, ensuring equal terms of funding, examinations, etc. Since 1917 the Dutch constitution has guaranteed financial equality between public and private schools. Groups of parents that want to found a school according to their own vision (religious, pedagogical, etc.) can do so and receive public funding. Schools are subject to extensive controls on salaries, capital investment, etc. covering both public and private schools, and to avoid a hierarchy of prestigious to poor schools, tuition fees are prohibited. Students from very disadvantaged background elicit 90 per cent more funding than others. The terms of examination are the same across schools, but the schools are left with much freedom in terms of course materials and how to teach. Private schools are typically organised as non-profit foundations with a high degree of self-selection of new board members, and no primary schools are run by private firms. National umbrella organisations of Catholic and Protestant schools respectively exist, but function mainly as lobby organisations while not having authority over the individual schools. In 2000, 68 per cent of students in primary education attended a non-government school, the vast majority being Catholic and Protestant schools, which have a religious origin, but today mainly distinguish themselves by a reputation for offering educational quality.

Despite having virtually no tradition for private schools, **Sweden** in 1992 introduced a Dutch-style funding system in compulsory education (primary and lower

**Box 3. School choice in the United States,
the Netherlands and Sweden (cont.)**

secondary level) leading to a rapid expansion of private schools and improved performance in public schools in areas where competition is pronounced. Private schools (*fristående grundskolor*) are now guaranteed public funding on the same basis as municipal schools in the same area, but are not allowed to charge tuition fees. Equally, the funding to public schools respond automatically to changes in attendance. Choice among public schools across municipalities is allowed, but limited in practice as students living nearby are given preference. And no private school can reject students from within the municipality. The share of students attending private schools has grown from 1 per cent in 1992 to 4 per cent in 2000/1. Unlike elsewhere, schools with a religious affiliation represent only 15 per cent of private schools. The majority of private schools, 60 per cent, either consider themselves as non-specialised or adhere to certain pedagogical ideas. The remaining 25 per cent put emphasis on special topics like arts, teach in other languages or have specific ethnic orientation. Much of the growth since 1992 reflects students moving into private schools competing with public schools on offering a non-specialised programme. Schools organised like private limited companies play an important role in this process and have grown from nothing to a share of 34 per cent of the private schools, the remaining part being organised as teacher – or parent – co-operatives, associations and non-profit foundations. In upper secondary education (*gymnasieskolor*) parallel reforms have been implemented, with the share of students attending private schools growing from below 1 per cent to 3 per cent in five years.

Sources: Peterson (2001), Dijkstra (2001), Bergström and Sandström (2001) and national sources.

models have very different implications for the extent of student sorting across schools. Tuition-funded schools are more accessible for students from advantaged socio-economic backgrounds. Letting low-income families apply for a limited number of vouchers to attend such private schools may even reinforce this difference in learning outcomes, as it is likely to shift the more motivated students out of public schools, deteriorating the peer-learning effect there.⁹ By contrast, the models applied in the Netherlands and Sweden include a series of safeguards against cream skimming, sorting and unequal learning opportunities. This includes prohibition of tuition fees, extra funding for students from very disadvantaged background in the Netherlands, and preventing private schools from rejecting students

from within the municipality in Sweden. Letting parents choose among schools is likely to reveal existing problems in schools via falling enrolment. In such situations, by having clear procedures for intervention, authorities can prevent students with less attentive parents from being left behind in poorly performing schools. Finally, the American Magnet Schools use choice directly as an engine to achieve more integration.

Contracting with private firms for the operation of public schools or entire districts is an alternative way of introducing competition that may circumvent the potential problems of student sorting associated with individual school choice. It may also facilitate the adjustment needed for extra resources to be provided in disadvantaged areas. So far this has only been tried on a limited scale in OECD countries, primarily the United States, covering around 0.3 per cent of enrolment in compulsory education. Private tuition taking place after school hours is not reflected in the enrolment numbers of Figure 1, but matters in some countries, including Korea where it has grown rapidly over the latter decades.

Post-compulsory education

The share of private institutions increases with the level of education and the degree of orientation towards specific professional skills.

- In upper secondary education, private institutions accommodate a larger share of students than in primary and lower secondary education in most countries (Figure 1, panel B).
- In tertiary education orientated towards practical, technical or occupational skills, private institutions account for more than one out of five students in half of the OECD countries (Figure 1, panel C). Within Europe, it is at this level that private institutions matter most; in Finland, Norway, the Czech Republic, Austria, Germany, Iceland and Switzerland, 20-55 per cent of students attend private institutions, compared with 10 per cent or less at other levels of education. Being better able to liaise with industry is an important motive for private arrangements at this level.
- Independent private universities play a large role in Japan and Korea where four out of five students in tertiary education attend private institutions, while the traditional top universities are typically public (Figure 1, panel C and D). For Poland, Mexico, the United States and Portugal, the share of enrolment in independent private institutions is considerable in academic-oriented tertiary education and advanced research programmes, and larger than at other levels of education (Figure 1, panel D).

Generally, there is a move over time towards private institutions and towards giving public institutions more operational freedom while increasing competition. The private American universities increased their share of total tertiary enrolment

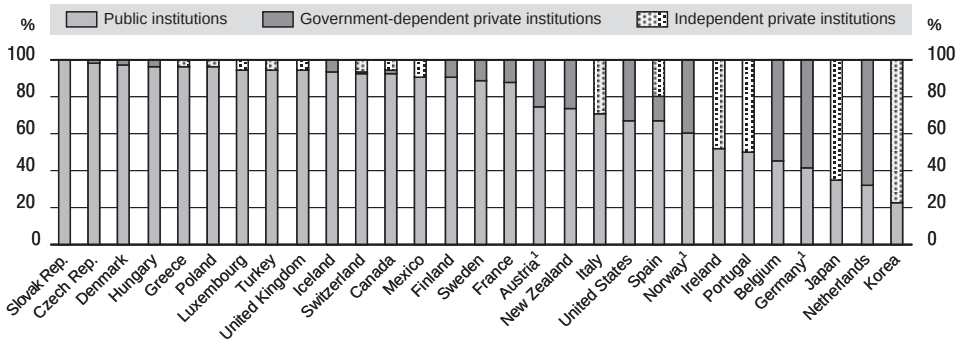
over the 1990s by one third to 35 per cent. The Czech Republic, Hungary and Poland are actively pursuing establishment and expansion of an independent private university sector as a means of increasing capacity. Similarly, private universities specialised in MBA and ICT-related programmes for in-work students have increased their role in Germany and France. In Austria the authorities have developed a system of accreditation for local and foreign private institutions of higher education, thereby lowering entry barriers and widening the scope of education on offer to students. In upper secondary as well as tertiary education, some OECD countries, and notably the United Kingdom, have implemented reforms transforming hitherto public schools and universities into private trusts, allowing them more operational flexibility.

In parallel, there has been a move towards efficiency-enhancing incentives in formulas channelling funding to public and private institutions. This change has been more widespread than in compulsory education, since students in post-compulsory education are more mobile and potentially better informed – provided availability of published professional evaluations of study programmes on offer – facilitating competition among institutions. By allocating funding automatically on the basis of student enrolment, Australia, Belgium, Denmark, the Netherlands, New Zealand and the United Kingdom operate implicit voucher systems where universities are rewarded for attracting students by improving their education programmes and for reducing drop-out rates when funding is based automatically on the passing of exams, as in Denmark. Finland, Norway and Sweden have adopted mixed funding schemes, weighing different performance measures including degrees earned.

Early childhood education and care¹⁰

Provisions for children below compulsory school age cover a wide range from pre-schools focused on learning through centre-based day care to informal family-based day care. The extent and form of public involvement varies across these different categories. For pre-schools, public funding is predominantly channelled through public institutions rather than subsidies to parents purchasing services. Public institutions therefore account for a somewhat larger share of enrolment than private day care centres and pre-schools in the majority of OECD countries (Figure 2). For family-based day care, public funding, for natural reasons, is typically channelled through subsidies and tax-credits, allowing users more choice. Direct public spending and indirect expenditures via tax credits related to early childhood education and care for children under compulsory school age varies across OECD countries in the range 0-3 per cent of GDP, reflecting differences in the coverage of formalised care, public versus private funding and differences in compulsory school age.

Figure 2. Public and private institutions in early childhood education and care, 2000
Share of children enrolled in pre-primary education and centre-based day care for children from 3 years



Note: Includes pre-primary education and organised centre-based programmes designed to foster learning and emotional and social development in children from 3 years to compulsory school age as recorded in the OECD Education Database. Some types of day-care like play groups and home-based programmes are not included. See note to Figure 1.

1. For Austria, Norway and Germany, data do not allow stipulating precisely the share of government-dependent vs. independent private institutions, but as many receive a significant share of public funding, private institutions are shown as government dependent here.

Source: OECD Education Database 2002.

In terms of the framework set out earlier, childcare is a good candidate for exposure to competition via user choice. There is a large benefit from getting services that are well adapted to parents' needs, and unlike in compulsory education, the risk of cream skimming and undesirable sorting is limited. Moreover, as childcare relies on less specialised professions than education, government losing monopsony in the labour market is only a concern if regulation or collective agreements require specific staff.

Comprehensive voucher-type reforms aimed at equalising the level of public funding per child across public and private institutions by channelling *all* public funding through users have been introduced in a few countries. Australia has implemented the most comprehensive reform, replacing the previous system based on grants to non-profit organisations and local governments. Public funding is now distributed to families via the Child Care Benefit earmarked for childcare provided in Commonwealth-approved services.¹¹ The public subsidy is thereby levelled across different institutional settings – including for-profit and non-profit community-based day care centres and to some extent family-based day care. All families are eligible for a minimum amount, and assistance is higher for lower

income families. The Netherlands and Norway are currently considering similar comprehensive reforms, and in the United States, childcare vouchers have gained ground in federal family-support programmes since the early 1990s. Under this federal programme, services were previously provided through direct funding to public institutions or through grants or contracts with selected private childcare institutions, whereas recipients are now entitled to a voucher or cash benefit giving access to a wider range of care facilities.

Subsidies and tax credits conditional on documented expenses for purchase of private childcare, however, resemble voucher systems and exist in many OECD countries (Table 2).¹² Like vouchers, these subsidies and tax credits allocate public funding on a per-user basis, thereby giving parents an incentive to choose the form of childcare that is least costly and suits their needs best across different options of family-based and centre-based day care. But these subsidies and tax credits do not necessarily imply a level playing field relative to childcare facilities funded via other channels. None of the programmes reviewed in Table 2 pay more than € 500 per child per month – most considerably less – which is often not as much as for parallel public institutions funded by block grants. In many countries these subsidies and tax credits are targeted at (or higher for) low income and working families in order to improve their work incentives. Providing subsidies and tax credits rather than separate public institutions for children from these families may facilitate integration of children from different backgrounds in the same institutions. Subsidies and tax credits for purchase of childcare from competing care settings is distinguished also by parents carrying the marginal cost, which is not typically the case for public monopoly provision, where the individual users cannot affect the size of co-payments by choosing among alternative suppliers.¹³ Letting parents carry the marginal costs is warranted, provided that childcare facilities do not have local market power requiring price regulation (as indicated also earlier in Table 1).

Among private institutions, both non-profit organisations and private firms play a role with striking variation across countries. Private firms play the largest role in Australia, where the share of day care centres operated on a for-profit basis has grown during the 1990s to 73 per cent currently. In the United States, private firms supply 30 per cent of childcare services. For-profit childcare also exists in most European countries, including Belgium, Italy, the Netherlands and Portugal, primarily for children under three years, and to a much more limited extent in Finland and Norway. Interestingly, the involvement of informal family-based day care can be seen as a way of solving the monitoring problem. By choosing a day carer the parents know personally, they ensure that the carer has an incentive to give attention also to hard-to-observe service aspects, since neglect becoming apparent over time would imply losing a valued personal relationship. This has the effect of balancing short and long run incentives like the reputation concern of formal suppliers.

Table 2. **Subsidies and tax credits for purchase of child care**
Arrangements in late-1990s or latest available year

	Programme description ²	Value per month per child, euro ¹		
		-100	100-500	500-
Australia	Child Care Benefit earmarked for childcare provided in Commonwealth-approved services. All families are eligible for a minimum amount, and assistance increases as family income decreases.		x	
Belgium	Deduction reducing taxable income by 80% of actual costs of childcare. Maximum tax credit is 5-10 times higher for parents in employment than for parents outside employment.	x	x	
Canada	Limited number of subsidies for low-income families, paid directly to care providers. Tax credit for childcare expenses for working parents.		x	
Denmark	Local governments can give a subsidy to the purchase of child care from private providers or to care organised by groups of parents.		x	
Finland	Subsidy for purchase of private centre-based or family-based day care paid directly to the provider. Basic flat-rate with earnings supplements		x	
France	Subsidies for parents using registered family day carers or employing in-home carers. Tax credit for employed parents of 25% of costs of purchasing childcare and 50% of costs for employment of in-home care up to a maximum.	x	x	
Germany	Limited number of subsidies to low income parents using centre-based or family-based day care services approved by local authorities. Tax credit to working lone parents and to married couples if one parent is sick or disabled	x	x	
Luxembourg	Tax credit for the costs of (public or private) care for children under 14, reducing taxable income by documented costs up to a maximum	x		
Netherlands	Tax credit for a portion of cost for private child care up to a maximum		x	
United Kingdom	Tax credit for low- and middle-income families for child care costs		x	
United States	Limited number of subsidies for low-income parents in employment, maximum amount varies by state. Tax credit for actual childcare expenses for employed parents up to a maximum	x	x	

1. As the level of subsidies and tax credits often depends on income and other conditions, programmes can be placed in several intervals.

2. See Lundsgaard (2002) for more detailed information on the individual programmes.

Source: OECD based on national sources.

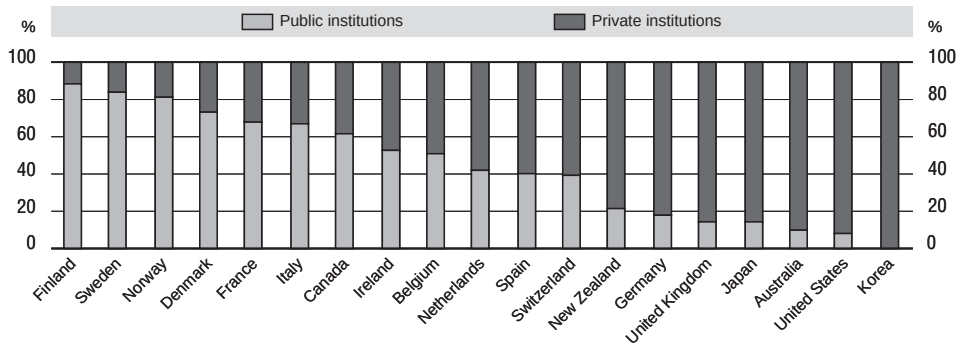
Long-term care for elderly and disabled¹⁴

The publicly funded provision of long-term care for elderly and disabled is growing in OECD countries and includes public and private residential institutions and help at home as well as subsidies for informal employment of personal attendants and tax credits and income support for relatives or friends acting as carers. At a level around 3 per cent of GDP, public expenditure on long-term care is highest in the Scandinavian countries, reflecting a relatively wide publicly funded coverage of both care in residential institutions and formal care at home, as well as demographics. Conversely, in southern Europe and Asia public and mandatory insurance expenditure is limited, as families retain a larger role in long-term care.

Providing publicly funded long-term care in private nursing homes and residential institutions typically takes the form of subsidies resembling voucher systems – either reimbursing part of the fees paid by residents or paying a subsidy directly to the institution, based on the number of residents. Consequently, the effectiveness of competition hinges on the choice of institutions made by the elderly individuals or their relatives. In Australia, the government has sought to control the prices charged by private residential institutions, making compliance with price controls a condition for receiving federal nursing home funding. And to avoid “cream skimming” and access problems for elderly in severe conditions, the Resource Utilisation Group (RUG) payment system where residents are assigned to different health status categories implying different funding rates has been adopted in the United States, Iceland and parts of Canada. The RUG system has also been tried on a pilot basis in a number of countries, including Finland, Japan, Netherlands, Spain, Sweden and the United Kingdom. For the OECD countries for which data are available, the share of private residential institutions in total capacity varies widely from less than 20 per cent in Finland, Sweden and Norway to more than 80 per cent in Germany, the United Kingdom, Japan, Australia, the United States and Korea (Figure 3). Many of these private institutions are non-profit organisations and submitted to tight public regulation, but for-profit firms operate a substantial share of institutions in Ireland, New Zealand, Portugal, the United Kingdom and the United States, accounting for 69 per cent of nursing homes in the United States.

A growing range of programmes provide benefits and tax credits for the families of the elderly or disabled to retain their role as caregivers, or for the elderly or disabled to employ a personal attendant of their own choice (Table 3). Such arrangement may facilitate very flexible services close to individual user preferences, and provided that the elderly or disabled is mentally capable and sufficiently assertive, it is likely to entail more effective monitoring of quality than with a monopoly supplier leaving more of the monitoring role to government. The size of these benefit programmes in terms of number of users varies dramatically across

Figure 3. **Public and private institutions in long-term care for elderly, late 1990s**
Share of beds in nursing homes and residential care institutions¹



1. This figure is based on collection of available national material where the exact definitions may vary. Generally only staffed homes providing nursing care and/or practical help with activities of daily living are included while long-stay hospital sections are not included.

Source: OECD based on national sources.

countries, from very few under pilot programmes to two thirds of all recipients of publicly funded long-term care in Germany. Like vouchers these programmes allocate public funding for care on a per-user basis rather than through institutions and allow the user the choice of what person should receive this public funding as caregiver. Unlike vouchers, however, the programmes in Austria, Finland and Germany allow users to spend the money on whatever purpose they want. Indeed this allows very flexible solutions including purchase of practical aids in combination with care from a personal attendant, but also brings the programme closer to income support. The personal budgets introduced in the Netherlands allow some of the same flexibility, but the budget can only be spent on care-related purposes based on the approval from a public agency. One of the policy objectives behind benefits and tax credits to support informal care is to reduce the need for more expensive formal care like in nursing homes. Even though some programmes pay substantial benefits – up to well above € 500 per month in Austria, Denmark, Finland, France, Germany and Sweden (Table 3) – these payments are still less than the cost of the alternative formal care services. In other words, making public support for informal care available as a choice, in practice works to reduce public expenditure, as relatives and other informal caregivers are likely to work more and at inconvenient hours.¹⁵ Conversely, to avoid paying publicly for within-family care that would be provided anyway, benefits cannot be paid to spouses in France and the United States and not to any relatives in the United Kingdom (Table 3).

Table 3. **Benefits and tax credits for informal long-term care**

Arrangements by 1999/00 or latest available information

	Programme description ²	Can relatives be employed?	Value per month, euro ¹		
			–100	100-500	500–
Australia	Means tested income support to carer who can only take other work for a maximum of 20 hours a week.	Yes		x	
	Cash benefit paid to relatives caring at home for an elderly who would otherwise be eligible for nursing home.	Yes	x		
Austria	Cash benefit paid to the disabled with substantial care needs. No restrictions on the use of payment.	Yes		x	x
Canada	Tax credit for low-income individuals living with or providing care for an infirm relative over 65	Yes	x		
	Subsidy to care-giver to purchase respite care without restriction on who is hired.	Yes	x		
Denmark	Disabled with substantial care needs can select a relative as carer for a maximum of six months. The person is employed by the local government on conditions similar to those of municipal care staff.	Yes			x
Finland	Benefit paid to the care-giver who may be anybody the elderly chooses. Informal caregivers obtain pension rights through municipal institutions. Received by a number of carers corresponding to 2 per cent of all elderly.	Yes	x	x	x
	Cash benefit paid to disabled or frail pensioners with no restrictions on its use. Received by 4 per cent of all elderly.	Yes	x	x	
France	Means-tested benefit to the elderly which may be either channelled to a residential institution or used for hiring a personal attendant. Relatives except spouses may be hired on the condition that they are unemployed and not receiving retirement income.	Yes, except spouses		x	x
Germany	Eligible users can choose between services and a cash benefit. Those choosing cash receive around half the value of those choosing services. There are no restrictions on the use of the cash benefit which is chosen by 50-70 per cent of eligible users.	Yes		x	x
Netherlands	Personal budget allowing the elderly or disabled to purchase care services from self-employed, private firms or non-profit institutions, employ relatives or friends, or purchase practical aids. To obtain a personal budget, users must reach a written agreement with a regional public agency stipulating rights and duties, and users are responsible for obtaining good quality care.	Yes		x	

Table 3. **Benefits and tax credits for informal long-term care** (*cont.*)
 Arrangements by 1999/00 or latest available information

	Programme description ²	Can relatives be employed?	Value per month, euro ¹		
			–100	100-500	500–
Sweden	Benefit paid to relative or friend taking leave to care full-time for a terminally ill person.	Yes		x	x
United Kingdom	Benefit paid to carer who must have low income and not be a full-time student.	No		x	
United States	Cash benefits paid to elderly or disabled. Programme design varies across states. Relatives can be employed, but in most states not spouses.	Yes, except spouses in most states	x	x	

1. As the level of payments typically depends on measures of need, such as the extent of disability, programmes can be placed in several intervals.

2. See Lundsgaard (2002) for more detailed information on the individual programmes.

Source: OECD based on national sources.

Contracting with a limited number of private firms and non-profit organisations for the provision of publicly funded formal help at home is occurring in some countries. In some cases, contracts are awarded based on a standard competitive tendering process, where suppliers bid on the price. In other cases, contracts are made with a set of suppliers allowing users a choice of supplier, but with an option for government to select among suppliers in subsequent contracting rounds thereby adding to the competitive pressure on suppliers. Supplying formal help at home through public institutions nevertheless remains the dominant mode of service provision in the Nordic countries as well as the United Kingdom.

Employment service

It is common among OECD countries to involve a broad range of public and semi-public education institutions as well as private firms in the training of job-seekers, while individual assistance and matching of job-seekers with vacancies is typically not outsourced. Australia and the Netherlands, however, have recently reformed their publicly funded employment services, and private suppliers – including non-profit community-based organisations as well as private firms – have now taken over the individual assistance of job-seekers (Box 4). Similarly, in the United States federal programmes have given local authorities the option of contracting with private suppliers for all kinds of employment services. In other OECD countries reforms have gone less far. In the United Kingdom as well as Sweden and

Box 4. Employment Service in Australia and the Netherlands

In **Australia** the public Commonwealth Employment Service (CES) was replaced by Job Network in May 1998. Under the new scheme a broad range of non-profit organisations and private firms now provide publicly funded employment services, including the matching of job-seekers with existing vacancies, job search training and individually-tailored intensive assistance to more disadvantaged job-seekers. To access Job Network services, job-seekers must be referred by Centrelink, a national agency that also processes claims and payments for a range of benefits including unemployment assistance. Having been referred, job-seekers may choose individually among the suppliers already approved in a competitive tendering process.

Providers are paid according to their performance, as for instance, commencement of a job training course entails some payment to the provider while a larger fee is paid if a participant gets a job afterwards and if he or she succeeds in keeping the job for at least 13 weeks. For some fees, the level has been determined by bids made in the competition for tenders. The re-tendering in 2000 following the first two years of the Job Network allowed the authorities to select extensively among the market participants, and suppliers that were awarded contracts for the second Job Network had, in the first Job Network, a placement performance 25 per cent above the average for all providers.

Opening the provision of employment services to competition has entailed a marked restructuring through entry of new providers, some aiming at narrow user segments, others being broader in coverage. In the second contract period stretching from 2000 to 2003, Job Network counts over 200 providers. Community-based and charitable organisations have a market share of 45 per cent, and private companies have a share of 47 per cent. The public agency succeeding CES, called Employment National, now primarily plays a role in the traditional function of matching job-seekers with vacancies, while its market share of intensive assistance to disadvantaged job-seekers has dropped to 1 per cent. 15 per cent of the providers have specialised in providing services only to targeted groups on the labour market, including disabled and indigenous people. Moreover, the number of sites in regional Australia from which the employment service is available has doubled with the second contract period, resulting from a shift towards smaller geographical tendering blocks, allowing providers to recover the costs of operating in remote areas through more differentiated subsidies.

In the **Netherlands** a contracting system has been in operation since January 2001. Dutch becoming unemployed go through the public Organisation for Work and Income (CWI) which provides advice and matching of job-seekers with vacancies based on its national database. Those eligible for unemployment benefit or disability benefit are then referred to the public agency UWV which handles benefit claim assessment and payments, and which is responsible for reintegration assistance for job-seekers but is obliged to contract with private non-profit or for-profit suppliers. Those eligible for subsistence benefit are referred to their municipality which handles benefit payments and provides reintegration assistance either in-house or – as they are now encouraged to – via contracted suppliers.

Box 4. **Employment Service in Australia and the Netherlands**

The contracting procedures followed by the UWV is based on a relatively detailed system of 22 target groups defined by different conditions or handicaps making it difficult for the job-seeker to find employment. Larger target groups are then further subdivided by economic sector and finally region. For each segment only one or a couple of contracts will be awarded based on a competitive tender, implying no or a limited choice for job-seekers. Suppliers bid for contracts by stating a price per job-seeker served, and are then paid typically half this rate when a job-seeker has received assistance and the other half, plus a bonus, if the person is subsequently employed. Substantial vocational training is funded separately and does not depend on the employment outcome.

The UWV has contracted with a total of 41 suppliers for operation during 2002, the now privatised former public supplier, Kliq, being the largest with a 17 per cent market share. The rest of the market is dominated by large suppliers associated with the former social insurance agencies, insurance companies and health and safety services, but still with a lot of mobility as from 2001 to 2002, 18 new suppliers were awarded contracts, many being smaller start-ups.

Sources: OECD (2001a), Riggs (2000), Webster and Harding (2001) and Struyven and Steurs (2002).

other Nordic countries, former public agencies supplying training for job-seekers have been transformed into independent institutions, and in France associations play a large role in publicly funded training of job-seekers. Finally, to improve the management of employment services within the public sector, Switzerland has developed detailed performance measures facilitating benchmarking. Employment services typically account for only a small fraction of GDP, but are still important, as the costs of ineffective services, in terms of benefit payments, can be high.

Crafting appropriate economic incentives for suppliers of employment services requires careful attention to the performance indicators used in funding mechanisms. Exactly what type of services each user needs varies much more for training and job-search assistance than for any other service analysed in this article. Resolving the principal-agent relationship between government as funder and the suppliers of employment services via a very detailed and comprehensive contract is therefore not feasible. Moreover, as a significant portion of the job-seekers may lack motivation (as indicated also earlier in Table 1), user choice alone does *not*

ensure effective competition – with users monitoring the agents on behalf of the principal by actively selecting the suppliers giving the most adequate and effective service. When involving alternative suppliers in employment services, OECD countries therefore typically rely on relatively flexible contracts, with payment based on elaborate outcome indicators in order to accommodate shifting needs over time, and to set a focus on re-employment of job-seekers thereby avoiding supplier-induced demand for ineffective procedures. Letting funding depend on outcome indicators such as the share of job-seekers that are in employment six months after going through training or job-search assistance, however, strongly enhances the incentive for cream skimming; even if the training or job-search assistance is highly effective in raising the likelihood of subsequent employment, individual characteristics and abilities may still matter much more. To meet this problem, job-seekers are assigned to contracted suppliers of employment services by a government agency in both Australia and the Netherlands.¹⁶

Enforcement of active participation by job-seekers lacking motivation is important for employment services to be effective and requires special attention as there may be legal restrictions on the extent to which contracted suppliers can apply economic sanctions to job-seekers. In Australia this has been solved by a procedure whereby the private suppliers notify Centrelink if a job-seeker does not show up for training or other assistance appointments. Centrelink then has the legal authority to withhold income support payments until the person attends an interview at Centrelink. If a reasonable excuse is provided, payments will be restored from the date of suspension. This procedure is, in fact, similar to what exists in most countries with public employment service agencies.

Outsourcing of support functions, contracting and public private partnerships

Sub-contracting for support functions can be an alternative or additional way of introducing competition, even if final services are delivered through a monopoly. Outsourcing of this kind plays some role in all OECD countries – but the institutions supplying publicly funded services seem to retain support functions in-house more often than do firms in business service sectors. The input combinations used by different sectors can be analysed using input-output statistics (Figure 4).¹⁷ On average, public administration and defence buy support services from firms in telecommunication, transport, catering, insurance, IT, real estate, and other business service sectors, with the volume corresponding to roughly 10-20 per cent of their production value. Australia, which has actively pursued contracting-out as a policy of public management reform, stands out with a higher share. Comparing the input composition of different sectors is inherently difficult where production processes are not alike. Still, business services including accounting, auditing, consultancy, architecture, engineering and legal services may resemble the activities of public administration and therefore its input composition (shown in the first columns)

Figure 4. **Sub-contracting, late 1990s**

Composition of inputs as a share of production value, based on input-output statistics

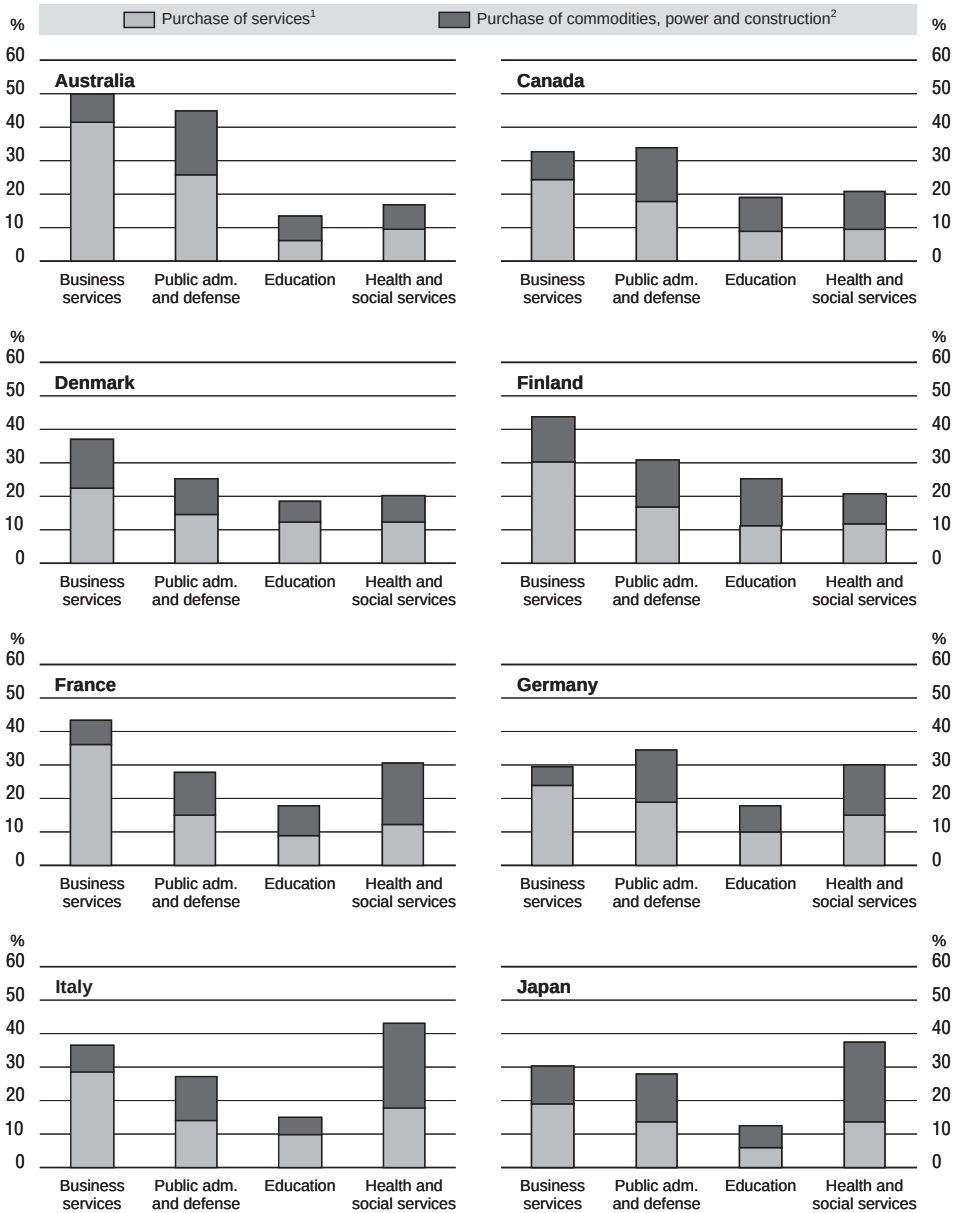
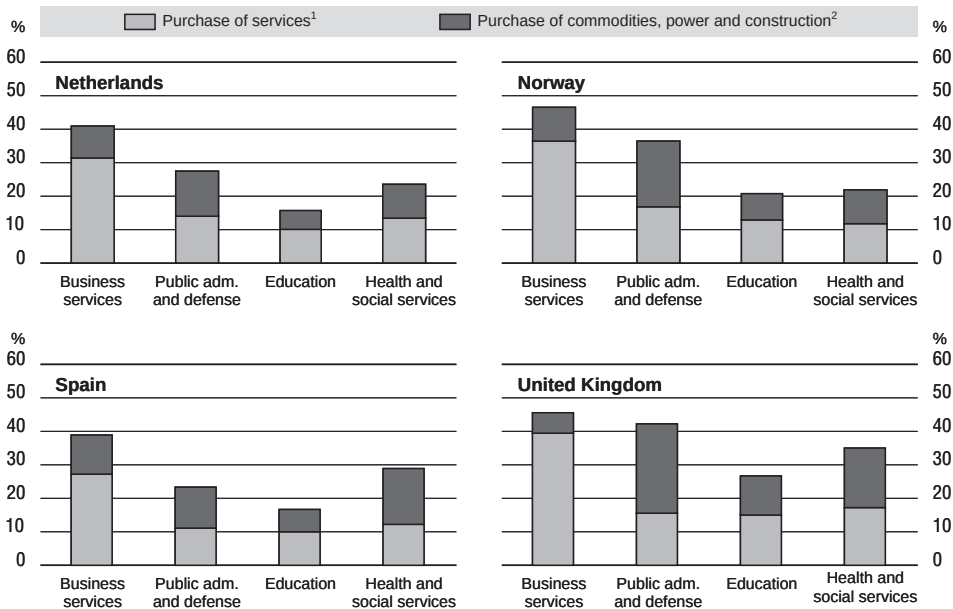


Figure 4. **Sub-contracting, late 1990s (cont.)**

Composition of inputs as a share of production value, based on input-output statistics



Note: Data refer to 1998 for the Netherlands and the United Kingdom, 1997 for Canada, Denmark, Japan and Norway, 1995 for Australia, Finland, France, Germany and Spain, and to 1992 for Italy.

The figure shows what sectors supply the inputs used by business services, public administration and defence, education, and health and social services respectively. The remaining part of production value reflects value added in the firms and institutions internally, *i.e.* wages and operating surplus. Purchases from and payments to and among public administration, defence, education, health, social and community services have been eliminated, as statistical methods differ across countries. The business services sector shown for comparison in the first columns includes accounting, consultancy, architecture, engineering and legal services, ISIC 36. Public administration includes also agencies for compulsory social security schemes.

1. Services refers to input from telecommunication, transport, insurance and other kinds of business service sectors, ISIC 27-36.

2. Commodities, power and construction refers to input from ISIC 1-26.

Source: OECD, STI/EAS based on input-output tables from national accounts.

may be used as a rough benchmark. Indeed, in all the countries analysed, the production of these business services involves a larger share of sub-contracting for support services. The magnitude of the difference may indicate a scope for increased sub-contracting in the public administration of OECD countries. For education, and in some countries also for health and social services, the share of purchased service inputs is still lower, but for these sectors the business service sector may be less applicable as benchmark.

Support functions can also be outsourced via intra-governmental contracting. For example, most government-owned buildings used by universities and federal ministries in Austria have been transferred to the fully government-owned corporation *Bundesimmobiliengesellschaft* (BIG), and in other countries including Denmark, the Netherlands, Norway and Sweden, similar reforms have been implemented during the last decade. Such intra-governmental contracting may promote economies of scale and specialisation in building maintenance, cleaning and security services, but also improve the allocative flexibility for public institutions, as long as the buying agency has some discretion to decide on where to buy the service. Indeed, charging a rent reflecting the market value may induce a change to more appropriate facilities in situations where public agencies for historical reasons occupy buildings that match their current needs poorly.¹⁸

While the review of childcare and long-term care in earlier sections showed a wide variation with countries like the United States in one extreme having large involvement of private and for-profit suppliers and with the Nordic countries in the other extreme having mainly public and some non-profit suppliers, there does not seem to be a similar pattern for technical services. Comparing information from detailed surveys and government accounts data for the United States, Norway and Denmark shows that the extent of contracting for technical services like waste collection, and street repair and maintenance is fairly similar for these countries (Box 5).

Public private partnerships based on comprehensive contracts with private finance of investment are used frequently in the United Kingdom. Across OECD countries, public agencies rarely undertake the construction of physical assets like roads and school and hospital buildings, but rather contract with private construction companies. Beginning in the early 1990s, however, central and local governments in the United Kingdom have established a large number of more comprehensive contracts where private investors finance, design, build, maintain and operate facilities, meaning that government buys a stream of services rather than an asset, and pays according to a formula depending on availability and maintenance status of facilities. The cumulative net present value of expected future government payments under these contracts is close to 4 per cent of one year's GDP (Table 4), and while construction and maintenance of physical assets, such as roads, railways and buildings for hospitals and schools account for most contracts, the Public Private Partnership programme has been broadened to other types of assets, like IT-systems, and to encompass the full operation of services such as prisons. Most other European countries are systematically exploring the options for such comprehensive private-finance contracts in relation to new infrastructure investment, but while some, notably the Netherlands have adopted the approach for a number of large-scale projects, other countries have returned to the traditional model where government owns the asset. In Australia and the United States private

Box 5. Contracting-out in the United States, Norway and Denmark

Information on the involvement of external suppliers at a detailed service level is shown in the table for the United States, based on a nation-wide survey of cities and counties, and for Norway and Denmark, based on the accounts of municipalities and counties. Given the differences in sources, described in Lundsgaard (2002), numbers should be compared across countries with caution. Still, the following picture emerges:

- In basic technical service areas, such as waste collection, street repair and maintenance, the average extent of contracting-out is comparable in the United States, Norway and Denmark, although in Norway much of this is intra-governmental contracting.
- Some technical services reveal interesting cross-country differences. For public bus transport systems, the involvement of private operators appears to be considerably higher in Norway than in the United States. For fire protection, voluntary (non-profit) fire brigades are common in the United States, but contracting with private firms is largely non-existent in both the United States and Norway. In contrast, one quarter of fire protection is contracted for in Denmark, most of it with a private firm.
- In recreation and culture, there is a tendency for more involvement of private suppliers in the United States than in the Scandinavian countries, including private firms maintaining and administrating parks, sports facilities and cemeteries and non-profit organisations operating museums and public libraries.

Table Provision of publicly funded services in local governments, cities and counties

	United States		Norway		Denmark
	Other parts of government	Private firms and non-profits	Other parts of government	Private firms and non-profits	Private firms and non-profits ¹
Waste collection	3	62	40	27	75
Street repair and maintenance, snowplowing, sanding	5	23	23	2	39
Public bus transport	40	29	7	83	
Fire and accident protection	9	17	12	3	28
Ambulance services	12	45	5	59	
Operation and maintenance of parks, sports facilities and cemeteries	8	21	4	2	13
Museums	20	54	3	24	18
Public libraries	33	11	1	0	12

Note: See Lundsgaard (2002) for description of sources and methods.

1. Includes purchase of final services as well as intermediate services used by public entities supplying the final service, creating an upward bias compared to the numbers for contracting with private firms and non-profits in the United States and Norway.

Source: OECD based on national sources.

Table 4. **Public private partnerships (PPPs) involving private finance of investments**
Contracts concluded up to mid-2002

	Value of contracts ¹		Examples and comments
	Euro bn	Per cent of GDP	
Australia			Private prisons.
Austria/Hungary			The Budapest-Vienna superhighway completed in 1996 was built and operated by a private consortium. Following public demand for reduced tolls, government now pays a subsidy.
Finland			The Järvenpää-Lahti highway including re-construction and maintenance of 69 km highway for 15 years. Payment to the private consortium is based on the traffic volume (shadow tolls), but with a fixed upper limit to the total payments. Current policy, however, is only to make design-and-build contracts, while the public road administration will be in charge of maintenance.
Transport	0.2		
Total	0.2	0.1	
France			Out of total 8 800 km of motorway, 7 300 km are subject to tolls, out of which 800 km is operated by private companies. Within the original framework established in 1970, concessions have been granted without competition but according to the financial position of the respective companies, thereby financing new investments by toll receipts from older roads. The figures here include only projects under the new framework with concessions now being granted on the basis of competitive tendering, making them comparable to UK PPP-projects. Currently, government is preparing to sell the public companies operating toll roads.
Transport	1		
Total	1	0.1	
Ireland			The National Road Authority has implemented some PPP projects and is now developing a set of schemes.
Netherlands			The first elements of the High Speed Line South railway from Amsterdam to the Belgian border to be completed in 2005 and the A59 Rosmalen-Greffen road are being contracted. More large scale rail and road projects are likely to be organised as PPPs. Going beyond transport infrastructure, the use of PPPs is expanding to cover water purification, urban development and research/knowledge centres.
Transport	1.4		
Water purification	0.5		
Total	1.9	0.5	
Poland			In 1994, a program for a total of 2000 km motorway was initiated, giving concessions to private firms to construct and operate toll-roads. Until 2000 however, only 100 km of new motorway had been built, and toll revenues are now supplemented with public funding through road-availability payments.
Portugal			Beginning with roads, the application of private finance has expanded rapidly with 14 deals being concluded in 2000 across the areas of transport, water and energy.
Sweden			Railway from Arlanda airport to Stockholm.
Switzerland			For the new Transalpine Railway Lines, totalling euro 10 bn, PPP models have been considered, but for the basic construction of tunnels etc., work is now starting in a traditional publicly-financed framework.

Table 4. **Public private partnerships (PPPs) involving private finance of investments**
Contracts concluded up to mid-2002

	Value of contracts ¹		Examples and comments
	Euro bn	Per cent of GDP	
United Kingdom			The PPP model is used to an increasing extent in a wide range of areas, including roads, railways, IT-systems, prisons and buildings for schools and hospitals. By mid-2002 approximately 500 deals representing an estimated total value of euro 50 bn had been signed – the bulk of which since 1996. A considerable number of deals are announced and being prepared that will add to the values shown here.
Transport	29.1		
Health	7.3		
Education	4.3		
Public safety	1.8		
Defence	5.0		
Other areas	1.8		
Total	49.3	3.7	
United States			While toll roads are common in the United States, they are typically constructed by publicly-owned companies. Consequently, private capital is typically involved only through debt finance. Private prisons hold around 3 per cent of prisoners.

1. To illustrate the magnitude of PPP contracts accumulated during the last decade, the table shows the total net present value of projected future payments throughout the duration of these contracts. Comparing these stocks to the flow of annual GDP illustrates *how much* and for *how long* PPP contracts have been used. Notice that contract net present values include investment as well as costs of maintenance and other services.

Source: OECD based on national sources.

prisons are in several cases run as long-term contracts, with government payments based on criteria similar to those used in the United Kingdom under the public private partnership approach.¹⁹

CONCLUSIONS AND POLICY IMPLICATIONS

The picture that emerges from this article is that public funding and service supply are increasingly being de-coupled in the interests of improving service provision and cost efficiency. Public funding does not necessitate service supply via traditionally organised public institutions. Instead, allowing the *agents* supplying services more flexibility while shaping their incentives may be a better solution for government as a *principal* in terms of creating clear demand signals and promoting efficiency, and a range of different institutional approaches are being used to that end. These include the introduction of performance criteria for in-house public production, contracting-out, and combinations of user choice arrangements to introduce competition in service supply. At a technical and practical level,

whether, and to what extent, competition can be introduced, and by what instruments, depends on the characteristics of the service provided.

- Benchmarking and internal performance contracts are applicable for most services including police and public administrative functions.
- Competition through competitive tendering and contracting is appropriate for most technical functions such as cleaning, waste collection and maintenance of buildings and equipment, and the available data indicate that this frequently takes place in OECD countries. For publicly funded services used by individuals, competitive tendering and contracting with one supplier for a given geographical area or user segment may also be relevant when individual choice is considered not to entail sufficient competitive pressures or to result in counterproductive interaction among suppliers or supplier-induced demand. For employment services emphasis is typically more on contracting than on user choice for these reasons.
- Competition through user choice can be introduced via per-user funding of public suppliers, via tax credits or vouchers. In post-compulsory education, users can typically choose among different public institutions, while less so in compulsory education. In childcare and long-term care for elderly and disabled many OECD countries rely on a broader mix of suppliers by giving subsidies/tax credits for the purchase of private care and supporting informal caregivers financially.

Overall, the pattern of private sector involvement in publicly funded service provision appears to be quite variable, but the process of introducing competition does seem to have become important, in many cases, to public expenditure reform. What is characteristic about these reforms is *not* a marked shift towards privatisation as in the case of network utilities and state owned enterprises in other sectors in many OECD countries. Public institutions in education and care for children and elderly are rarely sold to private investors but rather given more operational flexibility, and reallocation of activity among different suppliers following reforms typically takes place only gradually – except in the case of employment services in some countries. What is characteristic is the development of regulation necessary to make competition effective and avoid negative side effects. Funding rates reflecting the different resource requirements of individual users can be necessary to avoid cream skimming and undesirable sorting in schools as well as nursing homes and employment services. Also, price regulation for the charges paid by users can be necessary to contain local monopolies and protect users being locked in as a result of sunk costs from shifting supplier. Published evaluations of suppliers can be essential to help users make an informed choice and to strengthen reputation effects thereby inducing suppliers to maintain a high level of quality throughout. Elaborate forms of performance related funding can be necessary to ensure a focus on outcomes rather

than procedures in areas like employment services. And with comprehensive contracting involving private finance of infrastructure, a series of obstacles may weaken competitive pressures and call for cautious contractual design. Advancing the understanding of regulatory issues like these based on OECD country experience is key to successful implementation of competition in publicly funded services.

Implementing reform requires attention not only on the endpoint, but also on how to manage the transition process. Given the complex regulatory issues involved, gradual transition may have the important advantage of facilitating learning and allowing fine-tuning of the system. Indeed, the contracting regimes for employment services in Australia and Netherlands are being adjusted during their implementation and with consecutive contracting rounds. Similarly, a gradual transition may have the advantage of allowing alternative suppliers time to establish and grow, preventing capacity constraints arising from sudden shifts in demand. Allowing more experimentation and diversity at a local level can be instrumental in both these respects; by facilitating learning and gradual industry growth, as has happened for development of user choice in care, and contracting more broadly in the Scandinavian countries, where local governments have relatively wide responsibilities. Making competitive tendering compulsory for specific services managed by local governments has typically been less successful. Instead, improving comparability of costs across suppliers by requiring local governments to use cost based accounting and treating public and private suppliers similarly with regards to value-added taxation, seems to be a more fruitful approach. When public organisations lose contracts or when users choose alternative suppliers, managing downsizing is a crucial transition issue in order not to accumulate dead-weight costs in terms of spare capacity.

NOTES

1. See the special issue of this journal on regulatory reform in network utilities and other sectors: *OECD Economic Studies*, No. 32, 2001/1.
2. See the annex in Lundsgaard (2002) for a more rigid microeconomic analysis of the incentives from competition and non-government ownership.
3. In the Netherlands, legislation guarantees unchanged employment conditions when public employees are transferred to the contractor winning a competitive tender. More generally, where public employees have civil servant status and enjoy special job protection and pension rights, transformation into private law employment relations and funding accumulated pension obligations is an important prerequisite to making contracting-out feasible, as reviewed by Debande (1999). See also Martin (2002) for successful and unsuccessful examples of building good labour relations into the contracting process.
4. Abstracting from any positive effects on labour productivity, higher wages for a given level of employment appear as a problem when seen from the perspective of the public purse, but this transfer of surplus resulting from changes in market power is not a problem from an overall economic perspective. Generally, market clearing from non-coordinated competition entails a more efficient allocation than one side having monopoly or monopsony power. However, as public funding is based on distortionary taxation, such transfers to employees do entail an overall economic efficiency loss.
5. As an illustration of how important and complex these mechanisms can be, consider the case of housing rent vouchers to low-income groups in the context of a large stock of old worn-down buildings. Such a situation can exist if rent regulation makes refurbishment economically unattractive to landlords, or in poor and deteriorating neighbourhoods where market clearing rents fall below the level necessary to cover the fixed costs of new construction works, but remain sufficient to cover the operating costs of existing buildings. In this context, the effect of housing vouchers to low-income groups may be higher rent levels with little improvement in the actual housing conditions for low-income families. In fact, Susin (2002) finds that housing vouchers distributed to some low-income groups, but not all, in the United States, have increased market rents to an extent that implies an increase in rent expenditure for non-recipient low-income families that more than offset the subsidy voucher recipients.
6. Scarcity of specialised production factors such as trained professionals may reinforce the budget pressures via price and wage increases in addition to quantity increases.
7. The importance of the number of professionals for supplier-induced demand has mostly been researched for health care, with Richardson (2001) giving a recent overview. Often, the number of doctors is found to be a stronger determinant of demand than user charges.

8. Most private schools in OECD countries have religious roots while a smaller share of private schools have been founded based on specific pedagogic ideas.
9. Allowing private schools to give tuition discounts to talented students may in a similar way contribute to inequality of education outcomes, since if motivated and bright students raise the performance of other students in their peers, any such policy that allows above average talented students to attend elite schools will reduce the achievement of students in the remaining schools. In the United States, propensity to attend private tuition-charging schools rises with income and ability, as documented by Eppele *et al.* (2000). One reason for this is the tuition discounts given by some expensive private schools to particularly talented students. Considering this as a trade whereby high-ability students from low-income families sell their positive contribution to their peers in exchange for access to the superior teaching provided at elite schools, Eppele and Romano (1998) point out that it is inefficient as the loss for pupil peers in public schools is not priced.
10. The description draws on Besharov and Samari (2000), Meyers and Gornick (2000), OECD (2002), OECD (2001c), Rostgaard and Fridberg (1998) and national sources.
11. Some operational grants still exist for institutions that are deemed part of the education sector and in some states.
12. Parental leave schemes are not included in the table, as they reflect a different category of care arrangement. Tax credits for employers contributing to childcare expenses exist in some countries as well, including Belgium, Italy, the Netherlands and the United States.
13. For tax credits, users carry the full marginal costs only when costs reach or supersede the maximum tax credit.
14. This section draws on Jenson and Jacobzone (2000), OECD (1996) and a range of national sources.
15. The experience from some of these programmes has raised concerns about the employment conditions of the personal attendants. For example, surveys from Austria show that only few have a formal contract and many are paid on an irregular basis.
16. Analysing employment service provision under the Job Training Partnership Act in the United States, Heinrich (2000) finds that non-profit suppliers were not more likely to serve disadvantaged clients, and that there were no consistent difference in the effectiveness in increasing participants' earnings and employment rates across for-profit, non-profit and public suppliers. Conversely, funding incentives improved the performance for all forms of service suppliers.
17. For example in France, input from other sectors account for 27 per cent of production value or output from public administration and defence. Around half of these inputs come from service sectors, while the other half is commodities, power and construction inputs. The 73 per cent of production value not reflecting inputs is the value added of the public administration and defence sector. Institutions in public administration also pay for/purchase some services from each other, but these have been eliminated from Figure 4, as statistical methods differ across countries.
18. Transferring assets to a separate government-owned corporation is not recorded as revenue and therefore does not affect general government deficit/surplus, but subsequently funding construction projects by borrowing within such a separate government owned corporation is off the balance sheet of general government. However, this in

itself does not reduce future repayments and therefore should be expected to have largely the same macroeconomic effects as public debt.

19. Seen in a historical perspective, these comprehensive contracts involving private finance follow a long tradition in many countries of giving concessions to private companies to develop, construct and operate infrastructure utilities while charging the users and not necessarily involving government in any financial transactions. For example in France, when channels, railways, city transport and gas and electricity utilities were initially constructed during the 19th century, it was largely based on private equity finance, and by 1860, infrastructure companies accounted for almost 70 per cent of the total capitalisation at the Paris stock exchange. In more recent history, private finance has played a role in the construction of French highways as toll roads (Table 4). What is new about the infrastructure projects under the public private partnership programme is that services are now “sold” to government. Instead of collecting tolls from drivers, the contractor of a PPP-highway receives “shadow-tolls” from government, as, for example, in the case of the *Järvenpää-Lahti* highway in Finland. The issue of giving the operators incentives to efficient design, construction and maintenance is thereby de-coupled from the question of funding.

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TAX RATIOS ON LABOUR AND CAPITAL INCOME AND ON CONSUMPTION

David Carey and Josette Rabesona

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INTRODUCTION

In order to assess the effects of taxation on labour markets, investment, savings and redistribution, it is necessary to construct measures that take account of statutory tax rates, rules that determine the tax base and credits. One approach is to calculate effective tax rates for particular household types or investment/source of finance combinations based on information about these tax factors. This approach, which is used in OECD *Taxing Wages* to calculate average effective tax rates on labour and in Devereux and Griffith (1998) to calculate average effective tax rates on capital, requires a great deal of detailed information and the combination of many individual cases to obtain representative aggregate estimates. Another approach, pioneered by Mendoza *et al.* (1994), is to calculate tax ratios,¹ which relate realised tax revenues directly to the relevant macroeconomic variables in the national accounts. This approach is relatively simple, captures the overall effects of deductions, credits and taxpayer behaviour. However, it relies on a number of limiting assumptions, most of which are needed to allow the available data to be used to form estimates of the value of revenue streams and the relevant macroeconomic variables. Moreover, the estimates are backward looking and, in the case of capital tax ratios, may not be well adapted to assessing the effects of taxation on both investment and saving in the presence of cross-border capital flows. Despite these limitations, tax ratios may provide a useful starting point for assessing tax burdens on labour and capital, notably to respond to claims that globalisation has resulted in a shift in the tax burden from capital to labour, and for analysing the effects of taxation on labour markets. However, this should be complemented by a broader approach when examining the economic effects of taxation that also considers average and marginal effective tax rates and, if possible, the effects of tax shifting on final tax incidence.

Tax ratio estimates could be improved by relaxing some of the unrealistic assumptions made by Mendoza *et al.* (1994). This paper proposes a number of changes to make the underlying assumptions more realistic. These changes reduce the increase in labour income tax ratios and raise the increase in capital income tax ratios compared with the Mendoza estimates, overturning the conclusion that there has been a relative shift in the tax burden from capital to labour in recent decades. The two data sets are, however, highly correlated in most countries. Even these revised tax ratio estimates are based on a number of unrealistic

assumptions that could not be systematically relaxed owing to a lack of data for certain countries and/or periods. Relaxing these assumptions where possible sometimes results in large changes in tax ratios, especially when assumptions concerning the treatment of self-employed income and personal capital income are modified. These results reinforce the view that caution is required when using tax ratios to support a given policy stance or to advocate a particular direction for reform.² They should be used in conjunction with more broadly based analyses and with other tax indicators and information that can corroborate the story they tell.

The methodology and underlying assumptions used to calculate tax ratios are outlined in the next section along with some of the data problems that are encountered. Revised tax ratios are presented in the following section, together with the main differences from tax ratios calculated using the Mendoza equations and simple regressions relating the revised ratios to the major macroeconomic variables of interest. Finally, the results of the sensitivity analysis to relaxation of some of the remaining assumptions that appear to be unrealistic are presented.

METHODOLOGY

General approach, underlying assumptions and data problems

The Mendoza *et al.* (1994) methodology involves relating realised tax revenues to estimates of the associated tax bases. Tax shifting is not taken into account: the initial impact of taxes is assumed to be the final incidence. Hence the tax burdens calculated using this methodology will not correspond to the burdens impacting on economic incentives if, as is likely, there is tax shifting. The tax treatment of losses, cross-border flows and tax planning are also ignored, further reducing the relevance of some tax ratios (notably, capital income tax ratios) as an input to analyses of the effects of taxes on relevant macroeconomic variables. Tax revenue data come from OECD *Revenue Statistics*. This contains time series on revenue streams from various types of tax – on personal incomes, corporate profits, sales, property, etc. – as reported by member countries. Estimates of the value of the associated tax bases come from national accounts. As such data do not readily fit with the tax revenue data, a number of assumptions – some of them very restrictive – are required to align the two data sets. One particular problem of fit concerns data on household taxes. These data do not distinguish between taxes paid on labour- and capital income. Mendoza *et al.* (1994) deal with this problem by assuming households pay the same effective tax rates on capital and labour incomes (*i.e.* they assume that the labour component of the household income tax is proportional to labour's share in household income). OECD data on statutory tax arrangements show that this assumption is unlikely to be a good one for many OECD countries (OECD, 1994). Some have dual income systems that treat capital income differently from labour income and/or

provide relief from double taxation of dividends. There are also special arrangements for pensions, owner-occupied housing and individual share ownership.

Another problem is that no distinction is made in national accounts between the labour and capital components of self employed income. As noted above, Mendoza *et al.* (1994) assign all self-employed income to capital. Alternative approaches, presented in the section on results, are to assign part of this income flow to labour and part to capital or to exclude taxes paid on this income from estimates of the tax ratios on labour and capital. The former entails making an estimate of labour income of the self-employed, which is an inherently difficult task that could be approached in a variety of ways, while the latter approach “gets around the problem” by setting it aside. Other problems that arise from using national accounts data are that:

- The definitions of national accounts data categories (*e.g.* the definition of the corporate and quasi-corporate sector) may not be fully comparable to analogous tax revenue data categories (*e.g.* corporate income taxes paid);
- The procedures for estimating the consumption of fixed capital, which is used in calculating net operating surplus, are not comparable across countries (and this has an important influence on the estimates);
- National accounts data may reflect avoidance and evasion incentives created by national tax systems. For example, if a country's tax policies favour capital income over labour income, then there would be an incentive to disguise labour income as capital income.³ The potential for switching reduces the reliability and comparability of estimates of the tax bases associated with capital and labour; and
- It also should be borne in mind that there are differences between the concepts of a comprehensive tax base in national accounts and in tax codes, especially for capital income. For instance, capital gains would be included in comprehensive income in a tax code but not in the national accounts (because there is no value added). Similarly, the payment of dividends increases the tax base in countries with a classical system for taxing corporate earnings (*i.e.* there is double taxation of dividends) but does not increase capital income in the national accounts (paying dividends does not create value added). Another problem is that *Revenue Statistics* are on a cash basis⁴ whereas national accounts are on an accrual basis. This means that the timing of the two data sets does not correspond.

Household income tax ratio, τ_h

Mendoza method

In order to calculate the labour (τ_l) or capital (τ_k) income tax ratios, it is necessary to calculate the household income tax ratio (τ_h). This is used to allocate per-

Table 1. **Mendoza and revised tax ratios**

Mendoza method	Revised method	
	Social security contributions not deductible	Social security contributions deductible
Tax ratio for total household income, τ_h $\tau_h = 1100 / (\text{OSPUE} + \text{PEI} + W)$	Same as Mendoza	$\tau_h = 1100 / (\text{OSPUE} + \text{PEI} + W - 2100 - 2300 - 2400)$
Tax ratio on labour income, τ_l $\tau_l = (\tau_h * W + 2000 + 3000) / (W + 2200)$	$\tau_l = (\tau_h * W + 2100 + 2200 + \alpha * 2400 + 3000) / (\text{WSSS} + 3000)$ $\alpha = W / (\text{OSPUE} + \text{PEI} + W)$ = share of labour income in household income $\beta = 1 - \alpha$ = share of capital income in household income	$\tau_l = (\tau_h * (W - 2100 - \alpha * 2400) + 2100 + 2200 + \alpha * 2400 + 3000) / (\text{WSSS} + 3000)$ $\alpha = (W - 2100) / (\text{OSPUE} + \text{PEI} + W - 2100 - 2300)$ Same as not deductible
Tax ratio on consumption, τ_c $\tau_c = (5110 + 5121) / (\text{CP} + \text{CG} - \text{CGW} - 5110 - 5121)$	$\tau_c = (5110 + 5121 + 5122 + 5123 + 5126 + 5128 + 5200 - 5212) / (\text{CP} + \text{CG} - \text{CGW})$	Same as not deductible
Tax ratio on labour income and consumption combined, τ_{LC}	$\tau_{LC} = \tau_l + (1 - \tau_l) * \tau_c$	Same as not deductible
Tax ratio on capital income, τ_k $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI}) + 1200 + 4100 + 4400] / \text{OS}$	$\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI}) + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$	$\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - 2300 - \beta * 2400) + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$

sonal income tax to capital and labour under the assumption that the average tax rate paid by each factor of production is the same (*i.e.* τ_h). (The results of sensitivity analysis exploring the importance of this assumption for the estimated labour and capital tax ratios are reported in the section on results.) The household income tax ratio is equal to personal income tax receipts divided by household income (Table 1). Note that in some countries,⁵ enterprise taxes are included in personal income tax (1100); symbols and mnemonics are described in Box 1. Household income comprises operating surplus of the private unincorporated sector (OSPUE),⁶ property and entrepreneurial income (PEI)⁷ and dependent wage income (W). Note that imputed rentals on owner-occupied housing are included in OSPUE and that pension fund and life insurance earnings, which are imputed to households in the national accounts, are included in PEI.

Box 1. Variable names and symbols used

The tax revenue data are identified using the OECD system (OECD *Revenue Statistics*):

- 1100 Taxes on income, profits and capital gains of individuals or households.
- 1200 Taxes on income, profits and capital gains of corporations.
- 1300 Unallocated taxes on income, profits and capital gains.
- 2000 Total social security contributions (2100 is paid by employees; 2200 by employers; 2300 by the self-employed and persons outside of the labour force; 2400 is unallocated).
- 3000 Taxes on payroll and workforce.
- 4000 Taxes on property.
- 4100 Recurrent taxes in immovable property.
- 4400 Taxes on financial and capital transactions.
- 5110 General taxes on goods and services (5111 VAT).
- 5120 Taxes on specific goods and services (5121 excise taxes; 5122 profits of fiscal monopolies; 5123 customs and import duties; 5125 taxes on investment goods; 5126 taxes on specific services; 5128 other taxes).
- 5200 Taxes on use of goods and performances [5212 taxes on motor vehicles paid by others (*i.e.* other than households)].
- 6100 Other taxes paid solely by businesses.

The variables from *National Accounts* are:

- CP Private final consumption expenditure.
- D Household dividend receipts.
- EE Dependent employment.
- ES Self-employment.
- CG Government final consumption expenditure.
- CGW Government final wage consumption expenditure.
- IG Investment by general government.
- INT Household interest receipts;
- IP Investment by private sector.
- IROOHN Imputed rental income on owner occupied housing net of expenses.
- OS Net operating surplus of the overall economy.¹
- OSPUE Unincorporated business net income (including imputed rentals on owner-occupied housing).²
- PEI Interest, dividends and investment receipts.³

Box 1. Variable names and symbols used (cont.)

- PIAPH Property income attributable to policy holders (life insurance and pension funds, excluding capital gains).
- W Wages and salaries of dependent employment.
- WSSS Compensation of employees (including private employers' contributions to social security and to pension funds).
- YPEPG Government interest payments.

1. This normally includes the statistical discrepancy.
2. The mnemonics for this variable reflect the definition in SNA68/ESA79, "Operating surplus of private unincorporated enterprises".
3. The mnemonics for this variable reflect the definition in SNA68/ESA79, "property and entrepreneurial income".

Revisions to Mendoza method

Mendoza *et al.* (1994) assume that households are not able to deduct social security contributions from their taxable income. While this is true in the United States, it is not so in most other countries.⁸ The household tax ratio equations should allow for this possibility, as they do in the third column of Table 1.

Some reallocation of tax data is also needed to make the estimates more realistic. In particular, business taxes, which are levied on unincorporated enterprises, should be removed from household tax and allocated directly to capital.⁹ This treatment would be in line with that accorded to corporate taxes. Business tax revenues in the countries concerned (Japan, Germany, and Austria) are shown in Table A1. Moreover, taxes on income, profits and capital gains that had not been allocated to households or companies (1300) should be allocated to one or the other on the basis of what seems most appropriate; Mendoza *et al.* (1994) ignored these taxes. The allocations of 1300 made for the revised calculations are as follows:

- Canada, non-resident withholding tax is added to 1200;
- Austria, tax on interest is added to 1100;¹⁰
- Denmark, almost all of this category represents a tax on pension fund earnings and, as a tax on capital income, is added to 1200;
- Greece, this category (*impôts extraordinaires*) is allocated to households (1100) and companies (1200) according to the relative weights of each in taxes on income, profits and capital gains (1000);

- Hungary, withholding taxes on dividends and interest are added to 1100;
- New Zealand, taxes on interest and dividends are added to 1100 while the remainder of 1300 is added to 1200; and
- Portugal, professional tax (*impôt professionnel*), supplementary personal tax (*impôt complémentaire personnes singulières et collectives*), and capital gains tax (*impôt sur plus-values*) are allocated to 1100, and industrial tax (*impôt industriel*), land tax (*impôt foncier rural et urbain*), agriculture tax (*impôt industrie agricole*), local direct taxes (*impôts directs perçus par les administrations locales*) and interest on late payments (*intérêts payés en retard*) are added to 1200.

Labour income tax ratio, τ_L

Mendoza method

The labour tax ratio relates labour's share of household income taxes ($\tau_h * W$) and taxes levied directly on labour income to labour income (see Table 1). The term for allocating household income taxes to labour ($\tau_h * W$) does this in line with labour's share in household income. All social security charges (2000) and payroll taxes (3000) are also allocated to labour, through the other terms in the numerator. Labour income, which appears in the denominator of labour tax ratio equation, consists of compensation from dependent employment, including employers' social security contributions (2200) (but excluding employers' contributions to private pension funds).

Revisions to Mendoza method

Private employers' contributions to pension funds and payroll taxes should be added to the labour income base, as they are elements of wage compensation.¹¹ These items can be included in the labour income base by replacing the denominator of the labour income tax ratio with "compensation of employees" (WSSS) plus "taxes on payroll and workforce" (3000),¹² as in columns 2 and 3 of Table 1.

Social security contributions of the self-employed (2300) should be allocated to capital, not labour, as self-employed income is treated as capital income in the Mendoza methodology. On the other hand, unallocated social security contributions (2400)¹³ should be allocated to capital and labour, not just labour, as they are paid out of both labour and capital incomes. Incorporating these changes entails disaggregating total social security contributions so that employees' (2100) and employers' (2200) contributions can be allocated to labour along with its share (α) of unallocated contributions (2400) and allocating self-employed contributions and the remaining unallocated contributions to capital.

Consumption tax ratio, τ_c ***Mendoza method***

The consumption tax ratio (τ_c) is calculated as the sum of general consumption taxes on goods and services (5110) and excise taxes (5121) divided by the sum of private consumption (CP) and government non-wage consumption (CG-CGW) net of these indirect taxes (see Table 1). Value added tax, which is by far the largest indirect tax in most countries, is included in the 5110 category. The denominator is considerably wider than the tax base normally subject to indirect taxation as government non-wage consumption expenditure and many goods and services (*e.g.* basic food in some countries, financial services, medical services) in final private consumption expenditure generally are not subject to indirect taxes. This wider tax base is retained on the grounds that indirect tax (notably VAT) is generally paid on inputs to produce such goods and services. Hence, contrary to the assumption made for calculating the other tax ratios, it is implicitly assumed that the tax burden on the inputs for such goods and services is passed through into higher output prices. Government wages (CGW) are excluded from the tax base because no indirect tax is levied on purchases of labour. Indirect taxes are deducted in the denominator to reflect the tradition of expressing indirect tax rates as a percentage of the price excluding the tax. For example, a 20 per cent VAT adds 20 per cent to the pre-tax price but represents 16.7 per cent of the total price including VAT. This adjustment ensures that the theoretical τ_c for this tax is 20 per cent, not 16.7 per cent.

***Revisions to Mendoza method*¹⁴**

A number of other indirect taxes should also be taken into account in the consumption tax ratio. These are taxes on profits of fiscal monopolies (5122), customs and import duties¹⁵ (5123), taxes on specific services (5126), other taxes on specific goods and services (5128)¹⁶ and taxes on the use of goods and performance activities (5200) except motor vehicle charges paid by others (5212).¹⁷ It would also be preferable to express the consumption tax base in gross terms (*i.e.* including indirect taxes) to improve comparability with the tax ratios on labour and capital income and to facilitate calculating a combined tax ratio on labour income and consumption.

Labour and consumption tax ratio combined, τ_{LC}

The labour and consumption tax ratio combined is of interest because this measures the relevant tax burden for choices between supplying labour or enjoying leisure. Assuming that all net labour income is consumed (now or in the future), it can easily be calculated by adding to the labour tax ratio the

consumption tax ratio adjusted for the share of net labour income in gross labour income: workers cannot spend income that has been taxed away. Mendoza *et al.* (1994) did not calculate a combined labour and consumption tax ratio.

Capital income tax ratio, τ_k

Mendoza method

The capital income tax ratio relates the share of household income tax pertaining to capital income [$\tau_h * (\text{OSPUE} + \text{PEI})$] and taxes paid directly out of capital income or wealth to capital income (see Table 1). Once again, household income taxes are allocated in line with the productive factor's share in household income, where household capital income comprises unincorporated business net income (OSPUE, which includes self-employed income and imputed rentals on owner occupied housing) and interest, dividends and investment receipts (PEI). The taxes paid directly out of capital income are corporate income taxes (1200),¹⁸ recurrent taxes on immovable property (4100) and taxes on financial and capital transactions (4400) to capital. While 4100 and 4400 are taxes on stocks of capital and capital transactions, respectively, they nevertheless represent a tax cost levied on capital investment that can be expressed as a percentage of income from capital.

Revisions to Mendoza method

All property taxes (4000) should be included in the capital tax ratio as they can be considered as surcharges on capital income.¹⁹ There is also a number of other taxes paid by business that should be included, including taxes on investment goods (5125),²⁰ motor vehicle charges paid by others²¹ (5212) and other taxes paid solely by businesses (6100).

RESULTS

Revised approach

The tax ratio on capital income (based on net operating surplus) increased by 6.4 percentage points between 1975-80 and 1990-2000 for OECD countries with complete data sets,²² to 46.3 per cent (Table 2, Figure 1); see Table A2 for tax ratios for individual countries. This increase was greater than that in the labour tax ratio, which rose by 5.3 percentage points to 32.3 per cent, and in the consumption tax ratio, which increased by 1.1 percentage point to 15.7 per cent. Hence, there was a relative shift in the tax burden from labour to capital income, including when the labour tax burden is assessed using the combined labour and consumption tax ratio.²³ The relative shift in the tax burden towards capital was particularly

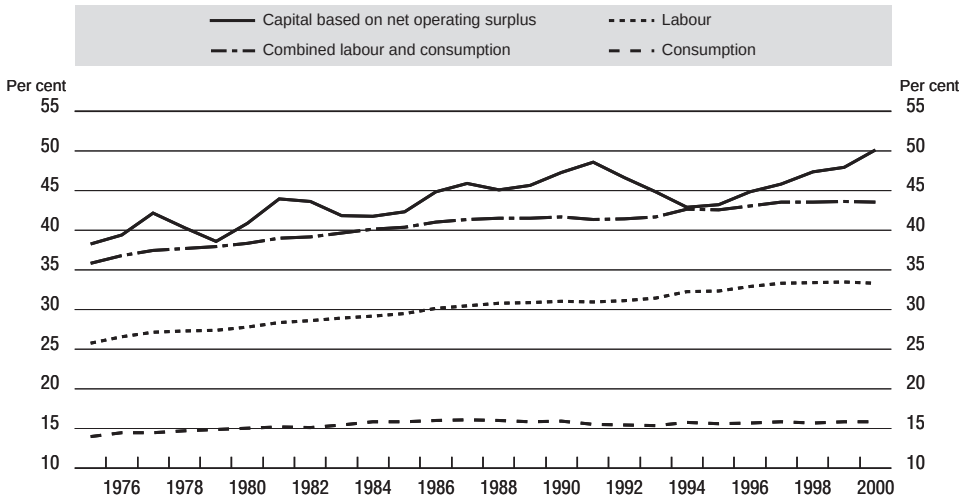
Table 2. **Tax ratios**
Per cent

	Capital based on net operating surplus				Capital based on gross operating surplus				Labour				Consumption				Combined labour and consumption			
	1975-80	1980-90	1990-2000	Change between 1975-80 and 1990-2000	1975-80	1980-90	1990-2000	Change between 1975-80 and 1990-2000	1975-80	1980-90	1990-2000	Change between 1975-80 and 1990-2000	1975-80	1980-90	1990-2000	Change between 1975-80 and 1990-2000	1975-80	1980-90	1990-2000	Change between 1975-80 and 1990-2000
Revised approach																				
United States	42.2	37.9	39.5	-2.7	29.2	25.8	27.3	-1.9	20.4	22.1	23.4	3.1	6.7	6.6	6.4	-0.4	25.7	27.3	28.3	2.6
Japan	35.4	47.6	50.0	14.6	24.4	31.1	27.9	3.5	17.3	21.7	24.1	6.8	6.0	5.8	6.4	0.4	22.9	26.8	29.4	6.5
EU-15 ¹																				
Average	42.4	46.0	47.5	5.2	24.6	27.0	28.7	4.1	32.0	35.1	38.0	6.0	15.9	17.3	17.8	1.9	42.6	46.3	48.9	6.3
Standard deviation	19.7	17.4	13.0	-6.7	9.4	8.4	6.2	-3.2	6.6	7.0	8.0	1.4	4.3	3.3	2.0	-2.4	8.1	7.4	7.6	-0.5
OECD²																				
Average	39.9	43.9	46.3	6.4	24.4	26.6	28.1	3.7	27.0	29.6	32.3	5.3	14.6	15.6	15.7	1.1	37.3	40.4	42.6	5.3
Standard deviation	15.9	15.0	12.7	-3.3	8.0	7.4	5.8	-2.2	9.7	10.0	10.3	0.6	5.2	5.5	5.3	0.1	10.8	10.4	10.8	0.0
Mendoza approach																				
United States	39.3	35.3	36.4	-2.8	27.2	24.1	25.2	-2.0	23.2	25.6	27.1	3.9	5.4	5.3	5.2	-0.2	27.3	29.5	30.9	3.6
Japan	31.4	41.9	42.5	11.1	21.7	27.4	23.8	2.2	19.7	25.1	27.6	7.9	4.6	4.9	6.1	1.6	23.4	28.7	32.0	8.7
EU-15 ¹																				
Average	33.0	36.6	37.4	4.4	20.1	22.1	23.1	3.1	35.5	39.2	42.5	7.0	16.4	18.1	18.8	2.4	45.7	49.9	53.1	7.4
Standard deviation	15.6	15.6	11.7	-3.9	8.4	8.4	6.5	-1.8	8.6	8.1	8.7	5.1	5.5	4.6	3.0	-2.5	11.4	10.0	9.7	-1.7
OECD²																				
Average	31.9	35.7	37.2	5.3	19.5	21.1	22.1	2.6	29.7	32.8	35.6	5.9	14.0	15.5	16.0	2.0	39.0	42.7	45.4	6.4
Standard deviation	12.8	12.6	10.6	-2.2	6.7	6.7	5.6	-1.0	11.4	11.5	11.9	0.5	7.3	7.9	7.5	0.2	14.0	13.3	13.1	-0.9

1. Simple averages of the countries with data in 1975. These countries are Austria, Belgium, Finland, France, Germany, Italy, Spain, Sweden and the United Kingdom.
2. Simple averages of the countries with data in 1975. In addition to the EU countries listed above, these countries are Australia, Canada, Japan, Korea, Norway, Switzerland and the United States.

Source: OECD, *Revenue Statistics and National Accounts*.

Figure 1. Tax ratios on labour and capital income and on consumption
OECD average,¹ per cent



1. Simple averages of the countries with data in 1975. These countries are: Austria, Australia, Belgium, Canada, Finland, France, Germany, Italy, Japan, Korea, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Source: OECD, *Revenue Statistics and National Accounts*.

marked in Japan, where the percentage point increase in the capital income tax ratio was twice that in the labour income tax ratio. By contrast, the tax burden shifted from capital to labour in the United States in absolute terms and in EU countries in relative terms, with the shift in the United States being particularly marked.

A problem with using capital income tax ratios based on net operating surplus to make cross-country comparisons is that charges for depreciation of fixed assets in countries' national accounts vary a great deal from one country to another. This variation is mainly attributable to assumed differences in service lives, which are often based on very old studies of tax lives²⁴ and are implausibly large. One way of circumventing this problem is to focus on capital income tax ratios based on gross operating surplus for such purposes. On this basis, the increase in the capital income tax ratio in OECD countries was 3.7 percentage points, similar to the increases in the EU and Japan but much higher than in the United States, where the capital income tax ratio fell. These movements brought the capital income tax ratios (based on gross operating surplus) more or less into line in the United States, Japan and the EU at 27-29 per cent. The distribution of capital income tax ratios also narrowed for the group of OECD countries for which full data sets are available.

Labour income and consumption tax ratios are well below the OECD average in the United States and Japan and higher in the EU. The distribution of labour income and consumption tax ratios in OECD countries for which full data sets are available has remained broadly unchanged over the past quarter century. In EU countries, by contrast, the distribution of labour income tax ratios has widened and that of consumption tax ratios has narrowed.

There are a number of caveats to bear in mind when comparing tax ratios across countries. One is that estimates of labour income tax ratios are influenced by the extent to which countries rely on private rather than public arrangements for the provision of retirement income. This is because contributions to private schemes, even if they are compulsory, are (rightly) not considered to be taxes whereas contributions to public schemes are considered to be taxes. Similarly, predominantly private health insurance arrangements (as in the United States) tend to reduce the labour income tax ratio compared with countries with predominantly social health insurance arrangements. As for the retirement income financing arrangements, this does not mean, however, that cross-country comparisons are false. It just means that readers should be aware that differences in labour income tax ratios may reflect to a considerable extent differences in social insurance coverage. By contrast, cross-country comparisons of capital income tax ratios will be distorted if public enterprises are subject to corporate tax in some countries but not in others (the government taking its share of earnings in the form of higher dividends).²⁵ It should also be noted that tax ratios on both labour and capital income are somewhat overstated in countries that levy taxes and/or social security contributions on most social security benefits. Such levies are particularly high in Denmark, Finland, the Netherlands and Sweden (Adema, 2001, pp. 27-28); this increases the numerator of the household income tax ratio without affecting the denominator. The effect on the estimates of adjusting for this factor in 1997 (the only year for which data are available) are examined below.

Differences from the Mendoza approach

Capital income tax ratios are higher in the revised approach than in the Mendoza approach. This is especially so in the EU, where this difference (based on net operating surplus) reaches 10 percentage points in 1990-2000. The difference reflects the wider range of taxes taken into account in the revised estimates, including social security contributions of the self-employed (which are larger in EU countries), and, in EU countries, the deduction of payroll taxes from operating surplus in the denominator.²⁶ These differences are considerably smaller when the tax base is gross operating surplus – as the tax base is bigger, differences in tax revenues are less amplified. The distribution of capital income tax ratios (based on both gross and net operating surplus) has narrowed more using the revised approach than the Mendoza approach, especially for EU countries.

Labour income tax ratios based on the revised approach are somewhat lower than in the Mendoza approach. This reflects the facts that part of social security contributions (2300 and part of 2400) is no longer allocated to labour and that the tax base is wider, including employer contributions to private pension schemes and payroll taxes. These changes do not, however, affect the ranking of labour income tax ratios – they remain much higher in EU countries than in the United States or Japan. While there is no change in the distribution of labour tax ratios for OECD countries in both sets of estimates, there is a widening in the distribution for EU countries in the revised estimates that is not present in the estimates based on the Mendoza approach.

Consumption tax ratios are lower in the revised method, despite a wider range of indirect taxes being included. This is because the base is expressed in gross terms (*i.e.* including indirect taxes). Consumption taxes continue to be much higher in the EU than in the US or Japan, although the difference is somewhat less marked than in the Mendoza approach.

Whereas there is a relative shift in the tax burden in OECD countries from labour to capital (based on net operating surplus) in the revised approach, the opposite occurs in the Mendoza approach. The relative shift in the tax burden from labour to capital in Japan is much stronger in the revised approach than in the Mendoza approach but somewhat weaker in EU countries. In the United States, the absolute shift in the tax burden from capital to labour is somewhat weaker in the revised approach than in the Mendoza approach.

Despite these differences, tax ratios in the revised approach are highly correlated with those based on the Mendoza approach in the majority of cases, suggesting that many empirical results would not be affected by the choice of approach (Table 3). There are, however, a number of exceptions to this rule: approximately 10 per cent of the correlation coefficients are less than 0.8.

Relations with variables of interest

The revised labour tax ratios are inversely correlated across countries with hours worked per member of the working age population (Figure 2). Results are similar when the tax burden on labour is measured using the combined tax ratio on labour income and consumption expenditures.²⁷ Denmark, Finland and Sweden, which have the highest labour income tax ratios, stand out for having higher hours worked per member of the working-age population than would be predicted on the basis of this relationship. This may reflect favourable childcare arrangements, which would help to compensate for the effects of high labour taxation by facilitating female labour force participation. By contrast, neither labour income nor combined labour and consumption tax ratios are significantly related to structural unemployment.²⁸ This is what would be expected if real wage rates are flexible in the

Table 3. **Correlation between Mendoza and revised approaches¹**
1975-2000²

	Capital based on net operating surplus	Capital based on gross operating surplus	Labour	Consumption	Combined labour and consumption
United States	0.99	0.99	0.98	0.94	0.98
Japan	0.98	0.99	1.00	0.82	1.00
Germany ³	0.96	0.96	0.98	0.97	0.99
France	0.92	0.92	1.00	0.95	1.00
Italy	0.98	0.98	0.99	0.99	0.99
United Kingdom	0.97	0.98	0.98	0.98	0.98
Canada	0.99	0.99	1.00	0.09	0.98
Australia	0.98	0.99	1.00	0.94	0.98
Austria	0.77	0.87	0.99	0.95	0.98
Belgium	0.99	0.98	1.00	0.88	0.99
Czech Republic ⁴	0.99	0.99	0.49	0.81	0.69
Denmark	0.98	0.97	1.00	1.00	0.99
Finland	1.00	0.99	1.00	1.00	0.99
Greece	1.00	1.00	0.99	0.86	1.00
Hungary	..	0.93	..	-0.78	..
Ireland	0.97	..	1.00	0.97	0.99
Korea	1.00	1.00	1.00	0.31	0.96
Netherlands	0.79	0.70	0.97	0.98	0.96
New Zealand	0.96	..	0.98	0.93	0.99
Norway	0.90	0.95	0.91	0.98	0.96
Poland	..	0.93	..	0.80	..
Portugal ⁵	0.98	0.96	0.42	0.92	0.95
Spain	0.98	0.98	0.94	0.98	0.98
Sweden	0.92	0.91	0.97	0.96	0.98
Switzerland	0.97	0.90	-0.18	0.96	0.17

1. Correlation coefficients less than 0.8 are bolded.

2. Czech Republic: 1993-2000; Denmark: 1998-2000; Ireland: 1977-2000; Greece: 1990-2000; Hungary: 1995-2000; Poland: 1991-2000; Netherlands: 1990-2000; New Zealand and Portugal: 1990-2000.

3. West Germany before 1991.

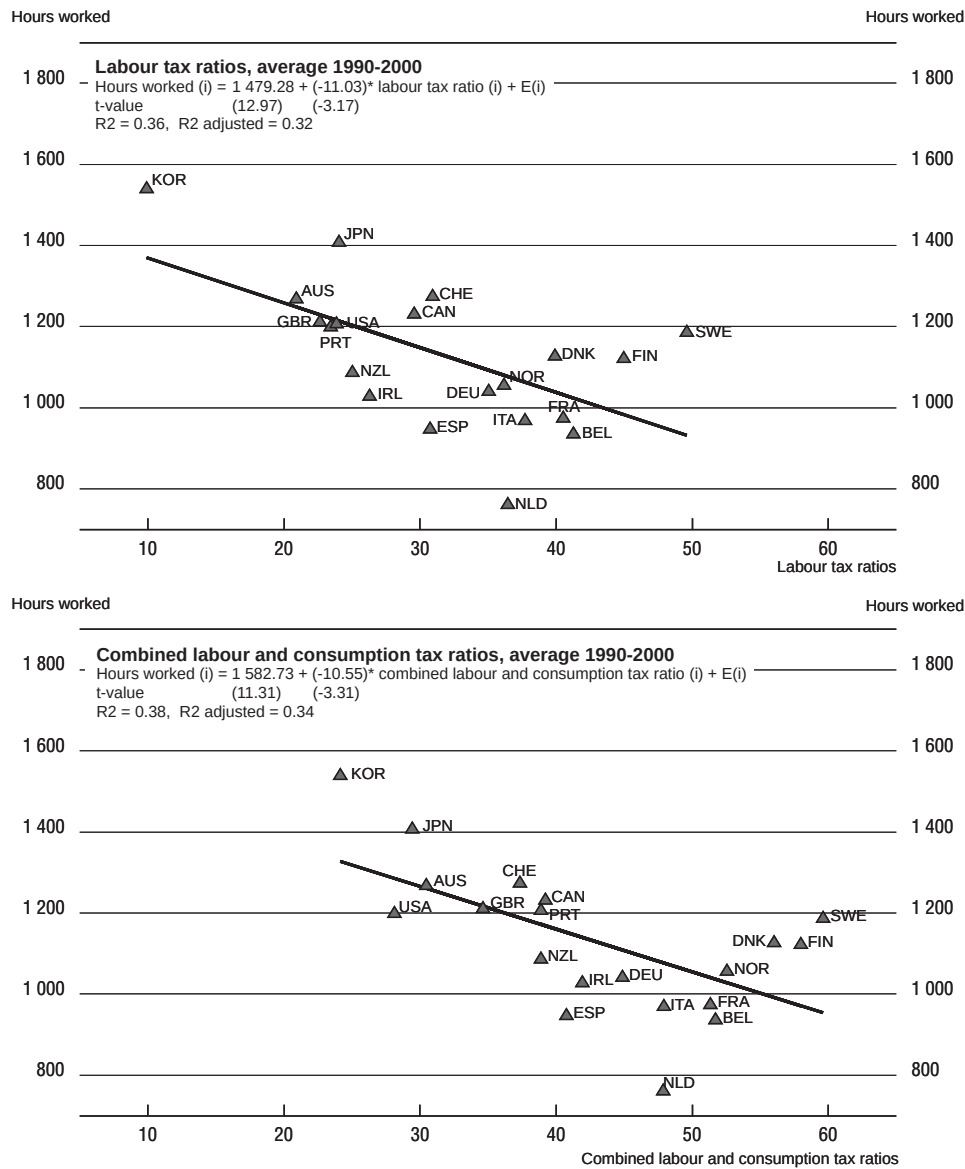
4. It is assumed that the tax ratio on capital in 2000 is the same as in 1999.

5. It is assumed that the tax ratios on capital in 1999 and 2000 are the same as in 1998.

Source: OECD, *Revenue Statistics and National Accounts*.

long run. Similarly, capital income tax ratios are not significantly related to either investment rates (business sector investment/GDP) or private saving rates (private saving/GDP).²⁹ This could reflect high international capital mobility in OECD countries, which weakens the link between domestic saving and investment. In these circumstances, taxes that discourage household saving may not have much effect on investment because the decline in household saving would tend to raise gross investment returns, attracting foreign capital and so driving rates of return back towards the level in world capital markets. Similarly, taxes that discourage

Figure 2. Labour tax ratios and hours worked¹
Per cent



1. Hours worked per member of the working age population.
Source: OECD, Revenue Statistics and National Accounts.

domestic investment need not reduce domestic saving if gross rates of return are determined in world capital markets. Capital income tax ratios that distinguished between taxes on returns from domestic savings and on returns from domestic investment would be more suited to assessing the effects of taxation on investment and savings decisions.

EFFECTS OF MODIFYING CERTAIN ASSUMPTIONS

There are a number of other adjustments to the tax ratio equations that could be made to obtain more realistic estimates. These relate to accounting for self-employed income (it is not all capital income, as assumed above), taxes on government transfer payments and preferential tax treatment for household capital income. Unfortunately, such changes cannot be made systematically owing to a lack of data for certain countries and/or periods. This section assesses the extent to which the inability to make these adjustments in most cases matters by estimating the impact on the revised estimates, henceforth referred to as the baseline, of making these adjustments whenever possible.

Dividing self-employed income into capital and labour components

Self-employed income does not fit neatly into either of the available categories – labour or capital income – in the above estimates. It does not entirely consist of capital income, as assumed above, but rather contains elements of both labour- and capital income. Unfortunately, SNA data do not provide a breakdown of self-employed income into these two categories. One approach to making such a breakdown is to assign this income flow to both labour and capital. Making such an assignment is inherently difficult and could be done in a number of ways. The approach adopted here is to assume that the self-employed “pay themselves” the same annual salary net of social security contributions (WSE) as that earned by the average employee [wages and salaries of dependent employment (W) minus employees’ social security contributions (2100), all divided by dependent employment (EE)] (Table 4).³⁰ The product of this imputed wage rate and the number of self-employed (ES) gives the imputed “wage bill” for the self-employed (WSE), excluding social security payments. This estimate of self-employed labour income is then used to calculate a labour income tax ratio that includes self-employed labour income and a capital income tax ratio that excludes such income.

This adjustment substantially raises the capital income tax ratio (the average increase is 15 percentage points in OECD countries) and slightly reduces the labour income tax ratio (the average reduction is 1 percentage point) in most countries (Table 5). The increase in the capital income tax ratio between 1975-80 and 1990-2000 is smaller than in the baseline in most countries (2 percentage

Table 4. **Dividing self-employed income into labour and capital components**

Modified tax ratios

Social security contributions not deductible	Social security contributions deductible
$WSE = ES * (W - 2100)/EE$ $\alpha = (W + WSE)/(OSPUE + PEI + W)$ $\tau_l = (\tau_h * (W + WSE) + 2100 + 2200 + 2300 + \alpha * 2400 + 3000)/(WSSS + WSE + 2300 + 3000)$ $\tau_k = [\tau_h * (OSPUE + PEI - WSE) + 1200 + \beta * 2400 + 4000]/(OS - WSE - 2300 - 3000)$	$WSE = ES * (W - 2100)/EE$ $\alpha = (W - 2100 + WSE - 2300)/(OSPUE + PEI + W - 2100 - 2300)$ $\tau_l = (\tau_h * (W - 2100 + WSE - 2300 - \alpha * 2400) + 2100 + 2200 + 2300 + \alpha * 2400 + 3000)/(WSSS + WSE + 2300 + 3000)$ $\tau_k = [\tau_h * (OSPUE + PEI - WSE - \beta * 2400) + 1200 + \beta * 2400 + 4000]/(OS - WSE - 2300 - 3000)$
Source: OECD.	

points less, on average) while that in the labour income tax ratio is broadly unchanged. With these changes, the conclusions that there was a relative shift in the tax burden from labour to capital on average in OECD countries and in Japan over the past quarter century are reversed. Moreover, the relative shift in the tax burden towards labour in EU countries³¹ on average and the absolute shift in the United States are stronger than in the baseline estimates. Nevertheless, the adjusted and baseline series are highly correlated in almost all countries for labour income tax ratios and in most countries (the correlation coefficient is 0.8 or more in 78 per cent of countries) for capital income tax ratios. There are, however, a number of exceptions to this conclusion: the adjusted and baseline capital income tax ratios are not highly correlated in Japan, France, Australia, Austria and Ireland while the labour income tax ratios are not highly correlated in the Czech Republic.

A weakness of this approach is that it may not accurately reflect the split of self-employed income into labour- and capital income components. There is a great variety of labour and capital income components for self-employed persons. At one extreme, the capital input can be almost zero (*e.g.* an opera singer) while at the other it can be very high (*e.g.* a farmer) (Directorate-General of the European Commission, 1998). It is not obvious that an assumption that self-employed persons pay themselves the average wage accurately reflects the average labour income for the self employed – it certainly doesn't for the two extreme cases cited.

Separating self-employed income from labour- and capital income

In view of the difficulties in decomposing self-employed income into labour and capital components, the alternative of abstracting from taxes on such income

Table 5. Effect of dividing self-employed income into labour- and capital components
1975-2000

	Labour income tax ratio			Capital income tax ratio ¹		
	Change in average level ²	Difference in change between 1975-80 and 1990-2000	Correlation coefficient ³	Change in average level ²	Difference in change between 1975-80 and 1990-2000	Correlation coefficient ³
United States	-0.19	0.16	1.00	4.82	-3.39	0.94
Japan	-1.36	0.58	1.00	50.30	-33.03	-0.48
Germany	-1.01	0.76	0.99	4.46	-4.98	0.93
France	-1.17	1.28	1.00	2.11	-12.30	0.58
Italy	-3.45	-0.16	1.00	12.75	1.38	0.90
United Kingdom	-0.67	-0.32	1.00	21.86	2.21	0.94
Canada	-0.75	-0.50	1.00	17.32	17.49	0.98
Australia	-0.44	-0.11	1.00	21.84	-9.70	0.65
Austria	-2.63	..	1.00	51.76	..	-0.27
Belgium	-1.28	-0.51	1.00	13.29	-4.19	0.88
Czech Republic ⁴	-0.87	..	0.77	2.78	..	1.00
Denmark	0.00	..	1.00	21.61	..	0.97
Finland	-1.00	-0.07	1.00	12.07	4.55	0.93
Greece	-9.09	..	0.99	4.09	..	1.00
Hungary	..	..	..	..	..	..
Ireland	-1.65	..	1.00	8.57	..	0.72
Korea	..	..	..	..	..	..
Netherlands	0.96	..	1.00	2.21	..	0.96
New Zealand	0.18	..	1.00	9.43	..	0.96
Norway	-1.08	0.71	0.94	0.05	1.92	0.98
Poland	..	..	..	..	..	..
Portugal ⁵	-2.39	..	0.98	21.52	..	0.97
Spain	-3.70	2.41	0.96	9.87	-3.80	0.93
Sweden	-0.70	-0.25	1.00	16.84	-21.50	0.88
Switzerland	-0.36	-1.43	0.98	20.34	39.67	0.89
Average ⁶	-1.48	0.18		14.99	-1.83	

1. Based on net operating surplus.

2. Compared with the revised approach baseline, percentage points.

3. Correlation coefficients less than 0.8 are bolded.

4. It is assumed that the capital income tax ratio in 2000 is the same as in 1999.

5. It is assumed that the capital income tax ratios in 1999 and 2000 are the same as in 1998.

6. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

altogether in the labour and capital income tax ratios has been followed in some studies (Directorate-General of the European Commission, 1998; Volkerink and de Haan, 2001). As no data are available in OECD *Revenue Statistics* on household income taxes paid on self-employed income, they must be estimated. Following the general approach above, this can be done by assuming that taxes are paid on such income in proportion to its share in household income. Putting this adjustment into

Table 6. **Separating self employed income from labour and capital income**
Modified tax ratios

Social security contributions not deductible	Social security contributions deductible
$\gamma = \text{PEI} / (\text{OSPUE} + \text{PEI} + \text{W})$ $\delta = 1 - \alpha - \gamma$ $\tau_k = [\tau_h * \text{PEI} + 1200 + \gamma * 2400 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000 - \text{OSPUE})$ $\tau_s = [\tau_h * \text{OSPUE} + 2300 + \delta * 2400] / \text{OSPUE}$	$\gamma = \text{PEI} / (\text{OSPUE} + \text{PEI} + \text{W} - 2100 - 2300)$ $\delta = 1 - \alpha - \gamma$ $\tau_k = [\tau_h * (\text{PEI} - \gamma * 2400) + 1200 + \gamma * 2400 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000 - \text{OSPUE})$ $\tau_s = [\tau_h * (\text{OSPUE} - 2300 - \delta * 2400) + 2300 + \delta * 2400] / \text{OSPUE}$
Source: OECD.	

effect entails only allocating to capital the share of household income taxes relating to “interest, dividends and investment receipts” (PEI) (Table 6). The share of PEI in household income (γ) must also be calculated so as to allocate unallocated social security contributions (2400) to labour and (pure) capital income.

This adjustment, which can only be made for most countries in the 1990s, does not affect the labour income tax ratio but has a large positive effect (28 percentage points, on average) on the capital income tax ratio in many countries (Table 7). Differences from the baseline capital income tax ratios tend to be greater than for the previous adjustment. Of the countries for which data are available to make the adjustment since 1975, it reinforces the shift in the tax burden from capital to labour in the United States and Norway between 1975-80 and 1990-2000 and strengthens the opposite (relative) shift in Finland and Korea. The adjustment also reverses the relative shift in the tax burden (from labour to capital) in Australia. The adjusted and baseline capital income tax ratios are highly correlated in most countries (the correlation coefficient is 0.8 or more in 78 per cent of countries); the exceptions are France, Australia, Austria, Ireland and Switzerland.

Excluding tax on government interest (transfer) payments

Government interest payments are transfers, not distributions of earnings on the factor of production capital. As such, taxes on government interest payments should be excluded from the calculations.³² This can be done by deducting an estimate of residents’ government interest receipts (YPEPG) from household capital income in the numerator of the capital income tax ratio: in this way, the part of household income taxes relating to government interest receipts is not allocated (Table 8). It is also necessary to deduct non-resident withholding taxes on government interest payments from corporate tax receipts (1200) in the numerator of the capital income tax ratio.³³ The non-resident withholding tax rate (t_{NRW}) used in

Table 7. **Effect of separating self-employment income from labour and capital income**
1975-2000

	Capital income tax ratio ¹		
	Change in average level ²	Difference in change between 1975-80 and 1990-2000	Correlation coefficient ³
United States	8.98	-4.68	0.95
Japan	28.14	16.54	0.82
Germany	22.60	..	0.90
France	110.92	..	0.21
Italy	20.98	..	0.98
United Kingdom	29.98	..	0.89
Canada	13.48	..	0.99
Australia	39.55	-12.83	0.58
Austria	27.41	..	0.69
Belgium	30.48	..	0.87
Czech Republic ⁴	14.77	..	1.00
Denmark	44.68	..	0.95
Finland	23.56	2.65	0.89
Greece	41.50	..	0.99
Hungary	..	..	..
Ireland	8.97	..	0.66
Korea	24.16	6.67	0.92
Netherlands	7.13	..	0.93
New Zealand	12.10	..	0.96
Norway	16.83	-12.23	0.92
Poland	..	..	..
Portugal ⁵	24.81	..	1.00
Spain	23.93	..	0.97
Sweden	48.64	..	0.98
Switzerland	28.29	..	0.62
Average ⁶	28.34	-0.64	

1. Based on net operating surplus.

2. Compared with the revised approach baseline, percentage points.

3. Correlation coefficients less than 0.8 are bolded.

4. It is assumed that the capital income tax ratio in 2000 is the same as in 1999.

5. It is assumed that the capital income tax ratio in 1999 and 2000 are the same as in 1998.

6. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

each country to make this calculation is the modal rate.³⁴ A difficulty in making this adjustment is that there are no data in most countries on non-residents' share of government interest payments. Based on such evidence for Australia and New Zealand, it is assumed that the non-resident share of government bond holdings is one-third.

This adjustment does not affect the labour income tax ratio and in general only reduces capital income tax ratios by a small amount (3 percentage points, on

Table 8. **Excluding tax on government interest payments**
Modified tax ratios

Social security contributions not deductible	Social security contributions deductible
$\tau_k = [\tau_h * (OSPUE + PEI - 0.67 * YPEPG) + 1200 + 2300 + \beta * 2400 - 0.33 * YPEPG * t_{NRW} + 4000 + 5125 + 5212 + 6100]/(OS - 3000)$	$\tau_k = [\tau_h * (OSPUE + PEI - 2300 - \beta * 2400 - 0.67 * YPEPG) + 1200 + 2300 + \beta * 2400 - 0.33 * YPEPG * t_{NRW} + 4000 + 5125 + 5212 + 6100]/(OS - 3000)$
Source: OECD.	

average) (Table 9). However, the adjustment has a quite a large effect on capital income tax ratios in Denmark, Sweden and Belgium, where government interest payments have been substantial. The adjustment reinforces the relative shift in the tax burden from capital to labour in EU countries³⁵ between 1975-80 and 1990-2000 but reverses the relative shift (from labour to capital) in OECD countries.³⁶ Nevertheless, the correlation between this and the baseline series is high for all countries; even in Belgium and Ireland, where there have been large changes in public debt interest payments over the past quarter century, the correlation coefficient is over 0.80.

Excluding direct taxes and social security contributions on government benefit (transfer) payments

Government benefit payments are also transfers, not factor incomes. Accordingly, direct taxes and social security contributions paid on them should also be excluded from the tax ratio calculations. This can be done by deducting direct taxes on social security benefits (DTB) from household income taxes (1100) in the numerator of the household income tax ratio and by deducting social security contributions levied on social security benefits (SSCB) from the numerator of the labour income tax ratio (Table 10). Estimates of these taxes and social security contributions come from Adema (2001) and are only available for 1997.³⁷ The modified equations are as follows:³⁸

Adjusting for direct taxes and social security contributions on government benefit payments reduces both labour and capital income tax ratios, with the decline in the former (3 percentage points, on average) being greater than that in the latter (1 percentage point, on average) (Table 11). The decline in labour income tax ratios is particularly large in the Netherlands, Denmark, Finland and Sweden where such tax revenues are important. (Indeed, taking this factor into account, the labour income tax ratio in the Netherlands is actually well below the OECD average, not above it). The effect of the adjustment on the capital income

Table 9. **Effect of excluding tax on government interest payments**
1975-2000

	Capital income tax ratio ¹		
	Change in average level ²	Difference in change between 1975-80 and 1990-2000	Correlation coefficient
United States	-1.78	-0.79	0.99
Japan	-1.41	-1.08	1.00
Germany	-1.35	-0.75	0.99
France	-0.97	-1.02	1.00
Italy	-3.23	-3.40	1.00
United Kingdom	-2.32	1.67	1.00
Canada	-6.73	-5.81	0.97
Australia	-2.52	-0.31	0.99
Austria	-2.23	-1.38	0.99
Belgium	-8.18	-3.52	0.87
Czech Republic ³	-0.43	..	1.00
Denmark	-10.67	..	0.99
Finland	-2.30	-3.04	0.99
Greece	-0.96	..	1.00
Hungary	..	..	..
Ireland	-2.51	..	0.86
Korea	-0.09	-0.05	1.00
Netherlands	-2.77	..	0.91
New Zealand	-3.40	..	0.87
Norway	-1.89	0.06	1.00
Poland	..	..	..
Portugal ⁴	-2.65	..	0.99
Spain	-0.95	-1.56	1.00
Sweden	-9.06	-3.48	0.99
Switzerland	-1.48	-0.39	1.00
Average ⁵	-3.04	-1.55	

1. Based on net operating surplus.

2. Compared with the revised approach baseline, percentage points.

3. It is assumed that the capital income tax ratio in 2000 is the same as in 1999.

4. It is assumed that the capital income tax ratios in 1999 and 2000 are the same as in 1998.

5. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

tax ratio is much smaller than on the labour income tax ratio in countries, such as the Netherlands, where most taxes on social security benefits take the form of social security contributions. Unfortunately, no data are available to calculate the effect of this adjustment over time. There is a risk that such taxes and contributions have increased over time, exaggerating the increase in tax ratios, notably for labour income, in the countries where these taxes had a large impact in 1997.

Table 10. **Excluding direct tax and social security contributions
on public social benefits**
Modified tax ratios

Social security contributions not deductible	Social security contributions deductible
$\tau_h = (1100 - DTB)/(OSPUE + PEI + W)$	$\tau_h = (1100 - DTB)/(OSPUE + PEI + W - 2100 - 2300 - 2400)$
$\tau_l = (\tau_h * W + 2100 + 2200 + \alpha * 2400 + 3000 - SSCB)/(WSSS + 3000)$	$\tau_l = (\tau_h * (W - 2100 - \alpha * 2400) + 2100 + 2200 + \alpha * 2400 + 3000 - SSCB)/(WSSS + 3000)$
Source: OECD.	

Table 11. **Effect of excluding direct tax and social security
contributions
on public social benefits, 1997**
Per cent

	Tax ratios		Change in level ¹	
	Labour	Capital ²	Labour	Capital ²
United States	23.7	38.5	-0.54	-0.26
Japan	24.2	49.7	-0.33	-0.10
Germany	33.5	32.5	-2.03	-0.36
Italy	38.0	40.8	-4.05	-2.63
United Kingdom	21.3	50.8	-0.53	-0.34
Canada	27.9	59.4	-2.45	-1.33
Australia	21.9	47.5	-0.41	-0.33
Austria	38.0	46.3	-3.89	-0.45
Belgium	39.4	52.5	-2.41	-1.67
Czech Republic	41.2	34.2	0.00	0.00
Denmark	34.6	64.8	-6.79	-4.44
Finland	39.8	40.1	-6.20	-3.48
Ireland	25.7	23.0	-0.47	-0.17
Korea	11.6	23.0	0.00	0.00
Netherlands	27.7	51.0	-7.44	-0.63
New Zealand	21.8	40.4	-2.52	-2.21
Norway	32.5	38.1	-4.06	-1.41
Sweden	46.1	57.1	-5.46	-5.12
Average ³	30.5	43.9	-2.75	-1.39

1. Compared with the revised approach baseline, percentage points.

2. Based on net operating surplus.

3. Simple average.

Source: OECD, *Revenue Statistics and National Accounts* and Adema (2001).

Allowing for preferential tax treatment of household capital income³⁹

Households pay lower tax rates on many forms of capital income than on labour income, contrary to the assumption underlying the standard tax ratio methodology that all household income is taxed at the same rate. Earnings on investments of pension funds and life insurance and imputed rentals on owner-occupied dwellings are usually not taxed at all, there is widespread relief from the double taxation of dividends and interest receipts are often taxed at a low rate. Each of these cases is examined in the remainder of this section for 1994-2000,⁴⁰ along with the effects of allowing for all of them at once.

Excluding property income attributable to members of pension funds and life insurance policy holders from household income

Earnings (excluding capital gains, which are not income in the SNA) on the investments of pension funds and life insurance policies (PIAPH) are imputed to their beneficial owners in SNA. They are included in the category of household income entitled "interest, dividends and investment income" (PEI). However, households do not pay tax on such earnings;⁴¹ in the rare cases⁴² where tax is levied on such earnings, it is paid by the pension fund or insurance company and as such, is included in corporate taxes (1200).⁴³ Accordingly, PIAPH should be deducted from the household income series used to allocate personal income taxes and unallocated social security contributions to labour and capital income (Table 12).

This adjustment results in a small decline in the capital income tax ratio (2 percentage points, on average) and a small increase (1 percentage point, on average) in the labour income tax ratio (Table 13). Although it is not possible to calculate the adjusted series before 1994, owing to a lack of information on tax systems, the impact of the adjustment over 1994-2000 generally seems to be too small to have much effect on shifts in the tax burden over the past quarter century. In addition,

Table 12. **Excluding pension fund and life insurance earnings from household income**
Modified tax ratios

Social security contributions not deductible	Social security contributions deductible
$\alpha = W / (OSPUE + PEI - PIAPH + W)$	$\alpha = (W - 2100) / (OSPUE + PEI - PIAPH + W - 2100 - 2300)$
$\tau_h = 1100 / (OSPUE + PEI - PIAPH + W)$	$\tau_h = 1100 / (OSPUE + PEI - PIAPH + W - 2100 - 2300 - 2400)$
$\tau_k = [\tau_h * (OSPUE + PEI - PIAPH) + 1200 + 2300 + \beta * 2400 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$	$\tau_k = [\tau_h * (OSPUE + PEI - PIAPH - 2300 - \beta * 2400) + 1200 + 2300 + \beta * 2400 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$

Source: OECD.

Table 13. **Effect of excluding pension fund and life insurance earnings from household income¹**
1994-2000

	Labour income tax ratio		Capital income tax ratio ²	
	Change in average level ³	Correlation coefficient	Change in average level ³	Correlation coefficient
United States	0.69	1.00	-1.66	1.00
Japan	0.32	1.00	-0.90	1.00
Germany	0.33	1.00	-0.87	1.00
France	0.33	0.87	-0.93	1.00
Italy	0.15	1.00	-0.19	1.00
United Kingdom	1.16	1.00	-2.96	1.00
Austria	0.27	1.00	-0.85	1.00
Belgium	0.46	0.99	-1.06	1.00
Denmark	1.97	1.00	-6.59	1.00
Finland	0.39	1.00	-0.87	1.00
Netherlands	1.61	1.00	-3.53	0.97
Portugal	0.09	1.00	-0.19	1.00
Spain	0.17	1.00	-0.31	1.00
Sweden	1.23	1.00	-4.73	1.00
Average ⁴	0.66		-1.83	

1. This adjustment is required for all countries but can only be made for the countries shown owing to data availability.

2. Based on net operating surplus.

3. Compared with the revised approach baseline, percentage points.

4. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

adjusted and baseline labour and capital income tax ratios are highly correlated for all countries. These results suggest that not making this adjustment is unlikely to matter for empirical results in most countries.

Non-taxation of imputed rentals on owner-occupied housing

Another form of household income that is often not taxed is imputed rental income on owner occupied housing net of expenses (IROOHN). In countries where IROOHN is not taxed,⁴⁴ it should be removed from the household income series used to allocate personal income taxes and unallocated social security contributions to labour and capital income (Table 14).⁴⁵

Adjusting for the non-taxation of imputed rentals on owner-occupied housing reduces the capital income tax ratio (by 4 percentage points, on average) and causes a small increase in the labour income tax ratio (by 1 percentage point, on average) (Table 15). The effect of this adjustment is quite large on capital income tax ratios in Finland, Canada and Australia. It could alter conclusions about shifts in the tax burden in these countries if the effect of the adjustment had been very

Table 14. Non-taxation of imputed rentals on owner-occupied housing

Deductibility of social security contributions/Countries	Modified tax ratios
Not deductible Australia, Canada, Portugal, United Kingdom, United States	$\alpha = W / (OSPUE + PEI + W - IROOHN)$ $\tau_h = 1100 / (OSPUE + PEI + W - IROOHN)$ $\tau_k = [\tau_h * (OSPUE + PEI - IROOHN) + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$
Deductible Austria, Finland, France, Germany, Italy (1995-98), Spain (1999-2000)	$\alpha = (W - 2100) / (OSPUE + PEI + W - 2100 - 2300 - IROOHN)$ $\tau_h = 1100 / (OSPUE + PEI + W - 2100 - 2300 - IROOHN)$ $\tau_k = [\tau_h * (OSPUE + PEI - 2300 - IROOHN) + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$

Source: OECD.

Table 15. Effect of adjusting for non-taxation of imputed rental on owner occupied housing¹
1994-2000

	Labour income tax ratio		Capital income tax ratio ²	
	Change in average level ³	Correlation coefficient ⁴	Change in average level ³	Correlation coefficient ⁴
United States	0.29	1.00	-0.70	1.00
Germany	0.86	1.00	-2.28	1.00
France	1.11	0.30	-3.11	1.00
Italy	1.15	1.00	-1.48	1.00
United Kingdom	1.01	1.00	-2.59	1.00
Canada	2.99	0.99	-7.77	0.99
Australia	2.35	1.00	-5.08	1.00
Austria	1.04	0.99	-3.30	0.99
Finland	4.01	1.00	-9.08	0.96
Portugal	0.46	0.88	-0.83	1.00
Spain	0.93	..	-2.43	..
Average ⁵	1.47		-3.51	

1. This adjustment cannot be made in the Czech Republic (1998-2000), Hungary, Iceland (1999-2000), Ireland, Luxembourg (1994-97), Mexico and New Zealand owing to a lack of data.

2. Based on net operating surplus.

3. Compared with the revised approach baseline, percentage points.

4. Correlation coefficients less than 0.8 are bolded.

5. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

small in the late 1970s. The correlation coefficient for the adjusted and baseline tax ratios is high in all cases except for the labour income tax ratio in France. These results may be influenced by different methods of assessing imputed rentals in the national accounts in different countries. For example, the methods adopted in Spain, the United Kingdom and Italy appear to yield lower imputed rentals (adjusted for the proportion of households that are owner-occupiers) than do the methods followed in Canada, France and Germany.

These estimates understate the effect on tax ratios of not taxing imputed rentals in countries where owner-occupiers' housing-related interest expenses are nevertheless deductible.⁴⁶ This is because gross (as opposed to net) imputed rentals would need to be deducted from household property income in the equations to allocate household taxes (1100) and unallocated social security contributions (2400) in these countries. Such an adjustment would increase labour income tax ratios and reduce capital income tax ratios by more than in the above calculations. Unfortunately, such an adjustment cannot be made owing to a lack of data on owner-occupiers' housing related interest expenses.

Relief from double taxation of dividends received by resident individuals

Another form of household income that is often taxed at low rates is dividends (D). Most countries provide relief to residents from double taxation of dividends, either through dividend imputation and/or low flat rate tax systems.⁴⁷ In countries with global income tax systems, this can be adjusted for by adding back the tax saving from the imputation-related rate reduction (t_{IR}) to household income tax receipts in the household income tax ratio and by deducting this tax saving from capital income taxes in the capital income tax ratio (Table 16).⁴⁸

The imputation-related rate reduction (t_{IR}) is calculated as the difference between the normal household tax ratio (τ_{h*}) and the actual tax rate paid by households on dividends (t_d). The latter (t_d) is calculated as the difference between the normal household tax ratio and the imputation credit rate (t_{cr}), all grossed up (by t_{cr} , the rate used to gross up dividends). This gives the following equations:⁴⁹

$$t_d = (\tau_{h*} - t_{cr}) / (1 - t_{cr}) \quad (1)$$

$$t_{IR} = (\tau_{h*} - t_d) \quad (2)$$

Countries' imputation credit rates (t_{cr}) are shown in Table 17.

In countries with scheduler tax systems, dividends are taxed at a different (generally lower) rate than other household income. This can be adjusted for by removing dividend income (D) from household income and by deducting household taxes paid on dividends ($D * t_{hd}$, where t_{hd} is the household tax rate on dividends net of imputation credits) from household taxes and adding them directly to taxes on

Table 16. **Dividend imputation and dividends taxed as ordinary income**

Deductibility of social security contributions/Countries	Modified tax ratios
Not deductible	
United Kingdom	$\tau_h = (1100 + D * t_{IR}) / (OSPUE + PEI + W)$ $\tau_k = [\tau_h * (OSPUE + PEI) - D * t_{IR} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$
Deductible	
France, Germany, Spain	$\tau_h = (1100 + D * t_{IR}) / (OSPUE + PEI + W - 2100 - 2300)$ $\tau_k = [\tau_h * (OSPUE + PEI - 2300) - D * t_{IR} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$

Source: OECD.

Table 17. **Imputation credit rates (t_{cr})**

	Imputation credit rate (t_{cr})
France	33.3% in 1994-2000
Germany	25% in 1994-97
	48.47% in 1998-2000
Spain	25% in 1994-97
	28.57% in 1998-2000
United Kingdom	20% in 1994-99
	10% in 2000

Source: OECD.

capital (Table 18). Household tax rates on dividends net of imputation credits t_{hd} are shown in Table 18.⁵⁰

Adjusting for special tax treatment of household dividend income generally reduces the capital income tax ratio somewhat (by 2 percentage points, on average) and slightly increases the labour income tax ratio (by 1 percentage point, on average) (Table 20); the exceptions are Austria and Portugal, where the flat tax rates imposed on dividends are higher than the household income tax ratio. These effects are particularly great in Germany, the United Kingdom and Norway: indeed, they could alter conclusions about shifts in the tax burden between labour and capital over the last quarter century in Germany and Norway if the effects of this adjustment were small in the late 1970s. The size of the adjustment for Germany has increased greatly since 1998 owing to a jump in the imputation credit rate while the opposite has occurred in the United Kingdom since 2000 (see Table 17). The correlation coefficient for the adjusted and baseline tax ratios is high for all countries except Germany and, in the case of labour income tax ratios, France and Spain.

Table 18. **Dividends taxed separately at flat rates**

Deductibility of social security contributions/Countries	Modified tax ratios
Not deductible	
Portugal	$\alpha = W / (OSPUE + PEI - D + W)$ $\tau_h = (1100 - D * t_{hd}) / (OSPUE + PEI - D + W)$ $\tau_k = [\tau_h * (OSPUE + PEI - D) + D * t_{hd} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$
Deductible	
Austria, Belgium, Denmark, Finland, Greece, Italy, Norway, Sweden	$\alpha = (W - 2100) / (OSPUE + PEI - D + W - 2100 - 2300)$ $\tau_h = (1100 - D * t_{hd}) / (OSPUE + PEI - D + W - 2100 - 2300)$ $\tau_k = [\tau_h * (OSPUE + PEI - D - 2300) + D * t_{hd} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$

Source: OECD.

Table 19. **Household dividend tax rates net of imputation credits**
Per cent

Austria	22% in 1994-96 25% in 1997-2000
Belgium	25% in 1994-95 15% in 1996-2000
Denmark	30% in 1994-95 25% in 1996-2000
Finland	0% in 1994-2000
Greece	0% in 1994-2000
Italy	12.5% in 1995-2000
Norway	0% in 1994-2000
Portugal	25% in 1994-2000
Sweden	0% in 1994-97 30% in 1998-2000

Source: OECD.

Interest taxed at flat rates

Many countries offer taxpayers the option of paying a flat tax rate (t_{int}) on interest income (INT) that is lower than the taxpayer's marginal rate.⁵¹ This departure from the assumption that all personal income is taxed at the same rate can be taken into account by excluding interest income from household income and by imputing tax on interest income directly to capital (Table 21).⁵² Flat tax rates on personal interest income (t_{int}) are shown in Table 22.

While these flat tax rates may be considerably lower than top marginal income tax rates, they are often higher than the household income tax ratio. This is so in

Table 20. **Effect of adjusting for relief from double taxation of dividends¹**
1994-2000

	Labour income tax ratio		Capital income tax ratio ²	
	Change in average level ³	Correlation coefficient ⁴	Change in average level ³	Correlation coefficient ⁴
Germany	4.43	-0.39	-11.54	-0.11
France	0.80	0.72	-2.22	1.00
Italy	0.35	1.00	-0.46	0.98
United Kingdom	2.11	0.84	-5.35	0.99
Austria	-0.45	0.99	1.40	1.00
Belgium	0.24	0.90	-0.56	0.98
Denmark	0.44	1.00	-1.52	0.99
Finland	0.52	0.99	-1.11	1.00
Greece	0.14	1.00	-0.10	1.00
Norway	2.45	0.97	-4.76	0.97
Portugal	-0.32	0.80	0.40	1.00
Spain	1.03	0.70	-1.89	1.00
Sweden	0.63	0.99	-2.12	1.00
Average ⁵	0.95		-2.29	

1. This adjustment cannot be made in Australia, Canada, the Czech Republic, Hungary, Ireland (1994-98), Korea, New Zealand and Poland owing to a lack of data.

2. Based on net operating surplus.

3. Compared with the revised approach baseline, percentage points.

4. Correlation coefficients less than 0.8 are bolded.

5. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

Austria, France, Italy, Japan and Portugal – half of the countries for which this adjustment is necessary and with data available to make it. In such cases, this adjustment increases the capital income tax ratio and reduces the labour income

Table 21. **Interest taxed at flat rates**

Deductibility of social security contributions/Countries	Modified tax ratios
Not deductible	
Portugal	$\alpha = W / (OSPUE + PEI - INT + W)$ $\tau_h = (1100 - INT * t_{int}) / (OSPUE + PEI - INT + W)$ $\tau_k = [\tau_h * (OSPUE + PEI - INT) + INT * t_{int} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$
Deductible	
Austria, Belgium, Finland, France, Italy, Japan and Sweden	$\alpha = (W - 2100) / (OSPUE + PEI - INT + W - 2100 - 2300)$ $\tau_h = (1100 - INT * t_{int}) / (OSPUE + PEI - INT + W - 2100 - 2300)$ $\tau_k = [\tau_h * (OSPUE + PEI - INT - 2300) + INT * t_{int} + 2300 + \beta * 2400 + 1200 + 4000 + 5125 + 5212 + 6100] / (OS - 3000)$

Source: OECD.

Table 22. **Flat tax rates on interest income**

	Per cent
Austria	22% in 1994-96 25% in 1997-2000
Belgium	13% in 1994 15% in 1995-2000
Finland	25% in 1994-95 28% in 1996-99 29% in 2000
France ¹	39.4% in 1994 19.4% in 1995 20.9% in 1996 25% in 1997-2000
Italy ²	30% in 1995-96 28% in 1997 27% in 1998-2000
Japan	20% in 1994-2000
Portugal	20% in 1994-2000
Sweden	30% in 1994-2000

1. These rates comprise a final withholding tax of 35 per cent in 1994 and 15 per cent thereafter and a variety of surcharge taxes, the most important of which is the general social contribution (CSG). These surcharge taxes were 4.4 per cent in 1994-95, 5.9 per cent in 1996 and 10 per cent thereafter.

2. There are no data for 1994.

Source: OECD.

tax ratio (Table 23). For the remaining countries, the adjustment has the opposite effect. This adjustment has a very small effect on tax ratios in all countries except Belgium and Portugal, where the effect on the capital income tax ratio nevertheless remains modest (2 percentage points). The adjusted and baseline tax ratios are highly correlated in virtually all cases (the only exception is the labour income tax ratio in Portugal).

The combined effect of the above preferential arrangements for capital income taxation

Bringing together the four cases of reduced capital income taxation for households, which concern pension fund and life insurance earnings, imputed rentals on owner occupied housing, relief from double taxation of dividends and flat tax rates on interest receipts gives the modifications to the tax ratios shown in Table 24.

Only five countries – France, Germany, the Netherlands, Spain, the United Kingdom and the United States – have data available to make all the necessary adjustments for preferential tax treatment of personal capital income. Taken together, these adjustments substantially reduce the capital income tax ratio in these countries (by 8 percentage points, on average) and significantly increase the labour income tax ratio (by 4 percentage points, on average) (Table 25). These effects are especially large in Germany and the United Kingdom. The correlation

Table 23. **Effect of adjusting for flat tax rates on interest income**
1994-2000

	Labour income tax ratio		Capital income tax ratio ¹	
	Change in average level ²	Correlation coefficient ³	Change in average level ²	Correlation coefficient ³
Japan	-0.38	0.99	1.07	1.00
France	-0.45	0.94	1.26	1.00
Italy	-1.28	0.98	1.63	0.98
Austria	-0.17	1.00	0.55	1.00
Belgium	0.94	0.90	-2.16	1.00
Finland	0.06	1.00	-0.14	1.00
Portugal	-1.02	0.78	2.13	1.00
Sweden	0.06	1.00	-0.23	1.00
Average ⁴	-0.28		0.51	

1. Based on net operating surplus.

2. Compared with the revised approach baseline, percentage points.

3. Correlation coefficients less than 0.8 are bolded.

4. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

coefficient between the adjusted and baseline tax ratios is low (less than 0.8) in all cases except for the labour income tax ratio in the United States and capital income tax ratios in the United Kingdom and Spain. These results suggest that many empirical results could be affected by using tax ratios that do not make such adjustments for preferential treatment of household capital income.

CONCLUSION

Tax ratios have been widely used in empirical economic analyses to approximate the taxes that distort key economic decisions, notably in the areas of employment, saving and investment. This paper proposes some modifications to the well-known methodology developed by Mendoza *et al.* (1994) for calculating tax ratios. While these modifications do not deal with many of the criticisms that have been addressed to this methodology, they do make the underlying assumptions more realistic. The main changes are that deductibility of social security contributions is taken into account, labour income is enlarged to include employer contributions to pension funds and the definition of capital taxes is widened to include a number of property taxes. This and the other changes made increase capital income tax ratios relative to the Mendoza approach and reduce somewhat labour income and consumption tax ratios. The revised estimates suggest that

Table 24. **Combined effect of preferential tax arrangements
for household capital income**

System/Countries ¹	AETR equations
Global personal income, social security contributions not deductible	
United States	$\tau_h = 1100 / (\text{OSPUE} + \text{PEI} - \text{PIAPH} + \text{W} - \text{IROOHN})$ $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - \text{PIAPH} - \text{IROOHN}) + 1200 + 2300 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$
Global personal income, social security contributions deductible	
Netherlands	$\tau_h = 1100 / (\text{OSPUE} + \text{PEI} - \text{PIAPH} + \text{W} - 2100 - 2300)$ $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - \text{PIAPH} - 2300) + 1200 + 2300 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$
Dividend imputation, global personal income, social security contributions not deductible	
United Kingdom	$\alpha = \text{W} / (\text{OSPUE} + \text{PEI} - \text{PIAPH} + \text{W} - \text{IROOHN})$ $\tau_h = (1100 + \text{D} * \tau_{\text{IR}}) / (\text{OSPUE} + \text{PEI} - \text{PIAPH} + \text{W} - \text{IROOHN})$ $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - \text{PIAPH} - \text{IROOHN}) - \text{D} * \tau_{\text{IR}} + 1200 + 2300 + \beta * 2400 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$
Dividend imputation, global personal income, social security contributions deductible	
Germany and Spain ²	$\tau_h = (1100 + \text{D} * \tau_{\text{IR}}) / (\text{OSPUE} + \text{PEI} - \text{PIAPH} + \text{W} - \text{IROOHN} - 2100 - 2300)$ $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - \text{PIAPH} - \text{IROOHN} - 2300) - \text{D} * \tau_{\text{IR}} + 1200 + 2300 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$
Dividend imputation, dividends taxed as ordinary income, flat rate on interest income, social security contributions deductible	
France	$\tau_h = (1100 + \text{D} * \tau_{\text{IR}} - \text{INT} * \tau_{\text{int}}) / (\text{OSPUE} + \text{PEI} - \text{PIAPH} - \text{INT} + \text{W} - \text{IROOHN} - 2100 - 2300)$ $\tau_k = [\tau_h * (\text{OSPUE} + \text{PEI} - \text{PIAPH} - \text{INT} - \text{IROOHN} - 2300) + \text{INT} * \tau_{\text{int}} - \text{D} * \tau_{\text{IR}} + 1200 + 2300 + 4000 + 5125 + 5212 + 6100] / (\text{OS} - 3000)$

1. Only countries for which all necessary adjustments can be made are shown.

2. IROOHN (net imputed rentals on owner occupied housing) is set to zero in Spain before 1999, when imputed rentals were taxed.

Source: OECD.

OECD countries have focused the increase in the tax burden during the past quarter century slightly more on capital than on labour, whereas the opposite conclusion is reached using the Mendoza approach. Nevertheless, even though differences between tax ratios in the revised and Mendoza approaches are sometimes quite large, the two sets of tax ratios are in most cases highly correlated,

Table 25. **Combined effect of preferential arrangements
for household capital income**
1994-2000

	Labour income tax ratio		Capital income tax ratio ¹	
	Change in average level ²	Correlation coefficient ³	Change in average level ²	Correlation coefficient ³
United States	1.28	0.98	-2.49	-0.14
Germany	6.68	-0.37	-17.50	0.61
United Kingdom	5.08	0.26	-11.74	0.82
Netherlands	4.13	0.60	-5.86	0.15
Spain	2.23	-0.27	-4.28	0.89
Average ⁴	3.88		-8.37	

1. Based on net operating surplus.

2. Compared with the revised approach baseline, percentage points.

3. Correlation coefficients less than 0.8 are bolded.

4. Simple average.

Source: OECD, *Revenue Statistics and National Accounts*.

suggesting that many empirical results would not be affected by the choice of approach. Relating the revised tax ratios to macroeconomic variables of interest, it is found that labour income (and combined labour income and consumption) tax ratios are inversely related across countries to hours worked per member of the working age population but are not related to structural unemployment. Moreover, the revised capital income tax ratios are not related to either investment or private savings rates.

There are still a number of unrealistic assumptions underlying the revised estimates that could not be systematically relaxed owing to a lack of data for certain countries and/or periods. These are that all unincorporated business net income is capital income, households do not receive government interest (transfer) payments and do not pay tax on social security benefits and that household capital income is taxed at the same rates as other income. Relaxing these assumptions where possible sometimes results in tax ratio estimates that differ substantially from the baseline estimates and/or are not highly correlated with the baseline. In the case of adjustments concerning self-employed income (dividing it into labour and capital components or separating it from labour and capital income), capital income tax ratios generally rise substantially. However, these adjustments have little or no effect on labour income tax ratios and yield tax ratio series that are highly correlated with the baseline series in most cases (but not for capital income tax ratios in a significant minority of countries). While the variety of adjustments made to account for preferential tax treatment of household capital income individually have only small effects, taken together they markedly reduce

capital income tax ratios, increase labour income tax ratios and mostly yield series that are not highly correlated with the baseline. These results reinforce the view that caution is required when using tax ratios to support a given policy stance or to advocate a particular direction for reform. Tax ratio estimates need to be corroborated by a significant volume of other information before conclusions can reasonably be drawn. This applies both to conclusions about a country's tax system and to the relative shifts in the tax burden suggested by the estimates in this paper.

NOTES

1. This is the terminology used in Volkerink and de Haan (2001), which we follow. Tax ratios are also known as effective tax rates, implicit tax rates and average tax ratios.
2. The OECD takes the view that further work relying on micro-data is required to assess the magnitude of potential biases to tax ratio estimates. In a recent OECD study (Volkerink and de Haan, 2001), the authors conclude that "... average tax rates measured using aggregate data will in a number of cases generate misleading indicators of the tax burdens on taxpayers, on factors of production, and on consumption. At the same time, it is recognised that an examination of such ratios is a useful exercise, if only to identify the substantial shortcomings of these measures. The message of this study is that policymakers should be aware of the measurement problems underlying average tax rate based on aggregate data, should they be fielded to shape public policy debates". In OECD (2000), it is noted that while average tax rates represent a more informative indicator of the burden and impact of tax systems than a simple reliance on nominal (statutory) tax rates or tax revenue as a share of GDP, their calculation raises several potentially significant methodological problems. The Working Party No. 2 on Tax Policy Analysis and Tax Statistics of the OECD Committee on Fiscal Affairs takes the view that average tax rate results relying on aggregate tax and national accounts data are potentially highly misleading indicators of relative tax burdens and tax trends. Work is currently under way by Working Party No. 2 Delegates using micro-data to assess the magnitude of potential biases to average tax rate figures derived from aggregate data.
3. The ease with which such a switch could be effected would depend on legal and labour market practices in the country concerned.
4. This can result in tax data in a given year including revenue from a tax that no longer exists, as occurred in Austria following the abolition of the business tax (*Gewerbesteuer*) at the end of 1993.
5. These countries are Japan, Germany, Italy, Austria and Greece.
6. For ease of comparison with Mendoza *et al.* (1994) and other studies in this field, we retain the variable names based on the definitions in SNA68/ESA79, even though the variables used are in fact from SNA93/ESA95. OSPUE corresponds to "unincorporated business net income" in the new system.
7. PEI corresponds to "interest, dividends and investment receipts" in SNA93/ESA95.
8. The other countries in which employees' social security contributions are not deductible are: Australia, Canada, Hungary, Mexico, Portugal and the United Kingdom. Such contributions are low by OECD standards in all of these countries except Hungary and Portugal. In Germany, Ireland, Poland and Turkey deductions are for a flat amount. Treating employees' social security contribution as not deductible when they are results in too much household tax being allocated to labour (overstating the labour income tax ratio)

and not enough household tax being allocated to capital (understating the capital income tax ratio).

9. As data on unincorporated business income including imputed rentals on owner-occupied housing are not available in all of these countries, such income was not deducted from household income for the purposes of allocating the remaining household taxes to labour and capital. This tends to overstate the capital income tax ratio (too much of household taxation is allocated to capital) and understate the labour income tax ratio.
10. Insofar as this tax is paid by households, such a treatment would be consistent with that in countries such as Germany that have resident withholding taxes.
11. With this change, the denominators of the labour and capital income tax ratios sum to GDP, ensuring that taxes are entirely allocated to one or other of the factors of production.
12. The inclusion of 3000 in the denominator of the labour income tax ratio follows the suggestion made in Volkerink and de Haan (2001).
13. There are unallocated social security contributions (2400) in the following countries: Greece (until 1987); Hungary; Mexico; Portugal (1985-87); the Slovak Republic; Switzerland; and the United Kingdom. Note that it is not necessary to include 2400 data for Austria to ensure that the sum of the other components of social security contributions (2100, 2200 and 2300) equals total contributions (2000).
14. A problem with the consumption tax ratio that cannot be resolved owing to data limitations is that it includes indirect taxes on investment goods in the numerator. In the case of VAT, this occurs for VAT-exempt industries that supply inputs to produce investment goods. Neither the purchasers of these inputs nor the tax-exempt suppliers themselves are able to claim back the VAT paid on the VAT-exempt industries' inputs. This problem mainly concerns the finance industry, which is generally VAT-exempt owing to the difficulty of measuring value added; by contrast, the problem does not affect government or the not-for-profit sector, as their outputs are classified as final consumption in the national accounts. For general indirect taxes other than VAT (such as sales tax and turnover tax), which are only levied in a few countries [the United States, Canada, Australia (until 2000), Hungary, Iceland, Switzerland (until 1995) and Turkey] the problem is more direct, in that such taxes may apply to investment expenditures more generally. Data are not generally available on VAT paid by tax-exempt sectors that supply inputs to produce investment goods or on the proportion of their outputs that are inputs to produce investment goods. With respect to other general indirect taxes, data are not readily available on the proportion of such taxes that relate to consumption goods. Hence, the consumption tax ratio will be overstated because indirect taxes on investment are included in the numerator. However, the degree of overstatement is unlikely to be great, especially as countries tend to have either a VAT or other general indirect taxes, but not both (the exceptions are Canada, Hungary, Iceland and Turkey).
15. Mendoza *et al.* (1994) excluded customs and import duties on the grounds that they were not significant in G7 countries but noted that these duties should be taken into account in extending the study to other countries.
16. In other words, we include all taxes on specific goods and services except taxes on exports (5124), taxes on investment goods (5125) and other taxes on international trade and transactions (5127).
17. This tax has already been allocated to capital.
18. The inclusion of 1200 in the numerator of the equation for the capital income tax ratio presupposes that this item relates entirely to capital. In fact, there are many small

corporations in some countries that are more comparable to small-unincorporated enterprises, which are considered to pay taxes on both labour and capital income. It would be consistent to treat these corporations in the same way as unincorporated enterprises. However, this cannot be done owing to the lack of aggregate data. In the absence of this adjustment, capital tax ratios tend to be overstated, although the degree of the distortion is unlikely to be great because such companies pay only a small share of total corporate taxes.

19. It is implicitly assumed that all such taxes relate to the income flows appearing in the denominator of the equation for the capital income tax ratio. While this is true for most property taxes (4000), it is not true for taxes on wealth in the form of art, racehorses or foreign property. Accordingly, the revised estimates tend to overstate the capital income tax ratio.
20. Only Norway levies such a tax.
21. I.e. other than households.
22. See notes to Table 2 for a list of the countries with full data sets. This includes countries for which other household income (YPE plus OSPUE) was estimated for periods before which SNA93/ESA95 data are available.
23. This does not necessarily mean that international tax competition has not caused a relative shift in the tax burden towards the least mobile factor of production, labour. Capital income tax ratios do not adequately capture the effects of international tax competition because both the numerator and denominator are reduced by it.
24. The methodologies are sometimes based on a variety of sources (lives of capital assets used for tax purposes, lives based on estimates made using company accounts or using survey data). These give rise to very different average lives. For example, estimates of capital consumption allowances are based on an assumed average economic life for equipment of 7 years in Switzerland, 11 years in Japan and 26 years in the United Kingdom (OECD, 1992).
25. Changes in the tax treatment of public enterprises, including through privatisation, will also distort trends in capital income tax ratios. For example, when the Austrian central bank was made taxable in 1994, this increased corporate tax revenue by more than 10 per cent.
26. There are no payroll taxes (Revenue Statistics category 3000) in the United States and Japan.
27. Using a growth accounting model, Prescott (2002) also finds that labour and consumption taxes have a very important negative effect on labour inputs. For example, he finds that the 30 per cent shortfall of output per member of the working age population in France relative to the United States is accounted for by lower labour inputs in France, which in turn can be explained by higher labour and consumption taxes.
28. This is based on the following OLS regressions (with t-values in brackets) based on average values for each country over 1990-2000:

$$\begin{aligned} \text{NAIRU}_i &= 5.43 + 0.05 * \tau_{li} + u_i \text{ and} \\ &\quad (2.07) (0.62) \quad R^2 \text{ adjusted} = -0.04 \\ \text{NAIRU}_i &= 4.13 + 0.07 * \tau_{lci} + u_i \\ &\quad (1.34) (0.96) \quad R^2 \text{ adjusted} = 0.0 \end{aligned}$$

where:

NAIRU = non-accelerating inflation rate of unemployment;

τ_l = labour income tax ratio; and

τ_{lc} = combined labour income and consumption tax ratio.

29. This is based on the following OLS regressions (with t-values in brackets) based on average values for each country over 1990-2000:

$$(\text{INVB/GDP})_i = 12.64 - 0.0 * \tau_{ki} + u_i \text{ and} \\ (3.84) \quad (-0.02) \quad R^2 \text{ adjusted} = -0.06$$

$$(\text{PSAV/GDP})_i = 21.95 - 0.05 * \tau_{ki} + u_i \\ (5.55) \quad (-0.66) \quad R^2 \text{ adjusted} = -0.03$$

where:

INVB = gross business investment expenditures;

PSAV = private sector saving; and

τ_k = capital income tax ratio.

30. Only baseline equations that change when an assumption is modified appear in this and the following sections.
31. EU countries with data available from 1975 onwards are: Germany, France, Italy, the United Kingdom, Belgium, Finland, Spain and Sweden.
32. This also ensures that two otherwise identical countries with the same government interest payments net of tax will have the same tax ratios on labour and capital, even if one does not tax such payments at all while the other imposes a very high tax on them. Without this adjustment, the standard tax ratio methodology wrongly suggests that the burden of taxation (on capital) is higher in the country that taxes government interest payments.
33. No adjustment to corporate income tax receipts (I200) is made in respect of residents because government bonds held directly by residents other than households are mainly in the hands of pensions funds and life insurance companies, who generally do not pay tax on earnings. Moreover, insofar as bonds are held by domestic financial intermediaries, the other major holder, tax is effectively shifted back to the household sector as intermediaries borrow from it to finance their bond holdings: interest on such loans is deductible for intermediaries but taxable for households.
34. This rate is 15 per cent in Belgium, Canada and Portugal. It is 10 per cent in Australia, Italy, Japan, Korea, New Zealand, Poland, Spain, and Switzerland and 0 in other countries.
35. EU countries with data available from 1975 onwards are: Germany, France, Italy, the United Kingdom, Austria, Belgium, Finland, Spain and Sweden.
36. The average increases in the baseline capital income tax ratio (based on net operating surplus) between 1975-80 and 1999-2000 in EU and OECD countries for which data were available to make the adjustment were 5.2 and 6.3 percentage points, respectively.
37. Adema (2001) contains combined estimates of direct taxes and social security contributions on government benefits (Table 7, pp. 27-28). These had to be divided into direct tax- and social security components to adjust for this factor in the tax ratio estimates. To do this, direct tax and social security contributions for three household types (single, no children, earning 67 per cent of average production wages (APW); single, two children, earning 67 per cent of APW; and married, two children, household head earns 100 per

cent of APW, spouse earns nothing) were calculated using the OECD Taxing Wages database. The average proportion of each component in total direct tax and social security contributions for the three household types was then used to allocate Adema's series to its direct tax- and social security contributions components.

38. These modifications also ensure that two otherwise identical countries with the same net government benefit payments will have the same labour and capital tax ratios, even if one does not tax such payments at all while the other imposes a very high tax on them. Without this adjustment, the standard approach to calculating tax ratios wrongly suggests that the burden of taxation (on capital and especially on labour) is higher in the country that taxes government benefit payments.
39. Tables in this section listing the necessary adjustments to allow for preferential tax treatment of household income only cover countries for which data are available to make these adjustments.
40. Information on the tax treatment of each of these forms of household capital income comes from the *OECD Tax Database*, which only starts in 1994.
41. The tax on pension benefits that households pay in schemes subject to exempt-exempt-tax (EET) rules is effectively levied on deferred labour income, not the earnings of the pension scheme. The fact that earnings are not taxed when benefits are taxed can be seen by considering the case of a contributor to a scheme subject to tax-exempt-exempt (TEE) rules. If tax rates and gross investment returns are the same, this contributor will get exactly the same net return on pension contributions as the contributor subject to EET rules, despite the fact that pension benefits are not taxed.
42. Such tax is levied only in Australia, Denmark, New Zealand and Sweden.
43. The distinction between corporate income taxes and individual income taxes in *OECD Revenue Statistics* is that corporate income taxes are levied on the corporation as an entity, not on the individuals who own it, and without regard to the personal circumstances of these individuals. Following this logic, "Taxes paid on ... the income of institutions, such as life insurance or pension funds, are classified as corporate taxes (1200) if they are charged on ... the institution as an entity without regard to the personal circumstances of the owners" *OECD Revenue Statistics* (2001, p. 266).
44. These countries are: Australia, Austria, Canada, Czech Republic (1998-2000), Finland, France, Germany, Hungary (1997-2000), Iceland (1999-2000), Ireland, Italy (1994-98), Japan, Luxembourg (1994-97), Mexico, New Zealand, Portugal, Spain (1999-2000), the United Kingdom and the United States.
45. This does not mean that there is no preferential treatment of imputed rentals in countries where they are taxed. As imputed rentals tend to be assessed at less than market values, they still receive favourable treatment. In fact, taxation of imputed rentals can be more favourable to the owner-occupier than tax exemption if he/she is able to offset tax losses (usually owing to high mortgage interest charges) against other income. This is the case in the Netherlands and Switzerland.
46. These countries are the Czech Republic (1998-2000), Finland, Italy (1994-98), Mexico (1994, 2000), Portugal (1994-98), and the United States. Countries with small capped deductions for interest expenses (so that they are mostly not deductible) are not included in this category.
47. The exceptions, which operate a classical corporate income tax system and a global personal income tax system, as assumed in the standard tax ratio methodology, are: Ireland in 2000; Japan; Luxembourg; the Netherlands; Switzerland; and the United States.

48. Countries with dividend imputation systems and that tax dividends as ordinary income but are not included in Table 16 owing to a lack of data are: Australia, Canada, Ireland (1994-99), Korea (1997), Mexico (1996-2000) and New Zealand.
49. As an example of calculating t_{IR} , consider the case of an Australian resident in 2000 subject to the top marginal tax rate (48.5 per cent). The imputation credit rate is 36 per cent (the corporate tax rate) and the dividend must be grossed up to its pre-corporate tax value for inclusion in the individual's global income subject to tax. Hence,

$$t_d = (0.485 - 0.36)/(1 - 0.36) \\ = 0.195$$

In other words, the individual only has to pay a tax rate of 19.5 per cent on dividend income. Hence, the tax saving from the imputation credit (t_{IR}) is 29 per cent, the difference between his marginal income tax rate (48.5 per cent) and the tax rate actually paid on dividend income (19.5 per cent).

50. Countries that tax dividends separately at flat rates but that are not included in Table 18 owing to a lack of data are: Hungary, Mexico (1994-95), the Czech Republic, Iceland, Korea (1998-2000) and Poland.
51. Countries that tax interest receipts separately at flat rates but that are not included in Table 21 owing to a lack of data are: the Czech Republic, Hungary, Iceland, Ireland, Korea, Mexico, and Poland.
52. These adjustments mirror those for dividends in a scheduler household income tax system.

Annex

Table A1. **Business and corporate taxes in selected countries**
Per cent of GDP

	Business taxes in 1100 ¹			Corporate taxes (1200) ²		
	1975-89	1990-2000	1975-2000	1975-89	1990-2000	1975-2000
Japan	0.04	0.05	0.04	5.62	4.50	5.14
Germany	1.20	1.21	1.20	1.98	1.50	1.78
Austria	0.89	0.52	0.74	1.37	1.74	1.52

1. These countries have business taxes that are included in the 1100 series (taxes on income, profits and capital gains of individuals).

2. The 1200 series in *Revenue Statistics* (taxes on income, profit and capital gains of corporations).

Source: OECD, *Revenue Statistics* and *National Accounts*.

Table A2. **Tax ratios – revised approach**
Per cent

	Capital based on net operating surplus				Capital based on gross operating surplus				Labour				Consumption				Combined labour and consumption			
	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000
United States ¹	42.2	37.9	39.5	-2.7	29.2	25.8	27.3	-1.9	20.4	22.1	23.4	3.1	6.7	6.6	6.4	-0.4	25.7	27.3	28.3	2.6
Japan	35.4	47.6	50.0	14.6	24.4	31.1	27.9	3.5	17.3	21.7	24.1	6.8	6.0	5.8	6.4	0.4	22.9	26.8	29.4	6.5
Germany ²	37.5	38.7	34.9	-2.6	23.6	23.1	21.2	-2.4	32.8	33.2	35.0	2.3	12.5	12.6	13.4	0.9	42.5	42.8	44.9	2.4
France	42.0	51.9	55.9	14.0	25.3	30.0	33.2	7.9	32.7	37.9	40.5	7.8	15.7	15.7	15.1	-0.6	45.3	49.6	51.3	6.0
Italy	21.7	32.7	42.7	21.0	15.2	23.6	31.0	15.8	25.8	32.1	37.7	11.9	10.6	11.7	13.9	3.3	35.0	41.5	47.9	12.9
United Kingdom ¹	64.2	69.9	53.2	-11.1	37.2	40.5	34.0	-3.2	25.5	24.4	22.6	-2.8	13.4	16.0	15.7	2.3	35.4	36.5	34.8	-0.7
Canada ¹	45.2	46.2	59.5	14.2	30.8	31.0	36.8	6.0	21.2	25.0	29.6	8.4	16.0	16.3	13.9	-2.0	33.8	37.2	39.4	5.6
Australia ¹	44.5	46.2	49.4	4.9	27.3	28.4	30.7	3.5	18.8	20.6	20.9	2.1	12.8	13.9	12.1	-0.7	29.2	31.6	30.5	1.3
Austria	45.1	40.3	42.2	-2.9	23.7	22.3	24.3	0.6	33.1	36.0	39.6	6.5	16.8	17.2	16.2	-0.5	46.4	49.1	51.2	4.9
Belgium	49.6	50.0	51.4	1.8	31.5	31.3	32.7	1.3	35.5	39.6	41.3	5.7	14.9	14.3	15.0	0.1	47.1	49.9	51.7	4.6
Czech Republic ³	..	..	40.7	..	..	..	21.6	..	..	..	41.5	..	..	..	13.0	..	..	..	47.2	..
Denmark	..	87.3	71.9	..	..	46.1	39.5	..	..	36.1	39.9	..	19.4	20.9	20.6	1.2	..	53.8	56.0	..
Finland	36.5	40.2	48.9	12.4	21.5	22.7	26.0	4.5	33.4	35.2	45.0	11.6	17.2	18.7	18.7	1.5	47.4	50.3	58.0	10.5
Greece	..	..	15.1	..	..	..	12.9	..	..	..	34.9	..	13.6	14.4	15.5	1.9	..	..	46.5	..
Hungary ¹	..	..	..	..	..	..	14.7	..	..	..	..	..	..	..	22.2	..	..	..	..	..
Ireland	..	25.1	24.1	..	..	..	..	..	..	25.0	26.3	..	17.6	21.4	21.2	3.6	..	41.0	41.9	..
Korea	9.7	13.2	22.5	12.8	8.3	10.5	16.7	8.4	3.4	4.5	9.9	6.6	13.7	16.3	15.8	0.8	17.9	20.0	24.2	6.3
Netherlands	..	..	52.8	..	..	..	32.7	..	..	..	36.4	..	16.3	16.8	18.0	1.6	..	..	47.9	..
New Zealand	..	..	43.8	..	..	..	..	..	..	..	25.1	..	11.7	15.0	18.5	6.8	..	..	38.9	..
Norway	42.4	50.3	39.4	-3.0	24.6	29.3	24.7	0.1	35.7	35.6	36.2	0.5	23.8	25.7	25.7	1.8	51.0	52.1	52.5	1.5
Poland	..	..	..	..	..	..	20.9	..	..	..	..	..	..	..	17.1	..	..	..	..	..
Portugal ^{1, 4}	..	..	28.1	..	..	..	17.6	..	..	..	23.9	..	13.3	17.8	19.9	6.7	..	..	39.0	..
Spain	12.8	20.5	28.8	15.9	9.1	14.2	20.0	11.0	24.7	30.0	30.7	6.0	5.2	11.5	14.5	7.6	29.9	38.0	40.8	10.8
Sweden	71.8	70.3	69.9	-1.9	34.1	35.3	35.7	1.6	44.6	47.9	49.6	5.0	18.3	20.6	19.8	1.5	54.7	58.6	59.6	4.8
Switzerland	38.4	47.0	53.2	14.8	24.4	26.5	27.1	2.7	26.9	27.7	30.9	4.0	8.8	9.0	9.3	0.5	33.3	34.2	37.3	4.1
EU-15 ⁵																				
Average	42.4	46.0	47.5	5.2	24.6	27.0	28.7	4.1	32.0	35.1	38.0	6.0	15.9	17.3	17.8	1.9	42.6	46.3	48.9	6.3
Standard deviation	19.7	17.4	13.0	-6.7	9.4	8.4	6.2	-3.2	6.6	7.0	8.0	1.4	4.3	3.3	2.0	-2.4	8.1	7.4	7.6	-0.5

Table A2. **Tax ratios – revised approach** (*cont.*)

Per cent

	Capital based on net operating surplus				Capital based on gross operating surplus				Labour				Consumption				Combined labour and consumption			
	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975-80 1	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000	1975- 80	1980- 90	1990- 2000	Change between 1975-80 and 1990-2000
OECD ⁵																				
Average	39.9	43.9	46.3	6.4	24.4	26.6	28.1	3.7	27.0	29.6	32.3	5.3	14.6	15.6	15.7	1.1	37.3	40.4	42.6	5.3
Standard deviation	15.9	15.0	12.7	-3.3	8.0	7.4	5.8	-2.2	9.7	10.0	10.3	0.6	5.2	5.5	5.3	0.1	10.8	10.4	10.8	0.0

1. Social security contributions are not deductible.

2. West Germany before 1991.

3. It is assumed that the capital income tax ratio for the Czech Republic in 2000 is the same as in 1999.

4. It is assumed that the capital income tax ratio for Portugal in 1999 and 2000 are the same as in 1998.

5. Simple averages of the above countries with data in 1975.

Source: OECD, *Revenue Statistics and National Accounts*.

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THE STOCK MARKET, THE HOUSING MARKET AND CONSUMER BEHAVIOUR

Laurence Boone and Nathalie Girouard

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INTRODUCTION

There is growing recognition that asset markets can have strong effects on private consumption and aggregate demand. Buoyant equity markets have often been credited with strong demand growth in the latter part of the 1990s, and subsequent economic weakness is partly attributed to the slump in stock markets since 2000. At the same time, financial market deregulation over the past two decades may have given a greater role to conditions in the residential property market in determining aggregate demand. Indeed, the increase in house prices in the 1990s is sometimes seen as having amplified the stock-market effect, and continued buoyancy in house markets over the past two years may have provided some offsets to the equity market slump. For policy making it is important to establish the existence and strength of these effects.

This paper analyses the roles of household financial wealth and housing wealth across the G7 countries, with the exception of Germany,¹ in determining private consumption. It estimates the possible impact of the different types of wealth on consumption and tests whether financial deregulation may have modified such relationships. The main results are, first, that for all countries, wealth channels are identified; second, that these effects vary significantly across countries; and, third, that for some countries, their importance has tended to rise markedly over the recent past.

The paper proceeds as follows. Firstly, the recent evolution of financial and housing wealth is presented. Secondly, the traditional channels through which wealth affects consumption are described briefly. Thirdly, the econometric methodology used to estimate wealth effects on consumption is outlined, and estimates of the sensitivity of consumption to various forms of wealth are presented. Fourthly, the impacts of recent financial and housing market movements on consumption are quantified. The following section tests the estimated relationships extensively to detect whether there has been a change in consumer behaviour over the recent past. Finally, the last section briefly summarises the main findings.

RECENT DEVELOPMENTS IN FINANCIAL AND HOUSING WEALTH

With the exception of Japan, the G7 countries experienced a rapid rise in household wealth during the 1990s, largely driven by sharp increases in asset valuations. This development was generally accompanied by a decline in households saving rates, except in France. Households in the United Kingdom and the United States

saw a particularly sharp acceleration in the stock of wealth in the latter part of the decade whereas in Canada, France and Italy, the increase was less marked.

In the 1980s and early 1990s, share prices grew steadily but at a relatively modest pace in most countries. Since the mid-1990s, however, stock markets have experienced a sharp increase followed by a slump starting in 2001. By September 2002, broad share price indices had tumbled by over 40 per cent from their 2000 peaks in the United Kingdom and the United States, and by close to 50 per cent in the euro area and Japan (Figure 1). Collapse at this speed and on this scale, even if shareholders did not fully factor in paper gains at the height of the boom, can be expected to substantially reduce consumption and aggregate demand.

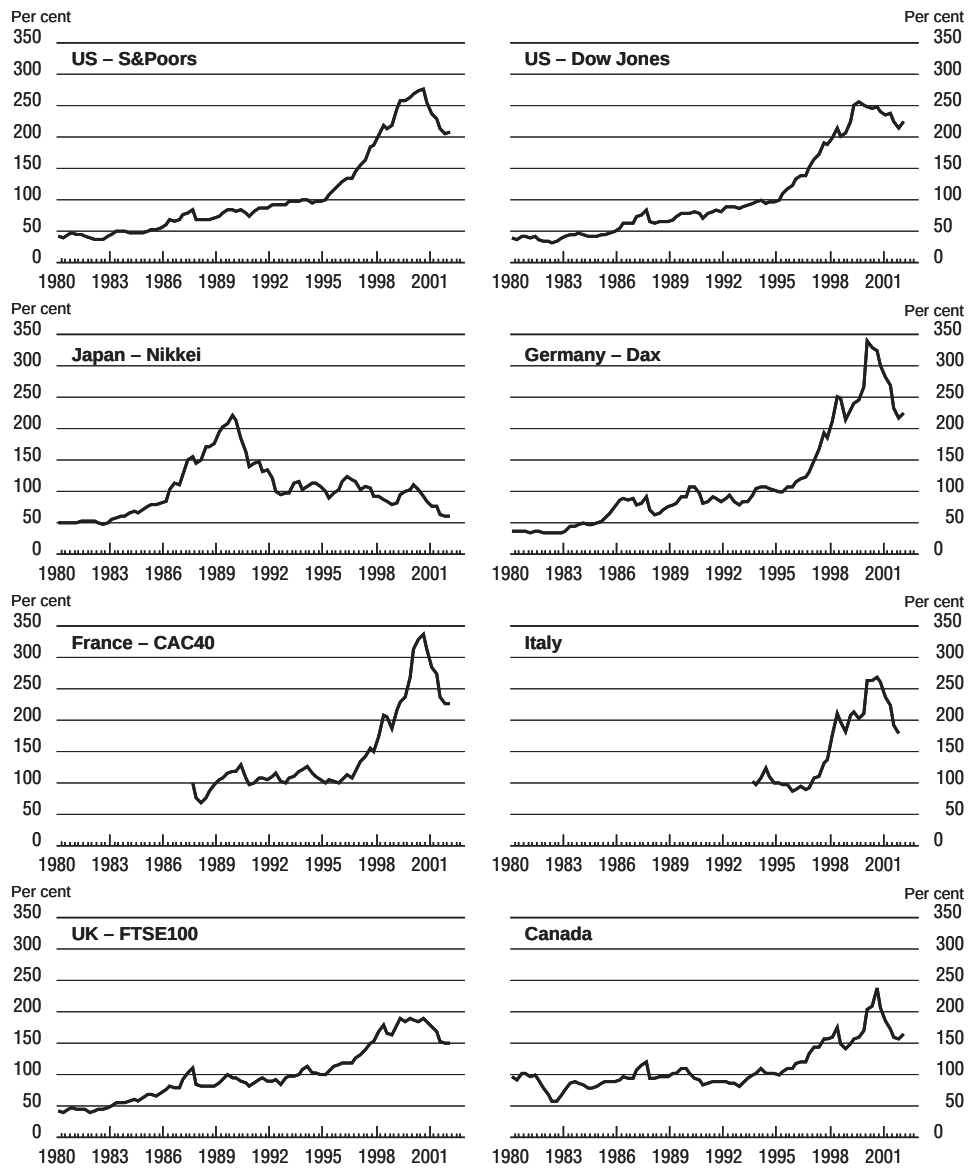
The amplitude of house price fluctuations has differed markedly across countries and over time within countries (Figure 2). Measured by the standard deviation of the annual growth rate of real house prices, fluctuations over the 1970-2001 period have been particularly strong in Italy, Japan and the United Kingdom. Conversely, the fluctuations have been comparatively small in France and, especially, the United States. In contrast to stock market developments, house price movements have differed significantly across countries in recent years. Between 1995 and 2001, real residential property prices grew by more than 20 per cent in France and the United States, and by nearly 50 per cent in the United Kingdom, but declined markedly in Germany and Japan, while remaining unchanged in Canada and Italy.

Mostly as a result of diverging asset price trends, the composition of household wealth has changed in recent decades in favour of shares and other financial assets (Figure 3). This movement was not even across countries and substantial differences remain between the English speaking countries (Canada, the United Kingdom and the United States) and the others. In the English speaking countries, financial wealth was already the most important component of total wealth in 1980 and accounted for about two-thirds or more of total wealth in the late 1990s. In France, Italy and Japan, financial wealth has climbed from low levels but only to about half of household total wealth, with a corresponding decline in the relative weight of real estate.

The proportion of wealth held in shares has increased to a different extent across countries since 1990. Among the G7 countries, the increase was most important in France and Italy, whereas it was more moderate in the United Kingdom and almost inexistant in Japan (Table 1). However, over the past two years, the relative weight of shares has receded dramatically with the collapse of their prices.

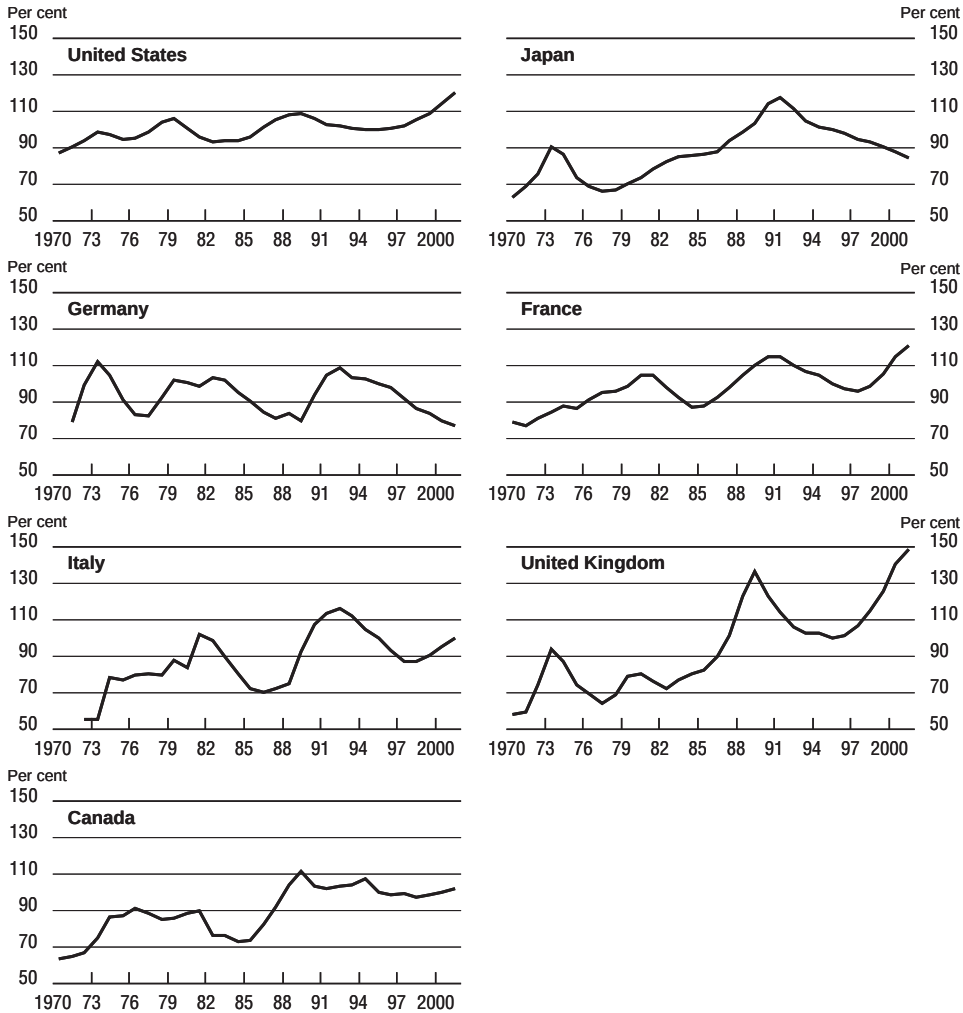
Looking at the evolution over the 1990s, the proportion of the population holding shares remained small, though it increased slightly in the countries reviewed. A relatively small percentage of the French, German and Italian population owns shares. By contrast there is a wider share ownership in the United Kingdom, possibly to some

Figure 1. **Real share prices, 1980-2002**
Index 1995 Q1 = 100



1. Share prices are deflated by the consumption deflators.

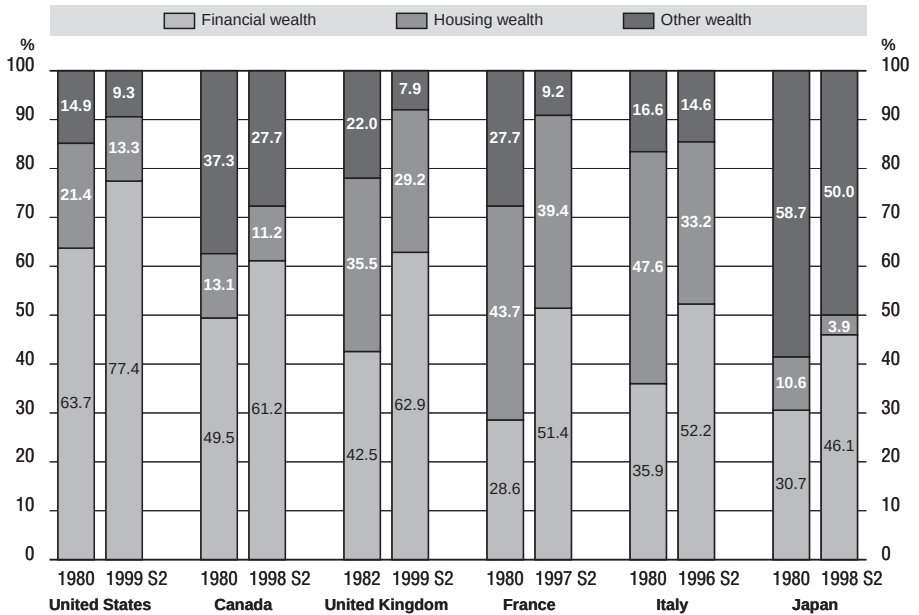
Figure 2. Real house price developments, 1970-2001¹
(1985 = 100)



1. House prices are deflated by the consumer price index. Data on residential property prices are not strictly comparable across countries due to differences in definition. In most countries, the house price index covers house prices on a national basis. However, in Germany, the index refers to the prices of houses located in western Germany. In Japan, the price index refers to residential land prices. Furthermore, depending on the country, the index relates to prices of existing and/or new houses, to prices of houses for owner-occupation only or also to prices of second residences, to prices of houses for which a loan has been applied for only or to a mix-adjusted house price index taking into account several differences in property type.

Source: Bank for International Settlements.

Figure 3. Total wealth decomposition in 1980 and 1999



1. Financial wealth is defined as financial assets minus financial liabilities, including mortgages. Housing wealth is defined as housing assets minus home mortgages. Other wealth is defined as net worth minus financial wealth and housing wealth.

Source: OECD, *Financial Accounts of OECD Countries*; United States, Federal Reserve, *Flow of Funds Accounts of the United States*, September 2000; Japan, Economic Planning Agency, *Annual Report on National Accounts 2000*; France, INSEE, *25 ans de Comptes du Patrimoine (1969-93)*, and *Rapport sur les Comptes de la Nation*; Italy, Banca d'Italia, *Supplementi al Bollettino Statistico*; United Kingdom, *National Accounts, Financial Statistics*; Canada, *National Balance Sheet Accounts*.

extent reflecting past privatisation programmes, and in the United States where private pension schemes have increased shareholding. The distribution of share holding across households has evolved little and those holding shares still belong disproportionately to the high-income population (Table 2). Using data from Table 2, Norman *et al.* (2002) estimated that for the population in the first three quartiles of the income distribution in each country, only 3.1 per cent own shares in Italy, 6.8 per cent in Germany, 10.4 per cent in France, 13.1 per cent in the United States and 19.1 per cent in the United Kingdom. This is important as the agents with the largest propensity to consume out of wealth are traditionally thought to be those with lower wealth holdings and lower income.

By contrast, the proportion of owner-occupiers is large and has been on an upward trend in the countries under review. Canada, Italy, Japan, the United Kingdom

Table 1. **Proportion of household wealth in shares**
 % of total wealth

	1980	1995	2000
Canada	13.3	14.1	18.9
France ¹	5.7	17.5	26.8
Germany	2.2 ²	7.5	12.9
Italy ¹	2.5	9.6	26.5
Japan	4.7	5.8	5.3
United Kingdom	5.5	13.6	14.6
United States	9.6	19.6	25.3

1. France and Italy's estimates for household equity holding include unquoted shares.

2. 1990.

Source: OECD.

and the United States have an owner-occupation rate of 60 per cent or more while France and Germany are in the 40 to 50 per cent range. The allocation of property wealth across households appears more evenly distributed than that of financial wealth. In the United States for instance, IMF (2002) using 1998 Survey of Consumer Finances data, showed that holding of shares (direct and indirect) as a ratio of income by decile of the income distribution surpasses housing wealth defined similarly only in the upper decile.

CHANNELS BY WHICH FINANCIAL WEALTH AND HOUSING WEALTH AFFECT CONSUMPTION

The effect of wealth on private consumption has traditionally been analysed in the framework of the permanent income hypothesis or the life-cycle model, where the level of consumption depends on households' "permanent income", *i.e.* the current and expected future labour income stream, plus their stock of wealth (Friedman, 1957, Ando and Modigliani, 1963). Given expected permanent income, households are assumed to try to spend evenly over their life, borrowing in early age, saving during the middle of their working lives and dis-saving in the later years. An unexpected increase in wealth (whether it is housing wealth or financial wealth) should therefore push consumers to spread the wealth gain over the remainder of their life, spending a bit more and saving a bit less.

In this framework, two main financing channels can be distinguished. The increase in wealth may add to higher consumption directly by households liquidating their assets. Another channel is that the increase in wealth raises borrowing capacity, which in turn may increase spending for liquidity-constrained households. The

Table 2. Pattern of share holdings across selected G7 countries

Income group (€) ^{1,2}	Percentage of population	Years	
Germany³		1997	2000
< 1 300	21.1	1.7	3.0
1 300-2 050	29.4	3.9	5.8
2 050-3 050	33.1	8.3	11.4
3 050-4 100	9.8	14.6	20.4
> 4 100	6.6	18.7	25.9
Total	100.0	6.2	9.8
France		1997	2000
< 1 500	32.3	6.1	7.4
1 500-2 300	32.2	10.1	11.2
2 300-3 050	18.3	15.5	14.3
3 050-3 800	8.4	19.1	21.1
> 3 800	8.5	32.6	31.4
Total⁴	100.0	12.0	12.7
Italy		1995	1998
< 850	17.6	0.2	0.6
850-1 700	33.4	2.0	2.4
1 700-2 600	22.9	5.0	5.7
2 600-3 450	13.5	10.3	11.9
> 3 450	12.6	21.7	31.7
Total	100.0	5.0	7.8
United Kingdom⁵		1993	1996
Lower quartile	25.0	8.2	13.4
Middle-lower quartile	25.0	14.8	15.6
Middle-upper quartile	25.0	27.0	26.5
Highest quartile	25.0	41.3	37.9
Total	100.0	22.8	23.3
United States		1995	1998
< 850	12.6	2.3	3.8
850-2 100	24.8	8.4	7.2
2 100-4 150	28.8	13.9	17.7
4 150-8 350	25.2	24.7	27.7
> 8 350	8.6	43.6	56.6
Total	100.0	15.2	19.2

Note: The table shows the proportion of each income group holding direct equities excluding mutual funds – for example, in 1997, 1.7 per cent of all German income earners earning less than EUR 1 300 per month owned direct equities excluding mutual funds. Percentage of population in each respective income group for latest available year.

1. Income groups by monthly net income, rounded to nearest unit of 50 (€, £, \$).

2. UK data by income quartiles, based on net household income.

3. German data include employee share ownership schemes.

4. Total does not sum exactly due to rounding.

5. Includes unit trusts, PEPs and government gilts.

Source: Bank of England, Deutsches Aktieninstitut, Deutsche Bundesbank, Banque de France/Paris Bourse, Banca d'Italia, Institute for Fiscal Studies and Federal Reserve Board.

magnitude of each of these effects depends upon a number of factors including the liquidity of asset markets, the extent of regulation in financial markets and the demographic distribution of asset ownership. The overall importance of the wealth effects is the results of the combination of these factors and channels.

Financial wealth effect on private consumption depends also on the nature of the assets. In France and Italy households appear to hold a large proportion of shares compared with share holding in the English speaking countries, but these holdings contain a large part of unquoted share, which may be less liquid and more difficult for households to value.² Moreover, there are no large-scale private pension schemes in France, Germany and Italy whereas the inclusion of asset holding in the form of private pension funds in the United Kingdom and in the United States results in a much greater proportion of wealth in quoted shares than in other countries. At the same time, it is likely that changes in the value of these locked-in pensions funds feed less directly into private consumption. Poterba (2000) suggested that consumers may keep “mental accounts” of assets that are earmarked for a specific purpose. Both of these factors could reduce the marginal propensity to consume out of financial wealth.

Regarding housing assets, there are other reasons for the wealth effect to be ambiguous. Owner-occupiers may perceive house price increases as an addition to their wealth, and reduce their saving out of current income. It is also possible that owners do not feel wealthier when the value of their property goes up since their implicit rental costs have gone up as well. However, in this case the increased implicit rental cost could induce the owners to trade down and the resulting housing equity withdrawal could be used to increase consumption. Households planning to purchase their own homes may, however, reduce their consumption in the wake of higher house prices as they will have to save more for higher down-payments and repayments. For these reasons, the strength of the housing wealth effect is uncertain.

Even if households regard their residential property to be wealth, their capacity to adjust current spending in response to shifting house prices is strongly dependent on the functioning of the financial system. This is notably the case when rising property values would encourage households to increase their current spending. To fund such spending increases, consumers would have to draw down other liquid assets or to borrow. Should credit not be forthcoming, households would be constrained in responding to higher house prices. In practice, households' ability to borrow is strongly dependent on their capacity to supply assets that can serve as a security for repayments and real estate is the most widely used collateral asset. By increasing borrowing secured on rising property values, households can withdraw part of the rise in housing wealth and use some of the proceeds to finance extra consumption. As for financial wealth, quantifying the importance of these wealth effects is an empirical question.

WEALTH EFFECTS: SPECIFICATION AND ESTIMATION ISSUES

The econometric analysis of the impact of different forms of wealth on private consumption adopted here consists of two steps. Firstly, owing to the non-stationary nature of the data, the long-term determinants of consumption are estimated using co-integration techniques. The dynamic evolution of consumption is then derived from these long-run relations, using an error-correction model. This allows the derivation of the speed of adjustment towards the desired level of consumption, and provides estimates of the short-term propensities to consume out of the different categories of wealth.

Estimation of the long-term level of consumption and its growth rate is based on the methodology used in Boone *et al.* (1998). Within the life-cycle/permanent income theory framework, a long-run relationship between the consumption to income ratio and wealth is estimated. Two specifications are used, in which wealth enters alternatively aggregated or disaggregated, as different categories of wealth may affect consumption with different magnitude as discussed above. The corresponding consumption equations can be written more formally as:

$$\ln(cy) = \alpha + \lambda(tw) + ect_{1a} \quad (1a)$$

$$\ln(cy) = \alpha + \beta(fe) + \gamma(he) + \delta(ow) + ect_{1b} \quad (1b)$$

where cy is the consumption to disposable income ratio, tw represents total wealth, fe financial wealth defined as financial assets minus financial liabilities other than mortgages, he housing wealth defined as housing assets minus home mortgages, ow other wealth defined as net worth minus fe and he . All the explanatory variables are in levels and expressed as ratios to disposable income, while the dependent variable, $\ln(cy)$, is the ratio of private consumption to disposable income expressed in logarithmic form.³ Disposable income embodies labour income, property income and transfer income minus taxes. α is a constant, β , γ , δ and λ are long-term propensities to consume out of financial wealth, housing wealth, other wealth and total wealth respectively. ect_{1a} and ect_{1b} are the residuals from the two regressions.

These specifications allow the identification of a target level of consumption in terms of wealth, as well as an estimate of the marginal propensity to consume out of each category of wealth. The deviations from the long-term relationship (estimated in terms of a cointegrating vector) can then be included as an error correction term in a dynamic equation explaining the short-term fluctuations of the consumption-to-income ratio. The short-run equations also include lagged differences of the long-run components, and can be enriched by taking into account:

- The interest rate to reflect substitution effects.

- The inflation rate as a proxy for uncertainty as well as the real depreciation of non-indexed financial assets.
- Fluctuations in the unemployment rate as a proxy for uncertainty surrounding the future stream of income.

As for the long-run relationships, two specifications, one with aggregated wealth and another with disaggregated wealth,⁴ are estimated:

$$\begin{aligned} \Delta(c) = & \tau ect_{1a}(-1) + \sum_{i=1}^n \gamma_i \Delta(c)(-i) + \sum_{i=1}^n \theta_i \Delta(y)(-i) + \sum_{i=0}^n v_i \Delta(tw)(-i) \\ & + \sum_{i=0}^n \kappa_i \Delta(unr)(-i) + \sum_{i=0}^n \rho_i \Delta(ir)(-i) + \sum_{i=0}^n v_i \Delta(infl)(-i) \end{aligned} \quad (2a)$$

$$\begin{aligned} \Delta(c) = & \tau ect_{1b}(-1) + \sum_{i=1}^n \gamma_i \Delta(c)(-i) + \sum_{i=1}^n \theta_i \Delta(y)(-i) + \sum_{i=0}^n v_i \Delta(fe)(-i) + \sum_{i=0}^n \lambda_i \Delta(he)(-i) \\ & + \sum_{i=0}^n \lambda_i \Delta(ow)(-i) + \sum_{i=0}^n \kappa_i \Delta(unr)(-i) + \sum_{i=0}^n \rho_i \Delta(ir)(-i) + \sum_{i=0}^n v_i \Delta(infl)(-i) \end{aligned} \quad (2b)$$

where Δ represents first-order differences and $ect(-1)$ is the error-correction term from (1a) and (1b) referring to the respective cointegrating vector.⁵ Intuitively, τ should be negative so that when consumption is moving away from its equilibrium value, it adjusts back in the next periods. The larger τ is, the quicker the return to the equilibrium path. Equations (2a) and (2b) can be estimated with OLS.

RESULTS AND INTERPRETATION: THE IMPORTANCE OF FINANCIAL WEALTH AND HOUSING WEALTH EFFECTS

Tables 3 and 4 report estimation results for the G7 countries with the exception of Germany.⁶ Panel A shows the results for the long-term relationship as represented by equation (1), whereas Panel B summarises the results for the short-term dynamics, as in equation (2). The existence of a cointegration relationship is tested with the ADF procedure.⁷ The usual standard tests (see Turner and Seghezza, 1998) are run for the dynamic relationships.

The overall results are satisfactory in the sense that the wealth variable is significant for all countries and of a magnitude similar to that found in previous work. The long-term elasticities range between 2 and 4 per cent for the countries listed in Table 3, with the exception of Canada where the estimation result put it at 6 per cent.⁸ With the disaggregated specification of wealth, the long-run marginal propensity to consume out of financial wealth varies between 4 per cent for the United Kingdom and the United States and 10 per cent or more for Canada and Japan (Table 4).⁹ The estimated long-run marginal propensity to consume out of housing wealth is in the range of between 3 per cent and 5 per cent for France, the United Kingdom and the United States, but exceeds 10 per cent for Canada and Japan. For Italy, the negative coefficient may reflect the specific features of home ownership in this country. It is a somewhat counter-intuitive feature of the results that in the United Kingdom and the United States, the marginal propensity to consume out of financial wealth is broadly similar to the marginal propensity to consume out of housing wealth, whereas in France the marginal propensity to consume out of financial wealth is higher than that of housing wealth. By contrast, for Canada and Japan the marginal propensity to consume out of housing wealth is larger than that of financial wealth but both propensities look excessively high in these countries.

The dynamic specifications for both total and disaggregated wealth are also satisfactory in the sense that the error correction coefficients are always significant with

Table 3. **Private consumption and total wealth: long-run relationship**

Panel A

	United States	Canada	United Kingdom	France	Italy	Japan
Total wealth	0.04 (13.3)	0.06 (9.7)	0.02 (4.5)	0.03 (2.1)	0.03 (6.3)	0.02 (7.5)
Short-term interest rate	-0.003 (-5.0)					
Long-term interest rate		-0.011 (-11.2)		0.003 (2.0)		-0.004 (-2.7)
Inflation rate					-0.009 (-7.2)	-0.011 (-7.0)
Constant	-0.31 (-18.3)	-0.28 (-8.7)	-0.17 (-6.1)	-0.30 (-4.5)	-0.33 (-16.3)	-0.23 (-12.0)
Time period	70:1-99:2	73:1-98:2	79:1-99:2	70:1-98:2	80:1-96:2	70:1-98:2
R2	0.81	0.92	0.41	0.09	0.85	0.89
Dummies			1993			
Cointegration tests						
ADF residuals (2 lags)	5%	5%	10% ¹	10% ¹	10% (1 lag)	5%

1. Without constant.

Source: OECD.

Table 3. Private consumption and total wealth: short-run relationship (*cont.*)

Panel B

	United States	Canada	United Kingdom	France	Italy	Japan
ΔY	0.42 (4.8)	0.33 (4.1)	0.50 (8.0)	0.50 (6.5)	0.80 (6.8)	0.48 (7.8)
$\Delta Y (-1)$				0.25 (2.7)		0.23 (4.5)
$\Delta Y (-2)$						0.15 (2.7)
$\Delta C (-1)$	0.21 (1.7)				0.25 (2.5)	
$\Delta C (-2)$	0.27 (2.9)	0.45 (5.6)		0.17 (2.0)		
Δ Total wealth	0.09 (2.7)	0.19 (2.3)	0.16 (4.1)			0.10 (4.6)
Δ Total wealth (-1)			0.22 (5.6)	0.08 (1.9)		
Δ^2 Total wealth (-1)					0.05 (1.8)	
Δ Unemployment rate		-0.003 (-2.0)				
Δ^2 Unemployment rate	-0.005 (-4.1)					
Δ Inflation rate (-2)			-0.004 (-2.6)	-0.003 (-3.1)		
Δ Interest rate					-0.002 (-1.8)	
Δ Interest rate (-1)	-0.002 (-2.4)	-0.003 (-3.0)				
ECT [-1]	-0.18 (-2.4)	-0.31 (-3.1)	-0.12 (-1.9)	-0.08 (-1.7)	-0.24 (-2.0)	-0.18 (-3.1)
Dummies					1993	
R2	0.82	0.87	0.72	0.92	0.93	0.90
SE	0.01	0.01	0.01	0.01	0.01	0.01
DW	2.00	1.80	1.54	2.01	1.86	1.81
Chow forecast test	0.87	0.62	0.95	0.32	0.38	0.48
Reset test	0.24	0.67	0.39	0.33	0.74	0.02
Serial correlation	0.09	0.12	0.40	0.95	0.14	0.36
Normality	0.03	0.38	0.68	0.57	0.87	0.22
Chow breakpoint test	0.27	0.01	0.00	0.13	0.41	0.06

Source: OECD.

the expected sign. The range of values across countries for the error-correction coefficients is rather narrow, giving a sizeable adjustment to a shock in wealth within four years.¹⁰ However, estimation results for Italy and Japan, and France to a lesser extent, when using disaggregated wealth specifications should be interpreted

Table 4. **Private consumption and different components of wealth: long-run relationship**

Panel A

	United States	Canada	United Kingdom	France	Italy	Japan
Financial wealth	0.04 (13.1)	0.10 (19.5)	0.04 (5.2)	0.08 (3.0)	0.08 (23.5)	0.12 (16.6)
Housing wealth	0.03 (1.8)	0.19 (3.6)	0.04 (5.2)	0.05 (1.9)	-0.06 (-7.1)	0.34 (8.1)
Other wealth			0.20 (5.8)	0.09 (2.3)		
Interest rate	-0.002 (-3.8)	-0.008 (-8.1)		0.009 (4.9)		
Constant	-0.26 (-12.3)	-0.41 (-10.3)	-0.40 (-9.4)	-0.50 (-4.1)	-0.32 (-27.5)	-0.55 (-17.6)
Time period	70:1-99:2	73:1-98:2	82:1-99:2	70:1-96:2	80:1-96:2	75:1-98:2
R2	0.82	0.93	0.87	0.66	0.95	0.94
Dummies		1982/1993		1978/1987	1982	1989
Cointegration tests						
ADF residuals (2 lags)	1%	5%	5% ¹	5% ¹	5% ¹	1% ¹

1. Without constant.

Source: OECD.

with prudence, either because the estimation period is short due to limited data availability (as for France or Italy), or because the explanatory power of the regression is low (as for France and Japan).

These estimations can be used to decompose changes in the consumption-to-income ratio due to their proximate determinants.¹¹ Over the long run, developments in financial wealth appear to have been a more important driver of consumption than housing wealth (Table 5). As regards consumption fluctuations in the short run, financial wealth effects also play a key role and seem to have increased in importance over the last decade in the United Kingdom and the United States (Figure 4). At the same time, the second most important variable appears to be housing wealth, whose contribution to the dynamics of consumption remains more even across the last decade, except for the United Kingdom where it is rising.

As the importance of financial and housing wealth on the fluctuations of consumption has significantly risen over the last decade, quantifying how recent stock markets and housing markets developments have impacted on short-term consumption is increasingly relevant to policy-makers. The corresponding estimates of the change in consumption are then given by the product of the marginal propensity to consume out of wealth and the estimated change in wealth.

The calibrated wealth effects from a 10 per cent rise in real share prices is larger in the United States than in the United Kingdom given the comparatively high proportion of household wealth held in shares in the United States. Indeed,

Table 4. Private consumption and different components of wealth:
short-run relationship (*cont.*)

Panel B

	United States	Canada	United Kingdom	France	Italy	Japan
ΔY	0.34 (3.5)	0.29 (4.5)	0.59 (10.2)	0.47 (6.2)	0.77 (16.3)	0.39 (4.3)
$\Delta Y(-1)$		0.20 (2.5)		0.20 (2.3)		0.26 (3.8)
$\Delta Y(-2)$						0.11 (1.7)
$\Delta C(-1)$	0.31 (2.6)					
$\Delta C(-2)$	0.18 (1.7)	0.27 (2.7)		0.19 (2.4)		
Δ Financial wealth			0.08 (3.2)		0.11 (5.1)	
Δ Financial wealth (-1)	0.06 (2.0)	0.20 (2.9)				
Δ Financial wealth (-2)			0.11 (4.4)	0.06 (3.4)		0.17 (5.7)
Δ Housing wealth			0.11 (6.0)			
Δ Housing wealth (-1)						
Δ Housing wealth (-2)					-0.09 (-4.5)	
Δ Other wealth				0.13 (3.8)		
Δ Other wealth (-1)					0.14 (8.0)	
Δ Other wealth (-2)	0.12 (1.7)				0.05 (6.0)	
Δ^2 Other wealth		0.25 (3.0)				
Δ Unemployment rate		-0.004 (-3.0)				
Δ Unemployment rate (-2)			-0.005 (-3.5)			
Δ^2 Unemployment rate	-0.005 (-3.8)					
Δ Interest rate (-1)		-0.004 (-2.5)				
Δ Inflation (-2)				-0.003 (-2.6)		
ECT [-1]	-0.17 (-2.1)	-0.25 (-2.8)	-0.24 (-2.5)	-0.14 (-2.1)	-0.30 (-2.6)	-0.30 (-3.3)
Dummies			1984/1989		1983/1993	1995
R ²	0.80	0.90	0.88	0.94	0.97	0.89
SE	0.005	0.01	0.00	0.01	0.00	0.01
DW	1.82	1.91	1.55	2.27	1.93	1.68
Chow forecast test	0.89	0.67	0.77	0.62	0.60	0.47
Reset test	0.04	0.28	0.64	0.55	0.58	0.24
Serial correlation	0.13	0.05	0.38	0.43	0.84	0.26
Normality	0.17	0.57	0.63	0.97	0.32	0.64
Chow breakpoint test	0.79	0.10	0.21	0.94	0.15	0.01

Source: OECD.

Table 5. Contributions to the long-run ratio in selected G7 countries

	Change in C/Y (in log)	Due to changes in			
		Financial wealth	Housing wealth	Interest rates	Other wealth
United States					
1980-90	8.6	7.6	-0.8	1.0	0
1990-99	6.2	9.1	-0.8	0.3	0
1995-99	3.3	10.2	-0.0	0.1	0
Canada					
1980-90	2.2	11.0	0.9	-5.1	0
1990-98	11.3	6.0	-0.2	2.4	0
1995-98	6.1	1.8	-0.4	3.2	0
United Kingdom					
1980-90	0.9	4.0	-3.0	0	-5.6
1990-99	1.6	3.8	-1.0	0	-2.8
1995-99	6.4	4.4	0.3	0	0.1

Note: The sum of the three last columns on the right hand side may not add up to the first column, due to non null residuals in the long-term equation.

Contributions to the long-term equilibrium consumption to income ratio are derived from the cointegrating vector:

$$\frac{C}{Y} = \alpha + \beta_1 FW + \beta_2 HW + \beta_3 OW + \delta Z_t$$

where FW stands for financial wealth, HW for housing wealth, OW for other wealth and Z represents all other variables.

Source: OECD.

Figure 4. Contribution of different wealth components to short-term dynamics of consumption

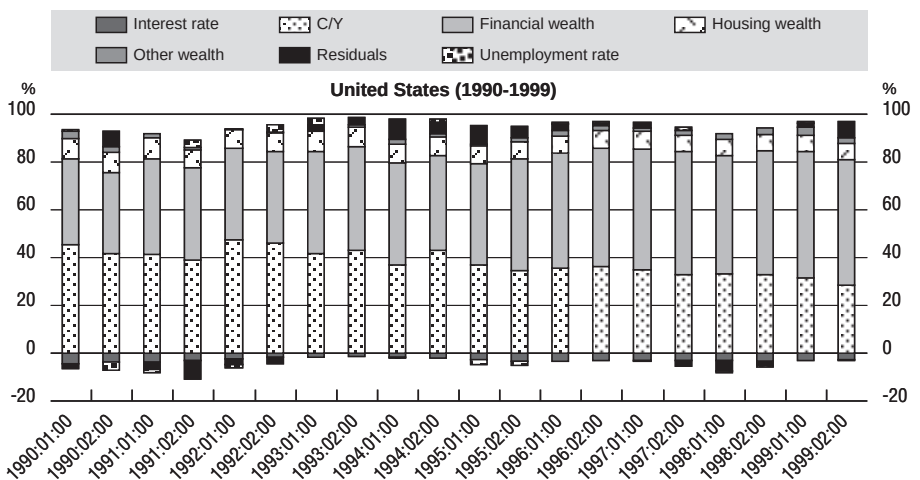
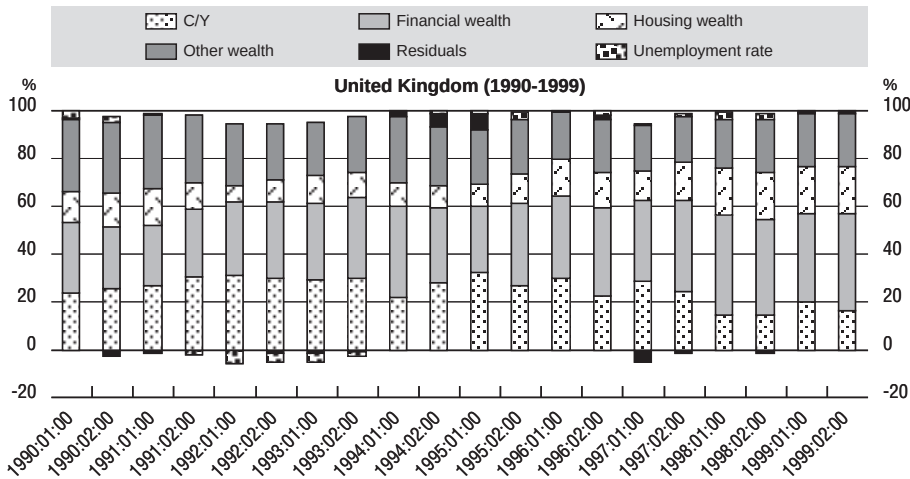


Figure 4. Contribution of different wealth components to short-term dynamics of consumption (cont.)



1. Contributions to the short-run dynamic of consumption are derived from the error-correction model in:

$$\Delta C_t = a(L)\Delta C_{t-1} + b(L)\Delta Y_t + c(L)\Delta FW_t + d(L)\Delta HW_t + d(L)\Delta OW_t + e(L)\Delta Z_t + \beta \left(\frac{C}{Y}_{t-1} - \alpha - \beta_1 FW_{t-1} - \beta_2 HW_{t-1} - \beta_3 OW_{t-1} - \delta Z_{t-1} \right)$$

where Δ stands for the first difference.

For example, financial wealth contribution is given by:

$$\frac{c(L)\Delta FW_t - \beta\beta_1 FW_{t-1}}{\Delta C_t - a(L)\Delta C_{t-1}}$$

Source: OECD.

in the United States, a 10 per cent rise in real share prices is estimated to raise consumption by 0.6 per cent compared to 0.4 per cent for the United Kingdom. As regards housing wealth, the effect is larger for the United Kingdom as the value of property holding is larger relative to disposable income. A 10 per cent rise in real house prices would increase consumption by 0.9 per cent in the United Kingdom compared to 0.3 per cent in the United States.

Overall, the results suggest that movements in share prices since 2000 could have contributed to a cumulated decline in consumption, by an amount of about 2.4 per cent for the United Kingdom and 1.6 per cent for the United States. At the

Table 6. **Impact on consumption of a 10 per cent rise in real share prices and in real house prices in the United States and the United Kingdom**

	Share holding as a % of household disposable income in 1999	Marginal propensity to consume out of financial wealth (%)	Change in consumption (per cent)	Housing wealth holding as a % of household disposable income in 1999	Marginal propensity to consume out of housing wealth (%)	Change in consumption (per cent)
United States	137	4.0	0.6	83	3.0	0.3
United Kingdom	99	4.0	0.4	227	4.0	0.9

Source: OECD.

same time, the rising house prices have only partially offset the capital loss in the United States but it has more than counterbalanced the loss in the United Kingdom. Looking forward and notwithstanding the uncertainty surrounding some of these estimates, this underlies the increasing importance of financial and housing assets for assessing demand conditions.

HAS CONSUMER BEHAVIOUR RECENTLY EVOLVED?

In many countries, a number of economic and regulatory changes have taken place over the past decades, which could be at the origin of a structural change in consumer behaviour, especially with respect to wealth effects. More specifically, changes in the functioning of financial markets have occurred in recent decades following progressive financial deregulation since the late 1970s. This has accompanied, and probably underpinned, reductions in borrowing constraints on consumers, thus weakening liquidity arguments and contributing to a reduction in households' aggregate propensity to save.¹² An important aspect of financial liberalisation in the 1980s and 1990s concerned interest-rate deregulation and liberalisation of the credit market (Girouard and Blöndal, 2001). This section tests whether wealth effects have changed over the recent period, following such structural changes across the G7 countries.

Testing for such structural breaks is not straightforward. It is difficult to select a date at which a break could have occurred on the one hand, and when its impact is fully integrated in consumer behaviour on the other hand. For example, the financial deregulation process took place at different periods in time across countries, and the timing of the impact of the reforms is uncertain. The power of the testing procedures is affected by these considerations, and several procedures have been used in the literature to cope with these difficulties.

This study uses a battery of procedures to test for potential structural breaks. The testing methods are the following:

- i) Estimation over sub-samples (Brechetta and Gerlach, 1997; Miles, 1994).
- ii) Introduction of dummies, allowing a one-off shift (Sefton and In't Velt, 1999) or a smoother change in the coefficients (Bayoumi, 1993; Hendry and Ericsson, 1991).
- iii) Testing the significance of a variable reflecting credit deregulation (Miles, 1994; Westaway, 1993).

Approach i) consists of estimating the relationships over sub-samples. Since the date at which the regime change might have occurred, and subsequent effects fully internalised, is uncertain, a rolling procedure was implemented, where the transition period is moved by one half-year each time and the equation re-estimated in a sequential fashion. This should permit to detect a regime switch, as reflected by different significance and magnitude of the coefficients on the wealth variables in the different sub-samples.

The framework for procedure ii) is to augment the long-run equations to allow for a shift in the coefficients, following a regime change, which may be written as:

$$cy = \alpha + \beta (wealth) + dummy * \beta' * (wealth)$$

where *wealth* is either total wealth or the various components of wealth described above. *Dummy* is either a zero-one dummy taking the value zero prior to the break and one after, or a time-varying dummy, following a procedure close to that of Bayoumi (1993). The time-varying dummy takes a value of zero before the regime change (which is assumed not to take place anywhere before 1982), then rises at the same pace as new mortgages, up to the peak and takes the value one afterwards.¹³ The basic idea underlying this approach is that the most important regime change for the wealth effects is likely to be financial deregulation, and the new mortgages variable reflects the increase in consumer credit triggered by financial deregulation.¹⁴ The dates for breaks are those identified by Girouard and Blöndal (2001). The interpretation is the same whatever the type of dummy: before the break, the coefficient(s) on the wealth variable(s) is β , after the break it becomes " $\beta + dummy * \beta'$ ". This specification implies common dates for the regime switch for all variables, but allows the strength of the impact to differ across variables. Finally, with approach iii), a significant equity withdrawal variable reflects households' increased borrowing capacity.

All the tests were undertaken for the long-run relationships, within the constraints imposed by sample sizes. For the dynamic relationships, only two tests were performed: sub-samples estimation (using cutting dates determined by the results of the rolling tests on the long-run cointegrating vectors), and the significance of housing equity withdrawal variable.

Table 7. **Summary table: structural break tests**

	Sub-sample estimates		0-1 dummies	Net mortgages dummies		Housing equity withdrawals
	Wealth decomposition	Total wealth		Wealth decomposition	Total wealth	
United States	+	+	+	+	–	+
Canada	+	+	+	–	–	+
United Kingdom	+	+	+	–	–	+
France	–	+	–	+	–	+
Italy	+	–	+	+	+	+
Japan	–	–	+	–	–	–

+ Significant effect of financial deregulation.

– No effect of financial deregulation.

Source: OECD.

Table 7 summarises the results from the various tests for a regime change. Three groups of countries can be distinguished based on these results. The first group consists of Canada, the United Kingdom and the United States. The second group includes France and Italy. And, finally, Japan is in a group of its own.¹⁵ For the first group, there is evidence of a break in the sense that the coefficients, either on total wealth or on some of its components are affected. It is however difficult to quantify the impact itself, as its magnitude is not the same across testing procedures. For the second group, the results are more mixed, possibly reflecting slower changes or delayed effects that appear too late in the sample to be econometrically captured. Finally, for Japan, the absence of evidence may be caused by the strong influence of abundant liquidity in the financial markets due to the loose monetary policy since the mid-1980s.

The results of the tests for financial deregulation using housing equity withdrawals, presented in Table 8, are more striking and support the hypothesis that rising housing equity withdrawals may have increased the consumption level in all countries. The equity withdrawal variable appears significant and with similar magnitude for all equations, except Japan, with the value of other coefficients remaining stable for both the disaggregated and aggregate wealth specification.¹⁶ Again, this effect on the long-run level of consumption might not persist in the long term; nonetheless, in our small sample sizes that include the period of deregulation, this effect is significant.¹⁷

SUMMARY

This paper provides evidence of significant wealth effects across countries, though their magnitude varies across countries and type of assets. In line with

Table 8. Private consumption, wealth and housing equity withdrawal: regression results

Panel A: Disaggregated wealth						
	United States	Canada	United Kingdom	France	Italy	Japan
Financial wealth	0.04 (13.4)	0.10 (18.5)	0.05 (9.1)	-0.04 (-2.2)	0.10 (8.7)	0.11 (10.4)
Housing wealth		0.22 (3.6)		-0.04 (-1.1)		0.29 (5.9)
Other wealth			0.18 (5.5)	-0.03 (-0.9)		
Housing equity withdrawal	0.005 (3.9)	0.005 (2.9)	0.008 (5.9)	0.017 (5.9)	0.006 (1.8)	-0.001 (-0.3)
Interest rate	-0.002 (-3.8)	-0.007 (-5.4)				
Constant	-0.22 (-21.3)	-0.43 (-9.7)	-0.36 (-9.5)	0.05 (0.5)	-0.48 (-10.1)	-0.51 (-9.8)
Time period	70:1-99:2	73:1-98:2	82:1-99:2	70:1-97:2	76:1-96:2	77:1-97:2
R ²	0.85	0.90	0.92	0.64	0.82	0.93
Dummies			1993	1978		1989
Cointegration tests						
ADF residuals (2 lags)	5%	5%	5%	5% ¹	5% ¹	10%
Panel B: Aggregated wealth						
	United States	Canada	United Kingdom	France	Italy	Japan
Total wealth	0.04 (11.9)	0.10 (10.1)	0.02 (6.7)	-0.04 (-4.1)	0.02 (4.5)	0.03 (8.0)
Housing equity withdrawal	0.003 (1.9)	0.009 (4.2)	0.009 (9.9)	0.017 (7.6)	0.005 (2.4)	-0.006 (-1.4)
Real interest rate	-0.003 (-5.2)			0.003 (3.0)		
Nominal interest rate		-0.002 (-1.8)			-0.005 (-4.4)	
Constant	-0.30 (-16.4)	-0.49 (-11.4)	-0.17 (-11.4)	0.08 (1.4)	-0.27 (-8.3)	-0.32 (-8.3)
Time period	70:1-99:2	73:1-98:2	79:1-99:2	74:2-98:2	80:1-96:2	77:1-97:2
R ²	0.82	0.86	0.83	0.68	0.88	0.78
Dummies			1993			
Cointegration tests						
ADF residuals (2 lags)	5%	10%	1%	10%	10%	5%

1. Without constant.

Source: OECD.

results found in recent literature, the long-run marginal propensities to consume out of total wealth range between 2 and 4 per cent for all countries with the exception of Canada where it is estimated at a somewhat unlikely 6 per cent. With the disaggregated specification of wealth, the results are not always very intuitive. The long-run marginal propensity to consume out of financial wealth varies between 4 per cent for the United Kingdom and the United States and 10 per cent or more for Canada and Japan. By comparison, the estimated long-run marginal propensity to consume out of housing wealth varies between 3 per cent and 5 per cent for France, the United Kingdom and the United States, but exceeds 10 per cent for Canada and Japan.

The importance of wealth effects has increased over time for some countries as deregulation and intensifying competition among financial institutions have eased the liquidity constraints facing households. Indeed, tests for the possibility of structural breaks give significant results for Canada, the United Kingdom and the United States. However, less robust evidence was found for the other countries. This result could be ascribed to the uncertainty of statistical estimations, to the lags necessary to capture the impact of regime changes such as financial deregulation on real activity, or more importantly, to delayed or too little financial deregulation.

NOTES

1. Germany was not included because housing wealth was not available over a long enough period for econometric analysis.
2. It is very difficult to get a satisfactory and harmonised way of valuating unlisted or unquoted shares held by households. In France, for example, recent work at the Bank de France and in the Commissariat Général du Plan suggests that the amount of unlisted shares held directly by households has been considerably overstated (CGP, Actionnariat des ménages, 2002).
3. A similar specification, relating the log of the consumption-income ratio to the unlogged wealth-income ratio has been used for instance by Muellbauer (1994). A thorough algebraic analysis on the derivation of the appropriate functional form for consumption equilibrium may be found in Rossi and Visco (1995). Note that $\ln(cy)$ can be approximated by $cy - 1$.
4. The total wealth specification was tested on the ground that for countries where the wealth effect may be weak, it will more easily appear in an aggregated framework. However, the disaggregated wealth effects might not all go in the same direction and their diverse influences provide a non-significant aggregate effect.
5. This approach requires first to check that the variables are $I(1)$, and then that the long run determinants of consumption cointegrate. Tests for integration and cointegration are summarised in Annex I of Boone *et al.* (2001).
6. The wealth data used in estimation are described in the notes to Figure 3, together with the sources. Other data come from the OECD Analytical Database (ADB). The frequency is semi-annual. Samples vary with data availability, but are generally between 1975 and 2000.
7. See Annex I in Boone *et al.* (2001) for the detailed results of the tests.
8. In the United States, recent studies suggest a marginal propensity to consume out of wealth in the range of 3 to 7 per cent (Starr-McCluer, 1998, and Brayton and Tinsley, 1996). For other countries, the evidence remains at best mixed. In Japan, for instance, estimates of the marginal propensity to consume out of wealth range from around 1 per cent (Mutoh *et al.*, 1993) up to around 4 per cent (Horioka, 1996; Ogawa *et al.*, 1996), varying considerably with the definition of wealth (liquid wealth versus total wealth) and income (labour versus disposable income). In France, on the other hand, a variety of studies (Bonnet and Dubois, 1995; Grunspan and Sicsic, 1997) provide no strong evidence of any wealth effect at all. In Italy, Rossi and Visco (1995) present evidence of a marginal propensity to consume out of wealth of the order of 3 to 3½ per cent, once an account is taken of double counting of social security transfers in the measurement of disposable income and pensions wealth.

9. There is some empirical evidence in favour of existence of disaggregated wealth effects. For multi-country analyses, see Case *et al.* (2001), IMF (2002) and Ludwig and Sløk (2002). Wealth effects are presented in terms of marginal propensity to consume in cents per dollar in Case *et al.* (2001) and IMF (2002), while they are in terms of elasticities (percentage increase in wealth) in the case of Ludwig and Sløk (2002). Moreover, all these authors used stock market indices and house prices as proxy variables for the housing and financial wealth components.
10. The speed of adjustment is usually measured by “half-lives”, which are computed as $\ln(0.5)/\ln(1 + \alpha)$, where α is the coefficient on the error-correction term.
11. The wealth variable over-explains, reflecting that the constant and the residuals are not taken into account in the break-down.
12. See Bayoumi (1993) and Caporale and Williams (1997) for such evidence for the United Kingdom.
13. This technique is very close to the estimation of time varying parameters.
14. When the growth rate was too volatile, the dummies were smoothed.
15. Detailed results for each test are given in Annex 2 of Boone *et al.* (2001).
16. However, in the case of the United Kingdom and the United States, the housing wealth variables becomes insignificant when the housing equity variables is included, probably reflecting similar information content.
17. When included in the dynamic relationships, the equity withdrawal variable appears only marginally significant (at the 20 to 30 per cent level), and often with the wrong sign while other coefficients are not significantly modified, which is in line with the sub-samples tests realised on the dynamic regressions. This result may have two interpretations. Either the short-term behaviour of consumers has not been affected so much (yet) by the change in the borrowing markets (maybe because borrowing constraints in the short term have not been alleviated), or the effect is only on the level of consumption (as captured in the long-run relationships).

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