Tax structure
inflation and unemployment

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Summary

Last decades show internationally a worsening 'trade-off' between inflation and unemployment, which phenomenon is called stagflation. A possible cause is the structure of taxes and premiums that OECD nations have in common. This common structure has a dynamic component: a tendency of reduction of both exemption and statutory marginal rates. The economic theory behind this policy and structure uses comparative statics and partial derivatives. The alternative dynamic analysis uses total derivatives, and thus takes account of tax parameter changes. In dynamics, the marginal rate relevant for incentives is close to the average tax rate. What is wrong about current policies, is that exemption is indexed on inflation while subsistence rises with inflation and real income. This causes either poverty or rising minimum wages, thus benefits, taxes, and lower incentives. If exemption was put at subsistence, then jobs could be created at the low end of the labour market, which saves benefits and reduces average taxes, which increases incentives. If low productivity labour has a stronger position in the labour market, then the risk of unemployment is spread more evenly, and trend-setting high productivity labour will be cautious about wage claims. Since the present situation is inefficient, an improvement is possible from which everybody can benefit (Pareto improving).

Keywords: inflation, levies, Phillipscurve, stagflation, taxes, unemployment

PM 1. Since 2004 Colignatus is the preferred author name in science. See http://www.thomascool.eu/

PM 2. This is a PDF generated in *Mathematica* 9.0 in January 2013. The paper was published by Guido den Broeder of http://www.magnanamu.nl 1994, ISBN 90-5518-208-7, and included in the archive EconWPA at St. Louis ewp-mac/9508002. It has been on the web also in html, at http://www.thomascool.eu/Solunemp/html1993/Solunemp.html

Introduction

The last decades show internationally a worsening 'trade-off' between inflation and unemployment, which phenomenon is called stagflation. A possible cause is the tax and premium structure that OECD nations have in common. In the following, we firstly introduce taxes and stagflation, secondly relate to the existing literature, and then discuss what we shall do.

Levies

Premiums will be taken as part of taxes. To emphasize the general character of the analysis, the body of the text below will use the word "levy". In the literature, premiums for old age, sickness, disability, unemployment and the like are often regarded as insurances, and studied separately. Here they are all lumped together with taxes proper, and studied in their relation to stagflation.

Most developed nations have nonproportional levies, i.e. with an exemption at the threshold and then a (rising) statutory marginal rate. Policy has been remarkedly similar across nations too. It has two distinct features, see OECD (1986) and for example The Economist (1993):

The policy feature concerning the slope, or the statutory marginal rate.
Both in theory and public discussion there is a consideration that high marginal rates have disincentive effects. This has resulted in the policy objective to reduce marginal rates. One way to reduce marginal rates has been the switch from income tax to VAT.

The policy feature concerning the intercept, or exemption.
Tax parameters, and notably exemption, are generally indexed on inflation. Since incomes tend to grow faster than inflation, exemption lags behind incomes. There is a deliberate tax creep - measured by the 'macroeconomic progression factor'.

These two features have complemented each other by the policy requirement of budget neutrality. Budget neutrality requires that the revenue loss due to slope reduction is compensated. This revenue will often come from the tax creep and the reduction of exemption.

Stagflation

These levy policies have been developed partly to do something against stagflation. Stagflation is the phenomenon of a worsened 'trade-off' between inflation and unemployment. The phenomenon can be described in terms of the Non-Accelerating-Inflation Rate of Unemployment (NAIRU). With a constant NAIRU there can be stable inflation at stable unemployment. With a changing NAIRU there are important changes in the trade-off. The relationship is depicted in figure 1. Note that the axes have double meanings. Case (a) gives the situation somewhat like the 1950s. The trade-off of inflation and unemployment then took place at low rates along the long drawn line. The trade-off of price acceleration and unemployment gives the short line, and the intersection gives the NAIRU. At that point price acceleration is zero, or inflation remains at a stable value. Case (b) gives the situation of stagflation, where both the NAIRU and the trade-off-process around it have worsened. The move from (a) to (b) can be called 'stagflationary'. In the 1960s and 1970s authorities targetted for low unemployment at the cost of rising and eventually high inflation. In the 1980s authorities targetted against inflation and accepted high unemployment.

Levies come into the argument into the following manner. (1) Levies divert income and thus affect aggregate demand, especially when levies go to benefits and consumption instead of saving and investments. (2) Levies reduce net wages, and thus are thought to affect the supply of labour. Statutory marginal rates are thought to have disincentive effects. (3) Levies are thought to cause forward shifting, i.e. that levies are shifted into wage costs. These issues will be discussed below.

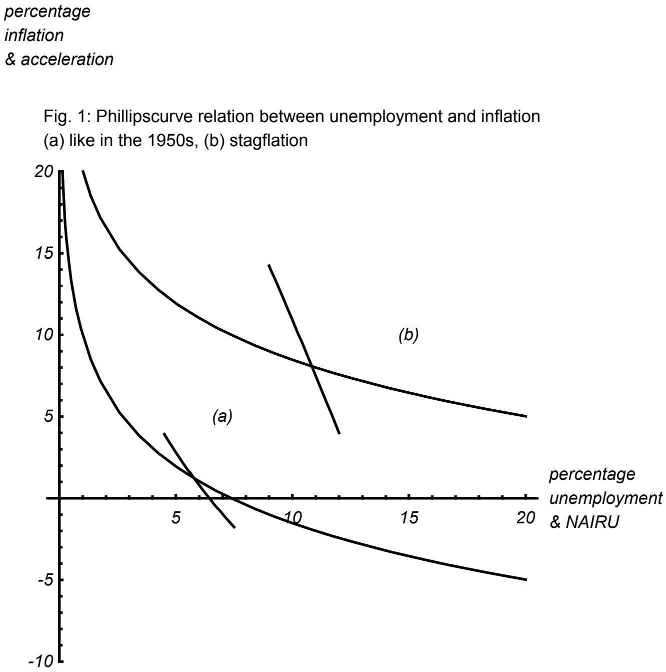


Fig. 1: Phillipscurve relation between unemployment and inflation
(a) like in the 1950s, (b) stagflation

Literature

The following references put the argument into perspective. Bruno & Sachs (1985) give a standard reference for stagflation. Their formal analysis uses homogeneous labour and proportional levies, though some of their statements allow for an interpretation of heterogeneity and nonproportionality. The need for modelling heterogeneous labour and nonproportional taxation is clearly recognized in the literature, see e.g. Beenstock et al. (1987) and Minford & Ashton (1993). Layard, Nickell & Jackman (1991), another standard, allow for heterogeneous labour, yet tend towards proportionality in levies. In addition, these references use dynamics but do not explicitly discuss the consequences of changes in levy parameters. Auerbach & Kotlikoff (1987) give a wealth of information on fiscal dynamics but do not specifically tackle stagflation. Other references which put the Phillipscurve in perspective are Okun (1981), Blanchard & Fischer (1989) and Friedman (1991). Very recent are The Economist (1994) and Phelps (1994). Extensive theoretical and empirical work has been done by the Centraal Planbureau (1992a&b), Gelauff (1992) and Cool (1992).

This paper extends the argument in Cool (1992), combining CPB internal notes Cool (1990) and Cool (1991). Highlighting only the main dynamic mechanism, this analysis remains embedded in full-scale empirical analysis and national economy modelling, so that other mechanisms are taken into account in the background.

What we shall do

In the following we will first develop the levy and stagflation concepts in more detail. Then we discuss the differential effects of exemption and marginal rates, using dynamics instead of comparative statics. A crucial topic is crowding out on the labour market. High productivity labour can replace low productivity labour more easily than conversely, and this has effect on inflationary wage claims. (This results into something like a continuous version of the insider-outsider theory.) We also discuss the issue whether stagflation is inefficient. If it is inefficient, then there is a Pareto improving alternative.

The paper concludes that current policies have not countered stagflation but have actually increased it. Current policies add to labour costs, reduce incentives, fuel forward shifting, and worsen the 'trade-off' between inflation and unemployment. The disincentive effect of levies depends less on the statutory marginal rate and more on the average levy over time (which average includes statutory rate changes). In addition, the lowering of exemption means either poverty or rising labour costs in the lower wage brackets, causing unemployment, and causing higher levies to pay for the benefits. If a welfare state is defined as a state that provides benefits for the lowly productive anyway, then it is run more efficiently by using the resources going into benefits to instead reduce labour costs and to price the lowly productive into jobs. This paper develops the argument that such a policy is dynamically sound too.

In the discussion we use a nonlinear and flexible levy function with three parameters. The use of this function allows us to give concrete examples. However, the basic results are independent of functional form.

Levy concepts

We abstract from different levy groups and deductions. Individual levy l[y] has base y, called gross income. National levy is L and its base Y, and these two give the national levy burden quote L / Y.

Gross income is related to productivity via nonwage costs and the profit rate. We abstract from other nonwage costs and also assume the equalization of profit rates, so that y may also be seen as an indicator of individual productivity. Appendix A contains a more detailed statement of those relations.

Most nations use nonlinear levies. The use of linear approximations, also in the design of new levy schemes, thus is not advisable. Appendix B, section 2, gives an example how a linear alternative fails to satisfy reasonable assumptions. Hence we have to find a neat nonlinear form.

A useful nonlinear levy function is:

(1) l[y] = r (y - x) y / (c + y) (y > x)

with y the levy base, r the marginal rate in the limit when y goes to infinity, x the exemption or threshold, and c a curvature parameter. The ordered set of parameters is q = (r, x, c).

The average levy is:

(2) l[y] / y = r . (y - x) / (c + y)

The statutory marginal rate is not too simple. At y = x it starts with the value r x / (c + x) and in the limit of y it equals r:

(3) $$\partial l/\partial y = r \left(1 - \frac{c\ (c + x)}{(c + y)^2}\right)$$

Note that the levy on the marginal dollar can always be approximated by l[y+1] - l[y].

Function (1) can be transformed into:

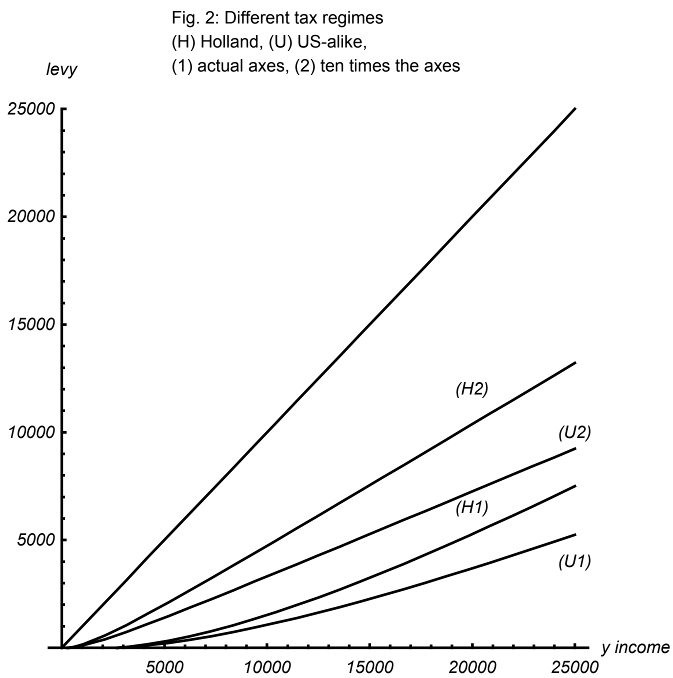
(4) l[y] = r.y - r.x - c.l[y] / y = a1.y + a2 + a3.(l[y] / y)

and, if one neglects the error in the l[y]/y quotient on the right, then it can be estimated by ordinary least squares.

Cool (1992) estimated (4), using macro tax data of the Netherlands only, with a reasonable fit. This result is reproduced below, in US dollars. The equation can be plotted for two ranges, (H1) for a low income range till \$25000 to show the curvature, and (H2) for a wider income range till \$250000 to show the straightness in the limit. See Figure 2, where one gets the wider range by multiplying the axes by 10. The 45-degree line has been added to allow visualisation of net income. Since the Dutch case has a high marginal rate in the limit of 57.2 %, we add US-alike lines U1 and U2 with a 40 % limit. The relevant equations are:

H1[y] = Holland[y] = .572 (y - 2674) y / (17554 + y)
U1[y] = USalike[y] = .400 (y - 2674) y / (17554 + y)

H2[y] = H1[10 y] / 10 (Holland, ten times the axes)
U2[y] = U1[10 y] / 10 (US-alike, ten times the axes)



Stagflation concepts

"Stagflation" is a concatenation of "stagnation" and "inflation". The word was coined around 1975 when national income growth stagnated and brought along unemployment. Since then GNP growth has somewhat recovered, and stagflation has been redefined and now is properly understood as a bad 'trade-off' of both inflation and unemployment.

To discuss stagflation, we will use the expedient of opposing three Views. These will be denoted as the Simple, the Complex and This Paper's Views.

The Simple View uses comparative statics with homogeneous and flexible labour supply and demand schedules. Every economist can dream the Marshallian Scissors of supply and demand, so it is not necessary to reproduce a graph. In this View, the orginal equilibrium will be reached at wage w* and employment E*. An income tax causes workers to demand a higher wage, and the supply schedule shifts upward. A payroll tax for employers causes a lower offer wage, and the demand schedule shifts downward. A new equilibrium with E' < E* finds employers paying gross w' > w* and workers receiving net w" < w*. With supply and demand schedules derived with marginal analysis of utility and profits, the underlying assumptions cause an important role for statutory marginal tax rates. First best here are lump sum taxes and zero marginal rates.

The Complex View is empirical and thus inherently dynamic. Empirical research, see e.g. Ashenfelter & Layard (1986), Hum & Simpson (1991) and Gelauff (1992) shows that marginal rates have surprisingly low elasticities. By consequence the average wedge is important, see Den Broeder (1989). Recently Minford & Ashton (1993) see scope for a larger effect, but, their study is still far from explaining stagflation, partly for the reason that it is not fully dynamic.

The reason for a lesser importance of marginal rates is that labour supply is not flexible, but rather fixed. People are still very much like Marx's proletariat. People have little else to fall back on but to supply their labour. There is some choice for partners and for people on benefits, but this does not have a major impact. By consequence, the major equilibrating forces exert themselves on the wage and the related employment. Here arises the dynamic situation of (wage) inflation and unemployment, and thus the issue of the Phillipscurve.

In the existing literature, e.g. Gelauff (1992), the statutory marginal rate actually increases employment, instead of reducing it as the Simple View would hold. A higher rate (under constant average) reduces earnings at the margin, penalizes and lowers wage demands, reduces (wage) inflation and thus increases employment. Similarly, a higher average rate (under constant marginal) causes compensating and useful wage demands at the margin, and reduces employment. These properties are consistent with analyses concerning a Tax-based Income Policy (TIP).

The OECD policies referred to in the introduction, directed at lowering statutory marginal rates, have been advocated using the rhetoric of the Simple View. In so far they have been successful in practice, it is because they have also lowered average rates. The reduction of marginal rates actually had a negative impact. Higher budget deficits have been relied on to pay for additional benefits and average rate reductions for higher incomes. Unfortunately, the empirical data over the 1980s now show the combination of a reduction of taxes on higher incomes and some reduction of unemployment, and thus seem to corroborate the Simple View. It will be difficult for policy makers to include more variables and accept the Complex View.

The Simple View makes the category mistake, of using arguments concerning the income distribution for issues of growth and employment. The Complex View already gives a correction. This Paper's View will extend on that. The major decision facing a person concerns the choice of his position within the income distribution. Under balanced growth, that distribution shifts evenly through time. Then the statutory marginal rates have other effects than the Complex View yet allows, and the average rate is even more important.

Phillipscurve concepts

The Phillipscurve reflects the hypothesis that inflation is influenced by unemployment. Of course other factors are important too, such as price expectations and forward shifting of levies. Whatever other influences on prices, the key notion of the Phillipscurve remains the influence of the employment situation. Vacancies will strengthen the position of employees and their unions, unemployment wil weaken it. Here, for simplicity, we take the general price level instead of wage inflation.

Let P be the price level so that dLog[P] is inflation. Let dLog[P*] be inflation required to achieve equilibrium, U the rate of unemployment, Us a shift variable, V the rate of vacancies, L/Y the levy burden, all at the macro level. Let H be a summary statistic of the history of these variables.

The inflationary process consists of the process along a curve and the shift of the curve, as already discussed in relation to figure 1. The following is a choice about what variable is important for what movement:

(5) dLog[P] = dLog[P*] - a Log[U - Us + z] (a >= 0)

(6) Us = Us[V, L/Y, H]

The Equilibrium Rate of Unemployment ERU arises when dLog[P] = dLog[P*]. It is not empirically warranted that an ERU exists. When it does:

(7) 0 = - a Log[ERU - Us + z]

(8) a > 0 => ERU = Us - z + 1

When dLog[P] = dLog[P*], then it is still possible that inflation dLog[P] is rather erratic, and possibly even accelerating. Unemployment might constrain acceleration too, which gives the Non-Accelerating-Inflation Rate of Unemployment (NAIRU). A suitable situation is that ERU = NAIRU.

This sums up a rather standard view of stagflation.

The analysis below concerns the relationship of levies to the shift variables. Forward shifting of the levy burden L/Y into wages is not discussed and taken for granted. The lack of V in (5) may not be wholly standard, and will be explained as part of our discussion.

Discussion: exemption

The nonproportional levy clearly becomes important when incomes differ, i.e. labour is heterogeneous in terms of productivity, labour costs and income. Lower income earners are affected disproportionally by the exemption level, not merely in terms of the income distribution but also in terms of their competitive position versus higher earners.

If b is the net subsistence benefit level, then m solves as the implied minimum labour cost:

(9) b = m - l[m]

Alternatively stated, the function g[y] = l[y] + b contains the system parameters on levies and benefits, and m follows as its fixed point m = g[m].

For the l[y] in (1), the solution of m for reasonable parameter values is:

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                  b - c - r x + Sqrt[4bc(1 - r) + (b - c - r x)^2]
(10)    m[b]  = -----------------------------------------------
                                 2 (1 - r)
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The solution of m can be determined graphically. Figure 3 shows this for the lower range (H1) of figure 2, using the net subsistence benefit of approximately $11000 for the Dutch family. Taking the intersection of the levy line l[y] and the "benefit line" y - b (parallel to the 45-degrees line), we draw a vertical line through it, and find m ~ $14000. We add a hypothetical employment/income/productivity density, and conclude that everybody below m will be unemployed. Working will not earn a subsistence living, which makes one eligible for benefits. Thus m defines minimum wage unemployment Um. People in Um are not relevant for the labour market and will not exert a downward pressure on inflation. Hence Um enters Us (here as part of H). This argument is developed in Appendix A.

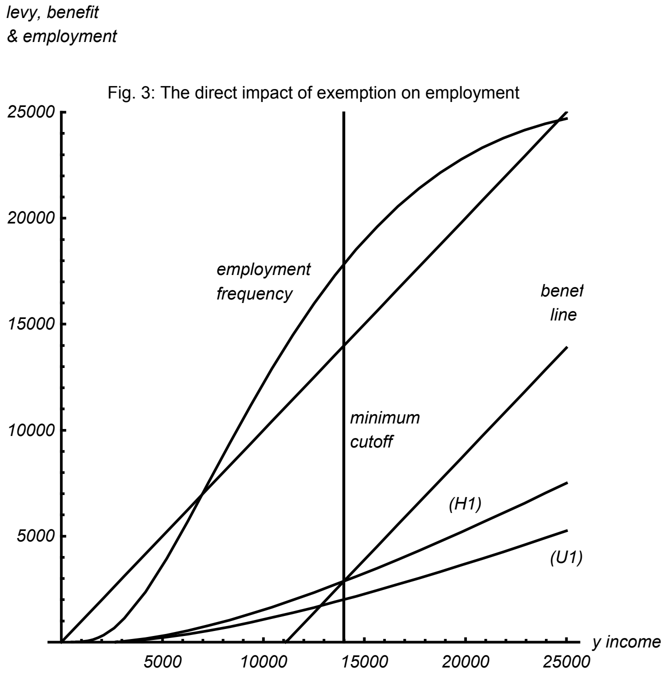
The situation of formula (9) and figure 3 is a rather standard minimum wage model. The innovation in this section comes from looking at the dynamic situation.

Sociobiological and social psychological causes, Aronson (1992a&b), apply. Net subsistence tends to be indexed on net general income. Sometimes there are legal rules on indexation in this manner. Often labour unions come in. More generally it is simply a social convention. A certain level of living is regarded as inacceptable, both by most employers and by the work floor in general. Sometimes labour market regulators may be aware of the problem of the minimum wage, and may opt for a lower indexation of m even though it results into a lower b. But the effectiveness of such measures depends upon the strength of conventions in all factories and sectors.

On the other hand, exemption x is established within the bureaucratic realm where there is no direct confrontation with the standard of living. For its own historical reasons, exemption is generally indexed on inflation.

Thus there is a differential indexation. Required gross minimum m rises faster than both net minimum b and the general level of income. In figure 3, when we subtract the inflation component from x, b and m, differential indexation shows up as m moving to the right. If productivity in the lower earnings scales doesn't rise faster than general productivity or income, then ever more people grow unemployed.

In the US the 1948 exemption was $600 a person. In 1990 it was $2050. Had the exemption been indexed it would have been $7800. See The Economist (1991). Similar figures exist for Holland.



The relative rise of m is rather obvious. For all clarity we shall prove it, first using the specific levy function (1), secondly independent of form. First we will show that m grows faster than b, then that m grows faster than productivity too, causing unemployment.

Let us first discuss the specific example of (1). Let the price level index again be P. With real growth index G, the nominal index is P G. For a dynamic path we have starting position b[0] giving m[0] = m[b[0]]. Parameter r will not be indexed. We neglect budget consequences.

First we find:

(11) b = P G b[0] (indexed on general welfare)

(9') b = m - l[m, (r, Px,Pc)] = m . {1 - r . (m - P x) / (c P + m)}

Since m is the solution of (11) and (9'), it implicitly defines index J:

(12) m = P J m[0] i.e. J = m[b] / (P m[0])

To prove that J > G, combine (11), (9') and (12), and see that P falls away in the second part:

(13) $G\, b[0] = J\, m[0]\, .\, \{1 - r\, .\, (m[0] - x/J) / (c/J + m[0])\, \}$

As G and J go to infinity, then $G\, b[0] \sim J\, m[0]\, (1 - r)$. For common parameter values the minimum level is taxed at a rate less than r, implying that $b[0] > (1 - r)\, m[0]$. Then J > G.

Let us secondly look at productivity and employment. When we start with full employment at m[0], then m[0] provides the equilibrium of supply and demand. Let the supply price (gross income / productivity) at the minimum be ms[0] and let the demand price (labour costs) at the minimum be md[0]. Then m[0] = ms[0] = md[0] is a minimum level of productivity at which one can work in the start situation. Assuming balanced growth for demand and supply gives the development of the labour market situation at the bottom:

(14) $y = P\, G\, y[0]$ in general, for all y (welfare = productivity)

=> $md = P\, G\, md[0]$ & $ms = P\, G\, ms[0]$

Equation (14) means that the supplied (inherent) productivity of those at the minimum grows as fast as the labour costs which employers could afford. It is likely that technology creates so many possibilities, that employers can finance even higher costs. However, the true supply price is not productivity but gross income m, which grows faster than the md. People in the class [md, m) will not find jobs paying the social minimum. They become eligible and apply for benefits, and are on this account unemployed.

It is now obvious that a more general statement is possible. The relevant mathematical theorem has been formulated by Cool (1992). We do not reproduce that result.

The general character of the analysis, and our use of the general term of "levies", will now be clear. If some insurance for old age, disability and the like is thought to be part of social subsistence, then exemption is warranted. A proportional VAT will be important too. It adds to the cost of living and thus indirectly to higher wages. A rise of VAT or a shift from income tax to VAT causes a shift, similar to a reduction of exemption. Though a VAT taxes profits too and thus seems to allow a general reduction of the price of labour, it raises costs disproportionally for the lowly productive.

Discussion: the slope

The section on "stagflation concepts" above clarifies an existing conceptual problem. Statutory marginal rates are important in popular understanding, but not in the empirical data. Research in the existing literature deals better with the data, but doesn't convince the popular view. This paper suggests a solution. Theory, public discussion and empirical research generally use the statutory rate as the "marginal". This is the partial derivative in (3). However, the levy function is better understood not as l[y] but as the multivariate l[y, q]. Rational agents will take account of parameter changes. Then the better marginal rate is the - dynamic - total derivative:

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(15)  dl[y,q]/dy = ∂l[y]/∂y + ∂l[y]/∂q . dq/dy
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Important is the following property. For nonzero values in general, it holds that the dynamic marginal rate equals the average rate, if and only if there is balanced growth:

(16) marginal = dl[y] / dy = l[y] / y = average <=> dl[y] / l[y] = dy / y = dLog[y]

This can be verified by manipulating numerators and denominators. Under balanced growth, levies will grow as fast as incomes, with a constant levy share L/Y. This situation would require certain changes of the levy parameters, see (15).

Function (1) can be used as an example for this general property. For l[y, q] in (1) a solution for a balanced growth path (with a stable productivity density) is that parameters x and c are indexed on y. In other words, if the index for y is i = P G, we find for the (individual) average levy burden that the index value drops from both numerator and denominator:

(2') l[iy; r, ix, ic] / (iy) = r (iy - ix) / (ic + iy) = l[y; r, x, c] / y (for all i > 0)

The marginal rate in (3) has the same property of remaining the same under growth indexing. This however is less relevant, since it does not relate to a general property as important as (16).

The situation of a constant dynamic marginal rate is depicted in figure 4 for a doubling of income. Point A is an arbitrary point on the employment density. We scale the density so that A also lies on the levy function (H). For that arbitrary income at A we determine the average levy as a ray through A and the origin. Now, if all incomes double, then the employment frequency density shifts, and A becomes B. If levy parameters x and c double too, then the levy function becomes (2H). At B the individual still pays the same average levy in C.

This analysis implies that levy incentives primarily affect decisions about one's place in the income density. By consequence the policy maker should rather look at investment and the rate of interest to find the true incentives for growth. This may be clarified.

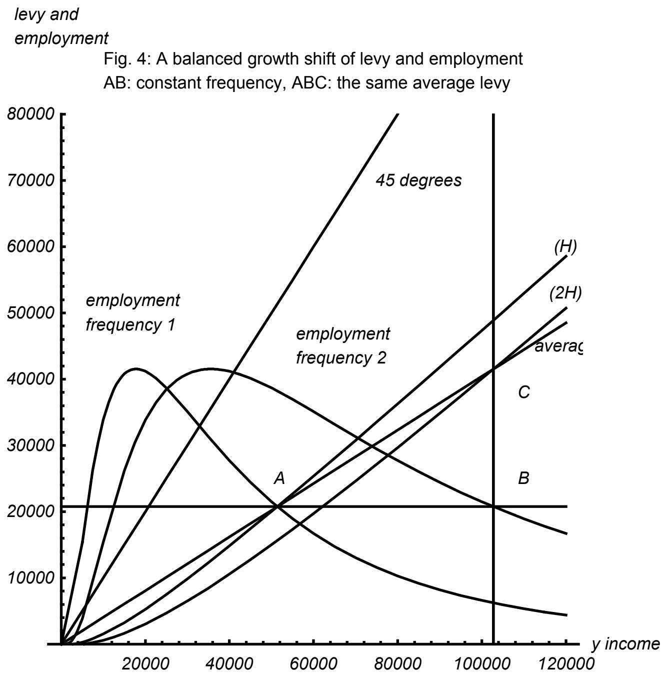


Fig. 4: A balanced growth shift of levy and employment
AB: constant frequency, ABC: the same average levy

Figure 5 (a&b) contains more information about the individual choice. They compare the trade-offs between work, income and leisure, both in the present and with a doubling in, say, thirty years. How the individual is going to react to the doubling of his income (opportunity) depends of course upon the shape of his utility function. There are price and income effects, which may cause substitution of income for leisure. What is important, is that we verify that the assumption of balanced growth implies that the tradeoffs remain similar in terms of gross and net income. For example, if a person starts working less hours, his income may rise by 80 % instead of 100 %, and if taxes rise by 80 %, the average tax burden still is constant.

Each tradeoff in fig. 5a consists of a pair of gross and net income, linked by a line (measuring the levy) at 16 hours of leisure and 8 hours of work. Double net income is in this case larger than gross income. Figure 5b shows the combinations of average and marginal rates for the two situations. Since we use levy relation (1) indexed on growth (in this case a doubling of x and c, with constant r), these tax lines don't change.

For another individual the income opportunity frontiers in fig. 5a will differ, and thus fig. 5b too; but under this method of indexation the tax lines remain constant too. This indexation can be said to be "neutral to the income change". The tax choices facing an individual, whose income grows as national income, are constant. The utility reaction thus depends on the change of income itself. Since the context is that all individuals are adjusting, this may be reformulated as that individuals are determining their place within the income distribution.

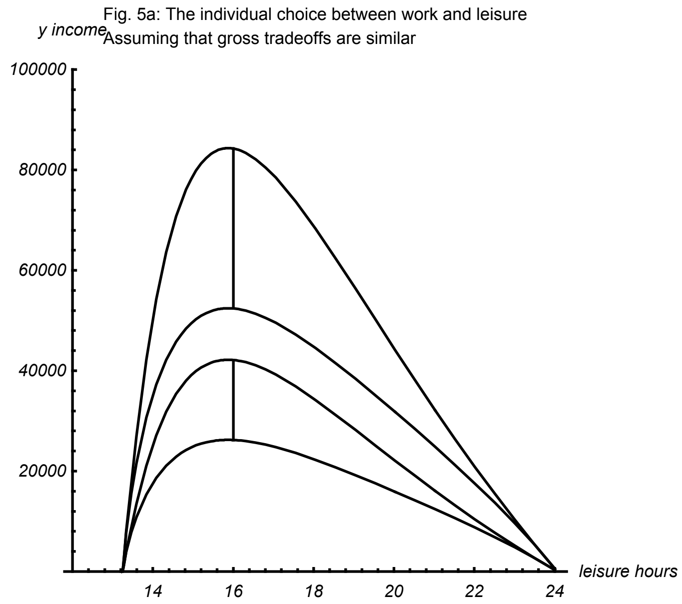


Fig. 5a: The individual choice between work and leisure
Assuming that gross tradeoffs are similar
y income
100000
80000
60000
40000
20000
leisure hours
14
16
18
20
22
24

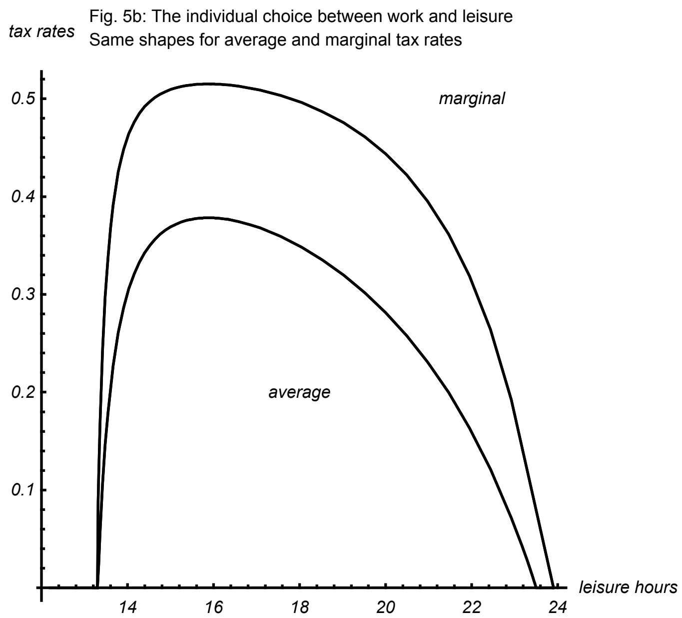


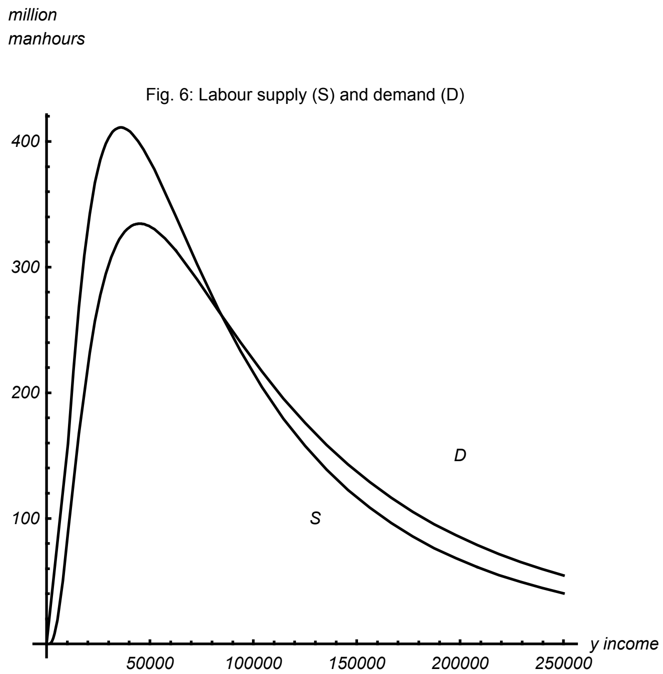
Fig. 5b: The individual choice between work and leisure
Same shapes for average and marginal tax rates
tax rates
0.5
0.4
0.3
0.2
0.1
marginal
average
leisure hours
14
16
18
20
22
24

Discussion: crowding out

Unemployment among the higher skilled is not large. The analysis here is that this is caused by crowding out on the labour market. When potentially higher productive people face the choice between unemployment and a comparatively lower paid job, they choose the latter. They thereby "take the places" of others - who repeat the process to others below. The initial set-back in pay level tends to translate into wage growth demand. Who crowds out, has a stake in trying for wage growth. Who have been crowded out towards unemployment, have some incentive not to inflate, but have little countervaling power against the general mood for inflation.

Figure 6 gives the stylized fact for labour demand (D) and supply (S), that vacancies tend to occur at higher income brackets and unemployment at lower ones. Demand could be approximated by next period's employment E, and thus D & S already include some crowding out effect. Though we do not neglect submarkets, there is a meaningful aggregation of vacancies and unemployment by bracket, giving Vl, Vh, Ul and Uh. When vacancies are asymmetrically relevant only for the higher incomes (V ~ Vh, Vl ~ 0), and when there are always vacancies for higher incomes due to crowding out (Vh >> 0), then V is not that important. This has been formalized here by eliminating V from (5). Secondly, V may become important again when V1 is made nonzero by proper tax policies. High values of Vl and Uh have the largest wage checking effect. High Vl and Uh make it difficult for the trend setting higher productive workers to shift the risk of unemployment to the lesser productive workers. We will not formally develop this point.

Fig. 6: Labour supply (S) and demand (D)



Discussion: suboptimality

This paper's analysis is that an unfortunate choice of levy parameters of has caused the shift of the Phillipscurve. Since this shift is avoidable and inefficient, the unemployed are idle resources and the economy produces at suboptimal level. Social welfare could be improved by replacing the current schedule by another one which allows the reduction of wage costs, creation of employment, saving of benefits, and less levies.

Searching for that alternative, we pay particular attention to the average levy. The average rate is not "more important" than the statutory marginal rate. In abstract sense they are both important. But the average rate gains in attention value due to our dynamic analysis.

One alternative regime is quickly found. A new "levy class", valid for people earning between b and m, does not cost anything in terms of revenues forgone, since people in that class presently do not work and thus do not pay levies. A drawback is that this new class creates a so-called 'poverty trap', a 100 % or more tariff, at m. This need not be regarded as a big problem however, since economic growth can be used to repair it gradually. However, it remains a challenge to see whether one can do better.

The most attractive alternative may well be labour cost compensation. This is a negative income levy for workers (NIL) - and not for others. In figure 3, an alternative levy line can start in the negative levy area and remain below the drawn existing levy. This new levy favours employment in the lower wage brackets.

Let the new levy be l*[y] = l[y, q*]:

(17) $\quad$ l*[y] = r* (y - x*) y / (y + c*) $\qquad\qquad$ (y >= m* >= 0)

The NIL will only be given from some minimal market earnings m*. This can be below subsistence b since the NIL makes up for the difference. The basic assumption thus is that the levy rates and minimum wage are co-ordinated:

(18) $\quad$ m* = b + l*[m*] $\qquad\qquad$ 0 < m* (for example m* < b < m)

There is a subtle difference in the meaning of x in (1) and x* in (17). In (1) x is really exemption, in (17) x* is just the intersection with the horizontal axis. In the standard stagflationary situation, x is rather low, and hence x* would be higher. To compensate part of the loss of revenue, one would reduce the curvature parameter, giving c* < c. Hence x* > x and c* < c.

If the new levy is to be superior, it must be for the dynamic marginal:

(19) $\quad$ l*[y] / y $\quad$ =< $\quad$ l[y] / y

Let the levy reduction be financed by saved benefits. Denote total employment as E. The change of employment will be a function of m*, say dE[m*]. Each newly employed person saves benefit b and adds income w = w[m*]. The latter might equal m* but would normally include a general rise of productivity. Determination of L* as revenue requires a difficult integral, but L* as expenditure is easy:

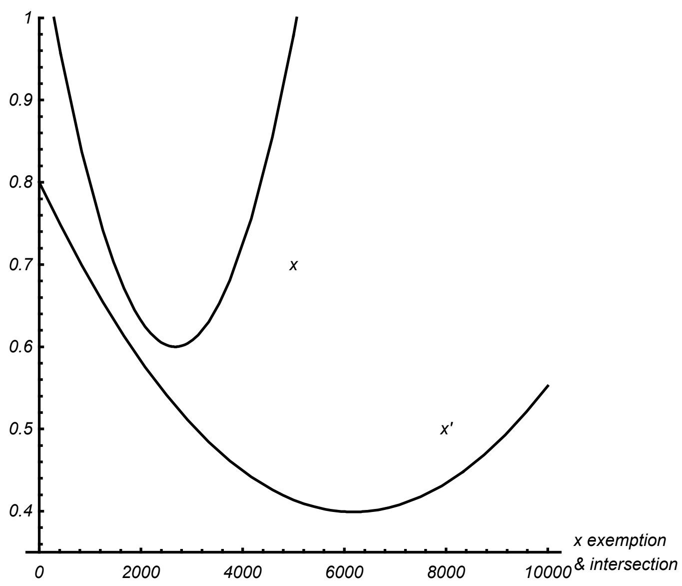
(20) E* = E + dE[m*]

(21) L* = L - b dE[m*]

(22) Y* = Y + w[m*] dE[m*]

Equations (17) till (22) sum up the new situation and the conditions to be fulfilled. Our deductions are transferred to Appendix B. The solution strategy is to take m* as the independent variable and solve for x* and L*/Y*. This gives a general choice set for x* and L*/Y*, for example as depicted in figure 7. The smaller choice set to the left depicts the perception of policy makers, with both a low exemption level (x) and a high levy burden. Lowering exemption is thought to cause higher benefit payments. Raising exemption is thought to cause higher marginal rates, lower incentives and thus lower national income Y. Alternatively, the enveloping choice set is the true situation according to the present analysis. It contains the possibility of a lower levy burden at a higher intersection (x' = x*). Thus a NIL would create employment, reduce average taxes and reduce stagflation.

Fig. 7: Budget neutral possibilities curves
(x) Perceived & exemption, (x') Actual & NIL



Conclusion

Stagflation is an international phenomenon, and its likely cause is the structure of taxes and premiums which OECD countries have in common. The common structure (actually a policy) is a tendency of reducing both exemption and statutory marginal rates under budget neutrality.

To analyse and verify this, we clarified three viewpoints and discussed the topics of exemption, slope, crowding out, and budget optimality.

We have found that the mentioned levy structure is a major cause for stagflation indeed. Current policies try to reduce marginal rates under budget neutrality, so that the result is lower exemption. Part of the common structure is that levies are indexed on inflation while incomes and social subsistence rise faster. This implies (1) a disproportional rise of labour costs in the lower wage brackets, causing poverty or unemployment, (2) a constant average levy with constant disincentive - while to pay for the benefits often budget deficits are incurred. Thus we have a clear explanation for the worsening trade-off between unemployment and inflation.

The stagflationary influence can only be traced by taking account of nonproportionality for the levies and of heterogeneity for labour, while the overall method must be dynamics instead of comparative statics. Not only levy parameter values within the year are important but also their changes over the years. This implies the use of total instead of partial derivatives.

By this analysis, the emphasis shifts from marginal rates to average rates.

This is likely more important for public discussion than for the literature. The literature has already been sensitive to the empirical data which show a different role for marginal rates. Public discussion however finds these empirical results hard to believe. It is precisely for the fact that popular understanding neglects the data and uses a simple model and static analysis, that the common tax structure has come about and is maintained. Current policies are said to be intended to fight stagflation, but they actually cause it. Perhaps, then, that the present analysis is more convincing.

It is useful for popular debate that the shift of emphasis to average rates is as clear as possible. The following is a small example of how a dynamic marginal rate can equal a normal average. Let exemption be \$10000, and let the statutory marginal rate thereafter be 50%. Someone earning \$50000 pays the levy of \$20000, on average 40%. Let all incomes grow 5%, and exemption be indexed on national income. Then exemption becomes \$10500, income \$52500, tax \$21000, again 40%. Thus on the (dynamic) "marginal dollar" this person doesn't pay 50% but 40%.

Since the present situation is inefficient, an improvement is possible from which everybody can benefit, i.e. a Pareto improvement. There are various ways to improve the present situation. A clear example is the following. Exemption has a natural position at subsistence, witness the 1889 analogy by Cohen Stuart (see Hofstra (1975)) that a bridge must hold its own weight before it can carry a load. If exemption were to be put at subsistence, then jobs could be created at the low end of the labour market, which saves benefits and reduces average taxes, which increases incentives. If a larger part of labour supply is eligible on the job market, then wage claims already will be reduced by standard analysis. In addition, this paper suggests that if low productivity labour has a stronger position in the labour market, then the risk of unemployment is spread more evenly, and (trend setting) higher productivity labour will be even more cautious with inflationary wage claims.

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Appendix A: Definitions, densities and the Phillipscurve

This appendix gives some elements for heterogeneous labour markets. The following accounting definitions are useful:

product= labour costs + profit
labour costs = wage costs + nonwage but labour related costs
= net income + (direct + indirect) taxes + premia + other nonwage costs
gross income = labour costs - other nonwage costs = net income + levy

Neglecting the "other nonwage costs" gives y = gross income = labour costs. Observed labour costs have a frequency density f[y]. Since the product is yp = y (1 + profitrate), equalisation of profitrates produces f[y] as a shift of the productivity density fp[yp].

The labour supply density depends on net income (y - l[y]) but can under mentioned assumptions be regarded as a function of labour cost y, as s[y] = s*[y - l[y, q]]. Total supply S follows from the integral from some minimum ms till infinity.

(A1) S[ms] = Integrate[s[y], {y, ms, Infinity}] (almost fixed)

Labour demand has density d[y] and an integral from some minimum md till infinity.

(A2) D[md] = Integrate[d[y], {y, md, Infinity}]

The employment density under mentioned assumptions then is:

(A3) e[y] = Min[s[y], d[y]] = f[y]

Unemployment u and vacancies v follow from the difference between supply and demand and actual employment.

(A4) u[y] = s[y] - e[y]

(A5) v[y] = d[y] - e[y]

Price inflation p in each market depends upon the power position of employers and employees, which is determined, amongst others, by the relative situation of unemployment versus vacancies. The relationship between inflation and the other variables clearly is a dynamic one. We thus read all variables as time dependent. We also add the price expectations p*, history of the variables, and add the levy burden for forward shifting:

(A6) p[y] = p[p*[y], u[y], v[y], l[y] / y, history]

The NAI-u arises as the solution of a stable u* for zero price acceleration.

The submarkets Phillipscurve in (A6) is not entirely satisfactory since it doesn't mention the influence of other submarkets. A macro-economic hypothesis is that the development within markets is not merely influenced but even dominated by general events.

For total employment we take account of a minimum wage m. We then take the integral from Max[ms, md, m] till infinity.

(A3a) E[ms, md, m] = Integrate[f[y], {y, Max[ms, md, m], Infinity}]

(A4a) U = (S - E) / S = U[ms, md, m] (a rate)

(A5a) V = (D - E) / S = V[ms, md, m] (a rate)

Minimum wage m typically dominates both ms and md. Would-be earners of ms < y < m become eligible for benefits. When they accept these voluntarily or from social pressure, they, in a sense, form no real supply. Yet they are supply, otherwise they would not be eligible. On the demand side, there would be a real demand for md < y < m if government would reduce m. But this demand is not relevant when m exists.

Denote mx = Max[m, md]. The situation that ms < mx causes two kinds of unemployment. The first part consists of the supply in the [ms, mx) range that is always unemployed, and the other is the more normal part.

(A7) U = Um + Un

(A7a) Um = Integrate[s[y], {y, ms, < mx}] / S = Um[ms, mx]

(A7b) Un = 1 - Um - E / S = Un[mx]

If ms < mx then only Un will exert a meaningful pressure on wage demand. A major dynamic process is that Um rises over time, contributing to the phenomenon of hysteresis. The Phillipscurve might stay stable in terms of Un, "normal" unemployment rate, but shifts in terms of U, the overall unemployment rate.

Appendix B: Alternative levy

General

We take up the argument at equations (17) till (22), determine constraints on new parameters q*, and try to solve for a plot of x* and L*/Y*. The key variable is m*, which determines new employment, national income and savings on benefits.

Since (19) must hold for all y, then also as y goes to infinity. Hence r* =< r. Taking the highest value r, and then eliminating it:

(B1) r* = r

(19a) (y - x*) / (y + c*) =< (y - x) / (y + c)

(19b) 1 - (x* + c*) / (y + c*) =< 1 - (c + x) / (y + c)

(19c) x* >= (c + x) (y + c*) / (y + c) - c*

The latter must hold for all y in the relevant range [m, infinity). Since (c* =< c) then the smallest value of the part ((y + c*) / (y + c)) in the relevant range is ((m + c*) / (m + c)) and the greatest is the limit 1. Since x* must be larger than the greatest value:

(19d) x* >= (c + x) - c* >= x (c* =< c)

In addition, we can find a relation for x* by working out (18):

(18a) x* = m* + (b / m* - 1)/r (m* + c*) (m* =< b)

Substitution of (18a) in (19d) using B = (b / m* - 1) / r = B[m*] >= 0 gives:

(B2) x* = m* + B (m* + c*) >= (c + x) - c*

(B2a) c* >= (c + x) / (1 + B) - m* = c*[m*]

The choice of m* thus defines certain ranges for c* and x*.

Levy revenue L* is an integral. Setting revenue equal to expenditure L* = L - b dE[m*] gives a restriction on q* too. Selecting various values of m* allows a plot of x* and L*/Y*.

Linear

A specific alternative would be the linear levy, with $c^* = 0$. Linearity allows the transformation of the intersection into a "levy credit" $k = r\,x^*$. With $r\,y$ as the ray through the origin that gives levies in the limit, the linear alternative is a parallel line, shifted k points along the axis. A linear function allows a quick determination of levy revenue:

(B3) $l^*[y] = r\,(y - x^*) = r\,y - k$

(B3a) $L^* = r\,Y^* - k\,E^*$

(18b) $r\,x^* = k = b - (1 - r)\,m^*$ or $x^* = b/r - (1/r - 1)\,m^*$

This allows easy analytical expressions for x^* and L^*/Y^*. The linear case however may have few solutions. If the original regime is very nonlinear ($c >> 0$) then this linear alternative is costly and may not exist. By diligent substitution:

(B3b) $L - b\,dE[m^*] = r\,(Y + w[m^*]\,dE[m^*]) - (b - (1 - r)\,m^*)\,(E + dE[m^*])$

(B3c) $L - r\,Y - r\,w[m^*]\,dE[m^*] + E\,b = m^*\,(1 - r)\,(E + dE[m^*])$

Divide by E and use employment growth rate $g[m^*] = dE[m^*] / E$. Denote $x'' = (Y - L/r) / E$. This x" is defined on known variables and gives some implied intersection. Likely $x'' > 0$. Substitute (18b) in (B3c)

(B4) $m^* = (\,b - r\,x'' - r\,w[m^*]\,g[m^*]\,) / \{\,(1 - r)\,(1 + g[m^*])\,\}$

For completeness only, expand L^*/Y^*:

(B3d) $L^* / Y^* = r\,(1 - x^*\,E^* / Y^*) = r\,(1 - x^*\,(E + dE[m^*]) / (Y + w[m^*]\,dE[m^*]))$

Note that substituting $c^* = 0$ and (18b) in (19d) gives a condition on m^*:

(B2a') $b/r - (1/r - 1)\,m^* >= (c + x)$ => $m^* =< (b - r\,(c + x)) / (1 - r)$

For the solution set of m^* in (B4) and (B2a'), $x^*[m^*]$ follows from (18b) and then L^*/Y^* from (B3d). This provides a plot of L^*/Y^* against x^*.

Combining (B4) and (B2a'), writing g = g[m*] and w = w[m*], gives the condition:

(B5)   m* = (b - r x" - r w g) / { (1 - r) (1 + g) } =< (b - r (c + x)) / (1 - r)

(B5a)   x" >= (1 + g) (c + x) - w g - b g / r

(B5b)   w >= { (1 + g)(c + x) - b g / r - x" } / g

Which is a restatement of the fact that if the original function is very nonlinear (high c), then the linear NIL is not likely to be feasible.

To proceed, we can fill in macro data, and use the estimated levy parameters.The estimates on page 5 exclude social premiums, and thus underestimate the room for improvement.

For Holland, Y = $294 bn, L = $155 bn, E = 5 mln. Then x" = $4319. The new intersection would be at x* = c + x = 20228, which is rather high.

Ad (B5a): A test using (B5a) could assume full employment. Let m* be put at zero, so that everybody with a productivity between 0 and m could find a job. For Holland g[0] ~ U = 10 %. Denote potential average earnings in this U-group as w[0] = h b. Then (B5a) solves into h >= 14.5. This means that average earnings in the U-group must be at least 14.5 times the benefit level. This is not realistic.

Ad (B5b): When w and g are not given, assume equality in (B5b), and find w = 15908 / g + 997. It follows that employment growth g must be large (say 30 %) before reasonable values are found for the potential average earnings applicable for the present unemployed.

Both results mean that it is not feasible in Holland to achieve full employment by replacing the existing regime with a linear NIL that specifically respects all individual average levy burdens. A nonlinear relation remains needed. Of course, this conclusion rests upon the parameter estimate that still excludes social premiums.

Partial linear

Another alternative is partial linearisation. Chose an arbitrary income y*, for example actual maximum income. The marginal rate or tangent at that point is given by (3), say r*. This tangent intersects the horizontal axis at x* = y* - l[y*] / r*. Thus a partly linear levy regime would be:

(B5)   l*[y] = r* (y - y*) + l[y*]   (y =< y*)

l*[y] = l[y]   (y >= y*)

The advantage of a (partly) linear scheme is that it allows a quicker recovery of the NIL, but it also tends to result into higher losses in the higher income section. So a nonlinear scheme might still be best.