Roots of the Recent Recoveries: Labor Reforms, Sound Finance or Private-Sector Forces?

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The big slide of economic activity – of employment in relation to labor force and male labor force participation in relation to working-age population – among the OECD economies from the mid-1970s to the mid-1980s in most cases and the long slump that followed sparked new structuralist modeling of employment determination and supplied an empirical record for testing it. Some consensus has grown up on the main mechanisms and causal forces behind the deep slump.[1]

In the 1990s, though, structural recovery became evident in many OECD countries. Unemployment in Ireland, the Netherlands, the U.K. and Denmark improved in the first half of the 1990s and again in the second half.[2] The U.S., Canada, Australia, New Zealand and Spain gained strongly in the second half. More recently, Sweden and Finland began to rebound from lost export markets early in the decade. Recovery, if any, in the other OECD members was too little and too late to change much their end-of-decade score. France, Germany, Italy, Austria, Switzerland and Greece saw a net setback over the decade and Belgium,

[1] Convergence by several scholars on a small set of macroeconomic forces and institutions can be seen in the recent symposium on unemployment in the *Economic Journal*. See Nickell (1998), Phelps and Zoega (1998), and Snower (1998).

[2] The U.S. case is not a full recovery since a fixed-weight index of the unemployment rates in the four educational groups is still short of its 1965 and 1970 levels.

Portugal and Norway barely progressed.

To search for important sources of the great slump – the shift of equilibrium unemployment rates onto higher paths in the 1980s – one had an idea where to look. OECD unemployment rates had risen roughly together from the mid-1970s to the mid-1980s – deviations were mostly in the timing – so the favored candidates to explain the movement were all OECD-wide shocks. Models of the equilibrium path set out by Phelps, with their emphasis on the profitability of business assets and the reward to work relative to workers' other support, pointed to five common shocks in that period:[3] OECD-wide increases in the effective cost of capital resulting from the reduced expectations of productivity growth emerging in the 1970s and the increased expected world real rate of interest emerging in the early 1980s; increases both in the income and services from private assets and in the benefits from social entitlements relative to after-tax wage levels resulting from the 1970s productivity slowdown and from the growth of the welfare state in the 1960s and 1970s; finally, the 1970s hikes in the world real price of oil.[4] A model by Layard, Jackman and Nickell pointed to new or expanded institutions in the postwar era, especially in Europe, such as unemployment insurance benefits and job protections, that heightened the sensitivity of unemployment to shocks.[5]

Finding sources of the selective and uneven recoveries begun in the 1990s is a different sort of problem. Was there a shock or evolution in the recovering countries not found in the non-recovering countries? Was there

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[3] Phelps (1994).

[4] Econometric support for these forces was found in Phelps (1994) and Phelps and Zoega (1996). Further evidence supporting real interest rates or productivity growth rates or both can be found in Blanchard (1997, 1999), Elmeskov, Martin and Scarpetta (1998), Nickell (1998) and Phelps and Zoega (1998). Recent evidence confirming the role of wealth can be found in Phelps and Zoega (1998) and Blanchard and Katz (1999).

an OECD-wide shock or evolution that powered recovery in some countries while blocked from doing so in the non-recovering economies? In either case, are the causal forces and mechanisms within the compass of existing theory or can they be accommodated by present models?

The first hypotheses we will examine credit the progress in recovering countries to their adoption of structural reforms and blames the continued stagnation elsewhere to a failure to enact similar programs. One such hypothesis, developed by Steven Nickell and the OECD Secretariat, points to reforms in labor policy by several OECD members. In this thesis, the huge rise of unemployment in Europe was made possible by those countries' anti-market labor policies and the remedy lies in eradicating those policies. The chief areas for reform are the high and long duration of unemployment insurance benefits, the high density and wide coverage of unions in wage-setting, and employment-protection laws driving up the average wait of the unemployed for a job.[6] Of course, good economic policy is crucial for good economic performance. Yet it may be that these particular reforms had little or no effectiveness. Perhaps planting the institutions of capitalism or maybe low-wage employment subsidies would be vastly more effective in cutting unemployment (even if more costly in other dimensions). Europeans who value welfare state protections want to know whether the unemployment reduction obtained by scaling them back is large enough to compensate for the loss of security.

An equally prominent hypothesis is the Rubin-Summers thesis crediting sound fiscal policy with powers to bring recovery. Their argument is

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[5] Layard, Nickell and Jackman (1991).
[6] See Nickell (1998), Elmeskov, Martin and Scarpetta (1998) and OECD (1999).

that a policy ending budgetary deficits and retiring public debt serves to shrink equilibrium unemployment through its salutary effects on national real interest rates and investor confidence.[7] The thesis recalls Samuelson's "neoclassical synthesis" according to which a tight fiscal policy, in combination with sufficient monetary ease or low enough wages to create and maintain labor-market equilibrium, promotes investment and thus productivity growth:[8] If productivity grows faster, the equilibrium path of employment may be pulled up with it. The supply-siders' doctrine that, up to a point at any rate, budgetary deficits through tax cuts are expansionary is the very antithesis of the Rubin-Summers position.[9] Findings by Giavazzi and others connecting expansion to public-expenditure cuts obviously bear on this debate.[10]

The second area of the paper examines some monetary hypotheses, which deviate to varying degrees from the non-monetary approach of the structuralist models. We first test the thesis of Fitoussi and others that tight-money in France, Italy and some others candidates for the EMU operated in the second half of the 1990s to depress employment far below its structural-equilibrium path.[11] We next test Ball's more radical thesis that prolonged monetary tightness in some OECD economies in the early or mid-1990s produced a hysteresis effect leaving today's equilibrium unemployment path on a higher track than it would otherwise be on.[12] We also look at the thesis that reductions in inflation achieved by many countries have served to reduce unemployment.

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[7] Conversation with Robert Rubin, September 1999, and Summers (1991).
[8] Samuelson (1956). See also Tobin (1960).
[9] See Mundell (1971) for the earliest statement.
[10] Giavazzi and Pagano (1990) and Giavazzi and Perotti (1999).

There is one conspicuous shock that is rather widespread in the OECD: the sensational rise of share prices and market capitalization found on most organized exchanges from New York to Helsinki, much of it fueled, it appears, by high expectations about the future profits from the new information technologies – in short, the new economy. That a rise in firms' valuation of the business assets they invest in – their investments in their employees, the customers they have acquired, and their stocks of tangible capital – would generally boost the equilibrium path of employment (not just customers, plant and equipment) was a clear implication of Phelps's theoretical framework. And, arguably, the rise in market capitalization reflects a rise in the valuation of investments in such business assets, present or future – or, vice-versa, a rise in market capitalization induces firms' managers to raise the value they assign to investing in such assets. A loose relationship between share price and employment growth found in U.S. data has given some empirical support for the argument.[13]

The last part of this paper will try to gauge the strength of the average relationship between the stock market and employment growth in the OECD countries and proceed to investigate whether disparities in the size of the stock market booms are broadly consistent with the selectivity, unevenness and timing of the recent recoveries. It will be desirable to try to determine whether the not yet recovered economies have had a smaller rise in their stock markets, properly measured, or whether some factors have blocked or delayed them from the average responsiveness to their stock-market rise.

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[11] Fitoussi (199X). Of course the contention of some that regular and equal-sized devaluations would have keep employment bounded above its equilibrium path is radically counter to the structuralist view.
[12] Ball (1999).
[13] Phelps (1999).

The next section introduces our framework. A necessary exercise here is to verify that not all the recoveries (and failures to recover) are well explained by the garden-variety market forces on which we have previously placed our emphasis: the world real rate of interest, national productivity growth rates, and the after-tax reward to work relative to workers' nonwage support, such as the imputed income from their durables and their (or their relatives') social benefits.

Our Framework and 'Baseline' View of the Recoveries

For a framework we rely on our own models of the equilibrium timepath of structural unemployment in a small open economy.[14] These models build on well-known concepts. One is the *incentive wage*, i.e., the wage level required (at given unemployment rate) for minimizing costs. With each decrease of the unemployment rate, u, the incentive wage is increased, so the "wage curve" is rising with $1 - u$. Another concept is the *demand wage*, i.e., the wage level firms can afford to pay (at given unemployment rate) and make a *zero profit* (inclusive of any net capital gain) on any current hiring and other investing. As the unemployment rate decreases the demand wage decreases, since quitting, shirking, absenteeism etc. worsen with the tighter labor market, thus raising producers' costs; so the "zero-profit curve" is falling with $1 - u$.[15] Finally there are the *net investment equations* giving the rate of change of the stock of "trained" employees, tangible capital and customers. The valuation – the worth, or value per unit or "shadow price" – that firms place on each of these assets, q^N, q^K and q^X, drives the rate of investment in the asset. To be more

[14] See Phelps (1994) or Phelps (1988, 1990) and Hoon and Phelps (1992, 1996). Monetary versions of the three models developed were introduced by Fitoussi and Phelps (1988).

[15] The incentive wage increases with employment since, with unemployment lower, thus quitting and shirking more frequent, there is more to be gained (a greater reduction of quitting and shirking) from a given small pay increase. The demand wage decreases because, with employee performance worsened, employers cannot afford the same high wage as before.

accurate, each of the models determines the path of *u* along with the *ratios* of the wage and the asset valuation to the asset's current productivity. Investment in the asset is a function of its valuation *relative* to its current productivity.

In the very short run, a shock that shifts up the zero-profit curve or shifts down the wage curve induces an upward jump of q^N as a ratio to productivity.[16] The valuation of employees jumps relative to the opportunity cost of diverting employees to training new ones. Over the medium run, then, firms quicken their hiring and raise their wages to combat quitting, in both ways causing employment to rise faster or decline more slowly.

Two Baseline Unemployment Equations

Our past empirical tests of these structuralist ideas have viewed macro forces as acting upon the valuations of the various business assets in two ways: One way is through the cost of capital. The other way is through the profits on business assets and thus possibly expected future profits.

In the models, the long-term *gross* cost of capital is the domestic long-term expected real interest rate. The correct measure, as first emphasized by Pissarides, is the gross cost *net* of the expected long-term growth rate, *g*, of the productivity of labor.[17] In our model, the reciprocal of this (net) cost of capital is a reasonable trial proxy for the shadow price of a trained employee and of the other business assets, *given* the "level" from which the expected stream of profits from such an asset starts.[18]

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[16] For intertemporal equilibrium to be reestablished, the shadow price must increase by just enough to restore equality of the demand wage and the incentive wage. The size of the jump depends on the associated change in the expected capital gain per trained employee.

[17] The argument by Pissarides (1990) that the expected *g* enters into the capitalization of business assets was used in some theoretical exercises in Phelps (1994). Our empirical work began using *r** without *g* but we brought *g* in once we realized the importance of the productivity slowdown by for understanding the slump, especially on the Continent. See Hoon and Phelps (1997).

[18] The reciprocal gives the present discounted value of a stream of profits that starts at 1 and grows at constant rate *g*. If each trained employee produced that stream of gross profit, after

For econometric purposes our measure of the gross cost of capital is an external measure, the average long-term real interest rate in the G7 – dubbed the world real interest rate and denoted *r**. The path of the net cost of capital is juxtaposed against the path of the unemployment rate in each of the G7 countries *ex* Japan in Appendix A1. The increases in this variable between the early 1970s and the mid-1980s are huge, though not equal and synchronous, in every country and precede large increases in the national unemployment rate. It is thus plausible that the slowdowns in labor productivity and the elevation of world interest rates played a big role in the rise of unemployment to its 1980s peak.

One can also see a major turnaround of this variable in recent years, owing to higher domestic productivity growth as well as a somewhat lower *r**, in many of the OECD economies. The improved productivity performance in the 1990s may account for some part of the recovery in process in many of the OECD economies. Tables in Appendix A1 show the changes from period to period in the average rate of growth of the (Hodrick-Prescott smoothed) productivity of labor, defined as GDP per person employed, and the growth rates themselves. The productivity slowdown in the 1970s is evident in all of the countries. Yet the recent productivity speedup is very selective. Among the countries that have experienced a marked reduction of unemployment in the 1990s, Australia, Denmark, Ireland and New Zealand have also enjoyed a recovery in the rate of productivity growth and so has the U.S. when productivity is calculated from the recent GDP data revision; the Netherlands and the U.K., on the other hand, do not show a productivity speedup. Of the non-

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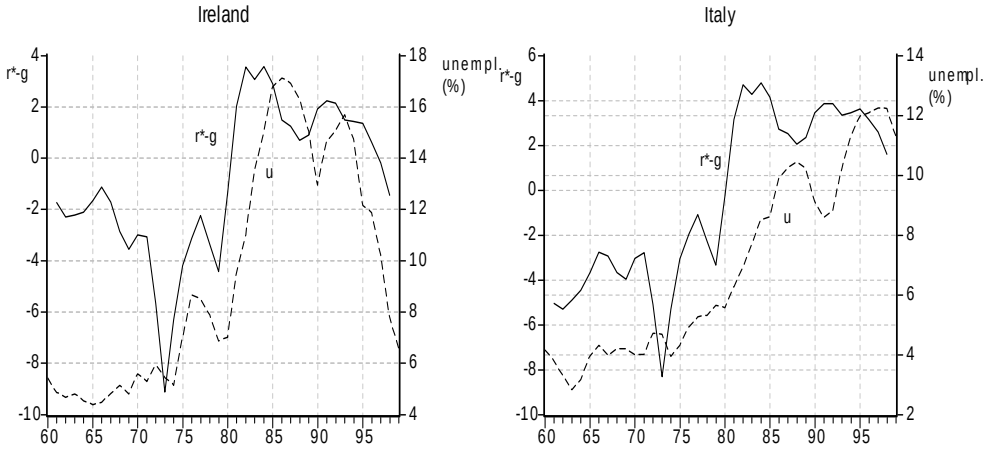
deducting the interest on the fixed capital and customers he will have to work with (given the current cost of capital), that reciprocal would indeed be the market value of such an employee.

recovering countries, only Norway has seen improvements in the rate of productivity growth. So, while surely no single causal variable would vary from country to country so as to account for the diverse experience of the OECD countries in the past decade, there is a tendency for improvements in employment and in productivity growth to coincide.

The differences in the evolution of productivity growth – hence the net cost of capital – across countries are significant. To illustrate these differences we show the data for one of the clearest success stories, Ireland, and compare them with those of Italy, where unemployment has been persistently high. In both countries the spectacular rise in the cost of capital in the late 1970s or early 1980 preceded a long climb of the unemployment rate. The recovery of the cost of capital to 1960s-early 1970s level in Ireland was followed by a good employment recovery though the partial recovery of capital costs in Italy was not.

Figure 1. Unemployment and the net cost of capital



The association between the unemployment rates and the cost of capital apparent in the two figures above is consistent with our theoretical

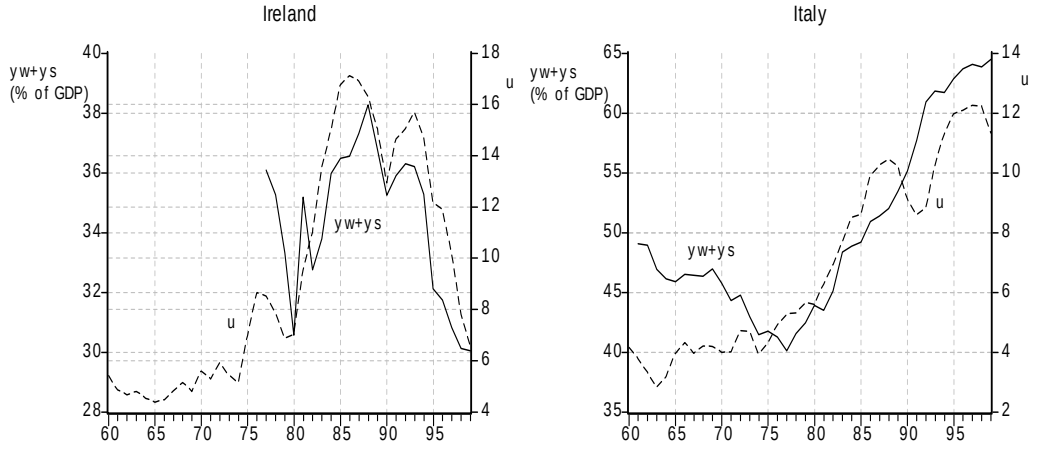
framework. We note that such an apparent association may be compatible with alternative models. What we have here is a failure to reject our own prior. Yet we believe that the strength of this association does warrant an explanation that any model of unemployment has to provide.

Clearly the cost of capital is not a sufficient explanatory variable. The value placed upon a trained employee and upon the other business assets depends on the "level" from which the expected stream of profits from such an asset starts, not just on the net cost of capital used to value the stream. So we require alongside the cost of capital one or more explanatory variables that impact on profitability through their influence on the zero-profit curve or the wage curve. One such variable in our models is workers' income (per worker) from wealth, private and social, *relative* to the reward to their work. The income from *social* wealth includes social insurance and social assistance benefits; that from *private* wealth includes the income not only from stocks and bonds issued by domestic firms but also consumer durables, national public debt, and net overseas assets. An increase in such income would increase quitting (shirking, absenteeism, etc.) at each unemployment rate, which would add to unit costs and thus reduce the valuation of employees, which would slow firms'hiring and thus the growth of employment. Similarly, a decrease of productivity or an increase of tax rates on labor, in increasing the incomes from wealth *relative* to after-tax pay, would exacerbate quitting etc. and thus lower employee valuations. (Thus productivity level and tax rates on labor matter for unemployment *through* their effect on the after-tax wage relative to the income and services from workers' wealth.[19]) The effect of this income-to-net-pay variable on the unemployment rate may be captured by introducing as a surrogate the total level of nonwage income and

benefits per worker as a *ratio* to the productivity of labor *multiplied* by the ratio of before-tax to after-tax wage – a compound variable we call *normalized nonwage support*.[20] The other of these profitability variables that we have used is the world real price of energy, though we will not pause to discuss that variable.

Appendices A2 and A3 show, respectively, the evolution of income from private wealth and social spending juxtaposed with the unemployment rate in the G7 *ex* Japan. As may be seen, the movement is far from identical from country to country. Yet there is a tendency over these countries for normalized nonwage support to show a cumulative rise starting in the middle of the 1970s and continuing for many years. In those countries where productivity accelerates in the 1990s, however, there is a tendency for the variable sooner or later to descend. Again, we show the data for Ireland and Italy. The Irish data, which begin in 1977, show a downward trend in recent years while in Italy there is no such trend visible in recent years.

Figure 2. Unemployment and nonwage support



[19] The econometric formulation here leaves open the possibility that in the long run wealth will have adjusted so as to restore the after-tax wage-to-wealth ratio to some long-run level that is independent of tax rates and of the cumulative labor augmentation from past technical progress.
[20] The derivation is laid out in Appendix B1.

Our previous work estimated equations explaining *either* the normalized increase of employment *or* the level of the unemployment rate, with the lagged unemployment rate always among the explanatory variables. Equation (1) is a stripped-down version of a typical example of these equations, re-estimated here with the observations of the 1990s and using a 19 country OECD sample for the period 1960-1998.[21]:

$$u_{it} = \alpha_i + \mu_i u_{it-1} + \phi_i^1 r_t^* + \phi_i^2 g_{it} + \phi_i^3 p_t^* + \phi_i^4 \tilde{y}^w \frac{1+t^p}{1-t^d} + \gamma_i \Delta\pi + \varepsilon_{it} \qquad (1)$$

Here u is the rate of unemployment, r^* is the world real rate of interest (see Appendix A1), g is the (smoothed) rate of change of labor productivity,[22] p^* is the real price of oil, y^w is the ratio of nonwage income to labor productivity, t^d is the rate of direct household taxes, t^p the rate of payroll taxes, and π is the rate of inflation (measured by the GDP deflator).[23]

Note that as an effort to control for "effective-demand" shocks we include the change in the rate of inflation, following Layard et al.[24] The idea is that if unemployment changes because of movements in aggregate demand, this is likely to be reflected by an increase in the rate of price inflation. The inclusion of the inflation-shock term may thus clean away such business-cycle movements, leaving what are changes in the natural rate to be explained by the remaining regressors.

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[21] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, U.K. and U.S.

[22] This is a Hodrick-Prescott-smoothed rate of change of labor productivity defined as real GDP per employed worker.

[23] We include a dummy variable for Finland and Germany in the 1990s – both countries experienced shocks due to the disintegration of the Soviet block – and Portugal in the late 1960s when an immigration wave temporarily raised unemployment. Yet our stripped-down baseline regressions cannot track satisfactorily the Portuguese unemployment rate.

[24] Layard et al. (1991) and Phelps (1994).

We first estimate equation (1) for each country separately without imposing any cross-country restrictions.[25] This is important to do because once we start constraining coefficients to take the same value across countries the possibility arises that a significant relationship for some of the countries creates the illusion of a sample-wide relationship, i.e. if we have one group of countries where our equation fits and another where it does not fit, the panel estimation may yield significant results only due to the inclusion of the former group of countries. The results are shown in Appendix A4. The coefficients of the interest rate ϕ_1 and oil prices ϕ_3 are generally positive while those of productivity growth ϕ_2 and the inflation term γ tend to be negative. However, the coefficient of nonwage income does not have the same consistent pattern.

We now impose cross-country restrictions. We make ϕ^1, $\phi^{2,}$, ϕ^3 and ϕ^4 have identical values across countries up to a factor of proportionality, θ_i; so that their ratios to one another are the same in all countries:

$$u_{it} = \alpha_i + \lambda_i u_{it-1} + \theta_i \left(\phi^1 r_t^* + \phi^2 g_{it} + \phi^3 p_t^* + y_t^w \frac{1+t^p}{1-t^t} \right) + \gamma_i \Delta\pi + \varepsilon_{it} \qquad (2)$$

The idea behind this restriction is that the differences in the effect of shocks across countries lie largely in the degree of real-wage rigidity, which can be captured by the parameter θ.

In light of the weak performance of the nonwage-productivity-tax variable, we estimate four versions of the equation separately. We first omit nonwage income entirely in the first column of Table 1 and then add it in the second column. We then add a comparable variable that measures the level of social

[25] We include a dummy variable for Finland and Germany in the 1990s and Portugal in the second half of the 1970s.

spending or transfers per worker (y^s) also normalized by productivity and then add the two together in the last column.

Table 1. Estimation Results for Equation (2)

	(1)		(2)		(3)		(4)	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
r^*	4.66**	2.03	7.05**	2.30	5.74**	2.28	7.52**	2.53
g	-21.82**	2.22	-33.61**	2.35	-17.19**	1.93	-26.55**	2.43
p^*	2.36**	2.60	2.16**	2.61	2.90**	3.14	2.38**	2.96
$y^w(1+t^p)/(1-t^d)$			1.07	0.82				
$y^s(1+t^p)/(1-t^d)$					2.98**	2.36		
$(y^w+y^s)(1+t^p)/(1-t^d)$							0.66	0.94

Note: ** significant at 5% level, * significant at 10% level.

The coefficients of interest rates, productivity growth and oil prices are all correctly signed and significant. Also, they are all robust to the inclusion of other possible variables and the choice of specification. The nonwage private income variable is less significant: Adding it does not affect the three coefficients and its own coefficient is not significant. However the social benefits variable performs better. Evidently the nonwage-income variable may not be among the movers and shakers of unemployment in the period under consideration, though it would seem risky to disregard its rise over the postwar period.

We also tried using the difference between long-run and short-run nominal interest rates – that is the slope of the yield curve – as a measure of monetary shocks. We expected that when short rates exceeded long rates, monetary

policy was expansionary and unemployment high but falling. We would on this count expect a negative coefficient. Looking at the results for the 19 countries, this turned out to be so on average. When the coefficient of the interest rate variable was constrained to take the same value for all countries its t-ratio was 10.34. That of the inflation-shock term was 4.35.

Table 2 reports for the column (1) benchmark equation the estimates of our fixed effects α_i, the sensitivity coefficients θ_i and the persistence parameters λ_i, in addition to the coefficient of the inflation shock γ_i.

Table 2. Further Estimation Results for Equation (2)

Country	α_i	λ_i	θ_i	γ_i	Country	α_I	λ_i	θ_i	γ_i
Australia	0.82	0.83	1.00	-5.55	Japan	0.24	0.92	0.09	-2.22
	(2.33)	(13.57)		(0.63)		(1.72)	(15.02)	(1.49)	(2.20)
Austria	0.25	0.95	0.30	-6.29	Netherl.	1.44	0.67	1.20	-18.61
	(2.12)	(36.05)	(2.16)	(1.94)		(3.10)	(8.12)	(1.98)	(1.42)
Belgium	1.52	0.81	1.54	-3.35	New Zeal.	0.58	0.91	0.61	-1.25
	(3.00)	(16.88)	(2.28)	(0.58)		(2.19)	(19.47)	(1.76)	(0.52)
Canada	1.90	0.69	1.33	-18.92	Norway	0.52	0.87	0.34	-6.99
	(3.51)	(9.13)	(2.11)	(1.80)		(2.17)	(15.16)	(1.49)	(1.68)
Denmark	0.84	0.83	1.06	-8.88	Portugal	1.09	0.85	0.06	-3.10
	(2.56)	(15.33)	(1.84)	(0.93)		(1.51)	(8.73)	(0.19)	(0.63)
Finland	1.62	0.58	0.87	-8.11	Spain	2.38	0.84	1.69	-11.06
	(4.22)	(7.91)	(1.69)	(1.02)		(3.56)	(22.72)	(2.19)	(1.33)
France	0.86	0.91	0.63	-2.69	Sweden	0.35	0.92	0.25	-3.76
	(3.37)	(30.73)	(1.99)	(0.51)		(1.57)	(15.51)	(1.06)	(0.68)
Germany	0.78	0.81	0.77	-20.18	U.K.	1.49	0.68	2.42	-3.44
	(3.40)	(17.75)	(2.15)	(2.40)		(3.10)	(12.09)	(2.42)	(0.72)
Ireland	1.81	0.85	1.88	-1.29	U.S.	2.62	0.49	1.08	-19.12
	(2.84)	(20.75)	(2.30)	(0.21)		(4.08)	(4.32)	(2.02)	(1.76)
Italy	0.62	0.94	0.32	-8.07					
	(2.50)	(29.88)	(1.64)	(2.30)					

Note: t-ratios in parentheses.

We note that many of the "success" economies are high-sensitivity/low persistence ones: the UK ($\theta = 2.42$, $\lambda = 0.68$), the Netherlands ($\theta = 1.20$, $\lambda = 0.67$) and the US ($\theta = 1.08$, $\lambda = 0.49$).

Going back to Tables 1 and 2 we now quanify the relationship between unemployment, real interest rates and the rate of productivity growth. The table below shows both the instantaneous effect and the steady-state effect of a rise in r^* of 5 percentage points -- that is a 500 basis point increase – and a fall in the rate of trend productivity growth by 3 percentage points – a 300 basis point decrease – for a sample of the countries. Our world real interest rate variable rose by 5 percentage points between the 1970s and 1980s while a slowdown in the rate of productivity growth between 2 and 3 percentage points was not uncommon between the average of the 1960s and the average of the 1970s.

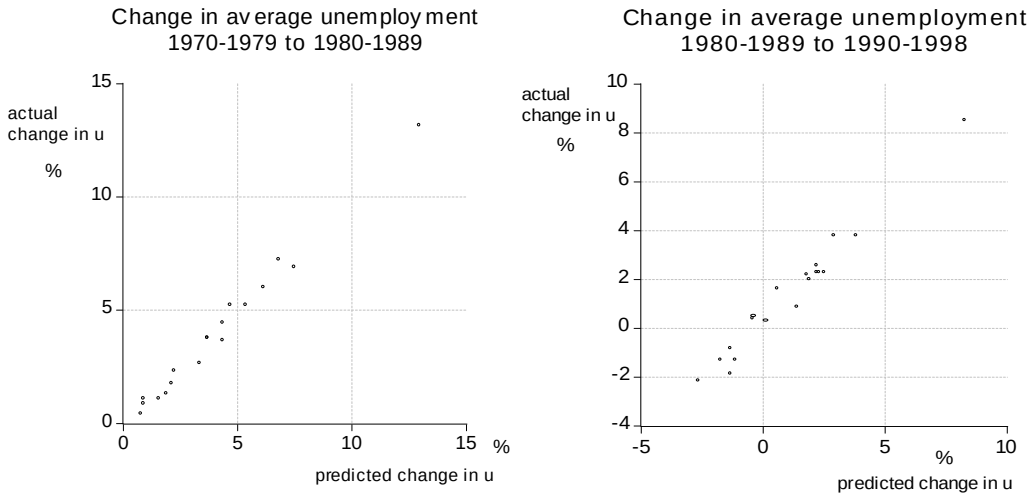
Table 3. Effect of interest rates and productivity growth on unemployment.

		Δu measured in percentages				
		France	Germany	Italy	U.K.	U.S.
$\Delta r^* = 5\%$	current effect	0.23	0.29	0.09	1.03	0.54
	steady-state effect	2.91	1.50	2.16	3.12	0.98
$\Delta g = -3\%$	current effect	0.49	0.61	0.18	2.18	1.15
	steady-state effect	6.17	3.19	4.58	6.61	2.09

Both the instantaneous and the steady-state effects differ between the countries. The magnitude of the interest rate effects is in the same ballpark as recent estimates by Blanchard (2000) while the effect of growth appears substantially higher. Taken together a simultaneous rise in r^* and fall in g can account for a large part of the elevation of average unemployment between the 1960s and 1980s. The figure below shows the actual change in average unemployment between recent decades plotted against the fitted change from

equation (2). The fit is quite good.

Figure 3. Actual and Predicted changes in unemployment between decades



Explaining Differences across Countries: Shocks versus Institutions

In our baseline regression, we have estimated the value of the sensitivity coefficient (θ) as well as the country-specific fixed effects (α) and the persistence parameter (λ) in equation (2). We now look to the institutional structure of these countries to explain the differences in the three parameters across the countries. But note that the parameters only affect the way the unemployment rate responds to macroeconomic shocks.

Layard and coauthors hypothesized that unemployment differences across countries could be attributed to differences in the level of the replacement ratio (*re*), the duration of unemployment benefits (*dur*), union coverage (*uncov*) and –density (*unden*), union- (*uncord*) and employer coordination (*emcord*), active labor-market expenditures (*labexp*) and an index of employment protection (*epl*).[26] We find that these variables explain 55% and 56% of the variation of the α and θ coefficients respectively while

not contributing to our understanding of the persistence parameter λ.

Table 4. Parameters Explained

Variable	$\hat{\alpha}_i$	$\hat{\theta}_i$	$\hat{\lambda}_i$
Constant	-0.16 (0.26)	0.58 (0.77)	0.97 (5.38)
re	0.02 (1.97)	0.01 (0.70)	-0.00 (1.69)
dur	-0.18 (1.24)	0.19 (1.45)	0.02 (0.52)
unden	0.01 (1.84)	0.02 (2.57)	-0.00 (1.95)
uncord	-1.29 (4.52)	-0.76 (2.42)	0.23 (2.50)
empcord	-0.07 (0.29)	-0.05 (0.17)	-0.01 (0.10)
uncov	1.09 (2.62)	0.08 (0.19)	-0.06 (0.55)
labexp	0.00 (0.42)	-0.02 (2.47)	0.00 (1.46)
epl	-0.03 (0.17)	0.13 (0.74)	-0.05 (1.13)
R^2	0.75	0.76	0.49
$\overline{R}^2$	0.55	0.56	0.08

Note: t-ratios in parentheses. ** significant at 5% level.
* significant at 10% level.

The fixed effects (α) are a positive function of the replacement ratio, union coverage and –density, and a negative function of union- and employer coordination. These coefficients are all statistically significant

[26] Layard et al. (1991). See also Nickell (1998) from which our data come.

apart from the coefficient of employer coordination. The sensitivity to shocks (θ) is a positive function of the replacement ratio, the duration of benefits and union density, but a negative function of the coordination variables and labor-market expenditures. Finally, the labour-market variables cannot explain the variation in the persistence parameter λ.

We conclude that the sign of each significant variable for α and θ is as expected from a reading of Elmeskov, Layard et al and Nickell.[27] These results confirm the significant effect of labor-market institutions on medium-term unemployment changes. But it may not be the institutions themselves that are a cause of the unemployment problem but an unfortunate combination of labor-demand shocks and institutions.

Can the baseline equation account for the diversity of recent experience?

The question now arises whether our simple benchmark equation (2) explains, without the benefit of new ideas, the diverse experience of OECD countries in the 1990s. To assess this, we estimated equation (2) for the period 1960-1991 and then did out-of-sample simulations and compared these with the actual evolution of unemployment during the period 1992-1998. The following table classifies the 19 countries in our sample according to whether the difference between the actual and the predicted unemployment rate was less than 1.5 points in 1998.

[27] Elmeskov et al (1998), Layard et al (1991) and Nickell (1998).

Table 5. Out-of-sample simulations: actual minus predicted unemployment in 1998

Lower than expected	As expected	Higher than expected
Finland (-3.88)	Austria (0.82)	Australia (2.14)
Ireland (-4.04)	Denmark (0.12)	Belgium (5.34)
New Zealand (-1.99)	Canada (1.17)	France (3.63)
Norway (-3.22)	Japan (1.47)	Germany (3.91)
United States (-1.56)	Netherlands (-0.69)	Italy (3.67)
	U.K. (1.10)	Portugal (2.10)
		Spain (5.93)
		Sweden (4.49)

Note: Numerical difference between actual and predicted unemployment in parentheses.

In the U.S. case, unemployment was 1.56 percentage points lower in 1998 than expected so the recent descent is not fully accounted for. When looking at recent years, Ireland has done better than what we would have expected from our model while Denmark and the Netherlands have done about as well as we could have expected and Australia and the UK somewhat worse. On the continent, France, Germany, Italy and Spain all have done worse.

The basic question addressed in this paper is what accounts for the cross-country differences in the evolution of unemployment in the 1990s. We consider three possible types of explanations.

- First, there is the appeal to labor-market reforms by the OECD secretariat and to budgetary policy by the U.S. Treasury. These views would credit the strong reduction of unemployment in some countries to policy reforms instead of private-sector market forces.
- There is the New Keynesian view that cyclical downturns have a persistent effect on unemployment through some form of hysteresis and the Anti-Inflationist view countries reduced their equilibrium unemployment path by conquering their inflation.

- Finally, deriving from our own models' property that employment depends on the level of asset valuations, there is the empirical hypothesis that a stock-market index or market capitalization series provides a proxy for those asset valuations that play a pivotal role in employment growth. The predictions of this hypothesis are compared with the data in the last section.

Labor-Market- and Budgetary Reforms

A careful study by the OECD Secretariat has identified "success stories" and failures in the implementation of its recommendations.[28] The recommendations involve measures to reduce or eliminate labor- and product-market restrictions and regulations, to increase spending on active labor-market programs and to reduce the duration of benefits. The records deemed successes by the OECD are Australia, Denmark, Ireland, the Netherlands, New Zealand and the U.K.

Two recent papers describe some of these changes.[29]

- Apart from Australia, all of these countries either kept unchanged or reduced the generosity of the unemployment-benefit system in the 1990s. Yet, we must add, France, Finland, Germany, Spain and Sweden, all countries usually not counted among the success stories, did the same. Spain came later.
- Denmark, Ireland and the Netherlands also spent more than the OECD average on active labor-market programs and increased this spending in the 1990s.
- The six countries reduced the labor-tax wedge in the 1990s.[30]

[28] Elmeskov, Martin and Scarpetta (1998).
[29] Scarpetta (1996) and Elmeskov et al. (1998).

- Union power was reduced in the U.K. in the 1980s, and in New Zealand in the 1990s. Moves towards decentralization of wage bargaining were made in Australia and in Denmark. The government started greater coordination with unions and employers in Ireland and the Netherlands.
- Employment-protection legislation (EPL) has been relaxed in Australia, the Netherlands and the U.K.

We can point to several other significant "institutional" reforms in the 1990s: the gradual reduction of the minimum wage in the U.S.; the increase in the size and coverage of U.S. EITC, the increasing exemption of low incomes from income tax and the massive subsidies for wage supplements or for training in the Netherlands, France and the U.S. While the importance of labor-market institutions is almost universally accepted, it is also widely believed – certainly by us – that the shocks that pushed the equilibrium unemployment path to higher and higher tracks in the 1970s and 1980s were mostly of a different nature.[31] A previous section indicated the ones we have emphasized in past work. Most of the six labor-market institutions in the OECD set – all but labor taxation – may have played a role in propagating shocks rather than originating them, since they had their origins well before the rise, beginning in the mid-1970s, in unemployment rates.[32] In view of the past influence of market forces – productivity growth and the rest – we think that exclusive reliance on institutional change as an explanation of recent developments is premature.

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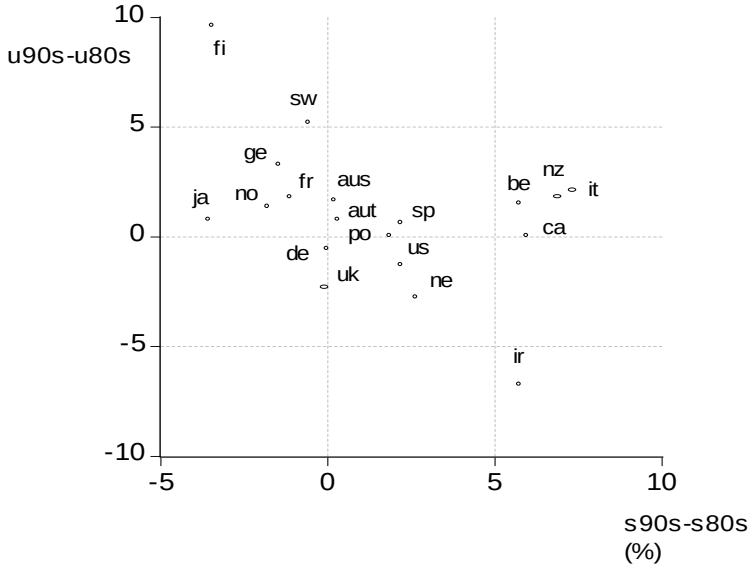
[30] The tax wedge was reduced by more than 5% in the U.K., Ireland and New Zealand and by almost 8% in the Netherlands (Elmeskov et al. (1998)).

[31] See Fitoussi and Phelps, 1988; Phelps, 1994; Phelps and Zoega, 1997, 1998; Blanchard, 1999.

[32] See Krugman (1994) on this point.

Turning to budgetary reforms, there is the Rubin-Summers thesis that an economic policy of ending budgetary deficits and retiring public debt drives down the equilibrium unemployment rate path by lowering national real interest rates and lifting investor confidence. Figure 4 shows the change in average unemployment plotted against the change in the average structural budget surplus *s* calculated by the OECD (Source: Economic Outlook).

Figure 4. Changes in structural budget surpluses and unemployment



A weak negative relationship is apparent, implying that an increase in structural surpluses coincides with a fall in average unemployment.

There are two subjects to be discussed. First, there are the differences across countries in labor-market performance. Second, there are the variations in average unemployment in any given country between decades and half-decades. We have already addressed the first issue from our own perspective. Here we have to check specifically whether

institutional reform can account for differences in the evolution of unemployment across countries.

We estimate an equation explaining changes in the average rate of unemployment by changes in the institutional variables – that is, labor-market- and budgetary reforms – and the macroeconomic shocks from our three country-specific market-forces – productivity growth, nonwage income and social spending. Is it changes in the institutions themselves that explain the evolution of unemployment or is it country-specific macroeconomic shocks that do the work? We have also emphasized the possibility that global shocks – such as the oil-price increases and changes in world real interest rates – have different impacts across countries due to the interaction of shocks and institutions.

Note that our approach differs from that of Scarpetta and of Elmeskov et al.(1998) in that they use a panel of countries in which the institutional variables explain mainly the cross-sectional variation in unemployment. They do not test whether observed changes in average unemployment can be accounted for by changes in labor-market institutions as opposed to macroeconomic variables. To repeat, it is possible that the institutions have mainly been important in determining the impact of global shocks rather than being the forcing variables.

The equation we estimate initially attempts to explain variation in the change in unemployment between the periods 1980-1989 and 1990-1998 across the 19 OECD countries by changes in the institutional variables alone. These include; the replacement ratio, the duration of benefits, union density, and -coverage, union- and employer coordination, labor-market spending and employment-protection legislation. The results are shown in the first column of Table 6.

Table 6. Reforms versus Macroeconomic Shocks

	Reforms		*Macroeconomic shocks*			
	Institutions	*Structural budget surplus*	*Nonwage income*	*Social spending*	*Growth*	*Fitted value from baseline regression*
c	2.42**	2.55	2.24**	1.12*	2.32**	0.12
	(2.13)	(2.16)	(2.20)	(1.91)	(2.11)	(0.40)
u(80-89)	-0.20	-0.18	-0.12	0.06	-0.10	0.04
	(1.17)	(1.21)	(0.83)	(0.69)	(0.62)	(1.46)
Δre	-0.20		-0.18	-0.23**	-0.19	0.00
	(1.02)		(1.52)	(3.16)	(1.53)	(0.12)
Δdur	0.61					
	(0.72)					
$\Delta unden$	0.13		0.14	0.66**	0.17**	0.02
	(1.00)		(1.35)	(4.67)	(2.01)	(1.48)
$\Delta uncord$	-5.53**		-3.42**	-0.93	-3.32**	1.13
	(4.17)		(2.09)	(0.71)	(2.07)	(1.82)
$\Delta emcord$	5.25		5.59**	6.05**	5.75**	-0.02
	(1.40)		(2.60)	(3.24)	(2.67)	(0.04)
$\Delta labexp$	-0.01					
	(0.07)					
$\Delta uncov$	0.76		2.91**	0.19	1.73	-0.61**
	(0.50)		(3.85)	(0.17)	(1.42)	(2.70)
Δepl	-0.72					
	(0.42)					
Δs		-0.87	-0.39	-0.09	-0.31	0.08
		(2.32)	(1.09)	(0.23)	(0.64)	(0.96)
Δs^2		0.13	0.04	-0.05	0.01	-0.02
		(2.02)	(0.64)	(1.16)	(0.12)	(1.40)
Δy^w			29.76			
			(1.46)			
Δy^s				21.33*		
				(1.93)		
Δg					-1.11	
					(0.01)	
$\Delta \hat{u}$						0.94**
						(15.71)
R^2	0.73	0.34	0.79	0.94	0.75	0.99
$\overline{R}^2$	0.45	0.20	0.58	0.85	0.49	0.97

Note: t-ratios in parentheses. ** significant at 5% level, * significant at 10% level.

We find that an increase in union coordination tends to decrease unemployment. However, this result stems only from a fall in union

coordination in Finland (which experienced a rise of unemployment). All other variables describing labor-market reforms have either insignificant or incorrectly-signed coefficients, or both.

We then include the average structural budget surplus *s* as a ratio of GDP – column three – and include a squared term to capture the nonlinearity apparent in Figure 4. Both coefficients are statistically significant. However, this variable on its own does not explain more than 30% of the variation in the data.

Next we test for the effect of macroeconomic shocks and report the results in columns 4-6 in Table 6. We first add the change in normalized nonwage income y^W and social spending y^S while omitting the least significant among the institutional variables. An increase in the level of nonwage income is associated with an increase in the unemployment rate and its coefficient. The social-spending variable has a positive and more significant coefficient. The increase in the ratio of social-security outlays to GDP ranged between 5% and 15% in the sample. We then add the growth rate of (trend) labor productivity.[33] This is the same variable as used in equations (1) and (2). The question is whether this variable can help account for differences in the evolution of unemployment across the countries. While the coefficients of other variables do not change much, the coefficient of the productivity growth variable is correctly signed but statistically insignificant. Looking at these three columns we are lead to believe that variation in the macroeconomic shocks cannot explain the

[33] It is possible that differences in productivity growth reflect differences in the pace of labor-market reforms. To test this we estimated an equation similar to the one above where the dependent variable was the change in the average rate of productivity and the right-hand side variables were the change in the same institutional variables as above. None of the regressors had a significant coefficient. We then included the institutional variables in levels and that regression was also not significant.

variation in the evolution of unemployment without taking into account differences in the way the economies respond to such shocks, i.e. institutional differences.

What remains is to quantify the effect of global shocks acting *differently* on the respective countries due to differences in their sensitivity, θ_i, to such common shocks. Our estimation results for equation (2) demonstrate the potency of the interplay of institutions and shocks and demonstrate that these interactive effects can potentially explain the differences in the evolution of unemployment across countries. We now add the fitted unemployment rate from our baseline equation (2) that takes into account the interplay of shocks and institutions. The results are reported in the last column of Table 6. The inclusion of this variable renders others insignificant while explaining almost all the variation in the data.

We conclude that the institutional reforms in the OECD proposal can only be a small part of the story. In several countries the equilibrium unemployment has fallen in the absence of net reform in our estimation while in others the net reform has not apparently affected equilibrium unemployment significantly. The Rubin-Summers thesis fares better, as our simple correlations indicated.

Monetary Theses

In this section the first hypothesis examined is that tight-money policy in France, Italy and some other aspirants to EMU membership operated to keep employment down, far below its structuralist-equilibrium path. This could explain why unemployment was higher in 1998 than what our baseline equation predicted in France, Germany, Italy and Spain. The idea

is that countries that try to defend the value of their currencies by raising their interest rates would suffer an additional rise in unemployment. We first tested for this by adding the difference between the domestic and the world real rate of interest to equation (2). The coefficient of this variable was found to be marginally significant for France (t = 1.2) but insignificant for the other countries. We realize that this finding may not constitute conclusive evidence against this hypothesis, only evidence that the difference between the world (really the G7 ex Japan) and the domestic real interest rate was not significant in equation (2).

We then consider the change in the average long-term real interest rate between the periods 1980-1989 and 1990-1998. When the change in average unemployment is regressed against a constant term and the change in average real interest rates for the 19 countries in our sample the result is

$$\hat{u}_{9098} - \hat{u}_{8089} = \underset{(1.87)}{1.00} + \underset{(2.32)}{1.01}\left(r_{9098} - r_{8089}\right).$$

This equation explains around 25% of the variation in the change in the unemployment rate. We next add the change in the average domestic real rate of interest to the equation of Table 6 (after omitting all insignificant variables) and show in Table 7 that this is significant at the 10% level.

Table 7. Institutions and monetary policy

	Real interest rates	*Nominal interest rates*	*Inflation*	*Inflation shock*	*Yield curve*
c	2.39**	1.72	1.86	2.17*	1.93
	(3.15)	(1.23)	(1.60)	(1.88)	(1.70)
u_{8089}	-0.07	-0.09	-0.15	-0.11	-0.07
	(0.60)	(0.67)	(1.10)	(0.73)	(0.59)
Δre	-0.05	-0.10	-0.14	-0.21	-0.09
	(0.41)	(0.84)	(1.29)	(1.45)	(0.85)

$\Delta unden$	0.30**	0.23**	0.26**	0.19**	0.20**
	(4.09)	(3.09)	(2.43)	(2.07)	(2.30)
$\Delta uncord$	-3.84**	-5.22**	-4.45**	-4.11**	-5.12**
	(2.26)	(3.53)	(3.13)	(2.71)	(4.81)
$\Delta emcord$	1.76	3.75*	4.26**	6.18*	3.33
	(0.78)	(1.73)	(2.19)	(1.89)	(1.56)
$\Delta uncov$	1.10**	1.14	0.70	0.53	1.40**
	(1.94)	(1.64)	(0.90)	(0.44)	(1.99)
Δr^l	0.71**				
	(2.51)				
Δi^s		-0.11			
		(0.46)			
$\Delta\pi$			-22.78		
			(1.24)		
$\Delta^2\pi$				-111.45	
				(0.63)	
$\Delta(i^l-i^s)$					0.18
					(0.96)
R^2	0.79	0.73	0.73	0.71	0.73
$\overline{R}^2$	0.64	0.53	0.56	0.53	0.54

** significant at 5% level, * significant at 10% level.

From this we can conclude that there is some evidence – although by no means conclusive – that differences in the evolution of monetary policy across the countries can explain the bad performance of the continental countries. We next replaced the change in the real rate by the change in the average (short-term) nominal rate of interest for the 19 countries. This variable has an insignificant coefficient that is incorrectly signed.

We next turn to the thesis of Ball that the years of monetary tightness occurring in some OECD economies in the early or mid-1990s elevated the equilibrium unemployment rate to a higher track. But if this is so, the nominal interest rate variable in Table 7 would have turned out with a positive and significant coefficient.

In columns 4-6 we perform further tests. We add the change in average inflation between the two periods, then the change in the first difference of inflation and finally the change in the average slope of the

yield curve. None of these three variables had a statistically significant coefficient.

We also allowed the effect of the inflation-shock variable on unemployment to depend on the rate of inflation by including interaction terms in equation (2). The theory is the New Keynesian one that, with low rates of inflation, wage and price contracts tend to be longer so there is more nominal-wage stickiness, which makes the effect of demand shocks greater. However, we did not find any evidence for this in the data.

In our tentative analysis, then, it remains a tenable hypothesis that monetary policy in Continental Europe caused unemployment to exceed its natural path over most of the 1990s – for reasons having to do with the run-up to the EMU, the Maastrict Treaty, and the tight money instituted by the Bundesbank to offset German unification expenditures. But the evidence is not conclusive. Moreover, the tight money episode, however important its influence may have been, appears to be over. Germany and most of the economies tied closely to it, such as France, Belgium, Italy and Spain, no longer have comparatively high short-term real rates of interest; the rates in Ireland, Holland, Finland, the UK and Portugal are appreciably higher, some markedly so.[34] Correspondingly, in the former countries the unemployment rate has tended to recede, mostly in 1998-99, to its level in the early 1990s – in France, for example, to 10.6, last seen in 1992. And inflation rates have stopped falling. So it is doubtful that monetary policy over the whole decade still plays a part in the failure of unemployment rates in these countries to recover more strongly.

To sum up at this stage: In our analysis, the variation across OECD members in the fall of unemployment is not adequately accounted for by

the cross-country variation in the pace of labor-market reform and the cross-country variation in inflation-rate and nominal-interest-rate changes. To explain the variation in the unemployment data found in the 1990s – to understand why unemployment has, for example, fallen so much in Ireland and the US while remaining so high in Italy and France – therefore requires adding at least one other causal force to the account. We turn now to our own proposed hypothesis.

The Jobs Impact of the 'New Economy' via Asset Prices

In this section we begin by arguing that the prospect of a "new economy" – a prospect closer at hand in some OECD countries than in others – offers in theory a possible explanation of the uneven structural recoveries in the 1990s. We then compare the predictions of this argument with a variety of evidence.

The thesis goes roughly as follows. In virtually every OECD country, expectations of a large step-up in productivity and thus the profit per unit on various business assets have been created by the recent advances in information and communications technologies. The prospect of a world in which most firms and persons can access the Internet from computers, mobile phones and television has stimulated expectations of new opportunities for profitable investment, including investment in new employees – though these opportunities are seen as more imminent in some countries than in others. Where this prospect appears to be relatively near, as in the U.S., there has been a galvanizing effect among

[34] See the convenient table in the Financial Times, June 12, 1999.

telecommunications firms and among equipment manufacturers, service providers, and content producers for the Internet. The consequent rise in financial wealth occurring in this sector has had the knock-on effect of driving up home construction and other investment in other consumer durables. So the economy appears to have all the trappings of a general investment boom. We would comment that the expectation of any other anticipated development boosting expected profitability at some time in the future – globalization, biogenetics, whatever – would serve as well. (Of course, to the extent the expectation comes to be seen as exaggerated and is therefore revised down, the boom will be scaled back. But it is the expectation that matters, as long as it lasts.)

This confidence-driven investment boom, our thesis continues, has the effect of creating jobs and pulling up (real) wages. The mechanism from the expected future leap of profitability to a boom in the labor market involves valuations of business assets. The transmission of the boom from business-asset markets to the labor market is tailor-made for our kind of structuralist model – not that our models are likely to be only ones to portray confidence in the future as sparking an inflation-free boom.

Although employee incentives are the heart of these incentive-wage models' generation of unemployment (without them there would be no unemployment), our models also have a brain – the expectation of forward-looking, value-maximizing firms, which drives the real valuations of business assets, which in turn impact on the rates of investment in these assets and ultimately on the equilibrium (i.e., correct-expectations) path of employment. In these models, an anticipated one-

time jump of productivity precipitates an immediate jump of asset values in anticipation of their greater returns (rents) once productivity has increased and these revaluations lead immediately to rising employment in the near term as well as a lift in real wages. (Obviously the value that managers rationally place on each employee having the requisite familiarization and orientation to the workings and objectives, known as firm-specific training, is one of these revaluations and an important one, but the argument does not absolutely require that, the other asset revaluations may very well affect positively the demand for labor.)

A stylized description of the effects of the future productivity shock under discussion is provided by the turnover-training model, which focuses exclusively on the intellectual capital that firms invest in their workforce and supposes for simplicity that all the firms in the model's open economy are in the same industry. Figure 4 describes how the expectation of a single future jump in the marginal and average value-productivity of employees translates into an anticipatory jump in the valuation of the prepared employee. Importantly, employment is related here to the asset price *normalized* by productivity.[35] The reason is that hiring depends on the *ratio* of the asset price, q^N, to productivity, $\Lambda\varphi$; so, indirectly, does quitting.[36] In the diagram, the Asset Price Curve depicts how, if it were stationary, the ratio of asset price to productivity ($q^N/\Lambda\varphi$) would depend on the tightness of the labor market ($1 - u$) and the Employment Curve depicts how, if it were stationary, the level of $1 - u$ would depend on

[35] The valuation of a prepared employee is normalized by the productivity of workers on the production line *gross* of the interest and depreciation on the equipment used, since employees moving from production to training are assumed to need an unchanged assortment of equipment.

$q^N/\Lambda\varphi$. The steady-state rest point is at the curves' intersection.[37] With the diagram we can describe precisely the equilibrium scenario is following the newfound expectation of a future increase of productivity. Starting from the rest point, $q^N/\Lambda\varphi$ must jump up in anticipation of the increased q^N following the future increase in productivity. Thereupon both $q^N/\Lambda\varphi$ and $1 - u$ must be rising, as hiring is up and quitting is down owing to the rise of q^N relative to $\Lambda\varphi$ – althought the ensuing although the ensuing labor-market tightening will be operating to attenuate those two effects. When the great day arrives, $q^N/\Lambda\varphi$ must jump down since Λ jumps up and q^N does not jump. After that q^N continues to rise, gradually regaining its former proportionality with Λ. In this aftermath, employment recedes back to its steady-state level, since q^N in this phase is depressed relative to productivity.[38]

FIGURE 4

It is important to add that the positive impact of expected future profitability on the valuation of (non-tradable) capital good, such as office and factory space, are also expansionary.[39]

An ideal test of these structuralist models would estimate how the

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[36] Given the nonwage income relative to productivity, quitting is a function of the wage relative to productivity, which wage setting makes a function of asset valuation relative to productivity.

[37] Appendix B2 provides information on the structure of the model, the slopes of the two curves and the dynamics of the system. Or see Hoon and Phelps (1992, 1996) and Phelps (1994).

[38] Another sort of shock is the sudden increase in the expected and actual *growth rate* of productivity. That kind of shock is not relied on here to motivate introduction of asset prices since it were the only kind occurring we would expect that our measured productivity growth variable would suffice to pick up the workings of this expectation. (For the record, such a shock shifts up the Asset Price curve. Thus it lifts up the downward-sloping equilibrium approach-path governing employment and the normalized asset value. In the equilibrium scenario, starting from the rest point, $q^N/\Lambda\varphi$, overshoots, subsequently giving up some of its gain along the path to the rest point.

[39] Suppose that this good is produced with labor alone while the consumer-good producing sector uses the nontradable capital good as well as labor. Then the increase in the price of the capital good is a rise in the *value productivity* of labor producing it with the result that wage rates are initially pulled up relative to wealth, quit rates drop and both the Asset Price Curve and the

valuations placed by managers on trained employees, tangible capital goods and customers impact on the pace of employment increase. Lacking data on most of these shadow prices, we improvise by hypothesizing that one or another measure of the firms' value in the capital market can serve as a proxy for these shadow prices. The next few sections pursue successive implementations of this idea.

Returning to our two benchmark equations (1) and (2), we now proceed to explore the explanatory power of capital-market measures of market capitalization either as a reflection or as a sort of cause of managers' valuations of their business assets (employees, customers and fixed assets). In our minds, managers learn things inspiring them to raise their valuations, then lay plans to invest in new (as well as old) employees, but analysts catch wind of the brightened prospects, driving up share prices in advance of all or most of the increase in business assets acquired; so our econometric tests are shaped accordingly. But it could be that assets do not lag behind valuations and possible even that share prices lag the accumulation of business assets – both driven by brighter prospects of profitability down the road.

To begin with, we try adding to the above set of explanatory variables the (real) share price, p^s, as a proxy for both the effective cost of capital *and* the profitability of one employee with his equilibrium outfit of tangible capital and customers. The share price must be entered as a ratio to the productivity of labor, which, abstracting from capital other than trained employees for the moment, is given simply by the (advancing) technology parameter Λ_t. The reason is that the hiring decision must

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Employment Curve are shifted in an expansionary way.

weigh the value of a new trained employee against the opportunity cost of the "trainers" orienting the new recruit, which is the existing employees' productivity in production. Recall, though, that while the hire rate may be so simply determined, the increase of employment is equal to hiring *net* of quitting and dismissals for shirking, and the rates of quitting and of shirking are functions of the income from the private and social assets that workers can fall back on in when they quit. The new equation is

$$u_{it} = \alpha_i + \lambda_i u_{it-1} + \theta_i\left(\phi^1 r_t^* + \phi^2 g_{it} + \phi^3 p_t^* + \phi^4\left(y_t^w + y_t^s\right)\frac{1+t_p}{1-t_d} + \phi^5 p_{it}^s\right) + \gamma_i \Delta\pi + \varepsilon_{it} \qquad (3)$$

Note that the cost of capital reappears in the equation in spite of the introduction of the stock-market variable. That is because the former impacts on the size of the interest to be deducted from productivity in the calculation of the 'demand wage' from the condition of zero pure profit (even if the valuation of the asset were unchanged) and a decrease of the demand wage, in stimulating more quitting, lowers the employment growth at the current unemployment rate.[40] The results are in Table 8 in the second and third columns of coefficients.

Table 8. Share Prices added to Unemployment Equation

Variables	Estimate	t-ratio	Estimate	t-ratio	Estimate	t-ratio	Estimate.	t-ratio
r*	4.66**	2.03	8.58**	2.84	7.97**	2.87	8.18**	2.66
g	-21.82**	2.22	-41.71**	2.98	-19.67*	1.88	-47.34**	2.91
p*	2.36**	2.60	1.44**	2.90	1.63**	3.09	2.86**	3.40

[40] There are also some byproducts of its coexistence with the share price. To the extent that the cost of capital receives credit for its total effects on employment effect, the share price will play the role of conveying expectations of future shocks to productivity and thus profitability. There is also a benefit from having the cost of capital there if our data on average share price (and on market capitalization too) are not accurate depictors of the business sector as a whole or if share price fluctuations are neither the effect nor the cause of changes in managers' valuations of business assets, then at least the possibility is open that *r** and *g* will survive to demonstrate that asset valuations are important.

p^s		-1.30**	3.21	-1.82**	3.60		
p^s-res						-1.25**	2.97
y^w+y^s				4.76**	3.00		

Note: **significant at 5% level. *significant at 10% level. Variables are in percent except *p** and p^s.

The share-price coefficient is significant and of the right sign – an increase in asset prices reduces unemployment – and the sign and significance of the coefficients of the other three variables remains intact.

To obtain the fourth column of coefficients we regressed the normalized share price for each country on the world real interest rate, the trend rate of productivity growth and the real price of oil. We then took the residual from that regression p^s-*res* and put it in place of the original share price variable – i.e. we only include the component that is orthogonal to the other regressors. Note that the orthogonal component has a larger and more significant coefficient, which implies that share prices affect unemployment independently from real interest rates and growth rates of output per worker.

For a second investigation we introduce market capitalization. Here we draw again on the turnover-training model, again admitting tangible capital into the model. But we now require that the shadow price of firms' physical capital is always found equal to its constant real acquisition cost. And in the interest of clarity, we work here with the case of *constant* hiring costs: each new hire requires the same amount of training by existing employees whose hourly opportunity cost is a constant, owing to

constant returns to scale.[41] So training costs per hire is a fixed proportion, β, of output per producing employee, Y/N_p.[42] Letting V denote the market capitalization of firms in the stock market, P_K the price of capital goods and K the stock of capital goods, the relevant Q for the turnover-training model is therefore defined as follows:

$$Q = \frac{q}{\Lambda\beta} \equiv \frac{\left(V - P_K K\right)/N_p}{\beta\left(Y/N_p\right)} \tag{4}$$

The numerator (with the division by N_p), labeled q, shows the (average) value of a trained employee in production, while the denominator shows an employee's acquisition cost. This Q is the analog of Tobin's Q (to use our notation), which is the value of a unit of physical capital as a ratio to the real cost, although the latter is usually presented as if the firm's other capital were nil.[43] Lacking any measure of β we omit it from the calculations of the above Q. Thus our calculated Q is a linear transformation of the theoretically correct one given in (4), being "off" by some unknown factor of proportionality.

We have so far calculated Q only for the US and France. The figure below shows this variable superimposed on the rate of growth of corporate employment net of the rate of growth of the labor force.[44]

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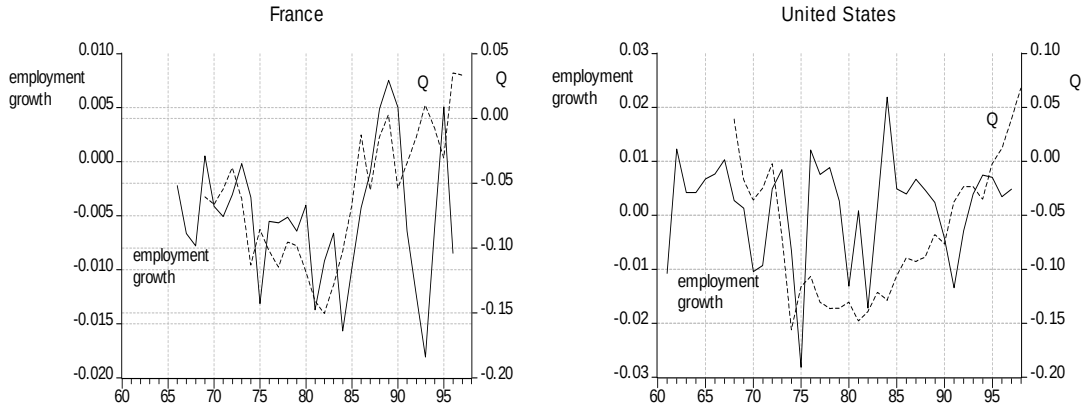
[41] For the constant costs case see Hoon and Phelps (1997) and Phelps (2000).
[42] Hoon and Phelps (1997).
[43] Of course, we would prefer a cleaner measure of the value of the workforce, a measure not containing the value of the customer stock and any other extraneous elements.
[44] The rate of growth of corporate employment is defined as

$$\frac{\Delta N^c}{L} - \frac{\Delta L}{L}\frac{N^c}{L}$$

Figure 5. Corporate employment growth and Q



We can see that in the US the Q variable tracks the low-frequency movement of the employment rate and the rate of employment-growth. In France, this is also the case up to the end of the 1980s – the 1990s have a combination of a booming stock market, low employment and low corporate-employment growth, which goes against our theory and may imply a Keynesian business downturn in the 1990s.

In order to have a large sample of countries we have to discard our *Q* variable, which is available only for the above two countries, and use instead a real-share-price index p^s again normalized by labor productivity Λ_t. The series appear broadly similar for all three countries, which gives us some confidence in expanding our sample. The experience of several countries is examined below.

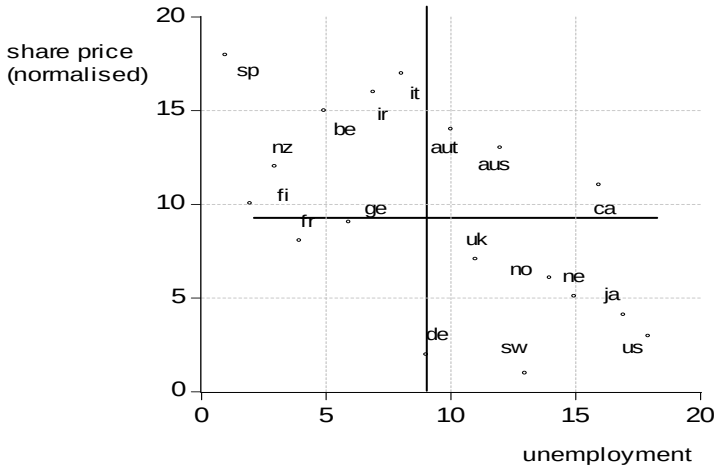
A basic question for this paper is whether the differences in the evolution of share prices across countries can explain why some economies' employment rates have improved better than expected while others have

---

N^c denotes corporate employment and L is the size of the labor force. The latter term is included in order to control for the growth of the labor force.

done worse.[45] We now look at the country data to see if we can explain the pattern shown in Table 5 – to see why some countries have had lower and others higher unemployment in the recent past than predicted by our baseline equation. We rank the countries in terms of the rise in average share prices and the change in average unemployment between the periods 1970s (1970-79) and 1990s (1990-99) and show the relationship between the two in Figure 6. The rank correlation is –0.60 which implies that the greater the rise in share prices, the smaller the rise (or larger the fall) in average unemployment. This negative relationship is apparent in the figure.

Figure 6. The ranking of changes in share prices and unemployment between 1970-1979 and 1990-1999



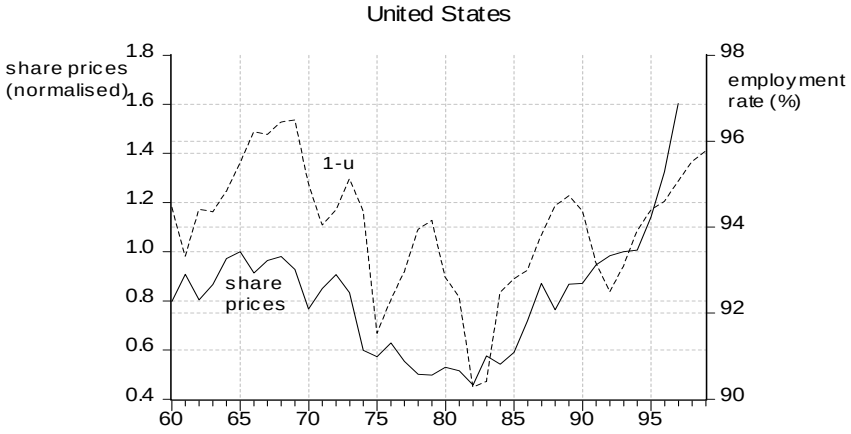
We now look closer at US data, then the high-unemployment countries of France, Germany, Italy and Spain and finally two countries that have had lower unemployment than expected, Ireland and New Zealand.

[45] A related question is if, at the microeconomic level, company employment moves with share prices in the long run – persistently low share prices imply persistently low employment. This we test in Appendix C and find that this is in fact so in our sample.

United States

In the United States, estimates of the natural rate of unemployment have an upward drift in the 1970s and 1980s,[46] but the 1990s show a downward movement with a sharp drop beginning at mid-decade. We have found that the US unemployment rate was in 1998 around 156 basis points below that what our baseline regression predicted in out-of–sample simulations. The forces behind these recent developments are a subject of debate. One of us recently argued that the steep descent of the natural rate in the U.S. since early 1995 is largely attributable to the stock-market boom[47]: The rise in the price of equity may reflect a rise in the valuation of the marginal employee. The latter would in turn cause the rate of inflow into employment to go up as firms expand their hiring and training. To assess this hypothesis we show in Figure 7 a stock-market index for the U.S. normalized by productivity (solid line) alongside the rate of employment (broken line).[48]

Figure 7. Share prices and the rate of employment in the US



[46] See Juhn, Murphy and Topel (1991) and Phelps and Zoega (1997).
[47] Phelps (1999).
[48] Both series have been normalized to facilitate the comparison.

It appears that the share-price series tracks the low-frequency – or decade-to-decade – movements in the employment rate fairly well. Note that this occurs at lower than so-called business-cycle frequencies. In fact, the discrepancy between the two series points out business cycles, which have brought either accelerating or decelerating inflation. This indicates a divergence between the actual unemployment rate and the natural rate: The late 1960s show a rise in employment not explained by high asset prices (period of rising inflation). The same applies to the late 1970s. The early 1980s had a cyclical downturn caused by the Volcker disinflation. Finally, and perhaps most interestingly, we may in the last few years have had unemployment above its natural rate, not because of its own rise but because of a fall in the natural rate itself. This may have allowed the unparalleled recent expansion to continue without rising inflation.
The visual impression is confirmed when we estimate a cointegrating relationship between the employment rate, the normalised stock-market index and our two global variables; the world real rate of interest and the real oil price.

Table 9. Results of Johansen's cointegration test for the US[49]

Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
50.19	47.21	54.46	None
23.47	29.68	35.65	At most 1

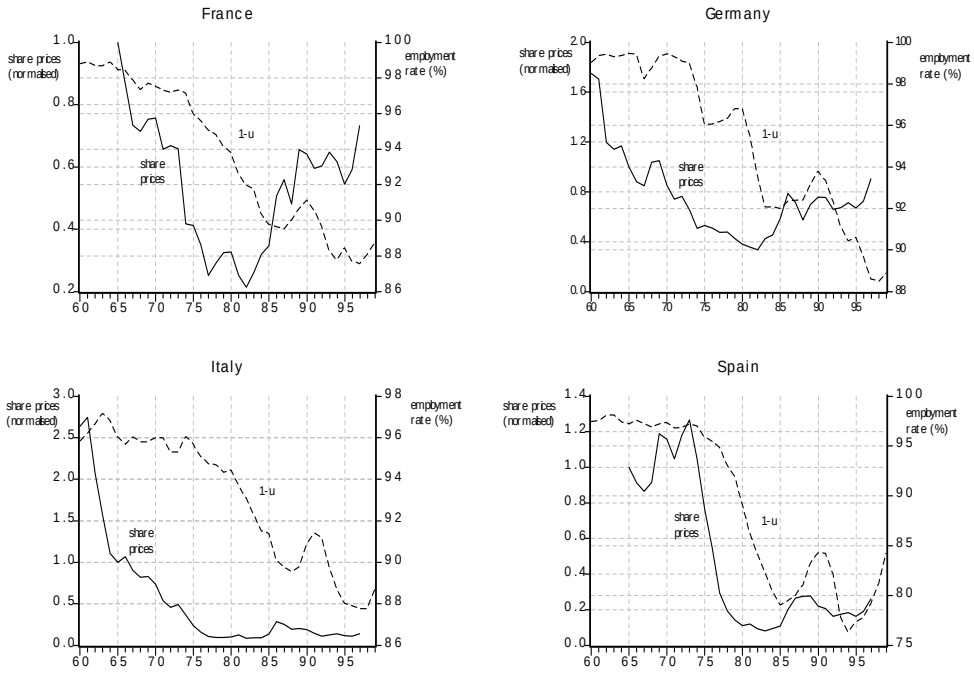
This result suggests a long-run relationship between the rate of employment and the three variables.

[49] The first difference of the inflation rate (which is stationary) is used as an exogenous variable.

France, Germany, Italy and Spain

These four countries all had higher unemployment in the 1990s than expected from our baseline equation (2). Figure 8 shows the normalized share-price index and employment rate for France, Germany, Italy and Spain.

Figure 8. Share prices and employment in France, Italy and Spain



Starting with Spain, the relationship is very clear. The fall in employment that started around 1975 is preceded by a fall in real share prices. The persistently low rate of employment after 1980 also corresponds to persistently low real share prices. The gradual fall in employment in the late 1970s suggests the presence of inflation while the currently low rate of employment appears to imply an unemployment rate somewhat higher than its natural rate.

In France, the employment rate started its descent around the same time although a slight fall can be seen as early as the late 60s. A fall in share

prices preceded the drop in employment to a lower plateau. However, an important difference with Spain arises when it comes to recent years. After 1985, the French stock market has recovered much of its lost ground. Its value in 1998 was not much different from that found in the early 1970s when we have normalized by productivity. But the employment rate has not recovered significantly. This implies that either the stock market is overvalued in the 1990s or that there is a persistent slump with the rate of unemployment exceeding the natural rate.

German employment started its descent slightly later. It fell sharply in the first halves of the 1970s and the 1980 and then again in the 1990s. This fall was preceded by falling share prices. As in the case of France, the further fall in the 1990s is not explained by a further fall in share prices. Share prices recovered some of their lost ground in the latter part of the 1980s, as did employment, but then held their ground through the 1990s when employment declined somewhat.

Italy shares the time pattern of France and Germany to a large extent. Both real share prices (again normalized by productivity) and the rate of employment had a downward trend since the mid1960s up to 1980. We can look at the continued rise in unemployment after 1980 – and especially the rise in the 1990s – as initially a delayed response to the earlier fall in asset prices and then a result of the restrictive monetary policy which preceded the establishment of the single currency.

We again test for cointegrating relationships between the employment rate, share prices, world real interest rates and the real price of oil. In each case we find one cointegrating vector between the variables.

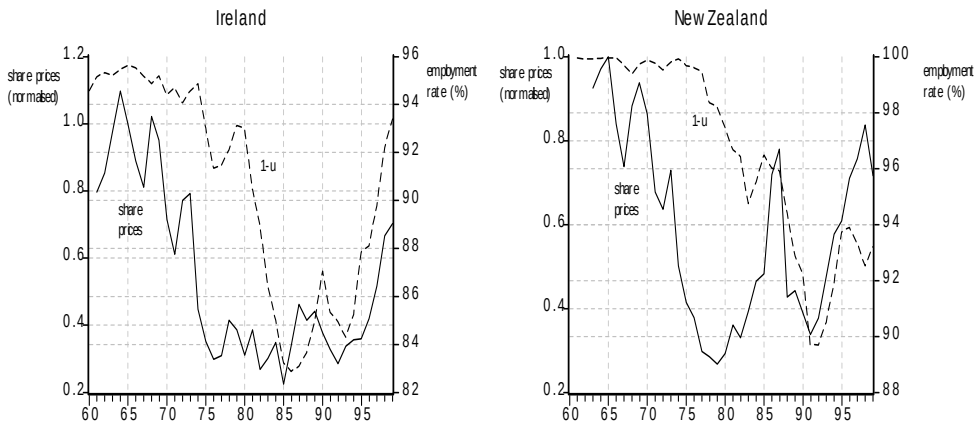
Table 10. Results of Johansen's cointegration test for France, Germany, Italy and Spain

Country	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
France	58.23	47.21	54.46	None
	26.15	29.68	35.65	At most 1
Germany	56.90	47.21	54.46	None
	29.72	29.68	35.65	At most 1
Italy	53.45	47.21	54.46	None
	24.63	29.68	35.65	At most 1
Spain	68.13	47.21	54.46	None
	31.23	29.68	35.65	At most 1

Ireland and New Zealand

Finally, we show in Figure 8 two of the recent good performers that are included in the OECD's success stories: Ireland and New Zealand. Both countries had a recovery starting in the mid-1980s and lasting until the early 1990s and have also had rising employment in the past five years or so. We can see that in both periods share prices rose prior to the recent rise in unemployment. While this is in no way conclusive evidence for our thesis, it is a much-overlooked fact that is supportive of our hypothesis about the role of asset prices in employment determination.

Figure 9. Share prices and employment in Ireland and New Zealand



The visual impression is once again confirmed by our cointegration tests. The rate of employment, share prices, world interest rates and real oil prices are again cointegrated for both countries.

Table 11. Results of Johansen's cointegration test for Ireland and New Zealand

	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
Ireland	75.40	47.21	54.46	None
	34.72	29.68	35.65	At most 1
New Zealand	54.97	47.21	54.46	None
	30.03	29.68	35.65	At most 1

Once more we have the visual impression of a long-run relationship supported by a cointegration test.

Causality

The long-run relationship between share prices and the rate of employment is consistent with our model. Of course, many other models would find stock price variations positively related to measures of economic expansions such as changes in employment. A point of departure between our model and the main alternatives – such as variants of the Keynesian model – involves the treatment of labor as a quasi-fixed asset. In our model, firms decide to hire new workers when they become more optimistic about future profitability even when they only want to maintain their current level of output. In models where labor can be hired and fired at little cost, changes in employment coincide with changes in output. Another difference is that in Keynesian models with a fixed natural rate or fixed Phillips curve changes in employment should be

positively correlated with inflation and, in principle, inflation changes or levels would do the job of explaining the movements of employment.

We first test explicitly whether changes in share prices precede changes in the unemployment rate or vice versa with a Granger causality test and using the raw unemployment- and share-price series. Results are in column (4) of Table 12.

Table 12. Granger causality tests of changes in unemployment and share prices

	Null Hypothesis:	Obs	Raw series		Corrected unemployment	
(1)	(2)	(3)	(4)		(5)	
			F	Prob.	F	Prob
Ireland	Δp^s does not cause Δu	36	11.88**	0.00	9.92**	0.00
	Δu does not cause Δp^s		0.00	0.95	0.02	0.89
New Zealand	Δp^s does not cause Δu	32	5.87**	0.02	5.81**	0.02
	Δu does not cause Δp^s		0.02	0.89	0.02	0.89
U.S.	Δp^s does not cause Δu	36	14.12**	0.00	14.40**	0.00
	Δu does not cause Δp^s		0.64	0.43	0.57	0.45
France	Δp^s does not cause Δu	36	1.47	0.23	1.50	0.23
	Δu does not cause Δp^s		0.09	0.77	0.09	0.76
Germany	Δp^s does not cause Δu	36	3.93*	0.06	3.93*	0.06
	Δu does not cause Δp^s		5.20**	0.03	5.20**	0.03
Italy	Δp^s does not cause Δu	36	3.46*	0.07	2.71	0.11
	Δu does not cause Δp^s		7.22**	0.01	3.36*	0.08
Spain	Δp^s does not cause Δu	36	3.43*	0.07	3.31*	0.08
	Δu does not cause Δp^s		0.76	0.39	0.67	0.42

Note: ** indicates rejection at 5% level, * indicates rejection at 10% level

The test results using the raw series indicate that changes in share prices Granger-cause change in the unemployment rate in Ireland, New Zealand and the US – these are the low-unemployment economies – and not vice versa. The tests also indicate that asset prices cause changes in

unemployment in Spain and not vice versa but the evidence is less clear for France, Germany and Italy. In Germany and Italy we cannot reject causality in either direction while in France we can reject both. However, for France it is more likely that causality goes from asset prices to unemployment.

The results so far are consistent with both models that treat labor as a fixed asset and also those that do not. An asset-price boom can precede, coincide or follow employment growth in both types of models. So the next step is to first regress changes in unemployment on changes in output – to take out the contemporaneous effect of output expansion on employment – and then to take the residual change in unemployment – the corrected unemployment series in the table above – and test whether this is preceded or followed by change in real share prices. The results for this corrected unemployment series are reported in column (5) in the table. These are consistent with the earlier results. Thus the relationship between changes in share prices and changes in unemployment remains qualitatively unchanged by this correction for the business cycle.

On the basis of this evidence we conclude that firms increase their hiring of new workers when real share prices rise – reflecting enhanced optimism about future profitability – independent of current output changes. In other words, we conclude that the hiring of new workers involves an investment dimension.

Since investment in physical capital may also be a function of shadow prices (that is, Tobin's Q), it is instructive to take a brief glance at the relationship between unemployment and physical investment at lower than business-cycle frequencies. We should note that Tobin-Q theory has fallen into some disrepute due to its apparent empirical failures. However,

with our own forward-looking model of investment in new workers, it is tempting to compare the predictions of the two models. Appendices A5 and A6 have the rate of investment (I/K) and the rate of growth of corporate employment and the employment rate, respectively, for the G7 countries (ex Japan). While the high-frequency correlation comes as no surprise, the low-frequency – or decade-to-decade – correlation in France, Italy and Germany is not to be expected from conventional theory – periods of low employment tend also to be periods of low investment rates. Moreover, the turning points in the advance of unemployment often correspond to the turning points in the rate of investment. Note that while the rise of unemployment to a higher plateau in the three unemployment-prone countries corresponds to a fall in the rate of investment to a lower plateau, both unemployment and the investment rate show no such behavior in the United States and the United Kingdom. These low-frequency correlations can be taken as providing some empirical support for Tobin-Q theory.

Conclusions

Our perspective on the natural rate in any market economy is that, to begin with, it shifts. It shifts with the economy's geography and demographics, of course, and also with the economy's institutions: tax and regulatory law, corporate ownership and governance, and welfare state protections and provisions. Furthermore, it doesn't just shift: It fluctuates as a result of business shocks disturbing firms' asset valuations, productivity and wealth. An advantageous feature of our models is that entrepreneurs' expectations about the future, say, future productivity, hence future profits, or future interest rates, enter the story through their

impact on the valuations of the types of business assets firms invest in, which in turn disturb product and labor markets. In past empirical work, taking a page from Layard et al., we estimated that the same business shock had unequal unemployment effects among the countries and we sought to trace these disparities to institutional differences.

The unusual record provided by the 1990s permits us to go a great deal farther in testing this framework. The impetus for the tests made here is a three-part hypothesis: First, managers' asset valuations impact sufficiently strongly on equilibrium unemployment that the two wide swings in economic activity observed in recent decades – the gathering slump that begin in the mid-1970s and the powerful recovery seen in several economies in the 1990s – may very well be the effect of swings in those managerial valuations. Second, the decline and rise in market capitalizations of firms may be a serviceable mirror, even if only in a distorted or exaggerated way, of the asset valuations by firms' managers.[50] Third, the 1990s rise in managerial valuations and the accompanying rise in the stock market went far beyond what can be explained by the capital-market and other macroeconomic influences contained in our empirical work, such as world real interest rates and domestic productivity growth rates, so that in this instance (and possibly others) the stock market may have considerable information value when added to the set of macro-economic *explanans* in the study of employment. It may be a sign of managers' expectations of a one-time future lift in the path of productivity and hence of profits that is distinct from and additive to any perceived improvement in the trend growth rate

[50] The first part is a substantive thesis in *Structural Slumps* and the second part is the hypothesis explored in Phelps (1999).

of productivity.

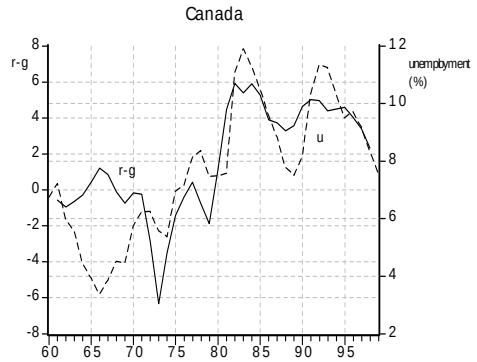
We first showed that an out-of-sample simulation of the 1990s with a stripped-down version of our previous unemployment equations gives *some* explanation of the recoveries, where they occur, since many of them coincide with a quickening of domestic productivity growth; yet this simulation cannot adequately explain the degree of recovery observed in the more successful economies of the past decade. We then showed that the labor market reforms advocated by the OECD Secretariat and the fiscal policy reform pointed to by the U.S. Treasury, while helpful in some cases, leave us far short of explaining which countries recovered in the 1990s and by how much. Yet, snatching victory from the jaws of defeat, we went on to show that the supplementary use of a stock-market indicator in our unemployment equations aids enormously in accounting for the 1990s recoveries.

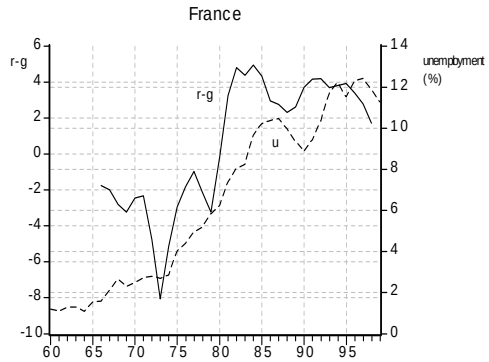
This finding, we think, testifies to the importance of asset valuations in the structuralist theory of employment – no matter whether stock-market prices are the prime mover driving firms to act, as supposed by Keynes and Tobin, or whether, as we are inclined to suppose, these prices are simply a mirror of managers' valuations of business assets, based on their expectations of future profits and capital costs. If our results are correct, the widespread impression that stock markets are a side show having no explanatory value was mistaken. But the larger significance of our results is that they support the Fisher-Tobin component – their approach to investing, whether in fixed capital or in employees and customers – in an essentially *non-monetary* theoryof employment and asset acquisition. Fisher and Tobin survive outside Keynes and provide a central part of the intertemporal general-equilibrium mechanisms producing fluctuations of

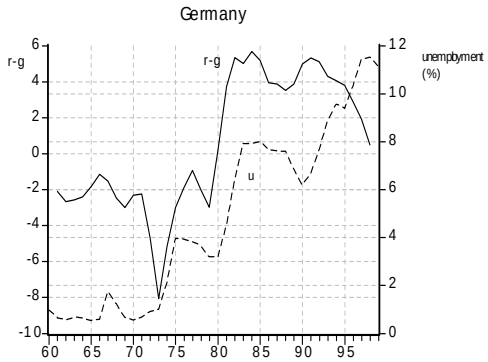
the natural rate.

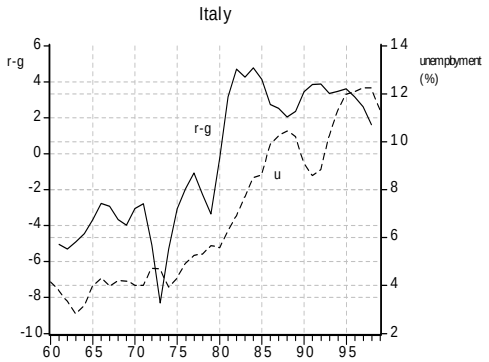
APPENDIX A1

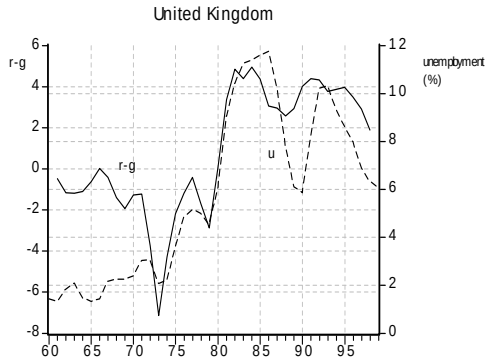
Unemployment and the cost of capital











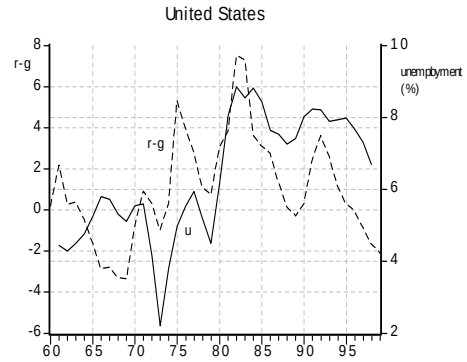


Table 1. Rate of growth of labor productivity

Country	Period							
	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-98
Australia	2.4	2.7	2.2	1.7	1.2	1.0	1.5	1.8
Austria	4.6	5.0	3.8	2.5	2.0	1.9	1.8	2.0
Belgium	4.0	4.1	3.6	2.5	1.8	1.6	1.6	1.7
Canada	2.1	1.7	1.5	0.9	0.9	0.9	0.9	1.0
Denmark	2.7	2.4	1.7	1.1	1.0	1.3	1.9	1.8
Finland	4.3	4.3	3.3	2.2	2.3	2.7	2.8	2.6
France	-	4.4	3.2	2.3	2.0	1.9	1.6	1.7
Germany	4.1	4.0	3.2	2.1	1.3	-	-	-
Ireland	3.7	4.4	4.3	3.5	3.3	3.5	3.9	4.6
Italy	6.4	5.2	3.5	2.4	2.1	2.1	2.0	1.8
Japan	8.3	7.3	5.0	3.0	2.5	2.4	1.5	0.6
Netherl.	-	4.4	3.5	1.9	1.2	0.9	0.9	1.1
Norway	4.9	5.0	5.7	5.7	4.6	3.6	3.9	5.0
NewZeal.	6.4	5.2	4.4	3.4	3.3	2.7	3.8	4.9
Portugal	6.4	6.9	6.8	5.6	3.8	3.7	3.6	3.7
Spain	7.9	5.5	4.2	3.1	2.6	2.2	1.8	1.1
Sweden	5.2	4.5	3.6	2.7	2.4	2.0	1.2	0.9
UK	2.7	2.9	2.3	1.9	1.9	1.6	1.5	1.5
US	3.1	1.8	0.8	0.6	0.9	1.0	1.0	1.1

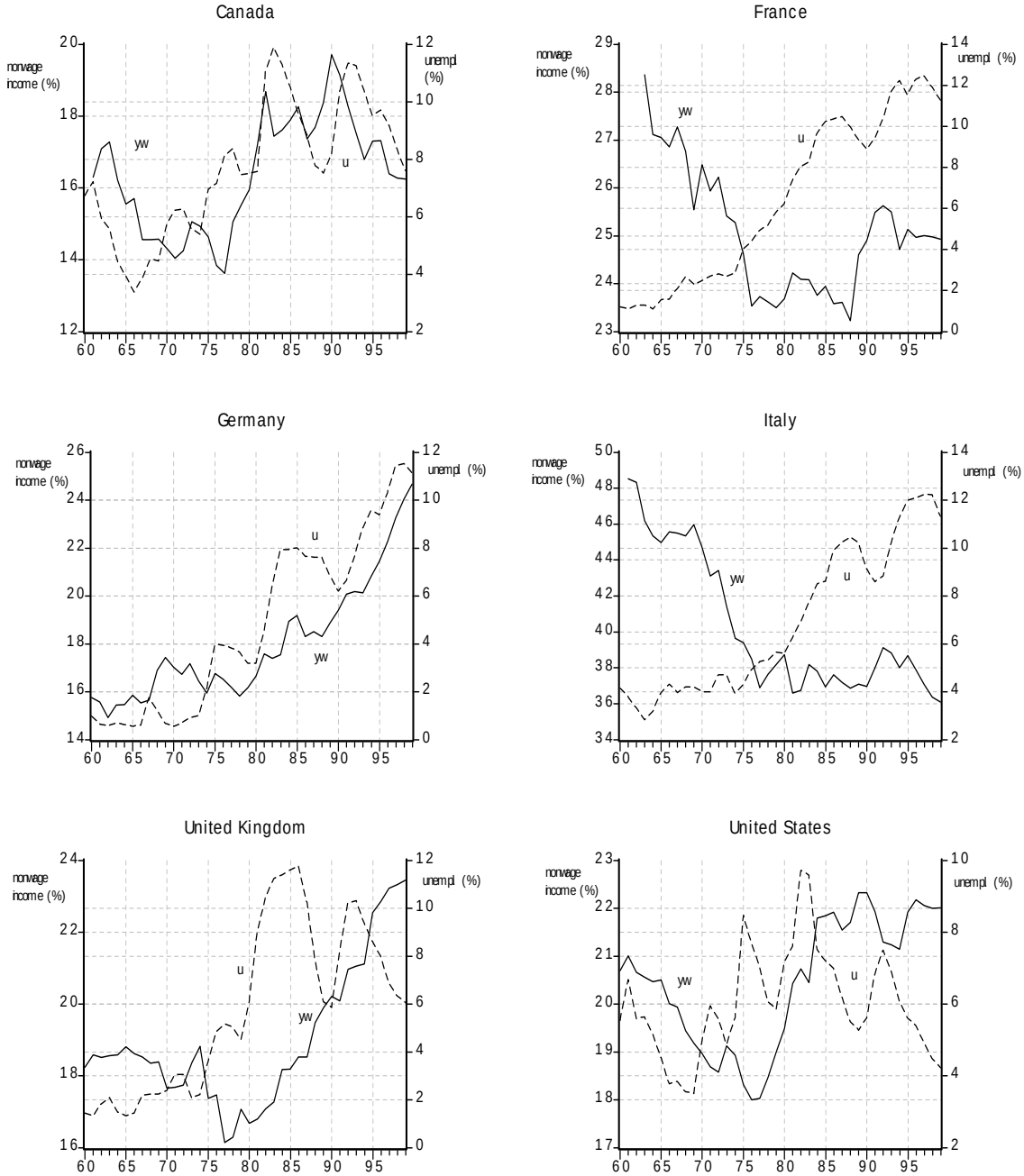
Table 2. Changes in the trend rate of growth of labor productivity

Country	Period							
	61-65	66-70	71-75	76-80	81-85	86-90	91-95	96-98
Australia	=	=	=	↓	=	=	↑	↑
Austria	=	↑	↓	↓	↓	=	=	=
Belgium	=	=	↓	↓	↓	=	=	=
Canada	=	=	=	↓	=	=	=	=
Denmark	=	↓	↓	↓	=	↑	↑	=
Finland	=	=	↓	↓	=	↑	=	=
France	-	=	↓	↓	↓	=	=	=
Germany	=	=	↓	↓	↓	-	-	-
Ireland	=	↑	=	↓	=	=	↑	↑
Italy	=	↓	↓	↓	↓	=	=	=
Japan	=	↓	↓	↓	↓	=	↓	↓
Netherl.	-	=	↓	↓	↓	↓	=	=
Norway	=	=	↑	=	↓	↓	↑	↑
NewZeal.	=	↓	↓	↓	=	↓	↑	↑
Portugal	=	=	=	↓	↓	=	=	=
Spain	=	↓	↓	↓	↓	↓	↓	↓
Sweden	=	↓	↓	↓	↓	↓	↓	↓
UK	=	=	↓	↓	=	↓	=	=
US	=	↓	↓	↓	↑	=	=	=

=: change less than 20 basis points, ↑ (↓): increase (decrease) in excess of 20 basis points, ↑(↓): increase (decrease) in excess of 50 basis points.

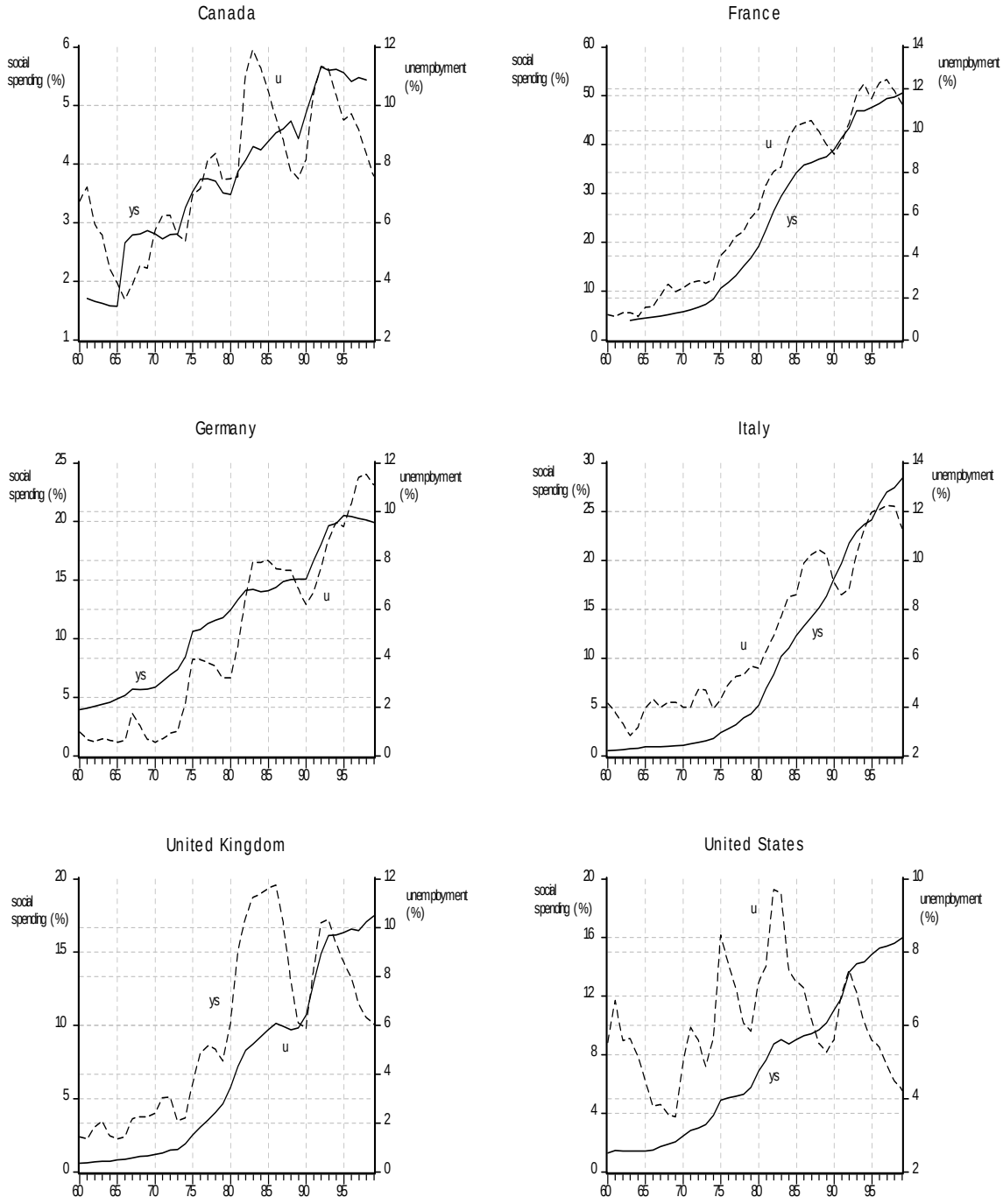
APPENDIX A2

Unemployment and nonwage income (share of GDP)



APPENDIX A3

Unemployment and social spending (share of GDP)



Social security contributions are used to proxy for social spending in Canada.

APPENDIX A4

Estimation results for equation (1) using data from 1960-1998

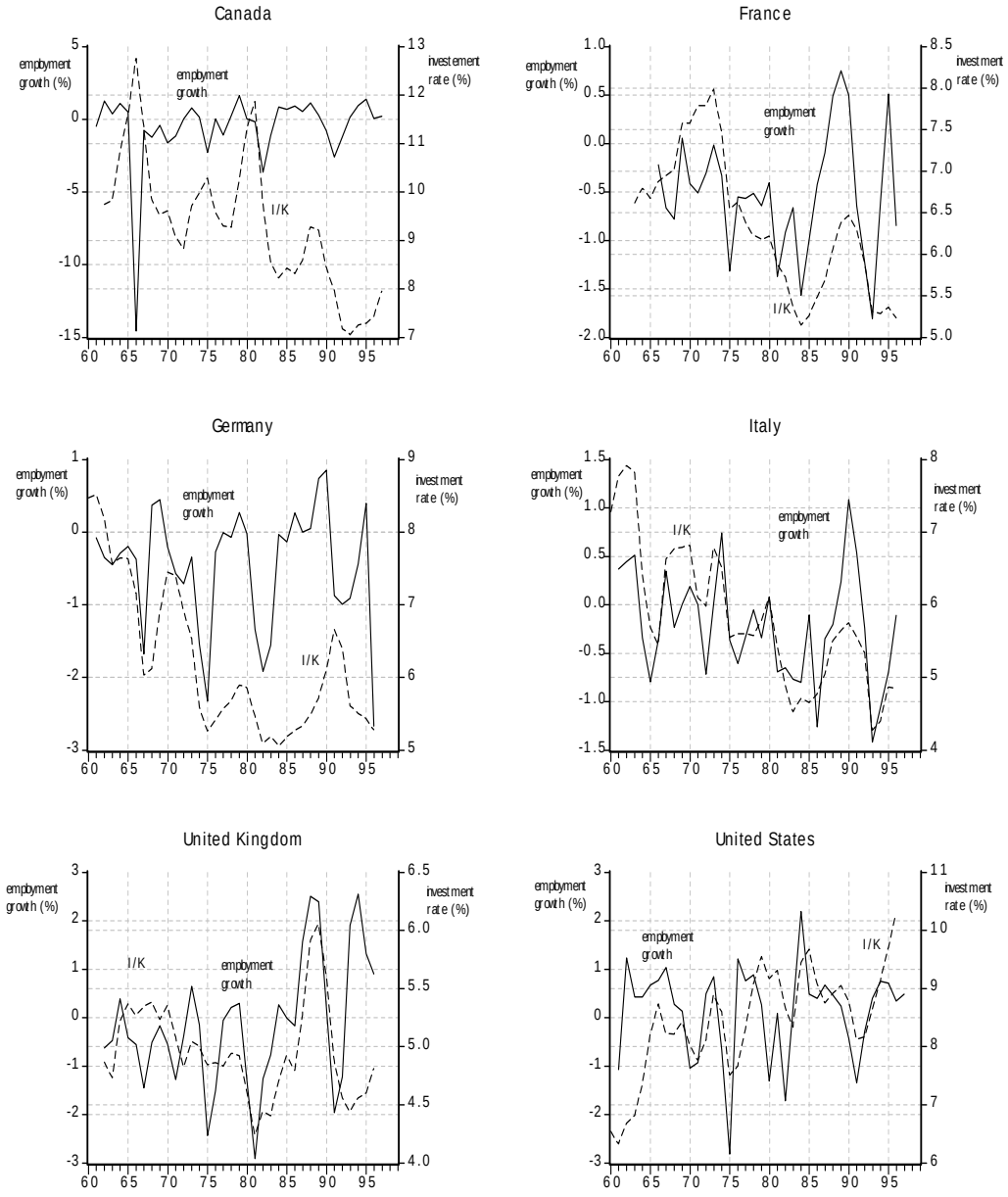
Country	α_i	μ_i	ϕ^1	ϕ^2	ϕ^3	ϕ^4	γ_i
Australia	9.0 (3.1)	0.6 (5.7)	18.3 (2.2)	-22.3 (0.5)	1.8 (1.5)	-32.9 (2.9)	-16.7 (2.0)
Austria	-2.7 (2.3)	0.7 (7.1)	5.9 (2.4)	-50.0 (3.3)	0.2 (0.4)	1.6 (2.9)	-9.1 (3.0)
Belgium	-0.6 (0.1)	0.8 (8.5)	-11.0 (1.0)	-46.5 (0.7)	3.4 (1.8)	0.2 (0.5)	-4.5 (0.7)
Canada	5.9 (1.2)	0.6 (5.9)	17.3 (1.6)	-177.5 (1.3)	1.1 (0.7)	-4.5 (0.3)	-28.5 (2.9)
Denmark	32.6 (3.7)	0.8 (3.7)	-27.9 (1.1)	-162.3 (1.0)	0.4 (0.0)	-13.9 (4.1)	13.9 (0.9)
Finland	-1.5 (0.2)	0.6 (5.5)	2.2 (0.2)	-33.6 (0.8)	1.6 (0.7)	2.3 (0.6)	-8.1 (1.0)
France	1.6 (0.5)	0.9 (8.0)	4.2 (0.6)	-35.4 (1.0)	0.8 (0.7)	0.0 (0.0)	-5.5 (1.0)
Germany	-6.2 (3.0)	0.7 (8.8)	10.6 (2.1)	7.6 (0.6)	2.7 (3.8)	13.5 (3.0)	-30.4 (3.5)
Ireland	2.0 (0.4)	0.9 (7.8)	13.6 (0.6)	-270.1 (1.6)	6.3 (2.4)	0.0 (1.7)	-7.3 (1.0)
Italy	-5.0 (1.8)	0.9 (12.4)	-2.1 (0.4)	-41.0 (2.2)	0.5 (0.7)	0.0 (2.2)	-8.3 (2.4)
Japan	2.1 (1.8)	0.8 (8.7)	-1.0 (0.8)	2.8 (0.4)	0.2 (0.6)	0.0 (1.2)	-2.6 (2.8)
Netherl.	-8.3 (1.8)	0.8 (7.2)	19.5 (2.2)	-27.8 (0.8)	6.0 (3.9)	19.8 (1.9)	-34.7 (2.8)
New Zealand	8.9 (1.9)	0.8 (9.9)	16.8 (1.4)	-34.3 (0.8)	-1.0 (0.7)	0.0 (1.3)	-0.6 (0.2)
Norway	-16.6 (2.5)	1.1 (10.6)	11.0 (0.9)	78.0 (1.4)	-0.6 (0.7)	5.8 (3.2)	-10.2 (2.2)
Portugal	5.7 (4.7)	0.7 (11.9)	-45.3 (5.9)	-50.9 (4.2)	1.2 (1.3)	0.0 (0.4)	-5.1 (1.9)
Spain	-4.8 (0.9)	0.9 (11.1)	10.6 (0.7)	-56.4 (1.6)	6.4 (3.8)	0.2 (1.4)	-10.4 (1.2)
Sweden	14.4 (4.2)	0.4 (3.4)	15.6 (2.7)	-62.0 (3.7)	-0.3 (0.3)	-38.8 (4.0)	-0.7 (0.2)
U.K.	-4.3 (1.0)	0.7 (9.2)	20.8 (2.6)	9.0 (0.2)	7.0 (5.4)	29.4 (1.4)	-7.7 (1.5)

U.S.	7.4 (3.3)	0.4 (4.1)	14.1 (1.8)	-49.1 (2.4)	3.2 (3.1)	-16.6 (2.0)	-27.0 (2.9)

t-ratios in parentheses.

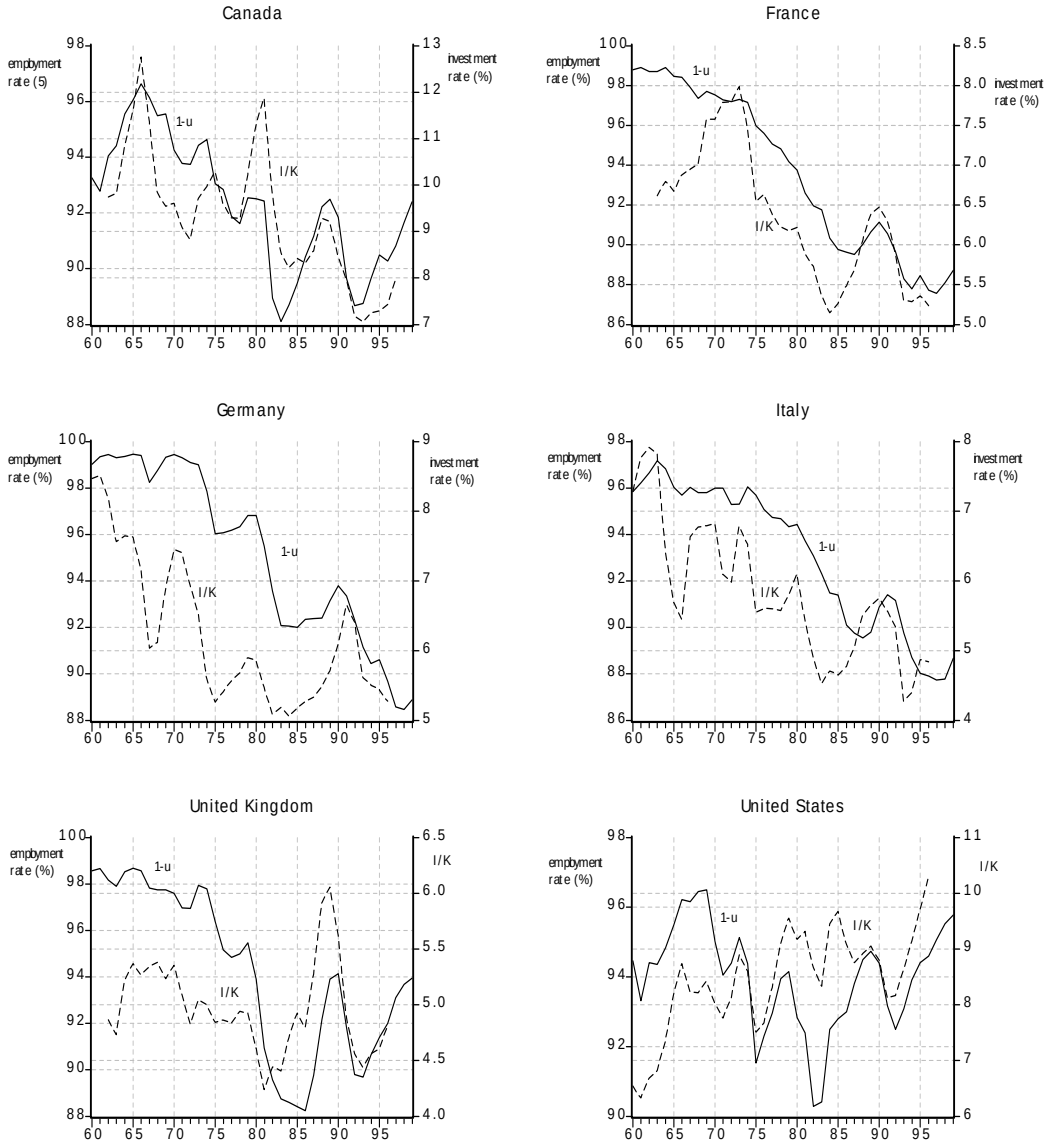
APPENDIX A5

INVESTMENT AND CORPORATE EMPLOYMENT GROWTH



APPENDIX A6

INVESTMENT AND THE RATE OF EMPLOYMENT



APPENDIX B1

Deriving the role of productivity and tax rates

The logic of the derivation of the compound variable involving labor productivity and labor tax rates is this. The model can be viewed as determining labor cost per employee, called “the wage to employers,” as a *ratio* to productivity. Yet its quitting behavior is a function of the wage *after* payroll taxes and income tax, called “the wage to employees,” expressed as a *ratio* to nonwage income. To disentangle this knot one needs first to divide both numerator and denominator in the latter ratio by the ratio of employee wage to employer wage, which makes the new denominator equal to the employer wage. One next divides both the new numerator and the new denominator by productivity, so that the employer wage in the denominator appears in ratio to productivity, as desired. The final numerator is then nonwage income as a ratio to productivity times the ratio of the employee wage to the employer wage. That is equal to nonwage income multiplied by the ratio of employer wage to employee wage and divided by productivity.

APPENDIX B2

A Dynamic System Underpinning Our Hypothesis

A simple dynamic system to back the story in Figure 4 is the open economy in Hoon-Phelps (1992) and Phelps (1994). The closed economy would also serve. Here, firms' assets are their employees, which are costly to train. There are rising marginal training costs. The real interest rate in terms of the economy's product is equal to the world real interest rate, r^*, which is taken to be fixed.

We add fixed capital in a simple way by admitting imports of equipment on short-term lease from overseas suppliers with zero transport costs. When employees move from producing to training they need the same equipment. The amount of capital per *augmented* employee, $K/\Lambda_t N$, is determined by the demand function, κ, which is decreasing in the given unit rental, $r^* + \delta$. Output per augmented employee allocated to *production* is given by $f(\kappa (r^* + \delta))$ and the rental per augmented employee is $(r^* + \delta)\, \kappa(r^* + \delta)$. Output and rental per *unaugmented* production worker are $\Lambda_t\varphi(r^* +\delta)$ and $\Lambda_t R(r^* +\delta)$, respectively.

In this setting, each identical firm, to maximize shareholder value, chooses the current hire rate, h, and wage, v, that maximize a Hamiltonian function. That function involves the current proportion of employees engaged in training per hiree, given by $\beta(h)$, which is an increasing function of h; the mortality rate, θ; the quit rate, ζ, which is a function of the unemployment rate, u, and of nonwage income, y^W, as a ratio to the wage; the shadow price the firm optimally awards itself for every current employee; and its current stock of employees, N. The current-value Hamiltonian is

$$\{\Lambda_t\varphi(r^* +\delta) -\beta(h)\, \Lambda_t\varphi(r^* +\delta) - \Lambda_t R(r^* + \delta) - v + q\, [h - \zeta(1-u, y^W/v) - \theta\,]\} N.$$

The necessary conditions for a maximum give the relationships behind the figures in the text. In these equations it will also be convenient to write the equations in terms of the *normalized* wage, $v/\Lambda\varphi$, the normalized shadow price, $q/\Lambda\varphi$, and normalized nonwage income, $y^W/\Lambda\varphi$. This introduces the actual and expected growth rate of Λ, to be denoted λ.

For a maximum, q must satisfy the arbitrage equation

$$d(q/\Lambda\varphi)/dt = -\, [1 + h\, \beta'(h) - \beta(h) - R/\varphi - v/\Lambda\varphi] + [\zeta\, (1-u, (y^W/\Lambda\varphi)/(v/\Lambda\varphi) + \theta + r^*-\lambda)]\, q/\Lambda\varphi. \qquad (1)$$

It says that a capital gain (loss) is needed to make up any shortfall (surplus) of the marginal profitability of employees, $\Lambda\varphi\, [1 + h\, \beta'(h) - \beta(h) - R/\varphi - v/\Lambda\varphi]$, over the economic interest and depreciation entailed, which is $q\, [[\zeta + \theta + r^*-\lambda)]$.

The optimal wage balances the marginal benefit of a small increase of the wage rate that results from the consequent reduction in the quit rate against the marginal cost in terms of the payroll on existing employees of the same small rise of the wage rate. This gives the condition

$$v/\Lambda\varphi = (q/\Lambda\varphi)[(1-u)\zeta_1(1-u, (y^W/\Lambda\varphi)/(v/\Lambda\varphi) + (y^W/\Lambda\varphi)/(v/\Lambda\varphi)\zeta_2(1-u, (y^W/\Lambda\varphi)/(v/\Lambda\varphi)]. \quad (2)$$

Here both lefthand and righthand sides have been multiplied by $v/\Lambda\varphi$ for typographical simplicity. The original righthand side gives the two effects on the quit rate of an increase in pay, both effects multiplied by the normalized worth of the quits averted. The original righthand side is equal to one.

The optimum scale of current hiring is at the point where the cost of speeding up by the amount of one new hire (as a ratio to the employee stock) would be just worth the gain per unit time from adding employees at that faster rate. The condition is $\beta'(h) = q/\Lambda\varphi$, which is convenient to write in the form

$$h = \phi\,(q/\Lambda\varphi), \quad (3)$$

where $\phi'(q/\Lambda\varphi) > 0$. Using that, we have the equation of motion for employment,

$$dN/dt = [\phi\,(q/\Lambda\varphi) - \zeta\,(1-u, (y^W/\Lambda\varphi)/(v/\Lambda\varphi) - \theta\,](1-u), \quad (4)$$

where without loss of generality units are chosen such that $N \equiv 1-u$.

The stationary loci. To obtain the Asset Price Curve, which is the stationary locus for normalized q in Figure 4 we need only set the left-hand side of equation (1) equal to zero, use (3) to substitute for h, and use (2), which implicitly gives $v/\Lambda\varphi$ as a function, say, $V^s(1-u, q/\Lambda\varphi; y^W/\Lambda\varphi)$. This gives the stationary locus

$$0= -[1+\phi(q/\Lambda\varphi)\beta'(\phi\,(q/\Lambda\varphi)) -\beta(\phi\,(q/\Lambda\varphi)) -R/\varphi -V^s(1-u, q/\Lambda\varphi; y^W/\Lambda\varphi)] + [\zeta\,(1-u, (y^W/\Lambda\varphi)/V^s(1-u, q/\Lambda\varphi; y^W/\Lambda\varphi) + \theta + r^* - \lambda]\, q/\Lambda\varphi. \quad (5)$$

Given $y^W/\Lambda\varphi$, the normalized share price can be shown to be decreasing in $1-u$. With a standard Blanchard-Yaari formulation of the accumulation of nonwage income, Hoon and Phelps show that the long run relationship is also negatively sloped.

To obtain the Employment Curve we proceed similarly, setting the left-hand side equal to zero and again using (2) to substitute $V^s(1-u, q/\Lambda\varphi; y^W/\Lambda\varphi)$ for $v/\Lambda\varphi$. This gives the stationary locus

$$0 = [\phi\,(q/\Lambda\varphi) -\zeta(1-u, (y^W/\Lambda\varphi)/V^s(1-u, q/\Lambda\varphi; y^W/\Lambda\varphi)) -\theta](1-u). \quad (6)$$

Given $y^W/\Lambda\varphi$, the employment variable can be shown to be increasing in the normalized shadow price. Again, with a Blanchard-Yaari formulation, the long run relationship is also positively sloped.

Dynamics. A common short cut in analyzing dynamic systems takes the more slow-moving of the two state variables, here the non-wage income variable, to be temporarily constant and analyzes the dynamics of the faster-moving of these variables, employment, accordingly. Here, this subsystem is simply equations (1) and (4) after making the substitutions for *v* and *h* from (2) and (3):

$$d(q/\Lambda\varphi)/dt = -[1+ \phi(q/\Lambda\varphi)\beta'(\phi\,(q/\Lambda\varphi)) - \beta(\phi\,(q/\Lambda\varphi)) - R/\varphi - V^s(1-u,q/\Lambda\varphi)] + [\zeta\,(1-u,\,(y^W/\Lambda\varphi)/V^s(1-u,\,q/\Lambda\varphi;\,y^W/\Lambda\varphi) + \theta + r^* - \lambda]\,q/\Lambda\varphi, \quad (7)$$

$$d(1-u)/dt = [\phi\,(q/\Lambda\varphi) - \zeta(1-u,\,(y^W/\Lambda\varphi)/V^s(1-u,\,q/\Lambda\varphi;\,y^W/\Lambda\varphi)) - \theta](1-u). \quad (8)$$

Analysis of this medium-run system gives the equilibrium motion along a negatively sloped "saddle path" leading (from either side) to the intersection of the Asset Price Curve and the Employment Curve corresponding to the given $y^W/\Lambda\varphi$ – dubbed here the medium-term rest point.

One kind of shock to this system is a sudden increase in the expected rate of labor augmentation, λ. Analysis of this system yields the intuitive result that such a shift of λ generates an upward shift of both the Asset Price Curve and the saddle path, hence a jump of the normalized share price, followed by a gradual sinking of that variable to its higher medium-term rest-point value and a gradual rise of employment toward its likewise higher medium-term rest-point value.

Even if real-life economies fluctuated only up and down this saddle path, there might be a reason to add a normalized stock-market indicator to the employment growth equation. Such an indicator could serve as a proxy for omitted asset stocks, such as customers and even fixed capital, which is rarely well measured.

The shock highlighted in Figure 4 brings out the major value added of a stock-market indicator. This shock is a sudden anticipation of a one-time shift at a future date in the path of productivity and thus of profits per unit of assets. That shock requires a difficult analysis with respect to the *aftermath* of the shock, since the quantum jump in productivity, once it actually occurs, has a quantum effect on the wealth-to-productivity ratio, so that ratio can no longer be held constant for analytical simplicity. But our interest is only in the existence of an expansion phase following the sudden anticipation of the future productivity shift. The reasoning to our conclusions that the asset price immediately jumps and that employment, if initially steady, will then be rising until the moment of the productivity shift appears inescapable. In such a 'bubble' scenario, a normalized stock-market indicator can serve to pick up the expectation of the future parameter shift – in our example, the productivity shift.

APPENDIX C

Share Prices and Company Employment

In this section we take a look at company data for Canada (Toronto), France (CAC40), Germany (DAX), Italy (Milan), the U.K. (FT) and the U.S. (DJ). This has the advantage of looking at changes in employment over time for units that share the same macroeconomic environment. We then test for the effect of real share prices p^s and profits (net profit margin, *pr*) on employment (*N*) growth. In addition, we allow employment growth to be affected by the change in the growth rate of nominal GDP, *Y*, which proxies for (macroeconomic) demand shocks. We estimate for each of the countries an equation of the form

$$\frac{\Delta N_{it}}{N_{it}} = \tau_i + \alpha_1 \log p_t^s + \alpha_2 pr_{it} + \alpha_3 \Delta^2 Y_{it} + \varepsilon_{it}$$

where τ denotes a company-specific fixed effect. The results for 1987-1998 are reported in Table 14 and the list of companies is in an appendix.

Table 2. Results using Company Data

	CA	FR	GE	IT	UK	US
α_1	0.12	0.03	0.02	-0.01	0.14	0.06
	(3.36)	(2.09)	(1.56)	(0.87)	(2.87)	(3.01)
α_2	0.29	-0.16	-0.06	-0.00	-0.59	0.07
	(1.89)	(0.78)	(0.14)	(0.17)	(1.11)	(0.34)
α_3	-1.23	0.16	0.20	0.42	-1.72	0.44
	(2.14)	(0.57)	(1.74)	(1.95)	(1.44)	(0.85)

Notice that the real share price is significant and correctly signed in all the countries apart from Italy, while the profit margin is only significant in Canada. The demand shock is correctly signed and significant only in Germany and Italy but incorrectly signed in Canada and the U.K.

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