This document is submitted to the Working Party No.2 FOR DISCUSSION under item V of the Agenda for their meeting to be held on 14-15 November 2000.

For further information please contact: Mr. Christopher Heady,
Tel: (33 1) 45 24 93 22 ; Fax: (33 1) 44 30 63 51 ;
Email: christopher.heady@oecd.org
NOTE BY THE SECRETARIAT

This document contains notes to accompany the presentations by Canada, Denmark and Norway on the use of micro-data to estimate average effective tax rates.
Average Effective Corporate Tax Rates in Canada

Using Micro Data
Presentation Outline

• Methodology
• Comparison to macro approach
• Overview of results
• Future work
Methodology

• **AETR for a group of firms:**
  – Sum of taxes paid / sum of business incomes
  – Firms with business income > 0
  – Based on the Corporate Sample File

• **Taxes included in the analysis:**
  – Federal income taxes
  – Federal capital taxes
  – Provincial income taxes
Methodology
definition of Business Income

• Net income per financial statements

• Plus
  – Income taxes and federal capital tax
  – Charitable donations

• Minus
  – Income of other corporations (e.g. dividends)
  – Foreign income
  – Losses of other years
Comparison to Macro Approach
The Micro Approach

• Based on disaggregated corporate tax data
• Excludes loss corporations
• Deducts prior years’ losses
  • Allows analysis by subgroups
    – sector
    – size
    – region
Comparison to Macro Approach
The Macro Approach

• Based on national accounts
• Includes loss corporations
  – Business income < 0
  – Income taxes are minimal
• AETRs are generally higher relative to the micro approach
• AETRs can be < 0
### Comparison to AETR papers

Taxes (included in numerator)

<table>
<thead>
<tr>
<th>AETR paper (<code>t_k</code>)</th>
<th>Micro (<code>t_corp</code>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate income tax</td>
<td>✓</td>
</tr>
<tr>
<td>Capital taxes</td>
<td>✓</td>
</tr>
<tr>
<td>Taxes on unincorporated businesses</td>
<td>✓</td>
</tr>
<tr>
<td>Taxes on investments of individuals</td>
<td>✓</td>
</tr>
<tr>
<td>Property Taxes</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Comparison to AETR papers

**Income (included in denominator)**

<table>
<thead>
<tr>
<th></th>
<th>AETR paper</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate profits &gt; 0</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Corporate profits &lt; 0</td>
<td>✔</td>
<td>X</td>
</tr>
<tr>
<td>Profits of unincorporated businesses</td>
<td>✔</td>
<td>X</td>
</tr>
<tr>
<td>Investments income of individuals</td>
<td>✔</td>
<td>X</td>
</tr>
</tbody>
</table>
Canadian AETR
1986 - 1997
Canadian AETR by Sector
Average 1994-1997
Canadian AETR by Asset Size
Average 1994-97
Variations in Results
Treatment of Losses

![Bar chart showing variations in treatment of losses from 1994 to 1997. The chart indicates the proportion of profit (Profit > 0) and all cases (All) over the years.]
Future Work

• Incorporate additional taxes
  – Provincial capital taxes
  – Payroll taxes
  – Property taxes
• Reconciliation to macro-based AETR papers
Note by Denmark

Calculating Average Tax Rates of Various Types of Income

Income tax is usually calculated on a broad income base. The base may consist of various types of income and the base may be reduced because of deductions. The income tax is therefore one tax on ‘wages, income from self employment, unemployment benefits, social pensions, etc’ and not a number of separate taxes on separate bases. In a somewhat narrow sense it is not possible to divide the taxes back to the various types of income, thereby concluding how much tax is paid on e.g. unemployment benefits. Logically, that question has no unique answer at the micro level (individual level) - except for persons, whose only source of income is unemployment benefit or the person receives no benefit at all.

Nevertheless a question such as “How much taxes is paid on (total) unemployment benefits” is relevant. And even if there is no unique way to answer this question, a pragmatic approach can be taken. A methodology to divide taxes into a number of sources has been developed in the Ministry of Economic Affairs, and has been applied in a number of circumstances for analytical purposes. The methodology is outlined below.

In order to make the division of taxes it is necessary to have access to a (sample) of tax returns on a micro-base, i.e. actual tax returns from administrative files.

Taxable income are - per definition - decomposable. We divide taxable income into n different types of non-capital income, positive capital income, negative capital income (interest deductions etc.) and m types of various other deductions (i.a transport, contributions to pension schemes etc.): 

\[ IT = I_1 + I_2 + I_3 + \ldots + I_n + K_p - K_n - D_1 - \ldots - D_m \]

IT denotes taxable income, I_j one of the n types of (non-capital) income, K_p and K_n positive and negative capital income, and D_j one of the m types of deductions in capital income.

The decomposition can be as fine as the underlying data sources allow. If the basic information is on a very aggregate form, it is not possible to decompose so far.

In order to divide the total amount of income taxes on to the income categories two steps are necessary:

1) The method is equivalent to the way tax credits for individuals with foreign source income (and Danish source income) is calculated in the tax assessments.

2) Positive capital income could also - if needed - be decomposed
First step: For each type of income or deduction we calculate the tax burden for each individual

\[ TX_{I,j} = \left( \frac{I_j}{IT} \right) \times TX \]

Etc. etc.

\[ TX_{D,i} = \left( \frac{D_i}{IT} \right) \times TX \]

TX denotes total taxes, \( TX_{I,x} \) the income tax on income type \( x \).

This definition is very straightforward: Each income component or ‘deduction component’ is attributed a ‘tax’ according to its share of taxable income. Note that the decomposition is complete (the ‘sub’taxes sum to the total income tax for the individual).

Second step may be slightly more complicated - depending on how fine a decomposition is requested. There is only one problem that is not solved in step 1, the fact that a number of negative taxes were introduced. The interpretation of the negative taxes is that they are ‘tax expenditures’. In principal all of these tax credits should be attributed to specific types of income. If - as an example - the deduction of type b is only relevant for persons with income of type c, then the tax on income type c is \[ TX_{I,c} + TX_{D,b} \]

In practice, however, only some of the deductions can be directly attributed to income types, e.g. the deduction for transport can (almost uniquely) be linked to wage income. Note that negative capital income (deductions for interest) is attributed to positive capital income; we can thereby calculate a tax rate for net-capital income.

In some cases a deductions is not attributable to a unique type of income. As an example, deductions for unemployment insurance can be claimed by both wage earners and unemployed. These types of deductions have to be split between wages and benefits.

Two approaches are possible.

1. Divide the deduction to the various types of income for the person in question according to the weight of income\(^4\)

2. Consider the type of deduction of  a tax credit, by not dividing it on to the various income components. In this case, taxes are also divided on to a number of ‘deduction types’, i.e ‘negative’ income types or tax credits for ‘various, specific purposes’.

Approach i) may in some cases be somewhat artificial, if the type of deduction is in no way connected to the type of income. Eg. a splitting of maintenance allowances becomes fairly artificial as this allowance is - independent from the type of income earned.

If approach ii) is used, then we do not make a full decomposition of taxes to various types of income - we also include a number of tax expenditures. In general this approach is probably the best.

---

\(^3\) The terms are added - but remember that \( TX_{D,b} \) is negative

\(^4\) Using only income components, not deductions.
None of the approaches are fully satisfactory - but fortunately the amounts involved are relatively small, so the final results do not depend heavily on the assumptions. Apart from deductions for transport, unemployment insurance and trade union fees deductions are very small.

The best way of ‘decomposing’ seems to be the following:

Deductions for transport are attributed to wage income as described above, deductions for unemployment insurance and trade union fees are divided on to the individual’s types of income (proportionately). A few of the remaining deductions are directly linked to wage income. The rest of the deductions are considered tax credits.

**Calculations**

In the calculations below we have divided income (except income from capital) in 4 categories:

‘Wages’

‘Income from self employment’

‘Private pensions’

‘All transfers’

Transfers have further been subdivided into 11 different categories, see table 1. We add 3 categories to these, tax-free transfers and two other (relevant) categories, occupational injuries, which is not separately defined in income statistics) and benefits to survivors. For both categories we have to make estimates.

<table>
<thead>
<tr>
<th>Type of transfer</th>
<th>Average tax rate on transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without adjustment for allowances</td>
</tr>
<tr>
<td>1. Social pensions</td>
<td>29.25</td>
</tr>
<tr>
<td>2. Supplementary pension</td>
<td>31.46</td>
</tr>
<tr>
<td>3. Civil servants pension</td>
<td>38.72</td>
</tr>
<tr>
<td>4. Early retirement pension</td>
<td>31.60</td>
</tr>
<tr>
<td>5. Sickness benefits</td>
<td>32.29</td>
</tr>
<tr>
<td>6. Parental leave</td>
<td>28.50</td>
</tr>
<tr>
<td>7. Educational allowance</td>
<td>20.96</td>
</tr>
<tr>
<td>8. Support, start enterprise</td>
<td>28.91</td>
</tr>
<tr>
<td>9. Unemployment benefit</td>
<td>31.98</td>
</tr>
<tr>
<td>10. Early retirement unemployment</td>
<td>31.46</td>
</tr>
<tr>
<td>11. Low income</td>
<td>29.12</td>
</tr>
<tr>
<td>(12. Zero-rate / tax free)</td>
<td>0</td>
</tr>
<tr>
<td>13. Occupational injuries</td>
<td>30</td>
</tr>
<tr>
<td>14. Survivors(^5)</td>
<td>10</td>
</tr>
</tbody>
</table>

Except for educational allowances and civil servants pensions all itemised tax rates without adjustment for allowances fall within the narrow range of 28\(\frac{1}{2}\) - 32\(\frac{1}{2}\) per cent.

---

5. Benefits are not taxed under personal income tax scheme; however, the amounts involved are negligible.
The adjustment for allowances changes the tax rates on (social) pensions and on low income (i.e., uninsured without the relevant allowances) only slightly, whereas tax rates on unemployment benefits, sickness benefits are reduced by 4.5%.
Note by Norway

Preliminary work on Average effective tax rates (AETR) based on Micro-data

This memo gives a short presentation of the preliminary work the Ministry of Finance, Norway, has done to calculate AETRs based on micro-data. This work is mainly motivated by the need to find some estimated value on the distortionary effect taxes have on employment, saving and investment. In Norway this is a major issue, especially since the Government in the recent budget proposal for 2001 proposed a rather large tax increase for the corporate sector. This has lead to a debate on the tax level in Norway compared to neighbouring countries, i.e. Sweden, Finland and Denmark. This debate has concentrated on tax-on-GDP rates, which are often, mistakenly, used as a measure on the (distortionary) tax level.

Our effort is concentrated on estimating AETRs for labour, capital and consumption using micro-data from Tax return statistics to complement data from Revenue and National account statistics. Total income for labour, capital and consumption is drawn from Tax returns. This is a straightforward process for most income components. Some items, mainly income from self-employed and basic relief, pose a bigger problem. In this memo, a simple method for dividing these between labour and capital income (for self-employed) and between labour income and pensions is developed. Tax from Revenue statistics is then divided between the different income components according to the same method.

The last part of this memo consists of results from our calculations so far. These are briefly compared with other tax ratios for Norway presented in several papers on the subject.

Theoretical Approach

In Norway, tax on individual taxpayers can be divided in three main parts. Tax on ordinary income, a governmental surtax and social security contributions. The latter two is levied on personal income that includes wage income and transfers (no deductions are given). Ordinary income includes all types of income (incl. capital income) less all deductions. The main task is therefore to split tax on ordinary income in tax on capital and labour components. The governmental surtax is clearly a tax on labour income. The social security contribution also includes a low rate tax on transfers for pensioners. This part is easily discerned in the Tax return statistics.

Ordinary income includes different types of wage income, capital income, transfers and income for the self-employed in addition to several deductions. Most of these items are readily identifiable either as capital or labour components. Some, however, is more difficult to discern. This is mainly a problem for the operating surplus of the self-employed. In Mendoza et. al. (1994) this is solved with rather unrealistically assuming that all income from self-employed is capital income. In Gordon and Tchilinguirian (1998) (DAFFE/CFA/WP2/RD(98)14) and Carey and Tchilinguirian (2000) (DAFFE/CFA/WP2(2000)9) this is solved with assuming self-employed “pay themselves” the same annual salary net of social security contributions as that earned by the average employee. In this paper, we use reported imputed labour income for self-employed from tax returns data to calculate the labour component of the operating surplus. The following method is developed:

Let the following apply:

(1) $r_0 + w_0 = 1$
where \( w_0 \) is the part of the operating surplus of self-employed that comes from labour, and \( r_0 \) is the part that comes from capital use.

The tax-rules of Norway states that most self-employed must calculate a personal income (i.e. wage income) based on their operating surplus. This is subsequently taxed with surtax and social security contributions\(^6\). The total calculated positive personal income from self-employed divided on total income for self-employed is assumed to give \( w_0 \). Through (1) this defines \( r_0 \).

The main objection with this method is that the calculated personal income for self-employed probably underestimates the actual income from labour, since there’s a significant difference in the tax-burden levied on wage and capital income. This means most self-employed has incentive to report their income as capital income. This estimate therefore needs further work.

The second problem is allocating basic relief since this is given for both labour income and pensions. To solve this problem we have used a rather mechanical approach where we calculate the labour component based on the composition of the basis for calculating the basic relief. The resulting estimate is that approximately 81 per cent of the basic relief can be allocated to labour income. The rest is allocated to pensions.

This leads to the following definitions of income:

- **Labour income** \((W + w_0O)\): Wage income, wages paid to share-holders etc. less deductions allocated to labour. Parts of the operating surplus of self-employed is also defined as labour income.
- **Capital income** \((R + r_0O)\): capital gains, dividends and realised gains from the disposal of shares etc. Parts of the operating surplus of self-employed are also included in this definition.
- **Income from pensions** \((P)\): Pensions for elderly, work-disabled, grants etc. less deductions allocated to pensions.

**Tax on Labour Income**

It is assumed that gross taxes on labour income can be expressed as the following share of gross tax on ordinary income:

\[
(1) \quad w = \frac{W + w_0O}{I}
\]

where \( W \) is wage income, \( O \) is operating surplus of self-employed and \( I \) is ordinary income gross of class allowance.

Net tax on ordinary income assigned to labour (gross of class allowance) can then be constructed as follows from tax-return statistics:

\[
\begin{align*}
- w \cdot \text{Gross tax on ordinary income} \\
- w \cdot \text{Tax credit for children} \\
- w \cdot \text{Tax benefits for Northern parts of Norway} \\
= \text{Net tax on ordinary income allocated to labour}
\end{align*}
\]

---

\(^6\) Since self-employed, obviously, isn’t employed and therefore don’t have an employer (who pay social security), self-employed use a higher rate than normal wage earners.
In addition the following elements are included in tax on labour:

- Social security contributions from workers (middle rate).
- Social security contributions paid by self-employed on the calculated personal income (high rate).
- Social security contributions paid by employers.
- Deductions for social security contributions paid in other countries.
- The governmental surtax (although some of it can be contributed to tax on transfers).

Social security contributions levied on transfers (low rate) is defined as tax on transfers and is therefore not included here.

**Tax on Capital income**

Similarly, gross taxes on capital income as share of gross tax on ordinary income are:

\[
(2) \quad r = \frac{R + r_0O}{I}
\]

where \( R \) is net capital income as expressed in the Tax-return statistics.

The net tax on ordinary income assigned to capital (gross of class allowance) is then:

\[
\begin{align*}
& r \cdot \text{Gross tax on ordinary income} \\
& - \text{Tax deductible share-market savings (AMS)} \\
& - \text{Home savings scheme (BSU)} \\
& - \text{Tax credit for corporate taxes paid on dividends} \\
& - r \cdot \text{Tax credit for children} \\
& - r \cdot \text{Tax benefits for Northern parts of Norway}
\end{align*}
\]

\[= \ldots \text{NET TAX ON ORDINARY INCOME ALLOCATED TO CAPITAL}\]

In addition to net tax on ordinary income allocated to capital the following is also included:

- Wealth tax on corporations.
- Property tax.
- Wealth tax on individual taxpayers.
- Tax on inheritance.
- Investment tax.
- Document tax.

**TAX Bases**

As a “benchmark” tax base we use the usual National accounts-denominator used by most OECD papers on the issue. The following definition is used:

**For Labour Income:**

Wages and salaries (WS) =
Government wage expenditure
+ Wage expenditure for financial businesses
+ Wage expenditure for non-financial businesses
+ Wage expenditure for households
+ Wage expenditure for foreign businesses
- Wage expenditure to foreign workers

For Capital Income:

Operating surplus of the overall economy (OS)

We then calculate corresponding tax bases based on micro-data from Tax return and Revenue statistics. The denominator for the labour tax ratio is defined by collecting all items in the tax return statistics that can be described as labour income. Operating surplus from self-employed is multiplied with the factor in (2) to define the labour component. Thereafter, all deductions connected to labour are subtracted. Loss-deductions for self-employed is multiplied with (2). Basic relief is multiplied with the following factor:

\[
\frac{\text{wage}}{\text{wage + total transfers}}
\]

to take into account that basic relief is also given for transfers. This is the same method used above.

The result is ordinary income gross of class allowance connected to labour. This value is very similar to the result from using aggregated data from National Account statistics.

Similarly, a tax base for capital income is calculated. Income and loss-deductions for self-employed is multiplied with (3). Included in the tax base is ordinary income for corporations from the Revenue statistics.

The resulting tax base for capital based on micro-data deviate significantly from the corresponding National Account tax base. Some of this difference is probably due to:

- The definition of property and entrepreneurial income of households (PEI) in the tax return statistics gives a significantly lower PEI than in the National accounts statistics. This is due to the fact that the PEI for tax purposes is lower than the estimated real value in the latter. A tax base based on micro data will therefore underestimate the actual tax base. Using PEI from the National Account statistics can amend this.
- Corporations that aren’t liable for tax on operating surplus (mainly local government enterprises and voluntary organisations) are excluded from the micro-data while included in the National accounts. Micro data will therefore underestimate the actual tax base.
- On the other hand, only positive operating surplus that’s tax-liable is included in the micro-data, while the operating surplus in National account statistics is net of losses. The latter underestimates the actual taxable operating surplus.
- Part of the difference may be explained with slightly different definitions of depreciation rates. The rates for tax purposes are normally lower than in the National account statistics.

These only explain part of the deviation between the two tax bases. Work still remains to define a tax-base for capital. In the following we have therefore presented several tax ratios for capital based on different tax bases.
Empirical Results

The results of this exercise are presented in table 1 together with several other tax ratios from different studies on the subject.

Table 1: Different average tax rates for Norway. Per cent

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>41.05</td>
<td>39.36</td>
<td>-</td>
<td>40.9 4)</td>
<td>39.7 5)</td>
<td>36.1</td>
</tr>
<tr>
<td>Personal income</td>
<td>-</td>
<td>20.35</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Capital</td>
<td>35.87</td>
<td>28.59</td>
<td>-</td>
<td>36.3 6)</td>
<td>25.3 7)</td>
<td>38.1 9)</td>
</tr>
<tr>
<td>Consumption</td>
<td>33.39</td>
<td>36.31</td>
<td>21.85</td>
<td>21.9</td>
<td>30.3</td>
<td>26.9</td>
</tr>
</tbody>
</table>

1) DAFFE/CFA/WP2(99)4/REV1.
2) DAFFE/CFA/WP2/RD(98)14.
4) Tax-base based on micro-data from Tax Return statistics.
5) Tax-base based on National Account Statistics.
6) Tax-base based on micro-data from Tax Return statistics, but with property and entrepreneurial income of households from National Account statistics. Including the petroleum sector. The tax rate excluding the petroleum sector is 28.6 pct.
7) Tax-base from National account statistics. Including petroleum sector.
8) Based on micro-data including the petroleum sector. The tax rate excluding the petroleum sector is 36.3 pct. This is probably not a relevant average tax rate since the value of property and entrepreneurial income (PEI) for tax purposes is very low in comparison with estimated real PEI in National Account statistics.
9) The denominator includes net operating surplus.
10) The denominator includes gross operating surplus.

In addition to the tax ratios we have described in the paragraphs above, we have calculated a AETR for consumption. This ratio is calculated with tax bases from both National Accounts and micro-data.
The estimates for labour consumption and corporations don’t deviate too much from other AETRs calculated. The picture for capital is somewhat different, depending on the tax base used. The ratio varies significantly depending on whether the petroleum sector is included or not. This is not surprising, since economic rent in the petroleum sector is quite large compared with other sectors and is highly taxed. We also see that whether the definition on property and entrepreneurial income for households (PEI) from National Account statistics or tax return statistics are used, influence the tax ratio for capital quite much. This is due to that a large portion of capital in Norway is invested in housing and property and therefore is an important part of the tax base. As mentioned above, a lot of work still remains on defining a workable tax base for capital based on Tax return statistics. The estimates for capital presented in the table are arranged in the order we “believe” in them.

Summary

We have presented some preliminary results from our work on tax ratios with micro-data. The methods used to calculate these are also presented. Future work on this issue will be concentrated on developing a better method for defining the labour income part for self-employed.