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Gylfi Zoega

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Inflation and Unemployment in Iceland in the Light of Natural-Rate Theory

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Gylfi Zoega*

Department of Economics, Birkbeck College
University of London, 7-15 Gresse Street, London W1P 2LL

Abstract

This paper uses Icelandic data to assess standard methods for estimating the natural rate of unemployment. Surprisingly, estimating the path of the natural rate of unemployment for the period 1990-1998 produces a natural-rate path that mirrors the path taken by actual unemployment. The paper goes on to show that this result is misleading for three reasons: First, the unemployment spells of low-income workers appear to have been partly voluntary and their unemployment therefore did not exert much downward pressure on wages and prices, nor did their reemployment at the end of the 1990s threaten price stability. Second, the influx of foreign workers during the recent boom reduced inflationary pressures. Taken together, the two effects caused the effective labour force to adjust to changes in the demand for labour, hence obscuring the relationship between inflation and unemployment over the cycle. In addition, there is an asymmetry in any effect unemployment may have on inflation in that wages and prices exhibit downward rigidity at low inflation rates. As a result, estimating the level of the natural rate of unemployment using data on inflation and unemployment tends to be misleading at low inflation rates.

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Introduction

The objective of this paper is to analyse price- and wage dynamics in Iceland in light of the theory of the natural rate of unemployment. Iceland was hit by rising unemployment at the beginning of the 1990s, as were the other Scandinavian countries. Unemployment peaked in 1995 but has since fallen back to levels that have put price stability at risk. Inflation seemed insensitive to changes in unemployment for most of the 1990s, although it has risen in the last few quarters. For this reason, attempts to estimate the path of the natural rate of unemployment in the 1990s have sometimes generated paths that mirror the one taken by the actual unemployment rate itself (see Gudmundsson and Zoega, 1997; Central Bank of Iceland, 2001, page 6). It is the objective of this paper to re-evaluate the evidence and to propose some possible explanations for these surprising results.

A number of OECD countries have experienced non-inflationary expansions in recent years.[1] Numerous explanations have been offered for the apparent disappearance of price inflation. There is the thesis of Akerlof et al. (1996, 2000) that past and expected inflation stops being relevant in wage- and price setting when it reaches very low levels. This may prevent an inflationary spiral from emerging because past inflation does not – or at least not completely – feed into current inflation. Other authors have tried to explain why the natural rate of unemployment may have fallen in recent years. Demographic changes could possibly constitute such an explanation when the within-group unemployment rates differ across the sexes, age groups or education groups: when a high-unemployment demographic group shrinks in relative numbers, the aggregate unemployment rate is likely to fall (Shimer, 1999). There is also the possibility that the within-group unemployment rates have fallen across the board (Phelps and Zoega, 1997 and 1998, amongst others). A fall in the within-group rates could be caused by more rapid technical progress and lower real interest rates that make firms step up hiring, lowering the natural rate of unemployment for all demographic groups.[2] Finally, wage norms may take time to catch up with rising rates of productivity growth. A rise in the rate of technical progress may then gradually reduce the marginal cost of labour because wages fail to keep up with rising productivity (Ball, 2000).

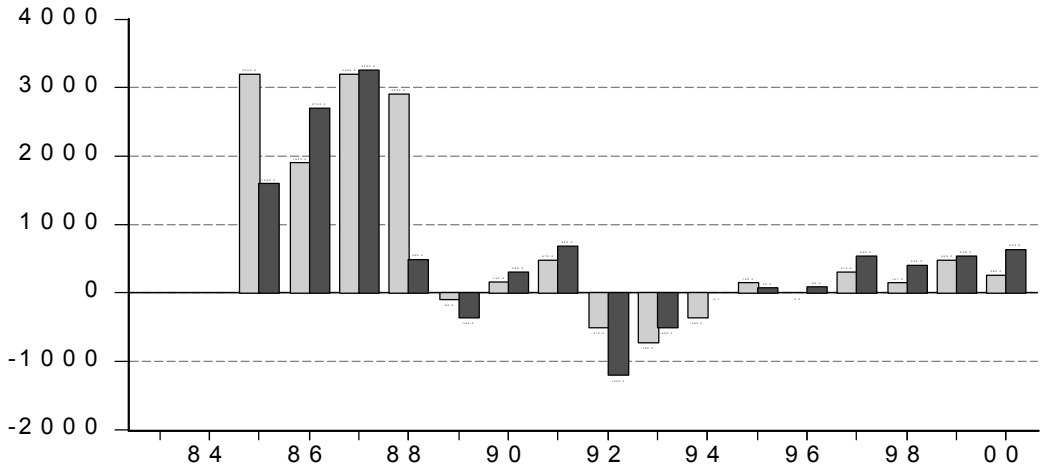
[1] These include the United States, the U.K., the Netherlands, Australia and New Zealand to name a few examples.

Iceland provides a good testing ground for these, and other, explanations in light of its small size and good official statistics. In addition, several developments have taken place in Iceland that may help explain the – until quite recently – dormant inflation and have not been touched on in the literature so far. We start in Section I by describing the recent experience in the Icelandic labour market. We then spell out a simple model of equilibrium in the labour market, use it to derive a method to estimate the natural rate of unemployment and apply it to Icelandic data. In Section III we discuss and compare some of the possible explanations for the recent developments. Section IV concludes.

I. From bust to boom

Labour demand rebounded in the second half of the 1990s. Following a depressed labour market in 1989-1996 firms started to report vacancies, hiring accelerated and unemployment fell to an average rate of 1.3% in 2000. The figure below has the number of vacancies.

Figure 1. Number of reported vacancies, 1985-2000 (April and Sept./Oct.)



Source: Biannual survey by the *National Economic Institute*.

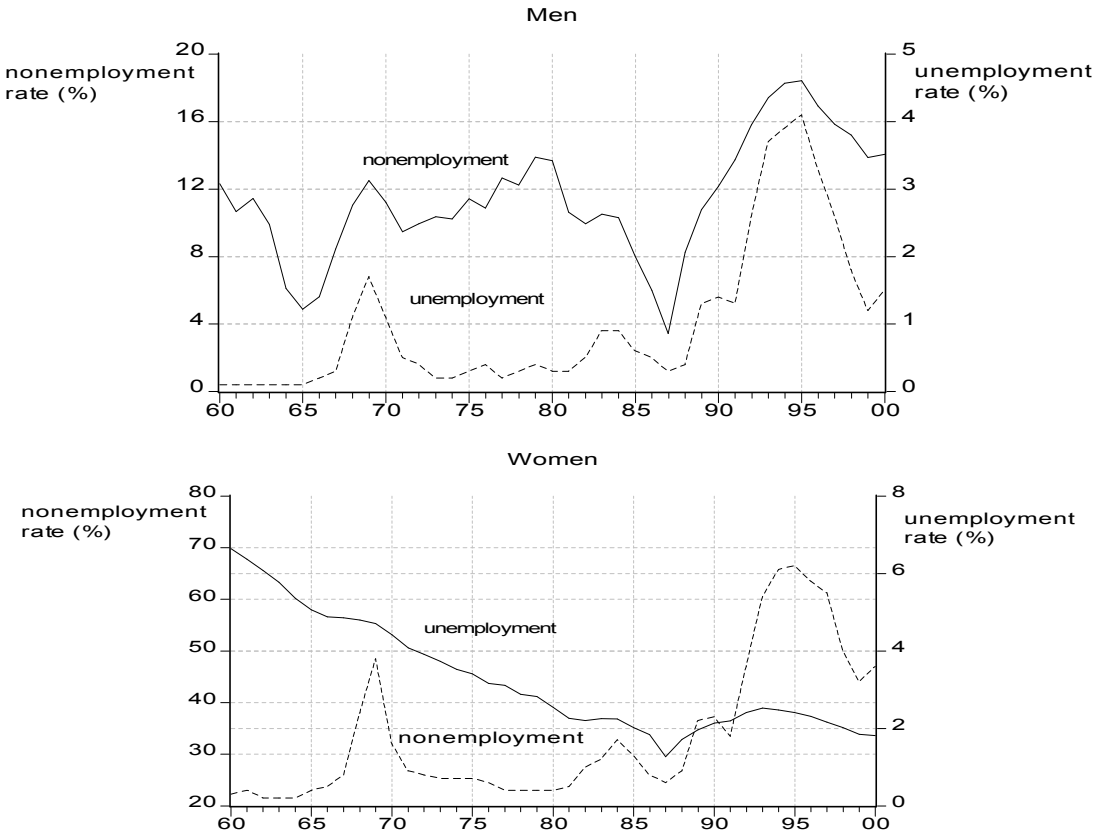
Despite a pickup in the number of vacancies in 1997-2000, their number did not rival those seen in the last expansionary period in the mid 1980s. However, the fall in the unemployment rate was substantial as shown in the figure below, which also plots the non-employment rate (non-employment as a ratio to the working-age population).

[2] See also Phelps and Zoega (2001), Fitoussi, Jestaz, Phelps and Zoega (2000), Phelps (1994), Pissarides (2000).

Figure 2. The unemployment rate and the non-employment-to-population ratio. All workers.

Note that despite the impressive recovery of the unemployment rate, the decline in non-employment was much smaller in comparison. It is helpful to separate men and women before drawing any further conclusions. The figures below have unemployment and non-employment by sex.

Figure 3. The unemployment rate and the non-employment-to-population ratio, men and women



Both the unemployment rate of men and their non-employment rate peaked in 1995. As shown in Table 1, the former rose by 6.2% from 1990 to 1995 and unemployment by 2.7%. In contrast, non-employment among women rose by only 2% over the same period while unemployment rose by 3.9%. Turning to the recent expansion, the unemployment and non-employment rates fell slightly more in the case of women – 3.5% versus 2.8% for unemployment and 4.6% versus 3.3% for non-employment.

Table 1. Changes in unemployment and the employment-to-population ratio 1990-1999

Years	Sex	Δ u (%)	Δ Non-employment
1990-95	Male	2.7%	6.2%
	Female	3.9%	2.0%
1995-99	Male	-2.8%	-3.3%
	Female	-3.5%	-4.6%

The net effect of these two episodes was to increase the rate of non-employment among men and the unemployment rate among women. This, together with the relatively low vacancy rate, suggests that the unemployment rate in 1999 may have overstated the tightness of the labour-market pressure. In particular, one would conclude that these were not as strong as in the mid-to-late 1980s.

Tables 2 and 3 show that during the 1990-95 period, the increase in the number of working-age men without a job was close to 6,000 men of which 2,009 registered as unemployed – the rise in unemployment accounted for about 1/3 of the total rise in non-employment. For women, the increase in the number of non-employed was smaller, or 3,127, while the increase in the number of unemployed women was equal to 2,250, which is higher than for men. We can conclude that while more women became unemployed, the increase in total non-employment was higher for men. In contrast, the expansion appears to have benefited both sexes equally.

Table 2. Changes in the working-age population, the number of people unemployed and the number non-employed, 1990-1999

Years	Sex	Working-age population	Number employed	Number non-employed
1990-95	Male	4,047	-1,919	5,966
	Female	3,872	745	3,127
1995-99	Male	3,819	6,101	-2,342
	Female	4,146	6,639	-2,493

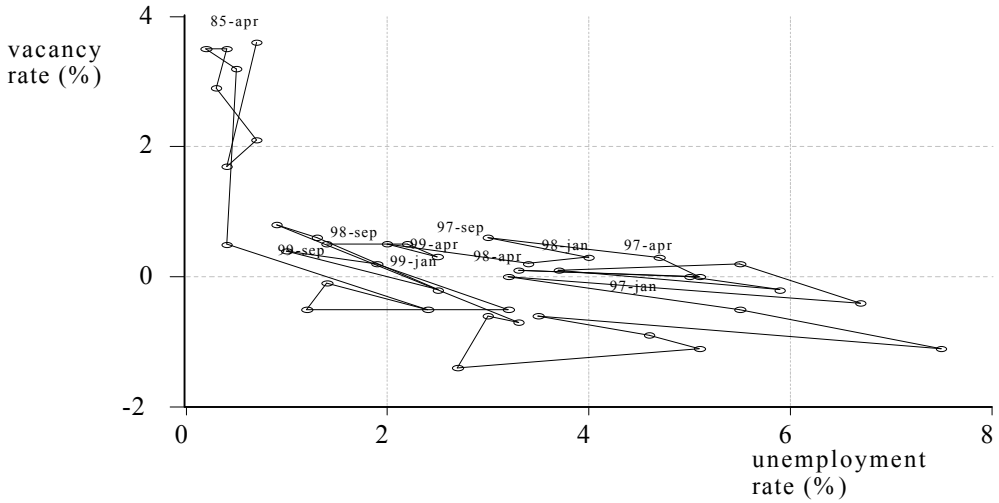
Table 3. Changes in the labour force, the number of employed and the number of unemployed workers, 1990-1999

Years	Sex	Labour force	Number employed	Number unemployed
1990-95	Male	90	-1,919	2,009
	Female	2,995	745	2,250
1995-99	Male	4,133	6,101	-2,028
	Female	4,812	6,639	-1,827

Note also that while the number of employed men fell by close to 2,000 between 1990 and 1996, the number of employed women rose. The total number of lost jobs equals the difference between the two, only 1,174! The bulk of the increase of around 9,000 in non-employment and 4,000 in unemployment is thus accounted for by an increase in working-age population and the labour force.

The recent labour-market expansion can be further described by drawing on the so-called Beveridge curve (see Blanchard and Diamond, 1989) that plots the relationship between vacancies and unemployment (both as a ratio to the labour force) shown below. One would expect these to be negatively related over the business cycle – rising unemployment and a falling number of vacancies should go hand in hand – while shifts are caused by changes in the level of friction in the matching of jobs and unemployed workers. Unemployment has fallen since the beginning of 1997 while the vacancy rate (now defined as a ratio to the labour force) increased but only slightly.

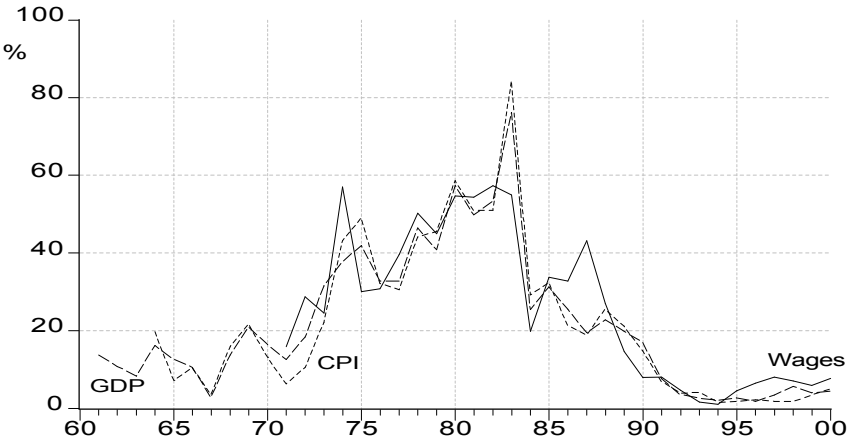
Figure 4. The Beveridge curve, 1985-1999



Note that the vacancy rate at the end of 1999 was nowhere near the rates experienced in the mid 1980s, which were around 3%, while unemployment was approaching its earlier level. This suggests that labour-market pressures were less serious than the unemployment rate would imply.

The figure below shows wage inflation and price inflation, measured by both the consumer-price index and the GDP deflator.

Figure 5. Price- and wage inflation in Iceland



Notice the increase in wage inflation in 1996-2000. However, price inflation remained lower by year 2000. The resulting change in real wages in the past ten years follows.

Table 5. Real-wage growth in recent years

Year	%	Year	%
1990	-6.20	1996	4.03
1991	1.11	1997	5.93
1992	0.84	1998	6.73
1993	-2.49	1999	5.76
1994	-0.53	2000	3.50
1995	2.76		

A key question is whether the expansion brought the unemployment rate dangerously low, i.e. if the actual rate was lower towards the end of the expansion than the one compatible with stable prices. Some past estimates have tended to put the level of the natural rate considerably above the current level of 2%.[3] These apply standard methods – to be reviewed below – and estimate the natural rate based on the sensitivity of inflation (or rather the change in inflation) to the rate of unemployment. Note that in 2000 the rate of wage and price inflation increased. The recent wage growth is shared by most occupations. Table 6 shows the proportional change in nominal wages from the last quarter of 1999 to the last quarter of 2000. The average increase in real wages was 3.5% over this period.

Table 6. Growth of nominal wages, various professions, %
(Last quarter of 1999 to last quarter of 2000)

Manual labour	9.4	Office workers	7.9
Specialist labour	8.9	Technicians	8.1
Craftsmen	8.6	Professionals	9.2
Services	10.2		

Source: Kjararannsóknarnefnd, March 2001.

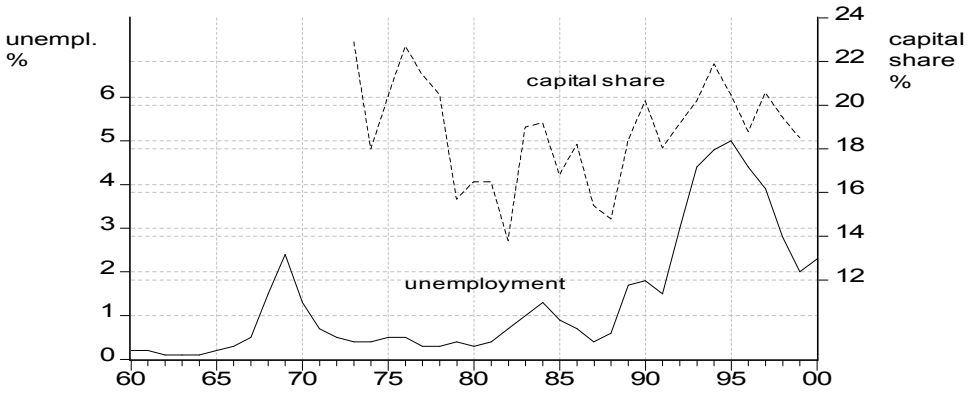
[3] This applies to the OECD and a paper by this author using similar methodology (Bjorn Runar Gudmundsson and Gylfi Zoega, 1997). However, the Central Bank of Iceland's estimates have been somewhat lower.

Although the wage increases are somewhat larger on average in the service sector, there is no clear tendency for any occupation to lag seriously behind.[4] Taken at face value, these numbers suggest rising wage inflation.

Few accurate measures of total factor productivity growth exist for Iceland (see, however, Central Bank of Iceland, 2000). However, by looking at the share of labour and capital in national income, we can infer that wages grew faster than productivity in recent years. This finding is of significance beyond the recent inflation acceleration and appears to be an interesting characteristic of the Icelandic economy. Figures 6 and 7 below show the two factor shares superimposed on the unemployment rate.[5]

Figure 6. The share of labour in national income and the unemployment rate

Figure 7. The share of capital in national income and the unemployment rate



[4] The data also reveal that the average wage growth is slightly higher for women (9.4%) than men (8.5%) and higher for people living in Reykjavik (9.5%) than on the countryside (8.1%).
[5] Note that the share of profits does not include depreciation.

Interestingly, there appears an inverse relationship between unemployment and the share of labour (see also Central Bank of Iceland, 2000, page 7). Unemployment rose when the labour share fell in 1983-1984 and came down in 1986-1987 when labour's share rose. The fall in labour's share in the first part of the 1990s went together with rising unemployment and the recent rise in the share coincides with falling unemployment.

We now step back and describe the determination of labour-market equilibrium – that is, the natural rate – and use it to derive and describe a method used to calculate the natural rate of unemployment before returning to the Icelandic saga.

II. Theory behind the natural rate

Equilibrium in the labour market is determined by the interaction of employers and employees. In one formulation, employers attempt to set prices high relative to wages and employees attempt to set wages high relative to prices. In equilibrium, the two demands are reconciled, i.e. the equilibrium unemployment rate is such that workers' and firms' demands are consistent. This is the "battle of the mark-ups" emphasised by Layard and Nickell (1986).

Alternatively, one can envisage employers setting wages to affect incentives; that is to raise workers' retention rates, morale and productivity (see Phelps, 1968). In this case the equilibrium unemployment rate is also determined by the equality of the demand wage (this is the inverse of the price-wage ratio) and the supply wage (the one needed to affect worker incentives). When unemployment is below the natural rate, employers realise that raising (relative) wages raises profits by increasing the efficiency of the workforce. In a symmetric equilibrium, they all end up raising wages – hence only raising the real product wage, which then forces them to reduce the workforce. As unemployment grows, the efficiency of labour rises and the incentive to raise relative wages falls until the natural rate of unemployment is reached with constant wages and employment and correct expectations: unemployment has become a disciplinary device.

In both of these formulations, the equilibrium rate of unemployment – in steady state the natural rate of unemployment – depends on the level of workers' alternative income – that is their non-wage income and social support – and employers' optimal

mark-ups – which depend on expected productivity growth and real interest rates, amongst other factors.

II.1 A textbook model

In the simplest case with constant returns to labour, the price-setting curve (labour demand under conditions of imperfect competition) can be written as

$$p_t = w_t - l_t + m_t(C_t) \tag{1}$$

where p and w denote the log of nominal prices and wages respectively, l is the log of labour productivity, C is the level of competition in product markets, and m is the mark-up of price over marginal costs. Similarly, the wage-setting relation can be simplified to become equation (2):

$$w_t = p_t^e - f u_t + l_t + z_t(W_t) \tag{2}$$

We let u denote the unemployment rate, p^e is the expected level of prices, and z is a vector of wage-push variables. The vector captures such factors as union objectives, the frequency of strikes, the generosity of the welfare state and the probability of finding a job once unemployed. We let z be a function of (national) wealth because more wealth is likely to increase welfare spending. The probability of finding a job reflects the rate of turnover in the labour market – how long one can expect to remain unemployed – which is closely related to the fraction of workers who remain unemployed for longer periods of time (the long-term unemployed).

Now putting equation (2) into (1) we get equation (3) that can be solved for the equilibrium unemployment rate – which is the natural rate of unemployment.

$$p_t = p_t^e - f u_t + z_t(W_t) + m_t(C_t) \tag{3}$$

The price level today is a positive function of the expected price level, the level of mark-ups m, and the wage-push terms in vector z. Last year's prices matter because they affect current wages – through wage setting – which then affect current prices – through price setting (see Pétursson, 2001). However the level of productivity l drops out as it raises both the supply- and the demand wage.[6] This represents a reasonable normalisation because workers' alternative wages in the form of interest, dividend and rent, can be expected to rise at the rate of labour productivity.

[6] This is consistent with a zero trend in unemployment over long periods of time despite growing productivity.

Setting $p_t = p_t^e$, which assumes correct expectations, gives a solution for the natural rate of unemployment:

$$u_t^* = \frac{m_t(C_t) + z_t(W_t)}{f} \tag{4}$$

The natural rate of unemployment is a positive function of the level of mark-ups, union militancy, the frequency of strikes and the generosity of the welfare state. Product-market competition and wealth affect the level of the natural rate through the level of mark-ups – more competition reduces the equilibrium level of mark-ups – and also by causing welfare spending to go up as the tax base expands – which raises unions' and workers' fall-back level of utility and acts to push up wages and raise unemployment.

One can now rewrite equation (3) as a Phillips curve. Simple algebraic manipulations yield:

$$p_t = p_t^e - f u_t + z_t(W_t) + m_t(C_t) \tag{5}$$

Assuming adaptive expectations – or rational expectations when inflation follows a random walk – gives $p_t^e = p_{t-1}$ and the Phillips curve acquires the accelerationist form:

$$p_t = p_{t-1} - f u_t + z_t(W_t) + m_t(C_t) \tag{5'}$$

It follows that in an expectational equilibrium – when inflation is neither rising nor falling – unemployment is at its natural level which is given by equation (4).

II.2 A simple method of calculating the natural rate

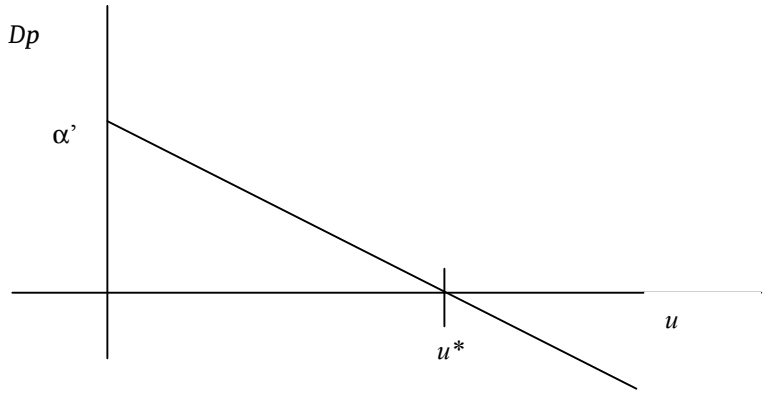
The key problem in calculating the level of the natural rate is the fact that one does not know a priori what are the elements of the vector z_t in equation (2) nor can we measure mark-ups accurately. In other words, we cannot a priori specify which factors influence the natural rate – can shift either the price- setting or the wage-setting relationship. For this reason, Elmeskov et al. (1993) assume that we can omit unknown terms from equation (5') without biasing the coefficient of the unemployment rate unduly, which gives the following empirically testable equation;

$$\Delta p_t = a - f u_t + e_t \tag{6}$$

where $a = m + z$ and e is the error term. It should be clear that a does not have to be constant over time and to the extent that it does change equation (6) involves a

misspecification. However, if this does not affect the estimate of f significantly, we can use the equation to calculate the natural rate by a simple rule of thumb. The natural rate of unemployment is by definition the rate of unemployment where inflation (be it price- or wage inflation) is unchanging. We show equation (6) in the figure below and how it defines the natural rate.

Figure 8. Calculation of the natural rate



The slope of this relationship is equal to $-f$ while the position depends on the value of a – hence the level of m and z. The rule of thumb for calculating the natural rate based on equation (6) is the following:

Rule of Thumb for calculating the natural rate

Find the value of f and use it to calculate how much unemployment would have to change for Δp to equal zero given its current value.

More precisely, we calculate the natural rate by setting $a = fu^*$ which gives the following equation;

$$\Delta p_t = -f\left(u_t - u_t^*\right) \tag{7}$$

that can be solved for u^* once we know the values of f, u_t and Δp_t:

$$u_t^* = \frac{\Delta p_t + f u_t}{f} \tag{8}$$

Since the estimate of u^* that is generated by equation (8) tends to be very noisy, one usually smoothes the series with the Hodrick-Prescott filter and the smoothed series describes the path taken by the natural rate of unemployment.

II.3 Measuring the natural rate of unemployment in Iceland

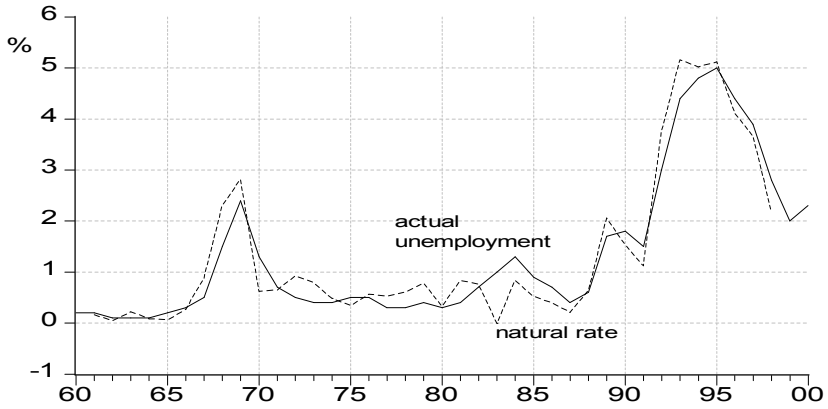
In Gudmundsson and Zoega (1997) equation (6) was estimated for the period 1970-1988 where the rate of change of the labour force was added to the regressors in order to control for its effect on unemployment, for reasons that will become apparent later in Section IV.2, and inflation was defined as the average rate of change in the GDP deflator in the two years that follow each unemployment observation. The results follow;

Table 7. Estimation results for equation (7), 1970-1988

Parameter	Estimate	t-statistic
α	25.63	4.35
ϕ	45.11	5.09
$\Delta\log(L)$	24.01	3.02
$R^2 = 0.65$	$\bar{R}^2 = 0.60$	

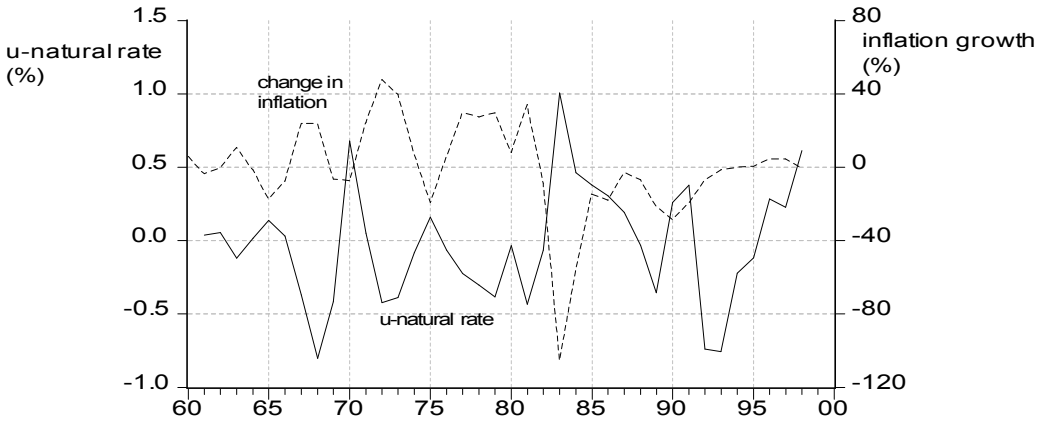
We can now look at the empirical performance of these estimates by updating the implied NAIRU and then reflect on the inflation experience. Figure 9 below updates the NAIRU estimates for 1995-1998 (see Gudmundsson and Zoega, 1997). In the past 12 years, the natural rate tracks actual unemployment to a surprising (one could say alarming) extent. In particular, it falls after 1996 with the general unemployment rate.

Figure 9. Natural-rate estimates for Iceland



In Figure 10 below there is a plot of the discrepancy between the actual unemployment rate and the natural rate estimate, on the one hand, and the first difference of the inflation rate, on the other. An obvious negative relationship is visible prior to 1989 which then disappears in the last ten years or so. The difference between actual unemployment and the natural rate is thus strongly negatively correlated with the acceleration of inflation up to 1990. This includes the 1960s (-0.57), the 1970s (-0.79) and the 1980s (-0.89). Note that while the coefficients were estimated for the period 1970-1988, the period 1960-1969 is out of sample. However, the correlation disappears in the 1990s (it is only –0.25 for the years 1990-1997). It follows that the model is not terribly useful when predicting inflation in the 1990s.

Figure 10. Inflation and the natural-rate estimates



At this point one needs to address two questions. First, what makes the estimated natural rate of unemployment track the actual unemployment rate so closely? Second, why does the discrepancy between the actual and the natural rate of unemployment fail to predict changes in inflation in the 1990s? The derivation of the natural-rate equation (8) gives some clues as to where to find an answer. It is clear that if the elevation of unemployment in the first half of the 1990s did not go together with falling inflation, and if the fall in unemployment in the second half of the 1990s did not cause rising inflation, then the natural rate estimate will follow closely the actual path taken by unemployment over this period. This leads to the question whether it is plausible that the natural rate changed in this manner or whether other factors

prevented inflation from responding to changes in the unemployment rate while the natural rate remained at its earlier level.

III. Possible reasons for the evolving natural rate in the 1990s

The question now arises whether the rise and fall of the natural rate shown in Figure 9 can be traced to any of its suspected determinants. One has to consider both those explanations that have been floated in the literature as well as those that may be particularly relevant for Iceland. We start with the former.

III.1 Explanations from the unemployment literature

The world's unemployment patterns fall broadly into three categories. First, in the U.S. the apparent changes in the natural rate appear small in magnitude. There is the gradual upward trend documented by Juhn, Murphy and Topel (1991) and the decline in the past 5 years. Second, there is the typical continental European pattern of two big elevations – in the mid 1970s and the early 1980s – followed by a partial cyclical recovery in the late 1980s and then a return to high unemployment in the 1990s. Finally, the Scandinavian countries (excluding Denmark which follows the continental pattern) exhibit constant average unemployment until the end of the 1980s, then a significant elevation followed by the recent recoveries.

The economics literature on medium term changes in the U.S. has focused on the nature of technical progress and demographics. This forms the first class of potential culprits:

- *Demographic trends* such as changes in the proportion of young workers and the least educated. Both groups typically have higher within-group unemployment rates. The ageing of the baby-boom population in the United States is one frequently mentioned reason for the current combination of low unemployment and low inflation (Phelps and Zoega, 1997, 2000; Shimer, 1998).[7]

[7] A recent paper (Katz and Krueger, 1999) also emphasizes the rise in the prison population but the share of the prison population in the civilian non-institutional population is now approaching one percentage point. This matters because the individuals affected are significantly more prone to unemployment. Kling (1995) found that the employment to population ratio is typically only 35% for this group.

- *Job insecurity* may have reduced wage demands by unions and allowed employers to offer lower wages without adverse effects on moral and effort. Due to corporate restructuring and re-organisation, workers can no longer count on their jobs as before. This factor would appear in the term z in the wage-setting equation (2).

- *Skill-biased technological change and international trade.* Both may reduce the marginal product of the least educated, raising their relative unemployment rates and reducing their relative wages (Krugman, 1994). The idea is that a fall in the level of productivity – l in equations (1) and (2) – affects primarily the demand wage (equation (1)) and not the supply wage (equation (2)) for this group because the poorest workers rely on welfare benefits rather than other forms of non-wage income. Presumably welfare spending is not very responsive to changes in productivity from one year to another.

None of these three explanations provides a plausible explanation for the unemployment path in Iceland in the 1990s. Demographic developments, biased technical progress and changes in international trade have been gradual and do not exhibit the cyclical pattern seen in the unemployment variable.

While such demographic and technological changes are given a big role in the literature on U.S. unemployment, studies of the elevation of unemployment in the rest of the OECD tend to emphasise different factors.

- *The price of oil.* The timing of the 1970s hikes in the world real price of oil coincided with the timing of the elevation of unemployment in a great many of the OECD countries. Models linking oil prices to unemployment go back to Bruno and Sachs (1986). The idea is that either the marginal product of labour falls because of a reduction in the use of energy – assuming that the two factors are complements in production – or that higher oil prices cause a rise in the mark-up of price over marginal costs which acts to reduce the real demand wage and hence raise unemployment. The real price of petroleum in Iceland (that is the ratio of the nominal price and the GDP deflator) fell in the mid 1980s – due to developments in world markets – before unemployment started is upward ascent.

Figure 11. Energy prices and unemployment

We can for this reason discount the possibility that changes in energy prices had much to do with the path of unemployment.

- *Non-wage income.* Increases both in the income and services from private assets and in benefits from social entitlements relative to after-tax wage and from the growth of the welfare state in the 1960s and 1970s should affect the supply wage through the term z in the equations above. Social benefits and private non-wage income – income from wealth – make labour more expensive since unions can demand and employers may offer higher wages in light of the improved fallback options of workers. In Spain and Italy an important component of non-wage income is family support.[8] This effect is again captured by the term z in the wage-setting equation (2).

The time path of welfare spending – as a proportion of GDP – trends upwards in Iceland from 1960 until the late 1980s and then levels off before unemployment starts its upward move.

[8] Despite very high unemployment rates, the household unemployment rate – defined as the fraction of households without any income earner – is close to the OECD average suggesting that the family may be the real welfare state.

Figure 12. Welfare spending (% of GDP) and unemployment

If anything, unemployment and welfare spending tend to be inversely related in Figure 12; when welfare spending rises, unemployment falls.

- *Institutions.* A model by Layard, Jackman and Nickell (1991) pointed to new or expanded institutions in the post-war era, especially in Europe, such as unemployment insurance benefits and job protection, which heightened the sensitivity of unemployment to shocks. This represents a culmination of work on the impact of the unemployment insurance system – both replacement ratios and the duration of benefits – the organisation of labour unions – such as their centralisation as pointed out by Calmfors and Driffill (1988) – and the extent of union density and coverage. This work has much influenced thinking at the OECD where institutional reforms were the backbone of policy recommendations in its *Jobs Study* (OECD, 1994). Once again, this effect is found in the term z in our model of Section II.

The evolution of labour-market institutions in Iceland does not fit the unemployment path. No fundamental changes in the organisation of labour unions or the unemployment-benefit system preceded the rise in unemployment.

- *The cost of capital.* There is the OECD-wide increases in the effective cost of capital resulting from expectations of lower productivity growth emerging in the 1970s and the increased expected world real rate of interest emerging in the early

1980s. Both developments may reduce investment in human capital, most importantly the training taking place in firms and employment contracts as a result. In the model of Section II, a higher cost of capital may cause firms to raise mark-ups – that is invest less in an expanding market share – hence reduce the demand wage, which then causes unemployment to go up.[9]

As shown in Figure 13 below, changes in real interest rates in the 1990s do not mirror changes in unemployment because interest rates remained high throughout the decade – having risen in the late 1980s – while unemployment rose in the first half of the decade and fell in the second half. However, developments in capital markets were sufficiently important to warrant a separate Section IV.2 below.

The literature on Scandinavian unemployment (i.e. Honkapohja, 1999) has put more weight on cyclical factors. In particular, financial crises, corporate debt and high real interest rates are presumed to have reduced aggregate demand causing a cyclical downturn. The high real interest rates in Iceland during the 1990s may have had such a cyclical effect on output and employment.[10]

IV.2 The local scenery

Section I described labour-market data during the bust of the first half of the 1990s and the boom of the second half of the decade. We now take a look at some of the shocks that may have affected the evolution of unemployment over this period.

Macroeconomic shocks

Capital markets were liberated gradually in Iceland during the 1980s. The most significant consequence of these reforms for our purposes was the rise in real interest rates and the lessening of capital rationing. Figure 13 shows the unemployment rate superimposed on two measures of real interest rates: the ex-post real rate of interest on non-indexed bank loans and the rate of interest on indexed bank loans.

[9] A formal model yielding this result is the customer-market model of Phelps and Winter (1970). In this model, the firm's mark-up decision is an inter-temporal investment decision: by reducing mark-ups the firm invests in an expanded market share in the future and by raising mark-ups it raises current profits at the expense of a lower future market share. It follows that a higher cost of capital would tend to reduce investment, hence cause firms to raise their mark-ups, which then acts to increase unemployment in our model.

[10] In the Scandinavian literature, it should be noted, there is also a strand of thinking that emphasises

Figure 13. Unemployment and the real rate of interest

The real-interest-rate series undergo a regime shift in the middle of the 1980s following the liberalisation of capital-markets. The real rate of interest on non-indexed bank loans jumps by more than 20% – that is 2000 basis points! The corresponding rise in the rate of interest on indexed bank loans is over 500 basis points. The shift in the interest-rate regime precedes the rise in unemployment in the early 1990s that started in 1988. However, this does not lend much support to the pure interest rate thesis above because the fall in unemployment in the last five years coincides with record high interest rates.

The liberalisation of capital markets and the rise in real interest rates brought about a transformation of the Icelandic economy. In contrast to the earlier period of negative required rates of return facing owners of productive capital, the post-liberalisation era had required rates of return in excess of 10%. The consequences of this regime shift were not unexpected; the number of bankruptcies increased drastically as shown in Figure 14.

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the structural or real factors behind the unemployment experience (see Lindbeck, 1997).

Figure 14. The number of bankruptcies

Interestingly, the plot showing the number of bankruptcies resembles the time path of unemployment and also the time path of the share of capital in national income. It follows that the number of bankruptcies and labour's share in national income are inversely related as shown in Figure 15. Taken together, Figures 13-15 suggest that the rise in the cost of capital in the mid- to later 1980s caused the share of labour to fall which then acted to raise the unemployment rate. This points towards shifts in labour demand as the key culprit in the rise and fall of unemployment in the 1990s.

Figure 15. Bankruptcies and labour's share in national income

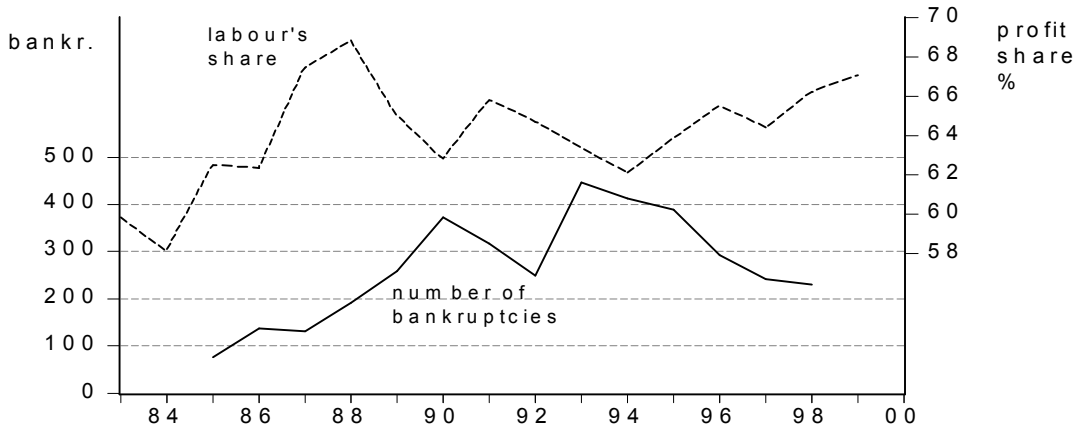
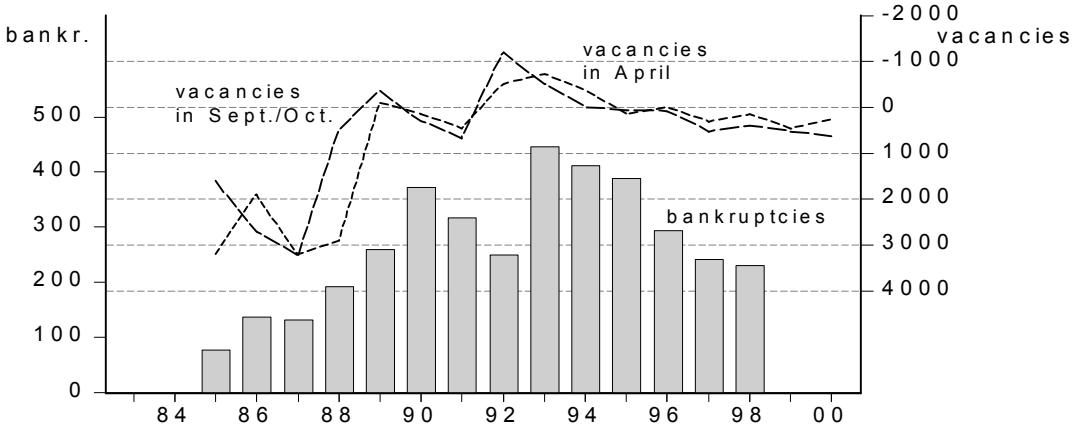


Figure 16 has the number of vacancies reported in the biannual survey by the *National Economic Institute* (also shown in Figure 1) – spring and autumn observations each represented by its own plot – alongside the number of bankruptcies for each year. Note that the scale measuring vacancies has been inverted to draw attention to the close association between the two variables. The negative relationship between the number of vacancies and the number of bankruptcies provides another

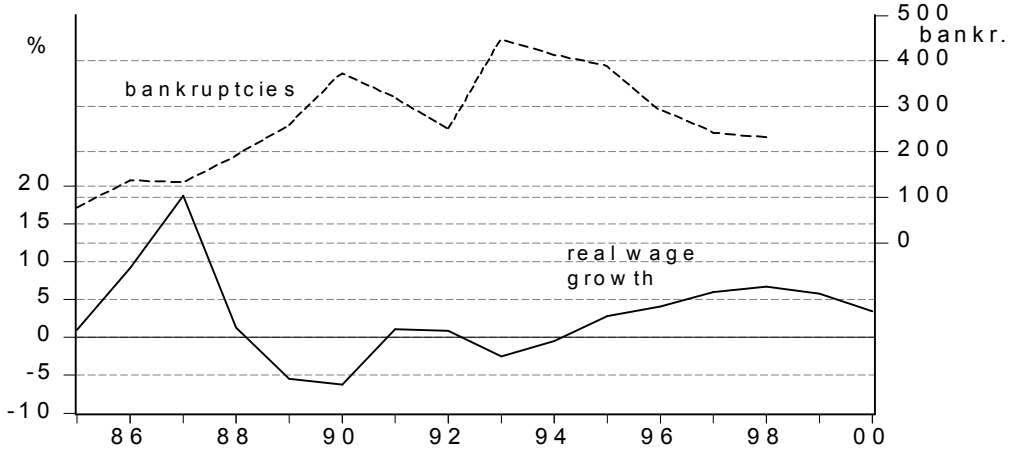
piece of evidence suggesting that labour demand fell in the first half of the decade and then recovered.

Figure 16. Bankruptcies and vacancies



Finally, the association between the number of bankruptcies and the growth of real (consumption) wages provides a further proof for the role of labour-demand shifts in the unemployment saga of the 1990s.

Figure 17. Bankruptcies and real wages



Real-wage growth falls when the number of bankruptcies is rising and picks up again when the number of bankruptcies levels off.

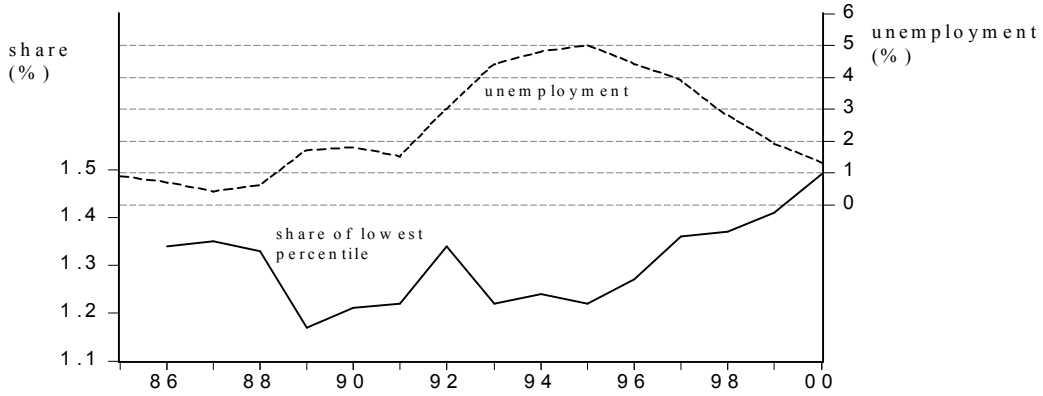
Unemployment resulting from reduced incentives to work

Figures 6 and 7 showed that the rate of unemployment and the capital share have moved together in Iceland, which yields a negative relationship between

unemployment and the share of labour in national income. A simultaneous fall in both the labour share and employment is a clear sign of an adverse labour-demand shock. Similarly, when labour demand recovers, this results in an increase in the labour share and a fall in unemployment. We can then exclude shifts in wages demanded – i.e. changes in union activity – from the list of possible culprits.

A fall in labour demand can cause rising unemployment in the presence of real-wage rigidity caused by either unions or efficiency-wage considerations as described in equation (2). However, even in the absence of such rigidities, unemployment can increase if there are fixed costs of having a job and/or unemployment benefits. In Iceland this becomes more likely because, as an empirical matter, the lowest wages fall disproportionately in recessions and rise disproportionately in recoveries. Figure 18 below shows that the share of the lowest percentile of workers in total earned income, on the one hand, and unemployment, on the other hand, are strongly correlated: when the share of the lowest-paid workers falls, unemployment tends to rise.

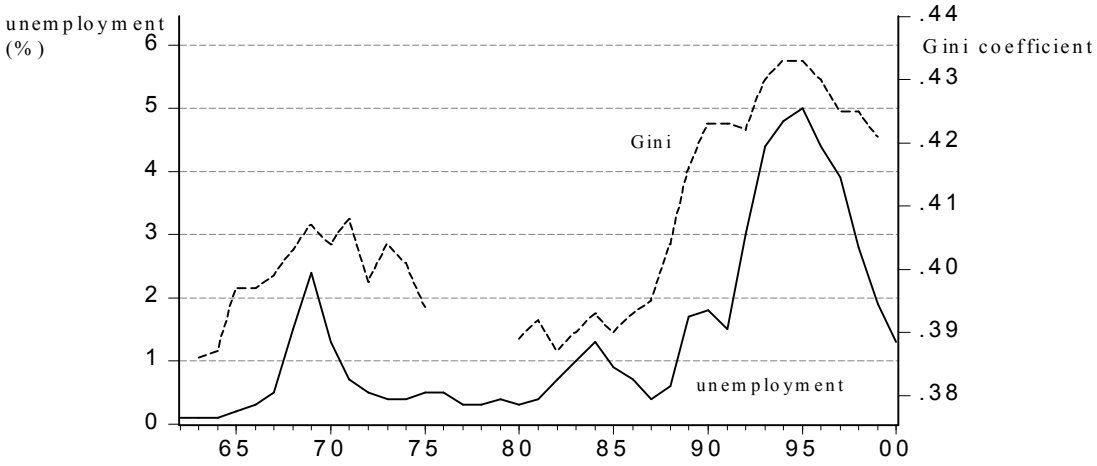
Figure 18. The share of the lowest percentile of workers in earned income and unemployment



A related pattern comes through in Figure 19 where the evolution of inequality (in terms of earnings) – measured by a Gini coefficient – is superimposed on the unemployment rate[11].

[11] The Gini coefficients are calculated for all taxpayers, independent of employment status, but the same pattern emerges when only employed workers are included in the sample.

Figure 19. Inequality and unemployment

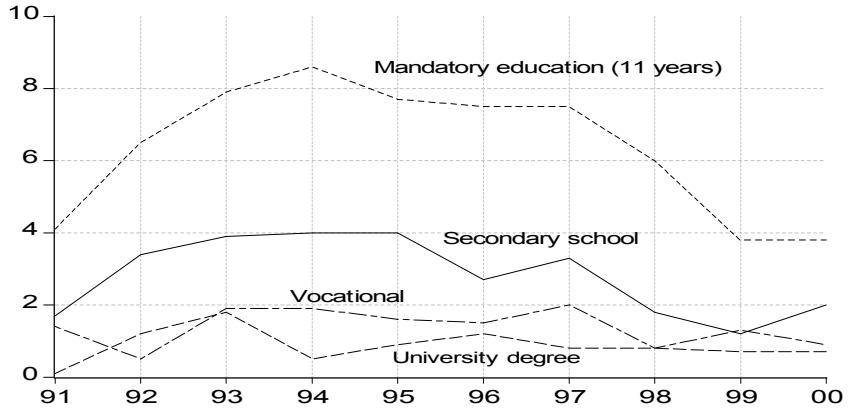


Source: National Economic Institute and Finnur Geirsson (1977).

The rise in inequality in the late 1960s coincided with a rise in unemployment. The same applies to the minor recession in 1983 and, more importantly, the sustained rise in unemployment starting in 1988. Finally, the last upswing – starting in 1996 – then makes the earnings distribution more compressed.

Figure 20 shows changes in unemployment rates by education. It is clear that the bottom group suffered disproportionately in the slump of the first half of the 1990s. It is not uncommon to observe higher unemployment rates among the less educated. In fact, this is the pattern in most OECD countries. What is interesting in the case of Iceland is, however, that unemployment rates of university graduates and workers with vocational training did not at all share the same pattern as the national average in the 1990s: these rates did not rise in the first half of the 1990s and fall in the second half of the decade. One has to move down to workers whose terminal degree is from secondary school to see the path of unemployment rising in the first half of the decade and falling in the second half. However, the numbers tend to be low for this group: the maximum unemployment rate reached in 1995 is only 4%. In contrast, when one looks at the unemployment rates of workers whose terminal degree is from primary school, the picture changes and we observe a strong cycle in the 1990s – the rate of unemployment rising from 4.1% in 1991 to 8.6% in 1994 and then falling back to 3.8% in 1999.

Figure 20. Unemployment rates by education



Source: *Hagstofa Islands*.

Consequently, the relative unemployment rate of the least educated rose in the first half of the decade if we measure it by the difference between the within-group rate and average unemployment.

Data on unemployment by family status is even more revealing. Table 10 has the rate of unemployment for women classified on the basis of their family circumstances. Notice that while childless women do better than the average, mothers do worse. This effect is strong for women with two or more dependent children, especially those who care for a child younger than six years of age. Both the absolute and the relative unemployment rate of women with two children moves with the average unemployment rate: when the rate of unemployment is high, relative unemployment is high among those with two children.

The numbers in this table suggests that the reason why unemployment rose in response to falling labour demand during the first half of the 1990s and then recovered in the second half lies not so much in the inflexibility of real wages – described by the wage-setting equation (2) above – as in a reduced incentive to remain actively in the labour market. When wages fall at the bottom end of the wage distribution, one finds that the unemployment rate of workers who have a high fixed cost of employment goes up. The fixed cost of childcare is considerable in Iceland. When we sum up the unemployment benefits and the cost of childcare for women with two young children, we find that the incentive to hold a low-paying job is almost non-existent. However, when wages start rising, the incentive to find a job is increased and the unemployment rate falls.

Note that the rise and subsequent fall in unemployment among women who do not have children is minuscule. Their unemployment rate started out at 1.6% in 1991 and peaked at 2.8% in 1995 and then fell to 1.8% in 1999. What distinguishes the two groups of women – those with children and those without – is primarily the cost of childcare plus any non-pecuniary benefit from staying at home.

Table 10. Unemployment rates for women aged 25-54, by family status

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Average, all women	**2.6**	**3.8**	**4.8**	**5.0**	**4.3**	**3.2**	**3.8**	**2.9**	**2.1**	**2.5**
No children	1.6	2.5	3.8	2.5	2.8	2.5	2.6	1.8	1.8	2.1
Children	3.1	4.4	5.2	6.3	5.1	3.6	4.6	3.6	2.3	2.7
1 child	1.6	2.9	3.8	4.2	2.8	3.2	3.3	2.7	2.2	1.7
0–6 years	2.4	5.6	7.2	5.7	3.0	3.3	2.9	4.4	1.8	1.6
7–15 years	1.2	1.4	1.8	3.3	2.8	3.2	3.6	1.5	2.4	1.7
2 or more children	4.2	5.7	6.5	7.7	6.7	3.9	5.6	4.2	2.4	3.4
Youngest 0–6	4.0	6.3	7.3	8.5	7.1	3.9	6.7	5.1	2.5	4.1
Youngest 7–15	4.5	4.3	4.2	5.5	5.8	4.0	2.9	1.9	2.3	2.1

Source: *Hagstofa Islands*

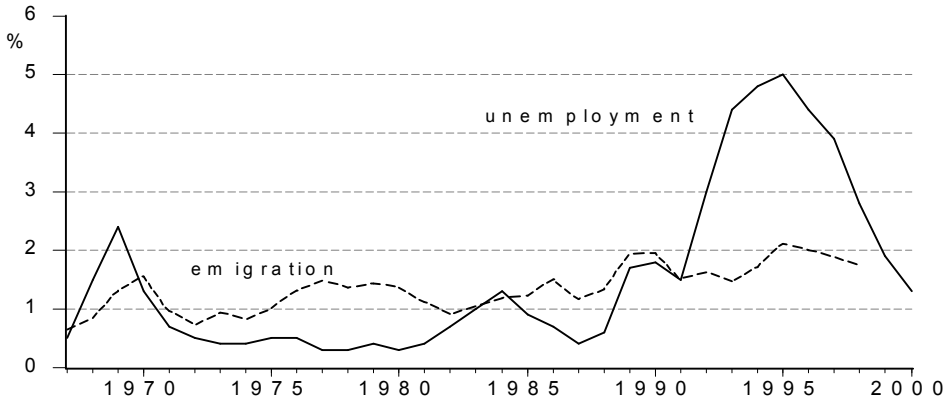
The pattern revealed in Figure 20 suggests the same explanation for the unemployment swings. When labour demand falls, which causes wages to go down, the unemployment rates of the least educated rise while those for workers with vocational and university training are hardly affected at all. Differences in wages across education levels suggest that the reason for the greater rise in unemployment among the least educated may be partly their low initial wages, which then fall below the reservation levels for continued employment. Falling wages at the bottom of the wage distribution may be to blame for increased joblessness. This may explain partly why wage- and price inflation did not respond to changes in the measured unemployment rate for a long time, not until the last two years or so. The fall in labour demand has caused the effective labour force to shrink and job losers do not exert significant pressures on wage- and price behaviour.

There is also another reason why the labour force has changed over the period. This has to do with the flow of foreign migrant workers to the country.

Migrant workers

Recent economic conditions in Iceland dictate that we pay special attention to the presence of foreign migrant workers who meet excess demand in certain industries – initially in the fish-processing industry but now also in the construction and service industries – who leave the country as soon as this excess demand ceases. This is a one-way stream of workers because the rate of emigration by Icelandic workers in response to economic downturns is small in comparison to cyclical changes in employment.[12]

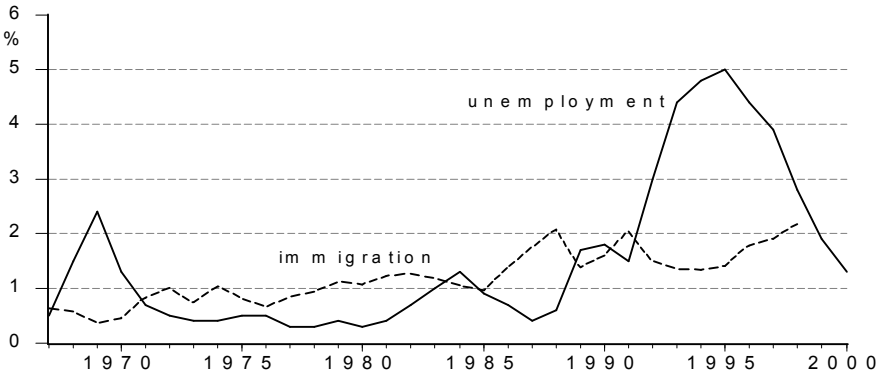
Figure 21. Emigration (ratio to labour force) and the unemployment rate



We note the sudden emigration in response to rising unemployment in the late 1960s. Apart from this, there is an upward trend in emigration from the mid 1980s to the mid 1990s and then a reversal of this trend. A similar pattern is visible in Figure 21, which has immigration as a ratio to the labour force.

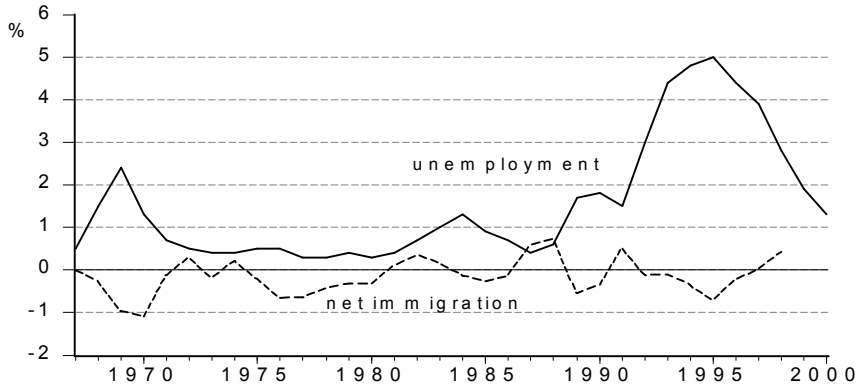
[12] See Agnarsson et al. (1998).

Figure 21. Immigration (ratio to labour force) and the unemployment rate



Finally, we plot the net in-migration (immigration net of emigration) as a ratio to the labour force against the unemployment rate in Figure 22. The two series are negatively correlated. When unemployment rises, the net rate of immigration falls and vice versa.

Figure 22. Net immigration (ratio to labour force) and the unemployment rate



A fundamental change in the identity of immigrants occurred in the late 1990s. Instead of Icelanders returning home, we can see a rise in the number of foreign workers, many from Eastern Europe, who come as temporary workers to meet excess demand for labour in the fishing industry, and more recently in construction and services. In this way the immigrants prevent wage pressure from building up in selected bottlenecks and the economy as a whole. It is likely that the influx of foreign labour has prevented wages from rising in recent years more than we have observed in the data.

The basic model can be modified to take into account (net)immigration. In

equation (2') we have added the rate of (in)migration $\dot{L}/L$ to the wage-setting schedule, while leaving the price-setting schedule unchanged. The idea is that when the value of $\dot{L}/L$ is high, more workers will be looking for a job than otherwise. This makes unions fear job losses among their members because they realise that any unemployed union worker would face stiff competition for jobs. The unions are likely to ask for lower wages as a result. The same happens when firms set wages in the absence of unions. They set lower wages realising that a job loss would have significant effects on the workers involved because it is more difficult to find a job with foreign labour competing for vacancies.

$$p_t = w_t - l_t + m_t(C_t) \tag{1'}$$

$$w_t = p_t^e - f\left(u_t + g\,\frac{\dot{L}}{L}\right) + l_t + z_t(W_t) \tag{2'}$$

The parameter g in equation (2') measures how substitutable foreign labour is in relation to domestic nationals. If they are equal in every sense, the coefficients g should be equal to one. It follows that an increase in the rate of flow of foreigners into the domestic labour market allows firms to set lower wages and induces unions to reduce their wage demands, hence expanding domestic employment. The natural rate of unemployment falls, which implies that lower rates of unemployment are now compatible with price stability.

We have shown that the one-to-one relationship between unemployment and inflation is disrupted by changes in the labour force over the business cycle. When the economy is booming, the lowest wages are pushed up bringing in workers who face a combination of low wages and fixed costs of employment and also – especially in recent years – immigrant workers. The process is then reversed when a recession sets in. These changes in the effective labour force weaken the relationship between unemployment and inflation. At low rates of unemployment, inflation does not rise as expected because firms are filling vacancies with workers who are just entering the labour market. And at high unemployment rates, the downward pressure on wages and prices is mitigated by the effective withdrawal of many low-income workers from the labour market as well as the departure of foreign workers. Equation (3) will now read

$$p_t = p_t^e - f\left(u_t + g\frac{\dot{L}}{L}\right) + z_t(W_t) + m_t(C_t) \qquad (3')$$

which gives the following as the definition of the natural rate of unemployment (when $p_t = p_t^e$):

$$u_t^{**} = \frac{m_t(C_t) + z_t(W_t)}{f} - g\frac{\dot{L}}{L} \qquad (4')$$

The equation implies that the natural rate is pushed down when the labour force is growing because workers face increased competition for jobs and this makes them reduce their wage demands. In a period when workers leave the labour market, the natural rate is pushed up for the same reason. Unions realise that their members face limited competition and that they can hence be more aggressive in their wage demands. Note from Figure 22 that the range of magnitudes of the rate of growth of the labour force due to net immigration is plus to minus 1%. The effect on the natural rate is then in the same range if γ=1. From Table 7 above one can infer that the value of γ is around ½, which reduces the maximum effect of migration to plus to minus ½%. Add to this the effect of entry/exit of low-skilled workers and one can get a sizeable effect on the estimated natural rate.

There is also another reason why the estimated natural rate path may follow the path of actual unemployment in some instances. If it is more difficult to make inflation fall when it is already low than when it starts out being high, there arises an asymmetry in the inflation dynamics, in particular the relationship between inflation and unemployment. This is the focus of the following section.

IV. The Structural stability of the Phillips curves

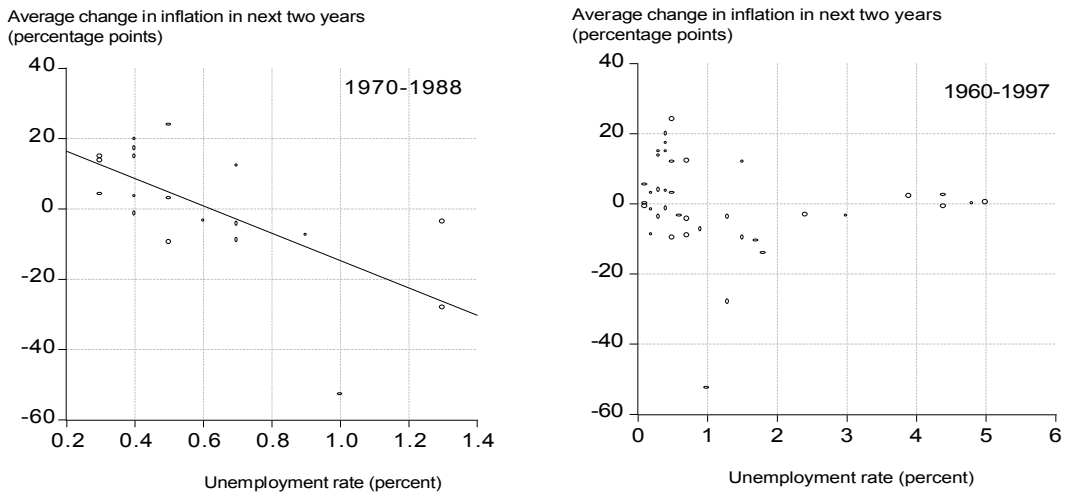
In light of the close correspondence between the estimated natural rate of unemployment and actual unemployment in Section III and the lack of predictive power of the natural- rate estimate, we now take a closer look at the underlying data and relationships.

III.1 Testing for structural instability

The figures below show scatter diagrams for the accelerationist Phillips curve. Figure 23 has the price-Phillips curve and Figure 24 the wage-Phillips curve. The former has the change in the rate of price inflation, measured by the GDP deflator on the vertical

axis and the unemployment rate on the horizontal axis. Inflation is measured as the average rate of inflation in the two years that follow each unemployment observation and the inflation difference is equal to the difference between its current value and its lagged value two years back. We first show the relationship for the period 1970-1988 and then for the whole period 1960-1997.

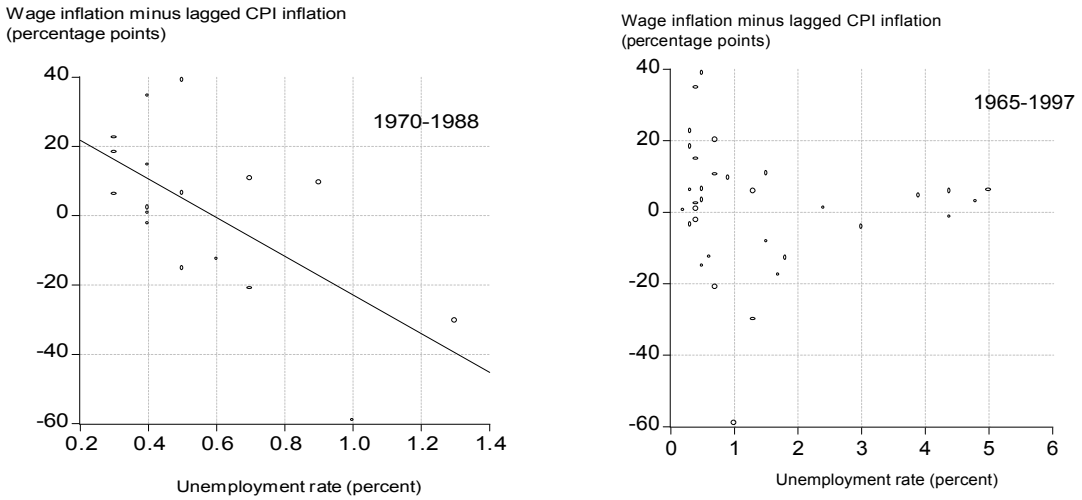
Figure 23. Phillips curve using the GDP deflator



There appears to be a relationship in the first period as shown in the left-hand chart. The figure also has the least-squared line fit through the observations for these years. The biggest outlier is in 1983 where the rate of disinflation was around –50% at only 1% unemployment. When one plots the two variables in a scatter diagram for the whole period 1960-97 the relationship disappears. It is blurred by the observations from the 1990s where high unemployment goes hand in hand with approximately constant inflation and also by observations from the 1960s where both rising and falling inflation occurs at very low unemployment rates – less than 1 percent for most years.

Now turn to the wage-Phillips curve plotted on a scatter diagram where the vertical axis has the difference between wage inflation and lagged price inflation (measured by the CPI) and the horizontal axis has the unemployment rate as before.

Figure 24. Phillips curve using a nominal wage index



Again one detects a negative relationship in the period 1970-88 but the absence of a clear relationship for the whole period 1960-1998.

In order to test more formally for a shift in the Phillips curves in the past decade or so, the table below has regression results for year-to-year price inflation on lagged price inflation, the overall unemployment rate and the rate of growth of employment in excess of the rate of growth of the labour force. We use both the CPI-index and the implicit GDP deflator. We then test for a structural break in 1989 by introducing a dummy variable for the years 1989-1997 and interacting it with the three right-hand-side variables. We allow the coefficient of lagged inflation to differ from one since a lower value would imply the presence of a permanent trade-off between inflation and unemployment, something that should not be excluded a priori. The results are shown in Table 11.

The results for the CPI index are in the first column of the table. Inflation is a negative function of the rate of unemployment and a positive function of lagged inflation when the period 1989-1997 is excluded. Note the very large coefficient of unemployment: a one hundred basis point increase in unemployment causes inflation to fall by a staggering 20% or 2000 basis points! This reflects on the period of high and volatile inflation in the 1970s and 1980s. For the period 1989-1997 these results no longer hold, unemployment now has a significantly positive coefficient and lagged inflation becomes entirely insignificant. The same pattern arises when we use the GDP deflator instead of the CPI index.

The wage Phillips curve in column three is a bit weaker but still exhibits the same pattern. The relationship between wage inflation and unemployment is made stronger in column four where the dummy variable now also includes the 1960s.

IV.1 Possible reasons for structural instability

It is clear that in the 1990s low and stable rates of inflation have coexisted with a wide range of unemployment rates. Akerlof et al. (1996, 2000) have put forth the thesis that at low rates of inflation, the current inflation rate ceases to be an important factor in price- and wage decisions. This draws on the idea of near-rationality – small departures from optimum involve only second-order losses – but is also supported by the psychology literature. The key word here is "editing". When people edit decision problems they rule out less important considerations in order to concentrate on the few factors that matter most. A literature in the psychology of perception suggests that a factor must reach a threshold of salience before it is even perceived (Gleitman, 1996). If workers do not perceive inflation as something that affects their nominal salaries, their job satisfaction may be enhanced by nominal wage increases even if they fail to fully reflect inflation. Firms can now achieve the same incentive effects at lower real wages as they can continuously offer pay increases. It follows that rather than attributing the episodes of sustained high or low unemployment to changes in the natural rate of unemployment that is invariant to inflation, these results attribute them instead to a change in price and wage setting behaviour that accompany periods of low inflation.

Even more importantly, it is widely accepted that nominal wages tend to be fairly rigid in the downward direction. With zero inflation we would expect some portion of workers to take nominal pay cuts each year. This would also apply at low rates of inflation – the nominal wage changes should be negative for some workers. If nominal wages were equally flexible upwards and downwards we should observe a symmetric distribution of nominal wage rate changes around the average increase. However, survey data of Icelandic workers show that the distribution of nominal wage changes is not symmetric.[13] Nominal wages are very seldom reduced, if at all, while

[13] Kjararannsóknarnefnd, 2000. The data come from a survey of 10,335 workers who were employed at one of 95 companies in the last quarter of 1995 and a survey of 11,787 workers employed at one of 102 companies in the last quarter of 1994. Workers were classified as; blue collar, craftsmen, retailers and office workers.

the right-hand tail is fatter indicating that some workers experience significant wage increases.[14]

IV.2 Testing for asymmetries

Equation (6) will now be re-estimated by making the effect of unemployment on inflation depend on the current rate of inflation and the sign of its first difference – whether this is rising or falling – and by allowing the coefficient of lagged inflation to have a value which depends on its own rate. The idea is that the coefficient of lagged inflation is an increasing function of the rate of inflation and approaches one at high rates of inflation while the coefficient of unemployment is small at low rates of inflation. The results are shown in Table 12 below for CPI inflation, the GDP deflator and nominal wages. For CPI inflation we find that at low inflation rates, the coefficient of past inflation is insignificantly different from one. This flies in the face of the Akerlof thesis and suggests that past inflation is also taken into account in price- and wage setting at low inflation rates. The same applies to price inflation when measured by the implicit GDP deflator and wage inflation. Moreover, we find that the coefficient of unemployment is rising in inflation in periods of disinflation but either constant or falling in inflation in periods of rising inflation.

Two lessons can be learned from the exercise. First, it is not likely that at low rates of inflation, current inflation depends less on past inflation contrary to what Akerlof has suggested.[15] Second, high unemployment is not likely to cause further disinflation once inflation has been curbed and reached very low levels. It follows that there is no unique medium-run equilibrium – that is the natural rate – at very low inflation rates. A trade-off between the inflation and unemployment results which can be used to find an optimal combination of the two as long as inflation does not cross some threshold value.

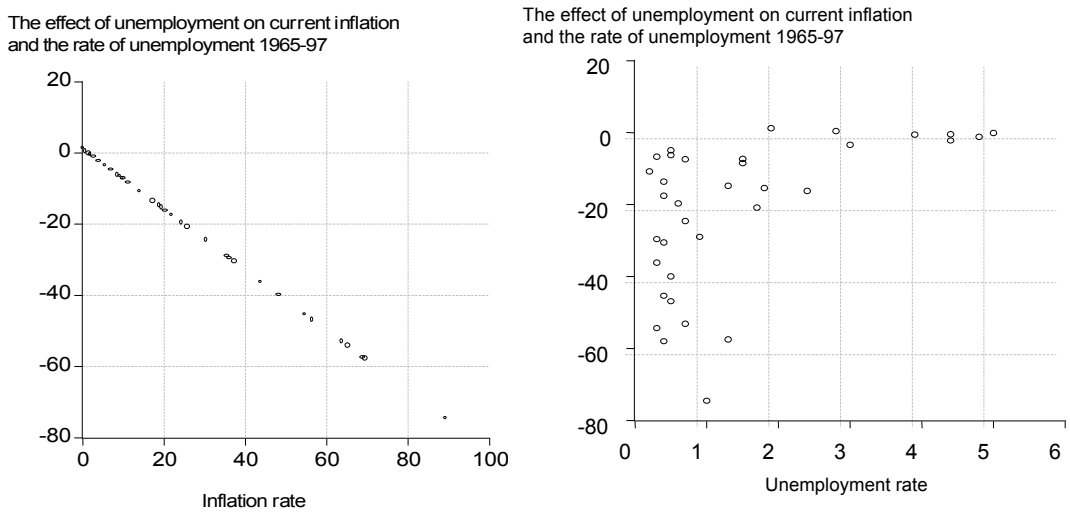
[14] The one exception is blue-collar women who apparently experienced wage cuts with the same frequency as wage increases.
[15] However, we should point out the few number of observations showing low inflation.

Table 11. Estimated equations for price- and wage Phillips curves

	Dependent variable							
Independent variables	CPI inflation		GDP inflation		Wage inflation		Wage inflation'	
	estimate	t-ratio	estimate	t-ratio	estimate	t-ratio	estimate	t-ratio
Constant	30.55	4.08	16.00	2.76	27.16	3.69	43.21	5.53
Dependent variable lagged two years	0.56	4.29	0.71	5.93				
Lagged CPI inflation two years					0.48	3.76	0.55	3.40
Unemployment rate	-20.35	3.08	-9.02	1.67	-8.57	1.32	-38.61	4.29
Rate of change of employment net of labour force	-6.56	0.84	-0.47	0.07	7.53	0.98	2.14	1.99
Time dummy	-32.59	0.98	-21.64	0.63	-33.21	1.02	-35.38	2.89
Time dummy*lagged dep. Variable	-0.14	0.12	-0.15	0.12				
Time dummy*lagged CPI inflation					-0.03	0.02	-0.31	0.59
Time dummy*unemployment rate	20.86	2.15	10.68	1.19	11.12	1.17	38.03	4.11
Time dummy*rate of change of employment net of labour force	6.02	0.59	0.84	0.09	-5.22	0.52	-2.16	1.85
Time period	1965-97		1962-97		1965-97		1965-97	
Observations	33		36		33		33	
Durbin-Watson statistic	0.97		0.88		0.97		0.82	
R^2	0.73		0.72		0.68		1.46	

Figure 25 below takes the results from the first column above (CPI inflation) and plots the coefficient of unemployment in times of disinflation.

Figure 25. Effect of unemployment on price disinflation (CPI), 1965-1997



The left-hand panel plots the coefficient against the inflation rate and shows a very strong downward pressure from unemployment on price inflation at high rates of inflation. With inflation running at 20% on an annual basis, a one-percentage rise in unemployment – that is a 100 basis point increase – causes a reduction in inflation of around 15% per year! But at low inflation rates the effect is much smaller. The right-hand panel then is a scatter diagram of the value of the coefficient and the actual unemployment rate over the whole period. Unemployment rates above 2.5% – accompanied by low inflation – have exerted very little downward pressure on prices.

Table 12. Price- and wage Phillips curves with asymmetric adjustment

	Dependent variable					
Independent variables	CPI inflation		GDP inflation		Wage inflation	
	estimate	t-ratio	estimate	t-ratio	estimate	t-ratio
Constant	11.52	1.37	2.44	0.52	7.66	0.75
Dependent variable lagged two years	0.84**	1.97	1.01**	3.51		
Dependent variable lagged two years – squared	0.0001	0.02	-0.003	0.66		
Lagged CPI inflation two years					1.24**	2.78
Lagged CPI inflation two years-squared					-0.007*	1.66
Unemployment rate	-3.36**	1.71	-2.15**	1.70	-1.51	0.68
Inflation*unemployment rate	0.48	0.95	0.89**	2.70	0.61	1.67
Dummy for disinflation *unemployment rate	1.22	0.89	1.60**	1.73	-0.07	0.07
Dummy for disinflation *inflation*unemployment rate	-0.85**	1.88	-1.08**	3.76	-0.88**	3.37
Time period	1965-97		1962-97		1965-97	
Observations	33		36		33	
Durbin-Watson statistic	1.54		1.84		1.05	
R^2	0.84		0.92		0.80	

V. Conclusions

The conclusions of this paper can be summarised as follows:

- The liberalisation of capital markets in the 1980s caused the required rate of return to rise to more than 10%. These high real interest rates caused a collapse of many established firms and industries.

- The wave of bankruptcies in the early 1990s coincided with a fall in labour's share of national income, an absolute decline of the lowest wages when measured in real terms, and a rise in the rate of unemployment, which peaked in 1995.

- Unemployment tended to be concentrated among low-wage workers, especially workers whose active labour-force participation is costly, i.e. mothers with dependent children.

- High unemployment in the middle of the 1990s did not exert significant downward pressure on wages and prices. There are three potential reasons: First, there is the voluntary nature of withdrawal of low-wage workers from active engagement in the labour market. Second, there was an outflux of workers. Third, there is the asymmetry in the response of wages and prices to unemployment, wage- and price reductions being much more difficult to implement than wage increases. These factors distorted the bivariate relationship between inflation and unemployment which made the natural-rate estimates follow actual unemployment over the period too closely.

- The recovery of labour demand in the second part of the 1990s did not initially create any price inflation for the same reasons although wages rose as could have been expected.

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