Appendix: Some tax arithmetic

This provides some back of the envelope calculations to assess the impact of an environmental tax reform on disposable income of wage earners; i.e. a reduction in wage taxes paid for by increased taxes on (polluting) energy consumption. In the extreme case of a reduction of the wage tax to zero the change in income for the representative wage earner is

$$
\Delta = I_W \tau_W - EE_W \tau_E
$$

where $I_W$ is (pre tax) wage income, $EE_W$ energy expenditure of wage earners, $\tau_W$ and $\tau_E$ the tax rates on wage income and energy expenditure respectively. In order to balance the budget the government must impose an energy tax rate of

$$
\tau_E = \frac{I_W}{(EE_W + EE_O) \tau_W}
$$

where $EE_O$ is energy expenditure paid for by non-wage income. Combining these two equations yields percentage effect on post tax wage income of a revenue neutral environmental tax reform as:

$$
\frac{\Delta}{(1 - \tau_W)I_W} = \frac{\tau_W}{1 - \tau_W} \left( 1 - \frac{EE_W}{EE_W + EE_O} \right)
$$

For $\tau_W$, current tax rate on earnings I assume 32% which is based on calculations by Patrick Minford for the UK. The share of energy expenditure by wage income in total energy expenditure we can rewrite as

$$
\frac{EE_W}{EE_W + EE_O} = \left( 1 + \frac{e_O}{s_W} \right)^{-1}
$$

where $s_W$ is the wage share of total income, $e_W$ and $e_O$ the share of energy spending for wage income and other income respectively. For $s_W$ I am assuming 0.6.\textsuperscript{2} Using the ratio between the bottom and top deciles of income distribution from Wier et al. (see Footnote 4) I am using $\frac{e_O}{e_W} = 0.5$. This yields an increase of 21% for post tax wage income.

\textsuperscript{1} I am assuming here that while taxes might alter employment and/or energy consumption levels they do not impact on expenditure. This is consistent with Cobb Douglas production and utility functions and for expositional simplicity. The argument extents to more general cases.

\textsuperscript{2} This is roughly consistent with the figures provided in Serres, A. D., Scarpetta, S., and Maisonneuve, C. D. L. (2001). Falling wage shares in Europe and the United States: How important is aggregation bias? Empirica, pages 375-401.