7 Sticky Consumption and Rigid Wages

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7.1 Introduction

A common explanation for the rise in European unemployment in the 1970s and early 80s has been based on the increase in import prices due to the oil and commodity price shocks.\(^1\) If workers resist the negative impact on the real wage, an import price shock will cause a rise in unemployment. In their influential book on unemployment, Layard, Nickell and Jackman (1991, p. 31) explain the existence and consequences of real wage resistance in the following way:

Workers value not only the level of their real consumption wage, but also how it compares with what they expected it to be. ... When external shocks like import price shocks, tax increases, or falls in productivity growth reduce the feasible growth of real consumption wages, this generates more wage pressure, which (in equilibrium) requires more unemployment to offset it.

The empirical study by Alogoskoufis and Manning (1988) provides a related view, the authors claiming that 'in Europe wage aspirations are extremely persistent...'

But to many economists, the idea that past expectations matter for the wage that workers demand is based on irrational behaviour. In his comprehensive review article of Layard _et al._ (1991), Phelps (1992, p. 1484), articulates these worries:

I am more reluctant to accept the argument that individual workers put up wage resistance when...it is irrational for them to do so. In part it is because I am skeptical that whole populations behave irrationally for long periods. In part it is because, in company with most other economists, I would prefer to model behaviour as rational and to turn to irrational mech-
anisms as a last resort...

In this paper we propose a rational explanation for why past expectations affect the current wage.² The idea is that consumption patterns are costly to change. For example, one cannot costlessly sell a large house and move into a smaller. Besides the pure transaction costs (frequently up to 5 per cent–10 per cent of the sale price, OECD, 1994, p. 67), come other monetary and non-monetary costs associated with the move. For small discrepancies between anticipated and actual income, the transaction costs will prevent adjustment of the consumption of durable goods. Thus, the full adjustment will be on consumption of non-durable goods. However, for large expectational errors in the income, it is preferable to incur the transaction costs and adjust consumption of durable goods also.

Transactions costs may have several effects on wage setting. Workers that unexpectedly lose their job will face a large loss in their income, and the transactions costs will increase the costs of adjusting consumption, and thus also the costs of becoming unemployed. Greater costs of becoming unemployed tend to reduce unions’ wage claims.

The wage moderating effect may be further strengthened if economic growth (and thus income growth) is above expectations. Consumption of durable goods will be ‘low,’ due to ‘pessimistic’ expectations in the past, while consumption of non-durables will be ‘high’ due to high income. Thus, consumption of non-durables will be suboptimally high compared to the consumption of durables. A further wage rise will lead to even higher consumption of non-durables, with little gain in utility due to the suboptimal consumption profile. The small gain from a wage rise will also induce moderation in the wage setting. The same effect could also be caused by rationing of credit, which prevents purchases of durables, thus causing a suboptimally low consumption of durable goods. Both these factors may contribute to an explanation of wage moderation in many European countries in the 1950s and 1960s.

However, if the room for wage growth is below expectations, as in Europe in the 1970s and early 1980s, the transaction costs may induce wage aggressiveness. With transaction costs, a modest but unexpected reduction in the real wage (or a lower increase than earlier expected) would typically lead not to a sale of consumer durables or other major changes in a worker’s lifestyle, but to a number of possibly quite painful adjustments on the margins that are left: food, clothes, holidays. We argue that it could well be rational for a utilitarian union to fight for the expected real wage when faced with an adverse shock, so as to preserve the consumption pattern of a majority of its members, while letting a minority go unemployed and make
major alterations in the way that they live: For all the members, the lottery is preferable to the sure disappointment.\(^3\)

The rest of the paper is organised as follows. In Section 7.2, we set out the basic model, which is analysed in Section 7.3. Section 7.4 contains some final remarks. All proofs are in the Appendix.

### 7.2 The model

We consider a trade union comprising \(L\) members. The union sets the wage \(W\), while one (or more) employer decides how many workers to employ at this level of pay; the standard specification of the monopoly union model. (The same qualitative results could be derived in a model where the wage is set in a bargain between union and employer.)

The labour demand function is \(N(\alpha, W) = \alpha - \alpha_1 W\), where \(\alpha\) is a stochastic parameter which indicates the product demand facing the firm (\(N = 0\) for \(W > \alpha/\alpha_1\)). More specifically, we assume that \(\alpha = \alpha^* + u\), where \(\alpha^*\) is non-stochastic, and \(u\) is uniformly distributed over the interval \([u^L, u^U]\), \(u^U > 0 > u^L\). The upper bound, \(u^U\) is assumed to be 'large,' to avoid boundary solutions. (Linearity of the labour demand simplifies the analysis, but is not important for the qualitative results.) \(L - N\) of the union members are unemployed.

Workers consume non-negative quantities of two kinds of goods; durable and non-durable. They all have the same utility of consumption, \(V(C, D) = C^\beta D^{1-\beta}, \beta \in (0, 1)\), where \(C\) is the quantity of non-durables and \(D\) is the quantity of durables. The main reason for choosing the Cobb-Douglas specification is tractability, but the main results do not hinge on this particular specification. As will become apparent below, the chosen utility function entails that workers are risk neutral for income levels where the consumption profile is optimal. This simplifies the interpretation of the model, because it implies that any risk aversion or love of risk is the consequence of an nonoptimal consumption profile. Consumption good prices are taken to be exogenous and fixed, and we normalise units so that both prices are equal to 1.

The model has four stages. At stage one, each union member makes a durable goods investment (buys a house, say), financed by borrowing at a zero rate of interest. At this point in time, the workers do not know the realisation of the labour demand parameter \(\alpha\), and hence their income. Each worker chooses \(D\) to maximise expected utility, and the choice is denoted \(D^*\). At stage two, the labour demand parameter \(\alpha\) is revealed. Knowing the labour demand, the union then sets the wage in order to maximise the sum
of the members' utilities. Given the wage chosen by the union, the firm at stage three chooses how many workers to retain, and these are randomly selected among the union members. Finally, at stage four, workers decide their consumption baskets, subject to the budget constraint $C + D = Y$, where $Y$ is income, equal to $W$ for employed workers and unemployment benefits $B > 0$ for unemployed workers. The workers may decide to sell their durable good and reinvest, or they may stick with the original level. Crucially, there is a fixed transaction cost of $T > 0$ associated with altering the volume of durable goods consumption from the volume chosen at stage one (for simplicity, $T$ is assumed to be independent of the size of $D^*$). We shall assume that the transaction costs are relatively small compared to the uncertainty in the income, so that if the wage turns out to be very small (large), the workers will indeed sell their durable good and buy a larger (smaller) quantity. This simplifies the analysis by preventing tedious boundary solutions. Moreover, we assume that the transaction cost is incurred even if the initial quantity of $D^*$ is zero. This assumption prevents the workers waiting to buy the durable good in order to avoid the transaction costs. We want to capture that, in the real world, there is ample time for shocks to disposable income after durable consumption goods are acquired.\(^5\)

Before turning to the analysis, let us briefly discuss some assumptions and properties of the model. The assumption that the labour demand parameter $\alpha$ is unknown when durables are purchased, while known when wages and employment levels are set, reflects that wages and employment levels usually are set much more frequently than for example a family purchases a house. There is clearly much more information about the economic situation the next year (which is the duration of most wage contracts) than about the next 10-20 years, which is the planning horizon of many house purchases.

The assumption that the union maximises the sum of the members' utilities is not crucial; the results are very robust to the choice of the specification of union preferences. As will become apparent below, the main results hold as long as the wage is determined by weighing the marginal utility of a wage rise for the employed against the costs of becoming unemployed, a feature common to all union models we know of.\(^6\)

The simple structure of the model with one consumption period and thus no saving involves strong limitations on the applicability of the model. Obviously, it is not well suited for an analysis of the purchases of durables and non-durables over the business cycle. However, we do believe that the model is suited for an analysis of larger and less frequent changes in the economy, for example huge oil price rises or the slowdown of productivity growth in the 1970s, where household dissaving may be a temporary solution, but not a permanent one.
The model is designed so that transaction costs is the only possible source of wage stickiness. This is done to sharpen the focus on the novel aspect of the paper and is not meant to imply that other explanations of wage stickiness discussed in the literature are unimportant.

7.3 Analysis

To solve the model, we start at the last stage. A worker that keeps his/her durable good, may buy \( Y - D^* \) units of the non-durable good, and thus obtains utility \( v^K(Y, D^*) = (Y - D^*)^\beta (D^*)^{1-\beta} \). A worker that sells his/her durable good, incurs the transaction costs \( T \), and reinvests, obtains utility

\[
v^S(Y, D^*) = \max \left\{ C^\beta D^{1-\beta} | C + D \leq Y - T, C \geq 0, D \geq 0 \right\}
\]

and straightforward calculations show that the optimal quantities are \( C = \beta(Y - T) \) and \( D = (1 - \beta)(Y - T) \), which yields utility \( v^S(Y) = \beta^\beta (1 - \beta)^{1-\beta}(Y - T) \). Given an optimal reinvestment decision, the utility of the worker is

\[
v(Y, D^*) = \max \{ v^K(Y, D^*), v^S(Y) \}
\]

We assume that the worker will keep the durable good if \( v^K = v^S \). The worker's choice depends on \( Y \) and \( D^* \). Consider first variation in income, \( Y \), for a given quantity of the durable good, \( D^* \). There exist two critical values for the income, which we denote \( Y^R(D^*) \) and \( Y^I(D^*) \), where \( Y^R(D^*) < Y^I(D^*) \), for which the worker is indifferent between selling and keeping the durable good, that is, where

\[
\begin{align*}
v^K(Y^R(D^*), D^*) &= v^S(Y^R(D^*)) \\
v^K(Y^I(D^*), D^*) &= v^S(Y^I(D^*))
\end{align*}
\]

The fact that there exists two and only two values of \( Y \) for which \( v^K = v^S \) is a consequence of the following observations:

1. \( v^K \) is strictly concave in \( Y \), while \( v^S \) is linear in \( Y \).
2. \( v^K \) is greater than \( v^S \) for \( Y = D^*/(1 - \beta) \).
3. \( v^S \) is greater than \( v^K \) for \( Y \) 'close to' \( D^* \) and for 'a very large' \( Y \).

This is all very intuitive: for low income levels, the worker will sell the durable good and buy less (Reduce), for high income levels the worker will sell the durable good and buy more (Increase), while for medium income levels the worker keep his/her durable good. Figure 7.1 shows a crucial part of the analysis: for income levels where the workers choose to sell their durable
Figure 7.1: The actual utility is given by the best of the two alternatives: selling the durable good \( v^S \) or keeping it \( v^K \).

good, utility is linear in income. However, in the interval where the workers keep their durable good, utility is a strictly concave function of income. For low income levels within this interval, the consumption of the non-durable good is nonoptimally low. Thus the marginal utility of income is high, as the consumption of the non-durable good may be increased. Likewise, for high income levels in this interval, the marginal utility of income is low, as the already nonoptimally high consumption of the non-durable good will be increased.

Then consider variation in the quantity of the durable good \( D^* \), for a given income. Again, there exist two critical values, which we denote \( d^R(Y) \) and \( d^I(Y) \), where \( d^R(Y) > d^I(Y) \), for which the worker is indifferent between selling and keeping the durable good, i.e. where

\[
\begin{align*}
v^K(Y, d^R(Y)) &= v^S(Y) \\
v^K(Y, d^I(Y)) &= v^S(Y)
\end{align*}
\]  (7.4)

The fact that there exists two and only two values of \( D^* \) for which \( v^K = v^S \) follows from the following observations:

1. \( v^K \) is strictly concave in \( D^* \), while \( v^S \) is independent of \( D^* \).
2. \( v^K \) is greater than \( v^S \) for \( D^* = (1 - \beta)Y \).
3. \( v^S \) is greater than \( v^K \) for \( D^* \) 'close to' 0 or \( D^* \) 'close to' \( Y \).
Again, all is very intuitive: a small quantity of the durable good will be sold to buy more, a large quantity will be sold to buy less, a medium quantity will be kept. From our assumption in Section 7.2 that the workers will sell their durable good if the wage turns out to be very small, it also follows that $B < Y^R(D^*)$ (as the wage can never be smaller than $B$), so that the unemployed will sell their durable good.

We now turn to stage three, the wage determination. The optimisation problem of the union is to set $W$ to maximise the sum of the members’ utility

$$U(W, \alpha, D^*) = v(W, D^*)(\alpha - \alpha_1 W) + v^S(B)[L - (\alpha - \alpha_1 W)]$$  \hspace{1cm} (7.5)$$

The maximisation problem is complicated by the fact that the workers’ utility function shifts depending on whether it is optimal to keep or sell the durable good. For expository reasons, we shall first analyse the maximisation problem of the union where the workers’ decision of whether to sell the durable good is taken as given. Let

$$U^K(W, \alpha, D^*) = v^K(W, D^*)(\alpha - \alpha_1 W) + v^S(B)[L - (\alpha - \alpha_1 W)]$$

and

$$U^S(W, \alpha) = v^S(W)(\alpha - \alpha_1 W) + v^S(B)[L - (\alpha - \alpha_1 W)]$$  \hspace{1cm} (7.6)$$

denote the sum of the members’ utility, conditional on the employed workers keeping ($K$) or selling ($S$) the durable good. $U^S$ is clearly independent of $D^*$ because $v^S$ is independent of $D^*$. The respective optimal wages are

$$W^K = W^K(\alpha, D^*) = \arg \max_W U^K(W, \alpha, D^*)$$

$$W^S = W^S(\alpha) = \arg \max_W U^S(W, \alpha, D^*)$$  \hspace{1cm} (7.7)$$

Maximisation of $U^K$ yields the first order condition

$$\frac{\partial U^K}{\partial W} \equiv \phi^K(W, \alpha, D^*) = 0$$  \hspace{1cm} (7.8)$$

where

$$\phi^K(W, \alpha, D^*) = v^K_1(W, D^*)(\alpha - \alpha_1 W) - (v^K(W, D^*) - v^S(B)) \alpha_1$$  \hspace{1cm} (7.9)$$

A similar condition can be derived for $W^S$. At the optimal wage, the utility gain for the employed workers of a marginal wage rise balances the loss
in utility for the workers that lose their job due to the wage rise. The corresponding indirect union utility functions are \( V^K(\alpha, D^*) \equiv U^K(\alpha, D^*) \) and \( V^S(\alpha) \equiv U^S(W^S, \alpha) \).

Note that \( W^S \) is independent of the size of the transaction costs, which reflects that utility is linear in income. \( W^S \) can thus be given the alternative interpretation as the wage that would be chosen if there were no transaction costs.

Let \( \alpha^O(D^*) \) denote the value of the labour demand parameter that makes the initial quantity of the durable good optimal ex post, defined as an implicit function of \( D^* \) by \( D^* \equiv (1 - \beta) W^K(\alpha^O(D^*), D^*) \). Correspondingly, let \( D^O(\alpha) \equiv (1 - \beta) W^K(\alpha, D^O(\alpha)) \) denote the quantity of the durable good that would be optimal ex post. (Although \( W^K \) depends on \( D^* \), it is shown in the appendix that \( D^O(\alpha) \) is unique.)

We are now in a position to describe how \( W^S \) and \( W^K \) depend on \( \alpha \) and \( D^* \).

**Lemma 7.1** The optimal wages \( W^K \) and \( W^S \) are continuous, differentiable and strictly increasing in \( \alpha \), and

\[
\frac{dW^S(\alpha)}{d\alpha} > \frac{\partial W^K(\alpha, D^*)}{\partial \alpha} > 0.
\]

Furthermore, \( W^S(\alpha^O) > W^K(\alpha^O, D^*) \).

Thus, the optimal wage is increasing in the labour demand parameter \( \alpha \). Intuitively, a rise in \( \alpha \) leads to a higher level of employment, which increases the utility gain of a wage rise (as more workers obtain the wage rise). Hence the union chooses a higher wage. Note also that the transaction costs make the wage 'more sticky,' as \( W^K \) is less responsive to variation in labour demand than \( W^S \) is.

The intuition for the second result in Lemma 7.1 is the following. When labour demand takes the value that makes the initial quantity of the durable good optimal ex post, the marginal utility of income does not depend on whether there are transaction costs. However the utility loss from becoming unemployed is greater with transaction costs, which makes the union choose a lower wage, that is, \( W^S(\alpha^O) > W^K(\alpha^O, D^*) \).

The next lemma shows the effect of \( D^* \) on \( W^K \).

**Lemma 7.2** \( W^K \) is strictly increasing in \( D^* \) for \( D^* \geq D^O \), while the effect of \( D^* \) is indeterminate for \( D^* < D^O \).

(The intuition behind this result will be explained after Proposition 7.1 below).
We now turn to the question of which of the two wages, \( W^S \) or \( W^K \), the union will choose. This is closely related to the similar question for the individual workers. It is clear that for \( \alpha \) close to \( \alpha_1 B \), the union must choose a wage close to \( B \) (if \( W \geq \alpha/\alpha_1 \), then \( N = 0 \)), and since \( B < Y^R(D^*) \), the workers prefer to reduce their quantity of the durable good. Correspondingly, if \( \alpha \) is very large, there will be full employment and a large \( W \), and the workers will prefer to increase their quantity of the durable good. For medium values of \( \alpha \) (in particular, for the \( \alpha \) that gives the wage that makes \( D^* \) optimal \( \text{ex post} \)), the workers prefer to keep their initial quantity of the durable good.

In fact, there are two critical values for the labour demand parameter, which we denote \( \alpha^I(D^*) \) and \( \alpha^R(D^*) \), where \( \alpha^R(D^*) < \alpha^I(D^*) \), for which

\[
V^K(\alpha^I(D^*), D^*) = V^S(\alpha^I(D^*)) \quad (7.10)
\]
\[
V^K(\alpha^R(D^*), D^*) = V^S(\alpha^R(D^*)).
\]

Furthermore, \( V^K \geq V^S \) for \( \alpha \in [\alpha^R(D^*), \alpha^I(D^*)] \), while \( V^K < V^S \) for \( \alpha < \alpha^R(D^*) \) and \( \alpha > \alpha^I(D^*) \). The interpretation is that when labour demand is close to its expected level, the union will set a wage which makes all employed workers keep their initial quantity of the durable good, while for large surprises, the wage will be such that all workers sell their initial quantity. It is quite clear that there can only be two critical values of \( \alpha \): \( W^S \) and \( W^K \) are both increasing monotonically in \( \alpha \), so if Keep (the durable good) is better than Reduce for \( \alpha' \), Keep is also better than Reduce for \( \alpha' + \epsilon \), \( \epsilon > 0 \). Likewise, if Increase is better than Keep for \( \alpha'' \) Increase is also better than Keep for \( \alpha'' + \epsilon \).

The effect of \( D^* \) is similar: for very low or very high values of \( D^* \), the union chooses a wage that makes the workers change their quantity of the durable good, while for 'medium' values of \( D^* \), the union chooses a wage that makes the workers keep their initial quantity. Thus, there are two critical values for the quantity of durable good, denoted \( D^I(\alpha) \) and \( D^R(\alpha) \), where \( D^R(\alpha) > D^I(\alpha) \), for which

\[
V^K(\alpha, D^I(\alpha)) = V^S(\alpha) \quad (7.11)
\]
\[
V^K(\alpha, D^R(\alpha)) = V^S(\alpha).
\]

We have \( V^K \geq V^S \) for \( D^* \in [D^I(\alpha), D^R(\alpha)] \), while \( V^K < V^S \) for \( D^* < D^I(\alpha) \) and \( D^* > D^R(\alpha) \). Thus, for intermediate values of the durable, the union will set a wage which makes all employed workers keep their initial quantity of the durable good, while for extreme levels, the wage will be such
that all workers sell their initial quantity. Again there can only be two such
critical values: \( V^S \) is independent of \( D^* \) while \( V^K \) is strictly increasing in
\( D^* \) up till the value where \( D^* \) is optimal ex post, \( D^O(\alpha) \), and decreasing in
\( D^* \) thereafter.

We are now ready to state the overall solution to the union’s problem.

**Proposition 7.1** (i) The union’s preferred wage, \( W^* \), is given by

\[
W^* = W^K(\alpha, D^*) \text{ for } \alpha \in [\alpha^R(D^*), \alpha^I(D^*)],
\]

\[
W^* = W^S(\alpha) \text{ otherwise.}
\]

\( W^* \) is an increasing monotonically in \( \alpha \), and is continuous in \( \alpha \) except for
two discrete positive jumps at \( \alpha^R \) and \( \alpha^I \). (ii) Alternatively, we may focus
on how \( W^* \) depends on \( D^* \). Then

\[
W^* = W^K(\alpha, D^*) \text{ for } D^* \in [D^I(\alpha), D^R(\alpha)],
\]

\[
W^* = W^S(\alpha) \text{ otherwise.}
\]

\( W^* \) is independent of \( D^* \) for \( D^* < D^I \) and \( D^* > D^R \), strictly increas-
ing in \( D^* \) for \( D^* \in [D^O, D^R] \). The effect of \( D^* \) is indeterminate for \( D^* \in
[D^I, D^O] \). Moreover, \( W^* \) is continuous in \( D^* \) except for two discrete negative jumps at \( D^I \) and \( D^R \).

The results are illustrated in Figures 7.2 and 7.3, respectively. The relation-
ship between \( D^* \) and \( W^* \) is the basis for our main result, as it shows how past
expectations (that determine \( D^* \)) influence the current wage. Let us first dis-

cuss a situation where labour demand turns out to be somewhat higher than
expected, so that the quantity of the durable good is somewhat lower than the
quantity that would be ex post optimal (cf. the analysis of stage one below).

More precisely, assume that \( D^* \in (D^I, D^O) \), so that although the quantity
of the durable good is ex post too low, it is still advantageous for the union
to choose a wage which makes the workers keep their durable good. In this
situation there are two reasons for why the union will choose a lower wage
than what it would have done if the quantity of the durable good were so
large or small that the workers would sell their durable good (cf. \( W^K < W^S \) in this interval in Figure 7.3). First, when \( D^* \) is nonoptimally low, con-
sumption of the non-durable good is nonoptimally high, and the marginal
utility of income is low. This reduces the union’s desire for a wage rise. Sec-
ondly, because the employed workers keep their durable good, their utility
is higher than it would have been if they sold the durable. The utility loss of
becoming unemployed is thus greater when the durable good is kept, which
makes the costs of a wage rise larger.
Figure 7.2: The chosen wage is increasing in labour demand, with discrete positive jumps when the workers shift between keep and sell the durable good. Transaction costs make the wage more sticky, as \( W^K \) is less steep than \( W^S \).

Figure 7.3: A small quantity of durables \((D^* < D^0)\) causes wage moderation (as \( W^K < W^S \)), while a large quantity of durables \((D^* \text{ slightly lower than } D^R)\) causes wage aggressiveness.
If \( D^* \) increases within this interval, this has two opposing effects on the optimal wage. The consumption of non-durable good is reduced, and the marginal utility of income rises. This raises the gain for the employed workers of a wage rise. However, as the consumption profile becomes less suboptimal, the utility of the employed workers increases, and the associated costs of a job loss increase too. The effect of an increase in \( D^* \) within the interval \([D^I, D^O]\) is thus indeterminant.

When \( D^* \) increases within the interval \([D^O, D^R]\), both effects cause the union to push up the wage. As above, a rise in \( D^* \) reduces consumption of the non-durable good and thus increases the marginal utility of income. However, now a rise in \( D^* \) makes the consumption profile more suboptimal. This reduces the utility of the employed workers, and thus reduces the associated costs of a job loss.

We then investigate the effect of \( \alpha \) and \( D^* \) on employment \( N \). Consider \( \alpha \) first. An increase in \( \alpha \) has a direct positive impact on \( N \) via the labour demand function, but it has also a negative indirect effect via the increase in \( W^* \). In the Appendix, we show that the direct effect dominates, so that \( N \) is increasing in \( \alpha \) except at the jumps \( \alpha^I \) and \( \alpha^R \). At the jumps, however, a marginal increase of \( \alpha \) leads to a non-marginal increase in \( W \), so the indirect negative effect dominates.

Employment is affected by \( D^* \) only indirectly through the wage. Thus, \( D^* \) has the opposite effect on \( N \) as it has on \( W \).

We now turn to how wage rigidity is affected by the parameter in the utility function, \( \beta \).

**Proposition 7.2** \( \frac{dW^K}{d\alpha} \) is increasing in \( \beta \) at the point \( D^* = D^O \equiv (1 - \beta)W^K \).

Thus, a small \( \beta \) entails more wage rigidity if the initial quantity of the durable good is at its ex post optimal quantity. The intuition is that a small \( \beta \) means that a large share of the income is spent on durables, and a small share on non-durables. Thus when income is lower than expected, the relative reduction in consumption of non-durables is large and causes a large loss in utility. Thus, the workers show greater resistance against a low wage the smaller the share in income of non-durable consumption is.

Somewhat more speculatively, a small \( \beta \) may also be associated with a large public sector, which presumably is associated with large taxes, and thus consumption on non-durables being a small share of gross income. To the extent that a large public sector involves a smaller degree of freedom in adjusting consumption, a large public sector will also lead to greater wage rigidity.
We finally turn to stage one, the determination of the initial quantity of the durable good, $D^*$. When purchasing the durable, the workers are assumed to know the functioning of the economy, as analysed above, but they do not know the realisation of labour demand $\alpha$. Thus, they do not know which wage level that will be chosen, the level of employment, or whether they will become employed or unemployed. Worker $i$ chooses $D_i$ to maximise the expected utility, that is,

$$D_i^* = \arg \max_{D_i} E[v(W^*(\alpha, D^*), D_i)p + v(B)(1-p)],$$

(7.12)

where $p = (\alpha - \alpha_1 W^*(\alpha, D^*))/L$ is the probability that worker $i$ keeps his/her job and $E[]$ is the expectations operator. In this maximisation, worker $i$ treats the average quantity of the durable good as a exogenous (because there are many workers). In equilibrium, all workers will of course choose the same quantity, so $D_i^* = D^*$. The first order condition is

$$E[v_2(W^*(\alpha, D^*), D_i^*)p(D^*)] = 0.$$  

(7.13)

Now, $v_{12}^F > 0$ and $v_{12}^S = 0$ for all $W$ and $D^*$. Thus, an increase in $\alpha^*$, which moves the distribution of $\alpha$ upwards, and consequently also raises the wage distribution upwards, will increase the left hand side of (7.13). Hence, it will cause the worker to choose a higher quantity of the durable good, a higher $D_i^*$. Combined with the result of Proposition 7.1, this shows how past expectations, represented by $\alpha^*$, affect wages through the investment in consumer durables.

### 7.4 Final remarks

This paper shows how consumption patterns may depend on expected wages. In particular, if there is a moderate adverse shock to labour demand, the wage chosen by a utilitarian union will be higher the more optimistic the workers were before the shock. Optimistic workers will have chosen a consumption pattern that fits a high income (that is, a large quantity of the durable good), and due to adjustment costs a moderate loss of income hurts quite a lot. This will induce the union to oppose the negative impact on the real wage of an adverse shock.\(^9\)

Note that the consumption pattern depends on the expected future wage, not the past wage. Hence what matters is the wage compared to expectations, not the change in the wage per se. The resulting real wage aggressiveness may thus result from an unexpected reduction in real wage growth, and not necessarily a reduction in real wage levels.
We have focussed on the role of expectations in determining the consumption of durables. But investment in durables is also affected by credit market conditions. In many countries credit has been rationed due to interest rate ceilings and other government interventions. To the extent that such regulation has prevented purchases of durables (the purchasing boom following financial deregulations indicated that investments have been suppressed), the consumption of durables have been lower than optimal. As we have seen, a low $D^*$ leads to wage restraint (Figure 7.3). Financial deregulation may not only have led to a boom and over-optimistic expectations; perhaps it has also removed a source of wage moderation.

In our model, the cost of changing the consumption pattern is monetary and hence works through the budget constraint. This is reasonable for durable goods like houses or cars. However, we may also think of the investment in durable good as a choice of hobbies, where to live, children’s education, and so on. A lower income may cause one to choose different and cheaper alternatives in all these choices. There need not be monetary transaction costs associated with choosing a different alternative, yet it may be perceived as very costly by the individual who has to make the change.

In the model, there is an extreme dichotomy in the sense that all employed workers keep their durable good, while all unemployed workers sell. A more realistic model would allow for individual differences regarding preferences, initial wealth, income of spouse, etc. Moreover, one could also allow for different types of durable goods. In this more realistic model, a loss of income could be met by a reduction of some but not all durable goods, and different alternatives would be chosen by different individuals. An adverse shock would still lead to wage aggressiveness, as long as the following crucial feature prevails: A ‘small’ income loss (lower wage than expected) is relatively more painful, due to the stickiness of the consumption pattern, while a ‘large’ income loss (becoming unemployed) is relatively less painful, due to the additional freedom in choosing all types of goods freely (but incurring the costs associated with changing the quantity of durable goods). As long as this feature holds, the investment in durable goods makes workers risk-seeking, and the negative impact on the wage associated with an adverse shock is resisted.\textsuperscript{10}

Note also that once we depart from the assumption that all union members are treated identically, we no longer need the rather extreme assumption that all unemployed workers must sell their durable good.\textsuperscript{11} Consider our model with the modification that layoffs are determined in a certain known order (seniority, say). Workers with a high risk of becoming unemployed might want to choose a low $D^*$, so as to avoid the need to sell if they become unemployed. Workers with low risk of becoming unemployed would
choose a high $D^*$, and thus face the decision problem of our model. In particular, if labour demand turns out to become lower than expected, the union would have to weigh the costs of a low wage and nonoptimal consumption profile against the costs of making some low risk workers redundant, inducing them to sell their durable good. Thus, an adverse shock may lead to wage aggressiveness, in spite of the fact that many unemployed (the high risk workers) do not sell their durable good.\(^{12}\)

**Appendix**

**Proof of uniqueness of $D^o$:** The proof follows from the fact that the inequality $\partial ((1 - \beta)W^*(\alpha, D^*))/\partial D^* < 1$ holds for all $D^*$. To see this, assume to the contrary that an increase in $D^*$ leads to a larger increase in $W^K$. It follows that $C$ will also increase and thus $v^K$ is reduced while $v^K(W^*, D^*) - v(B)$ would increase. As can be seen from the first-order conditions (7.8) and (7.9), this would lead to a decrease in $W^K$: a contradiction. ■

**Proof of Lemma 7.1:** The first order condition (7.8) defines the optimal wage as a function of $\alpha$ and $D^*$. Implicit differentiation of (7.8) with respect to $\alpha$ gives us

$$\frac{\partial \phi^K}{\partial W} \frac{\partial W^K}{\partial \alpha} + \frac{\partial \phi^K}{\partial \alpha} = 0. \tag{7.14}$$

Solving for $\partial W^K/\partial \alpha$, we obtain

$$\frac{\partial W^K}{\partial \alpha} = -\frac{\partial \phi^K}{\partial \alpha} / \frac{\partial \phi^K}{\partial W} > 0 \tag{7.15}$$

where the inequality follows from the second-order condition

$$\frac{\partial \phi^K(W, \alpha, D^*)}{\partial W} = v_{11}^K(W, D^*) (\alpha - \alpha_1 W) - 2v_1^K(W, D^*) < 0. \tag{7.16}$$

and

$$\frac{\partial \phi^K}{\partial \alpha} = v_1^K(\alpha, D^*) > 0 \tag{7.17}$$

The same procedure can be used to show that $W^S$ is also a strictly increasing function of $\alpha$. To show that $W^S$ rises more rapidly in $\alpha$ than $W^K$ does, observe that from (7.15)-(7.17) we obtain

$$\frac{\partial W^K}{\partial \alpha} = \frac{v_1^K}{-v_{11}^K N + 2v_1^K \alpha_1} = \frac{1}{-\frac{v_1^K}{v_1^K} N + 2\alpha_1} > 0 \tag{7.18}$$

and correspondingly for $\partial W^S/\partial \alpha$. However, observe that $v_{11}^K < v_{11}^S = 0$, which ensures that $\partial W^S/\partial \alpha > \partial W^K/\partial \alpha$.

To see that $W^S(\alpha^O) > W^K(\alpha^O, D^*)$, observe that

$$\phi^S(W, \alpha^O, D^*) > \phi^K(W, \alpha^O, D^*) = 0, \tag{7.19}$$
for \( W = W^K(\alpha^O, D^*) \), as \( v^K_1 = v^K_1 \) while \( \phi^K(W, D^*) > \phi^S(W) \).

**Proof of Lemma 7.2:** The effect of \( D^* \) on \( W^K \) can be found exactly as the effect of \( \alpha \), by implicit differentiation of the first-order condition. We have

\[
\frac{\partial W^K}{\partial D^*} = \frac{\partial \phi^K / \partial D^*}{\partial \phi^K / \partial W} \tag{7.20}
\]

The denominator is negative by the second-order condition, while

\[
\frac{\partial \phi^K}{\partial W} = v^K_1 N - v^K_2 \alpha_1 \\
= \beta (1 - \beta) \left( (W - D^* )^{1-\beta} + (W - D^* )^{2-\beta} \right) \cdot \\
(D^*)^{1-\beta} (\alpha - \alpha_1 W) \\
+ \beta \left( (W - D^* )^{1-\beta} (D^*)^{1-\beta} \alpha_1 \\
- (1 - \beta) (W - D^* )^{1-\beta} (D^*)^{-\beta} \alpha_1 \right). \tag{7.21}
\]

The first two terms are strictly positive, while the last term is negative. However, the sum of the last two terms \((-v^K_2 \alpha_1)\) is non-negative if \( \beta D^* \geq (W - D^*) (1 - \beta) \), or equivalently if \( D^* \geq D^O = (1 - \beta) W \).

**Proof of Proposition 7.1:** (i) Note that \( W^* = W^S \) if \( U^S > U^K \), while \( W^* = W^K \) if \( U^K > U^S \). From the existence of the critical values \( \alpha^I \) and \( \alpha^R \), it follows that \( W^S \) applies for \( \alpha > \alpha^I \) and \( \alpha < \alpha^R \), while \( W^K \) applies for \( \alpha \in [\alpha^R, \alpha^I] \). When \( U^S > U^K \), we must have \( W^* > Y^I \) or \( W^* < Y^R \), so that the individual workers find it optimal to sell (if the individual workers preferred not to sell, \( U^S > U^K \) could not hold). Likewise, when \( U^S < U^K \), we must have \( W^* \in [Y^I, Y^I] \), so that the individual workers find it optimal to keep. The features of \( W^S \) and \( W^K \) are shown in Lemma 1, and what remains of (i) is to prove the existence of the discrete jumps. Assume the opposite, that \( W^S(\alpha^I(D^*)) = W^K(\alpha^I(D^*), D^*) = Y^I \). From \( W^S = W^K \) and \( U^S = U^K \), it is clear that \( v^S = v^K \). But as can be seen from Figure 7.1, \( v^K_1 < v^K_1 \), so we cannot have \( \partial U^K / \partial W = \partial U^S / \partial W = 0 \), a contradiction. By the same type of argument it can be shown that \( W^S(\alpha^R(D^*)) = W^K(\alpha^R(D^*), D^*) = Y^R \) leads to a contradiction.

Then consider (ii). The values of \( D^* \) for which \( W^S \), respectively \( W^K \), applies are based on the critical values defined in (7.11) above, and can be shown with the same argument as in (i). We then prove that there holds \( W^S(\alpha, D^*) = W^K(\alpha, D^*) < W^S \) for \( D^* \in [D^I, D^O] \) (which also proves the existence of the negative jump). Assume the opposite, that \( W^K(\alpha, D^*) = W^S = Y^I \). As in (i) above, it is clear from \( W^S = W^K \) and \( U^S = U^K \), that \( v^S = v^K \). But as can be seen from Figure 7.1, \( v^K_1 < v^K_1 \), so we cannot have \( \partial U^K / \partial W = \partial U^S / \partial W = 0 \), a contradiction. By the same type of argument it can be shown that \( W^K(\alpha, D^R(\alpha)) = W^S \) leads to a contradiction.

**Proof of Proposition 7.2:** In the point where \( D^* = D^0 = (1 - \beta) W^K \), we have

\[
-\frac{v^K_1}{v^K_1} = \frac{1 - \beta}{\beta W} \tag{7.22}
\]

which is decreasing in \( \beta \). Inspection of (7.18) shows that \( dW^K / d\alpha \) is increasing in \( \beta \).

**Proof that \( N \) is decreasing in \( \alpha \) except at the jumps \( \alpha^R \) and \( \alpha^I \):** Assume the opposite, that an increase in \( \alpha \) leads to so big an increase in \( W^* \) that \( N \) is reduced. Except at the jumps, \( W^* \) is given by the first-order condition for local maximum (either \( W^S \) or \( W^K \)). But if \( W^* \)
increases and $N$ is reduced, $v_1 N$ is reduced while $v(W, D^*)$ rises, so the first-order condition cannot hold; a contradiction. Thus, an increase in $\alpha$ leads to an increase in $N$. ■

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Notes

1. See Bean (1994) for a discussion of this and other explanations.
2. For the record; we do not share the view that one should necessarily avoid theories based on behaviour which is not fully rational. Both the 'personal construct' theory and the theory of 'cognitive dissonance' popular in social psychology may alternatively explain the sort of path dependent preferences that we are concerned with here (see, for example, Earl, 1990, for an introduction), and further investigations along these lines may be worth an effort.
3. The idea that transaction costs make people more risk seeking has been explored in more detail by Flemming (1969), DeMeza and Dickinson (1984), and the fact that indivisibilities affect risk aversion has been recognised even earlier, by Ng (1965) and Eden (1979).
4. With exogenous prices, the model is clearly partial equilibrium. This seems unproblematic for sector-specific shocks to labour demand. However, for economy-wide labour demand shocks, the relative price may well be affected, although it is not obvious in which way.
5. Alternatively we could have added another period of consumption to the model, so as to provide a more explicit rationale for purchasing the durable at stage 1.
6. In fact, there is not even need for a union; the same argument could be made in an implicit contract framework.
7. This specification implicitly assumes that $v$ is the workers' von Neumann-Morgenstern utility, and that were it not for the adjustment costs, workers would be risk neutral ($v^S$ is linear in $Y$). Our analysis would go through even if the union maximised the expectation of a concave transformation of $v$.
8. We assume an interior solution; we intend to address the possibility of a corner solution with full employment in a companion paper.
9. If there is a very large negative shock, even the employed workers must sell their durable good, in which case adjustment costs do not matter for the wage.
10. In more recent work, we study a similar model with two types of workers, with low and high transaction costs, and confront the model with data (Ellingsen and Holden, 1996).
11. To our knowledge, empirical evidence on the effects of becoming unemployed is relatively scarce. Colbjørnsen (1994) reports that of a sample of about 700 long-term unemployed (that is, unemployed for at least the last six months) in Norway, about 15 per
cent have sold their car or house. For 16 per cent of the households, the spouse of the unemployed had to get a job.

12. This story suggests a reason for why layoffs often are not random in reality. With differential job security, workers can adapt their consumption pattern to their degree of job security. Senior workers can safely buy a house and start with expensive hobbies, while workers with lower seniority choose a less sticky consumption pattern so as to reduce the adverse effects of unemployment.

References


