

Seminar Paper No. 508

EGALITARIANISM AND GROWTH

by

Jonas Agell and Kjell Erik Lommerud



INSTITUTE FOR INTERNATIONAL ECONOMIC STUDIES
Stockholm University

ISSN 0347-8769

Seminar Paper No. 508

EGALITARIANISM AND GROWTH

by

Jonas Agell and Kjell Erik Lommerud

Seminar Papers are preliminary material circulated to stimulate discussion and critical comment.

November 1991

Institute for International Economic Studies
S-106 91 Stockholm
Sweden

EGALITARIANISM AND GROWTH

By Jonas Agell and Kjell Erik Lommerud*

ABSTRACT

Are competitive wage premia an obstacle to growth? The answer of the architects of the Scandinavian "model" in the 1950s and 60s was in the affirmative: By punishing expansive and growth enhancing sectors of the economy competitive wage premia put an unwarranted drag on the rate of structural change. We formalize this intuition using a two sector endogenous growth model, considering both open and closed economy cases. We also show that egalitarian pay compression, combined with active labor market policies, works exactly in the same way as an industrial policy of subsidizing sunrise industries.

November 28, 1991

*Research Fellow, Institute for International Economic Studies, University of Stockholm, S-106 91 Stockholm, Sweden, and Associate Professor, Department of Economics, University of Bergen, Jonas Reins gate 19, N5008 Bergen, Norway, respectively. We appreciate skillful research assistance from Kerstin Johansson. Without implicating them, we would like to thank Per-Anders Edin, Nils Gottfries, Assar Lindbeck, Torsten Persson and Lars E.O. Svensson for comments on an earlier version of the paper. We have also benefited from presenting the paper at seminars at the Institute for International Economic Studies, Stockholm; Center for Research in Economics and Business Administration, Bergen; and University of Bergen.

1. Introduction

Scandinavia in the decades following World War II is by many considered a success story. Growth was rapid and unemployment remained spectacularly low. At the same time powerful and centralized labor unions pursued strongly egalitarian wage policies, and apparently succeeded in establishing a more even distribution of wages and income than in most other countries. This is in stark contrast to standard economics, which suggests that compression of wages relative to productivities should lead to more or less severe efficiency losses. Today unemployment rates in Norway are rising towards the European average, and also in Sweden signs of macroeconomic distress are showing. As faith in the traditional Scandinavian "model" falters, it seems warranted to look back on its heyday. How was it possible to combine egalitarianism with growth and strong economic performance?¹

The 1980s have witnessed a revival of interest in trade union theory. Much of this literature is best viewed as portraying a firm-specific union bargaining with the employer side, but there has also been some focus on large, centralized unions and on their interaction with the government. For example Olson (1982) and Calmfors and Driffill (1988) claim that with highly centralized unions efficiency is less likely to be harmed than with intermediate centralism. The argument is that a large encompassing union is more likely to internalize some of the negative macroeconomic externalities present in wage setting. Probably there is some truth in this, but the story still seems rather incomplete as a description of union centralism in for instance Norway and Sweden. *Ceteris paribus*, if wage moderation is the key characteristic of centralized unions, we should expect countries with highly centralized unions to be low-wage economies. This does not seem to fit the

¹When we talk about the Scandinavian model as furthering growth, we mean that egalitarian wage policies, like the ones pursued in Norway and Sweden, can have this effect. We do not necessarily subscribe to other particular policy measures often associated with the Scandinavian countries. For example, we have no quibbles with the argument that a generous welfare state might require tax levels which are detrimental to growth; see e.g. Lindbeck (1990).

facts (Landesmann and Vartiainen, 1990).

In contrast, the intellectual architects of the Scandinavian model were much more preoccupied with the dynamic effects of centralized trade unionism. The crux of the matter was a deeply held suspicion of the role of competitive wage premia in the growth process. In the words of Gösta Rehn, labor is not "...like mercury, requiring only small level differences between two areas in order to float quickly, and in large quantities, from one of them to the other" (Rehn, 1988, p. 325, our translation). As a consequence firms in expanding sectors of the economy have to pay more or less substantial competitive wage premia to attract workers from firms in old and stagnating sectors. However, by increasing the wage bill of expansive firms these wage premia put an unwarranted drag on the rate of structural change.²

The suggested remedy was "solidaristic" wage policies.³ By compressing wage differentials between low-productivity and high-productivity sectors a central union can help to speed up growth and structural change. And as high-productivity sectors expand and low-productivity sectors are driven out of existence, redundant workers can find a better paid job in the expanding sectors of the economy. There is also a close link between solidaristic wage policies and the traditionally strong emphasis on active labor market policies, especially in Sweden. To speed up the reallocation of redundant workers the government should pay outright mobility grants and subsidize re-training directed at work in the expanding sector.

For decades, however, most academic economists have had troubles with this dynamic approach to union centralism. The belief has been that a system of

²The idea that intersectoral wage gaps create efficiency losses is also standard in the development literature; see e.g. Williamson (1988).

³The intellectual origins for the notion of solidaristic wage policies can be traced to the writings of the Swedish trade union economists Gösta Rehn and Rudolf Meidner in the late 1940s and early 1950s. For an English translation of some of the key essays, see Turvey (1952). Hibbs and Locking (1991) summarize some of the main institutional developments, and provide a very thorough empirical examination of the impact of solidarity bargaining on the Swedish wage structure. They conclude that the dispersion of relative wages among blue-collar workers declined on the order of 75 percent from the early 1960s to the early 1980s.

competitive markets would provide us with the right speed of structural change, and — as a corollary — that pay compression could only create inefficiencies: In the absence of market imperfections competitive wage differentials simply reflect the true opportunity cost of intersectoral labor mobility.⁴ Thus, while solidaristic wage policies remained an important (many would say the most important) ingredient of the Scandinavian model for several decades, it seems safe to conclude that most economists consider their theoretical underpinnings as at best shaky.⁵

The purpose of this paper is to show that these shaky views about growth and the role of competitive wage premia and union wage policy can be tied together using the tools of endogenous growth theory. Following the pioneering work of Romer (1986) and Lucas (1988), a key focus in much of this literature is that there can be socially increasing returns and positive externalities from producing in certain sectors rather than in others. This gives a rationale for why structural change might be suboptimal in a laissez-faire economy. One policy implication could be that the government should subsidize employment in the externality-generating sector, or education that is geared towards the needs of this sector. This could easily lead to larger income differentials — for the sake of faster growth. However, a radically different policy might also work. By compressing wage differentials between e.g. a high-tech, externality-generating modern sector and a low-tech traditional sector people will be forced out of the traditional sector into the modern one.

A first interesting analysis along these lines is provided by Chadha (1991). Chadha's focus is on Singapore, but Singapore's policy of promoting growth through

⁴For forceful presentations of this view, see Flam (1987), Kierzkowski (1982, 1984) and Knies and Herberg (1988).

⁵While observations of pay compression within union sectors are plentiful, and not confined to the Nordic countries (see e.g. Freeman and Medoff, 1984), there is scant theoretical work on the subject. For recent attempts, see e.g. Agell and Lommerud (1991), analyzing pay compression as an insurance device, and Moene and Wallerstein (1991) and Ramaswamy (1991), analyzing the interaction of bargaining institutions, pay compression and structural change.

certain "wage correction" policies closely parallels ideas prevailing in Norway and Sweden in the 1950s. Our analysis shares the spirit of Chadha's model, but differs in important respects. First, whereas Chadha envisage workers to be perfectly mobile across sectors, we introduce mobility costs that give rise to a well defined competitive wage differential. This allows us to explore the effects of competitive wage premia on growth in some detail, and to formalize the notion of wage premia as a tax hindering structural change.

Second, sluggish labor adjustments affect the allocation of labor *and* capital, and hence the functional distribution of income. To explore the distributional dynamics during a process of structural change we incorporate capital in our model. This links our analysis to the age-old debate whether or not economic development requires increased inequality as a prerequisite. Perhaps the most famous concept in this context is Kuznets' "U-hypothesis": When the development process gets started, inequality increases — only when economic development is well under way will society start to become more egalitarian again. On the face of it, the view of wage compression as a dynamic force in the growth process may seem to be in complete contradiction of the Kuznets hypothesis. However, the degree of equality does not only depend on the degree of wage dispersion among workers; also the functional distribution of income matters.

Invoking sector-specific externalities to explore the effects of such a multifaceted phenomenon as solidaristic pay compression is of course a procedure open to some criticism. First, one would be hard-pressed to argue that the Scandinavian proponents of pay compression actually had externalities in mind when they made their case in the late 1940s. Our topic, however, is not doctrinal criticism, but rather the potential effects of union egalitarianism put into practice. Second, our argument that external economies of scale are more important in a "modern" manufacturing sector (engineering, electronics, etc) than in a "traditional" sector (agriculture, textiles, etc) is not airtight. Clearly, there is a

marked disparity between the burgeoning theoretical literature on endogenous growth, often based on assumptions about externalities, and the relatively scant empirical investigation into the importance of externalities in the real world.

However, we do believe that the available evidence is sufficiently rich to prevent our conjecture from being dismissed off-hand. Caballero and Lyons (1989, 1990) report comprehensive evidence on significant externalities in U.S. and European manufacturing. In a follow-up, Bartelsman, Caballero and Lyons (1991) try to disentangle different sources of externalities. Overall, their results provide evidence that both fluctuations-oriented and growth-oriented external economies are important in U.S. manufacturing. Their findings also support the idea that external economies vary considerably across sectors. This idea also seems to be in line with common beliefs. Given the freedom of choice, why does almost everyone prefer electronics to textiles, and engineering to agriculture? To us, it is quite natural to think of electronics and engineering as activities more likely to generate positive knowledge spillovers. The importance of knowledge externalities is studied in the literature on R&D spillovers; for some recent empirical evidence, cf. Griliches and Lichtenberg (1984), Bresnahan (1986) and Jaffe (1986).

The remainder of the paper is organized as follows. Section 2 outlines the main elements of our endogenous growth model. In section 3 we study the properties of equilibrium growth in a laissez-faire economy, and go on to analyze the effects of competitive wage premia. Section 4 analyzes the consequences of "solidaristic" wage compression within this framework. Section 5 turns to the limitations of our analysis, and examines to what extent our results survive when we relax certain key assumptions. A final section provides some concluding remarks.

2. The basic model

a. Production and learning

Our basic set-up builds on Lucas (1988). The main difference is that we incorporate physical capital into the model, and assume that labor mobility across sectors is less than perfect. There are two competitive production sectors, a modern one denoted by subscript m , and a traditional one denoted by subscript t . Both sectors use labor and capital, in fixed total supplies, to produce consumption goods c_m and c_t . To this standard Heckscher–Ohlin set-up we add dynamic learning effects in the modern sector. As these learning effects cumulate over time, so will the economy's aggregate production possibilities.

The two consumption goods are produced according to the Cobb–Douglas production functions

$$(1) \quad c_m = h l_m^\beta k_m^{1-\beta}$$

$$(2) \quad c_t = l_t^\beta k_t^{1-\beta},$$

where l_i and k_i denote the labor and capital employed in sector i , and h is the human capital used in modern sector production. Of course, it would not be difficult to allow the share parameter β to differ between sectors. However, for our purpose it is convenient to suppress all kinds of intersectoral production heterogeneity related to factors other than dynamic learning effects.

As Krugman (1987) and Lucas (1988), we assume that learning effects in the modern sector represent an industry phenomenon, entirely external to individual firms. Following Lucas the rate of learning-by-doing (i.e. the rate of human capital accumulation) is specified as an increasing function of the size of the modern sector work force:

$$(3) \quad \dot{h}/h = \delta l_m,$$

where a dot over a variable defines a time derivative, and δ measures the intensity of our linear learning technology. The simple form of the learning equation is not crucial for our analysis. What we do need for our results to go through is a positive link between the resource base of the modern sector and its rate of external knowledge formation. Such a link occurs in a variety of endogenous growth models.

b. Factor markets and labor mobility

Students of structural change and growth processes often seem to focus on the role of sluggish *capital* reallocations across sectors. The concept of solidaristic wage policy builds on the polar view that insufficient *labor* mobility constitutes a major obstacle to growth.⁶ However, sluggish labor force adjustments is considered as having unwarranted side effects on the intersectoral allocation of capital. As old and stagnating sectors of the economy can pay lower than average wages, they can also afford to pay the going rental rate of capital. As a consequence, capital gets stuck in the wrong industries.

While intersectoral mobility costs may come in a variety of forms, ranging from necessary re-education to meet job requirements in the modern sector to outright travel expenses, we will in the following focus on locational preferences as a source of imperfect labor mobility. Apart from lending itself to a simple analytical treatment, locational preferences also seem to come close to the kind of mobility obstacles emphasized by critics of the solidaristic wage policies pursued in Norway and Sweden. By speeding up the deindustrialization of large, and often distant, areas of the country solidaristic wage policies unduly forced, it was argued, a sizable

⁶For an interesting recent paper discussing sectoral adjustment in the presence of restricted labor mobility, see Matsuyama (1990). Matsuyama focuses on irreversible educational decisions as a mobility obstacle. As there are no externalities in his model, the rate of structural change is always efficient.

portion of the population to desert their preferred ways of living.

To pin-point these arguments, we assume that workers always prefer to work (and consume) in the traditional sector.⁷ A convenient way of formalizing this is to assume a utility function of the form

$$(4) \quad U_t = \gamma U(c_m, c_t), \quad \gamma > 1$$

$$(5) \quad U_m = U(c_m, c_t),$$

where U_m is utility from living in the modern sector and U_t utility from living in the traditional sector. $U(\cdot)$ is homogeneous of degree one in the consumption of modern and traditional sector output. The parameter γ is a multiplicative shift factor, representing the location-dependence of utility. In short, any given consumption bundle gives higher utility if consumed in the traditional sector. For any given choice of geographical location workers maximize utility by allocating their wage income across the two consumption goods. Assuming that each worker supplies one labor unit irrespective of his sectoral affiliation, the resulting conditional indirect utility functions become

$$(6) \quad V_m = R w_m$$

$$(7) \quad V_t = \gamma R w_t,$$

where V_i is the indirect utility of living (and consuming) in sector i , w_i is the corresponding wage and R is some function of output prices.

⁷More realistically, locational preferences would depend on the whole history of where one has lived, so that a newcomer to the modern sector gradually adjusts her preferences. But as we focus on an ongoing migration process from the traditional to the modern sector, we find this simplification acceptable.

Consider the mobility decision of a traditional sector worker. To accept a job in the modern sector it must be the case that $V_m \geq V_t$, implying that the required wage premium must satisfy $w_m \geq \gamma w_t$. With competitive labor markets we then obtain the marginal mobility condition

$$(8) \quad w_m = \gamma w_t,$$

which must be satisfied at every point in time during a process of structural change, where resources gradually move from the traditional to the modern sector.⁸ Capital, on the other hand, is perfectly flexible across sectors:

$$(9) \quad r_m = r_t \equiv r.$$

To simplify algebra without loss of generality, we set total supplies of labor and capital equal to unity.⁹ The full employment conditions for factor markets then become

$$(10) \quad l_m + l_t = 1$$

$$(11) \quad k_m + k_t = 1.$$

⁸An example from the migration literature that receiving sector wages are discounted when compared with source sector wages, is Katz and Stark (1989).

⁹While common in Heckscher–Ohlin type models, the assumption of a fixed amount of capital, which can move without friction across sectors, is of course a rather questionable one. We do not suggest that intertemporal savings decisions and capital formation are unimportant factors for understanding growth and structural change in the real world. We do believe, however, in Ockham's razor — our formulation permits a clean-cut analysis of growth and competitive wage differentials.

c. The demand side

To close the model we assume a utility function of the constant elasticity form:

$$(12) \quad U(c_m, c_t) = [c_m^{-\rho} + c_t^{-\rho}]^{-1/\rho},$$

where $\rho > -1$ and $\sigma = 1/(1+\rho)$ is the elasticity of substitution between c_m and c_t .¹⁰ Denoting the relative price of traditional sector output in terms of modern sector output by q , the optimal consumption bundle must satisfy

$$(13) \quad c_t/c_m = q^{-\sigma}.$$

In our capital and labor economy, as in the pure labor model of Lucas (1988), the value of σ turns out to be crucial for the rate (and even direction) of structural change. Holding the factor allocation constant across sectors, the learning equation (3) implies that unit costs in the modern sector decrease over time. If σ is small ($\sigma < 1$) this bonus will be used to allow increased consumption of both goods, meaning that resources will move from the modern to the traditional sector. If σ is large ($\sigma > 1$) resource transfers will go in the other direction, and the absolute size of the traditional sector will decrease over time. As this situation seems to come closest to mind when thinking about structural change in the real world, we henceforth follow Lucas in assuming that $\sigma > 1$.

¹⁰With purely external human capital formation and no physical capital accumulation, all relevant aspects concerning consumer preferences are captured by the single period utility function depicted in (12).

3. Competitive wage premia, growth, and distribution

The equilibrium dynamics of our model are simple. As our representative agents face no intertemporal tradeoffs there is no role for forward-looking expectations in deciding equilibrium growth patterns. In the terminology of Krugman (1991) "history" is all that matters. Given the initial conditions the entire future growth path is uniquely determined.

It is useful to start out by characterizing equilibrium factor allocations. It takes just a few lines of algebra to show that perfect competition in factor markets must imply that¹¹

$$(14) \quad \frac{k_m/l_m}{k_t/l_t} = \gamma,$$

at each instant τ . Due to the proportional (and constant) wage premium γ , capital intensity in the modern sector always exceeds capital intensity in the traditional sector. Equation (14) is suggestive of the view of wage premia as a potential obstacle to growth. As the rate of external learning formation is directly tied to the size of the modern sector work force, the wage premium γ slows growth by promoting capital intensive production in the modern sector.¹²

To derive expressions for factor uses in absolute terms we must invoke the demand side. Substituting (1) and (2) into (13), and using (14), we obtain

¹¹We use the fact that perfect competition in factor markets implies $w_m = mpl_m$, $w_t = q \cdot mpl_t$, $r_m = mpk_m$ and $r_t = q \cdot mpk_t$, where mpl_i and mpk_i are the marginal products of labor and capital in sector i . Manipulating (1), (2), (8) and (9), we then obtain (14).

¹²In general, the competitive wage premium also creates a scale effect, as it decreases the overall size of the modern sector. This scale effect explains why the simple form of the learning equation (3) is less crucial. Had we rather chosen to specify knowledge formation as a function of modern sector output, or of some weighted average of factor inputs, we would thus still obtain a negative link between competitive wage differentials and external learning.

$$(15) \quad q = [h^{-1} \gamma^{\beta} (k_t/k_m)]^{-1/\sigma}.$$

Perfect competition in output markets implies that q must equal relative unit costs. With our Cobb–Douglas production functions, this means that

$$(16) \quad q = h \gamma^{-\beta}.$$

Combining (15) and (16) we have that

$$(17) \quad \frac{k_m}{1-k_m} = h^{\sigma-1} \gamma^{\beta(1-\sigma)}$$

$$(18) \quad \frac{l_m}{1-l_m} = h^{\sigma-1} \gamma^{\beta(1-\sigma)-1},$$

where we have used the equilibrium conditions (10) and (11), and where the last expression follows from combining (14) and (17). Equations (17) and (18) underline the key role of human capital as a vehicle for structural change. At each date the intersectoral allocation of production factors is directly linked to the stock of external human capital in the modern sector. To obtain the evolution of human capital, we substitute (18) in (3):

$$(19) \quad \frac{\dot{h}}{h} = \delta \frac{A}{1+A}, \quad \text{where}$$

$$(20) \quad A = h^{\sigma-1} \gamma^{\beta(1-\sigma)-1}.$$

Given an initial endowment $h(0)$ the nonlinear differential equation (19) implicitly defines the stock of human capital at each instant, and hence from (17) and (18) the time paths for the allocation of labor and capital. In the following we assume that

$h(0) > 0$. Our model then implies a process of ongoing structural change (if $h(0) = 0$, the economy gets stuck in an equilibrium where all production takes place in the traditional sector). As external human capital steadily accumulates in the modern sector, labor and capital gradually shift towards this sector. To further characterize the solution of (19), we note that A is, given our assumption on σ , a monotonically increasing function of h . The growth rate of human capital, \dot{h}/h , therefore increases over time, and reaches an upper bound δ when time approaches infinity.

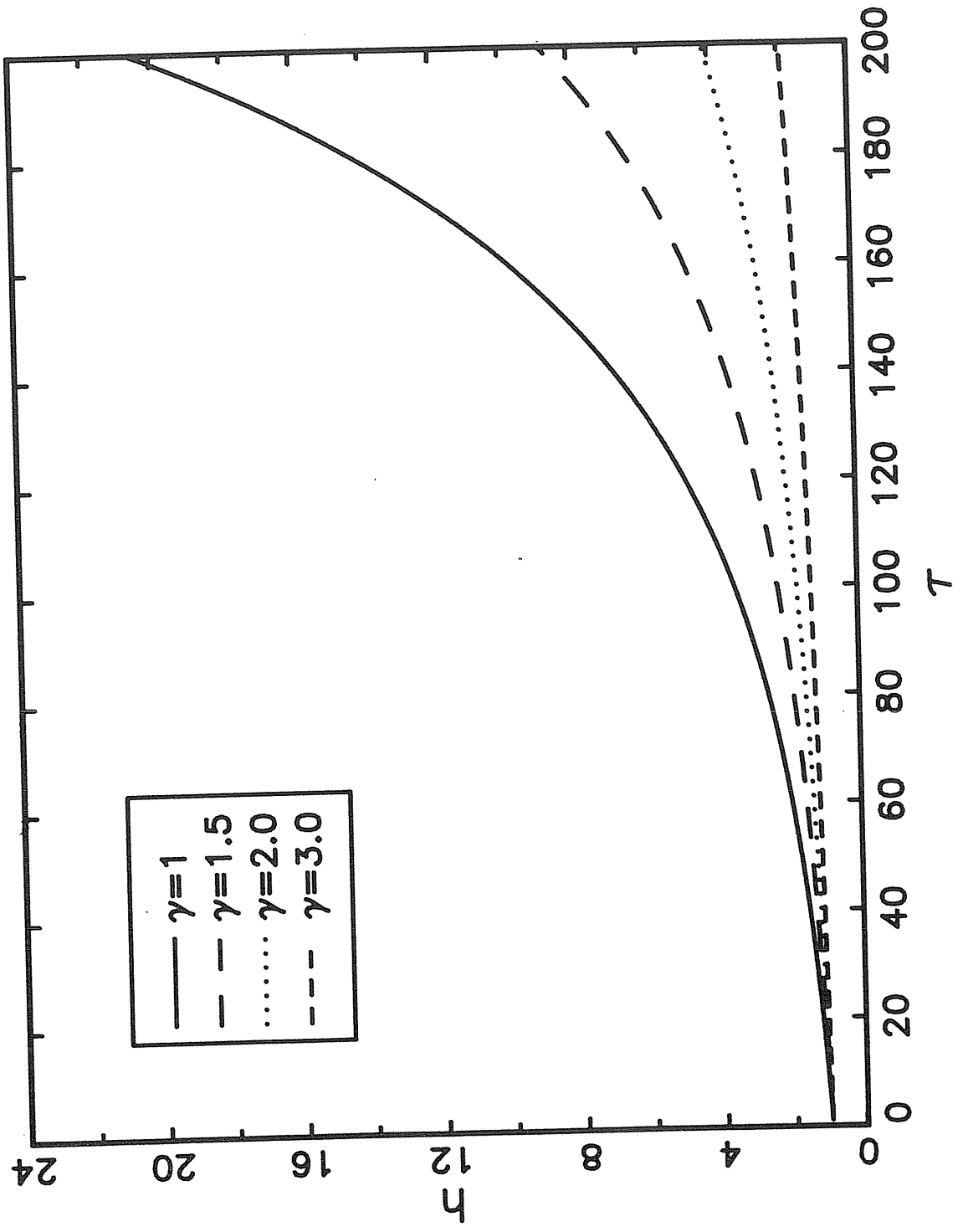
As in other models with external learning effects, the competitive equilibrium path is not efficient. The higher growth potential in the modern sector is not accounted for by private agents. As a consequence the rate of transformation from traditional to modern sector production is too slow. From (19) and (20) we also note that the growth rate of human capital is a decreasing function of the wage premia γ . If γ is sufficiently large, the growth process comes to a standstill.

Figure 1 illustrates the point. It shows the time path for the stock of human capital for different values of γ . In all cases we assume $\sigma=2$, $\beta=.75$, and $h(0)=1$. We set $\delta=.02$, which reflects an annual steady-state growth rate of two percent. As time goes by competitive wage premia put a cumulative drag on human capital formation. In effect, they operate as a tax on learning formation in the modern sector. Interpreting τ as calendar time and using the growth path for an economy without wage differentials (i.e. when $\gamma=1$) as the benchmark case, we note that the human capital stock at year 200 is about 80 percent smaller for an economy with $\gamma=2$.

INSERT FIGURE ABOUT HERE

Are economies with smaller wage premia better off than those with larger ones? Clearly, at any given instant an economy is better off in a state with a large, rather than a small, stock of human capital; *ceteris paribus*, a larger human capital

Fig 1



stock simply implies a more generous aggregate resource constraint. In this particular sense smaller wage premia are better than larger ones. While tempting, it is however still inappropriate to identify the growth paths of figure 1 with different levels of economic well-being. Economies with larger wage differentials have a preference for less rapid growth, and undertake smaller sacrifices in terms of current reallocations in order to reap future gains. Although the external nature of human capital formation means that the competitive growth path for any particular economy (characterized by a certain value for γ) falls short of its optimal one, there is no meaningful way of ranking growth paths across different economies.

Which growth rate would be chosen by a benevolent planner? As the planner internalizes the externality in modern sector production the optimal rate of structural change will always be larger than that provided in the competitive equilibrium. However, it will not be infinitely large either. Along the optimal growth path the planner must set the shadow value of transferring workers to the externality generating sector against current marginal costs in the form of a less desirable mix of consumption goods and a less desirable locational pattern of workers.¹³

The idea that sluggish intersectoral factor adjustments may have important consequences for the distribution of income is well-known from the literature on international trade; see e.g. Mussa (1982) and Neary (1978). How does structural change affect income distribution in our model? Labor incomes in the two sectors

¹³Consider a benevolent planner maximizing workers' utility (including capital owners in the welfare function would not alter the intuition). At any instant τ the return function is $R = l_m U_m + (1-l_m)U_t$, where $U_m = U(c_m^m, c_t^m)$, $U_t = \gamma U(c_m^t, c_t^t)$, and c_i^j denotes the amount of sector i production allocated to workers in sector j . Given some social discount factor, the planner maximizes the integral of $R(\tau)$ from time zero to infinity, subject to (3) and the resource constraints $h l_m^\beta k_m^{1-\beta} = l_m c_m^m + (1-l_m)c_m^t$ and $(1-l_m)^\beta (1-k_m)^{1-\beta} = l_m c_t^m + (1-l_m)c_t^t$. Setting up the corresponding Hamiltonian and deriving the relevant first-order conditions (treating l_m , k_m and the c_i^j 's as controls, and $h(\tau)$ as a state variable), it is straightforward to derive the intuition of the text.

are locked to each other by the relationship $w_m = \gamma w_t$. As the economy grows, the wage differential is constant in percentage, but increasing in absolute terms. However, in utility terms workers are always equally well-off in either sector: The very concept of a competitive wage differential implies that workers become indifferent to their sectoral affiliation. Clearly, this result does not fit very well with the U-hypothesis of Kuznets.

Matters become more interesting when we turn to the functional distribution of income. With perfectly mobile labor, it follows from (17) and (18) that the capital-labor ratio is unity at each date in both production sectors. With capital intensities thus given, both wage rates and the rental rate must increase in tandem with the stock of external learning capital; i.e. $\dot{w}/w = \dot{r}/r = \dot{h}/h$. With imperfect labor mobility ($\gamma > 1$) factor intensities change over time. From (14) capital intensity in the modern sector always exceeds capital intensity in the traditional sector by the multiplicative factor γ . During the growth process, when resources gradually get released from the traditional sector, capital intensity must therefore decrease in both sectors (this can be shown by repeated use of (17) and (18)). As the changes in factor intensities are favorable to capital owners, it follows that $\dot{w}/w < \dot{h}/h < \dot{r}/r$.

During the modernization phase competitive wage differentials affect the dynamics of functional factor shares. An increasing share of the fruits of structural change will accrue to capital owners. Over time, however, rates of factor price increase converge. As time approaches infinity, both capital returns and wages converge to the common growth rate \dot{h}/h . The implied pattern of factor returns is roughly consistent with a modified version of Kuznets' U-relation between development and inequality. However, while Kuznets focused on the uneven development of wages in different sectors, the modified U-result that comes out of our analysis pertains to the uneven development of functional factor shares. It should also be noted that our modified U-result pertains to growth rates of inequality, and not to absolute levels. Thus, even though the growth rate of wages

eventually catches up with that of capital, the inequality gap created during the transition phase will not be closed.

4. Solidaristic wage policies

The edifice of solidaristic wage policies stands on three equally important legs. While pay compression (the first leg) is a prerequisite for the Scandinavian approach to industrial restructuring, it must be complemented by two other measures to be effective. The second leg is a policy of generally high wages; wages must be set at such a level that firms at the low-end of the productivity distribution are under constant pressure to restructure and reallocate. The third leg is active labor market policies, designed to speed up restructuring and mitigate the individual consequences of structural change. Do these policies make economic sense?

Consider the *laissez-faire* equilibrium of the previous section. To highlight the mechanics of solidaristic wage policies, we now introduce its component parts in sequential order — keeping in mind their joint nature. First, think of a central union as fixing the wage differential at unity (implying a uniform wage rate w across sectors), but letting the wage level be determined in the market. While this removes the differential wage-tax on skill formation in the modern sector, it also affects the mobility decision of workers. Allowing for re-migration to the traditional sector, our economy will collapse to a one-good equilibrium. Labor will rush back to the traditional sector, and capital must follow suit. The economy gets locked into a low-productivity equilibrium, which is sustained forever.

The dual role of wage premia — stimulating intersectoral labor mobility but taxing modern sector firms — underlines that a policy of pay compression may, on its own, create more problems than it solves. To be successful, labor must somehow be induced to return to the modern sector, despite the lack of migration incentives.

In principle, solidaristic wage policy solves the problem in a harsh way: If the carrot does not work, why not use the stick instead? Full employment wages in the one-good equilibrium are too low, as they do not reflect labor's alternative use in the modern externality-generating sector. By raising the overall wage level a central union forces traditional sector firms to economize on scarce labor resources. The net outcome is traditional sector unemployment — the stick.

Clearly, traditional sector unemployment does not translate directly into a willing line of modern sector job seekers. Depending on the distribution of reservation wages, some workers may prefer to stay on in the traditional sector despite unemployment; other workers may, using an out-of-the-model argument, need some retraining to satisfy modern sector job requirements; etc. This is where the third leg of active and mobility-oriented labor market policies enter. By introducing extensive retraining programs and providing generous mobility grants the government would promote rapid and efficient reallocation of unemployed workers in the traditional sector.

Assume that the active labor market policies operate as intended, meaning that every unemployed worker in the traditional sector is willing to apply for a modern sector job.¹⁴ Within the context of our model, a central union then has some latitude in determining the growth rate. By accepting the full employment wage rate in the specialized equilibrium (i.e. when all production takes place in the traditional sector) the union opts for zero growth. However, at real wages higher than the full employment wage in the traditional sector the union is, at any given instant, confronted with a menu of growth-wage combinations; by increasing the wage level the union speeds up the rate of reallocation of workers to the modern

¹⁴This smooth and efficient reallocation of unemployed workers is of course not all that realistic. Even vigorous labor market policies is likely to be associated with some frictional unemployment due to job transitions. However, as indicated by the historical facts, the assumption of the text is not all that unrealistic either. In the 1950s and 60s (decades of rapid structural change), the average Swedish unemployment rate was about 1.5 percent; see e.g. Lindbeck (1975).

sector. Obviously, there is an upper limit to such growth oriented wage policies. If real wages are too high, only some fraction of unemployed workers in the traditional sector can find new jobs in the modern sector — the net outcome is aggregate unemployment.

It is easy to characterize the maximum growth path compatible with solidaristic wage policies. Denote the implied wage rate by w^* . At this wage labor demand of modern sector firms is just sufficient to absorb the unemployed in the traditional sector. Formally, we then have that

$$(21) \quad l_m(w^*) = u$$

$$(22) \quad l_t(w^*) = 1-u,$$

where u is the fraction of workers expelled from the traditional sector, and where $l_i(w^*)$ denotes the labor demand of sector i in a general equilibrium conditioned on the wage rate w^* . Consolidating (21) and (22) we obtain

$$(10') \quad l_m(w^*) + l_t(w^*) = 1.$$

Equation (10') is formally equivalent to the full employment condition (10) in the laissez-faire economy, the only difference being that involuntary mobility at a uniform wage w^* replaces voluntary mobility at a given wage differential γ . This immediately suggests a simple rule for determining w^* . Let w_c denote the equilibrium wage in a laissez-faire economy *without* wage differentials (i.e. when $\gamma=1$). From the preceding section we know that equations (17)–(20) then summarize the competitive dynamics, holding γ at unity. Clearly, as long as $w^*=w_c$ at each instant τ , the economy with solidaristic wage policies will replicate the competitive outcome. As time goes by the union must then increase w^* at the same

rate as the stock of external learning capital in the modern sector.

The bottom line is straightforward. Starting in a competitive equilibrium with imperfect labor mobility a central union may short-cut the potentially adverse effects of competitive wage premia on growth. By mimicking the walrasian outcome in a world with perfectly mobile labor properly devised pay compression may promote growth. Returning to the figure, we may now think of the different growth paths as referring to one particular economy, operating under alternative wage setting regimes. Depending on the value of γ , the difference between any of the broken curves and the solid curve represents the maximal additional growth potential provided by solidaristic wage policies.¹⁵

Solidaristic wage policies were designed to combine growth and income equality. Our analysis suggests that this dual purpose strategy may make economic sense. In the laissez-faire economy with imperfect labor mobility the modified U-result holds, implying that returns to capital owners increase at a faster rate than wages throughout the growth process. Along the maximal growth path (where $w^* = w_c$) wages are equalized across sectors, and the overall wage level grows in tandem with capital returns.

However, income equality is not the same as equality of welfare. While pay compression may lead to a – relative to laissez-faire – more even development of functional factor shares, it may also create new inequalities among different groups of workers. This possibility – often stressed in the policy debate in Norway and Sweden – is also clear from our analysis. Equalization of intersectoral wages means that workers always prefer a rationed job in the traditional sector to a job in the modern sector. In this sense, the gainers from pay compression belong to the (ever

¹⁵For reasons discussed in the preceding section, growth does not necessarily coincide with welfare. While laissez faire growth is surely too slow, the solid curve in the figure may well be associated with too rapid growth. A benevolent union may then adopt a less growth-oriented wage policy, and set the uniform wage rate somewhere below w^* , but above the full employment wage rate in the specialized no-growth equilibrium.

decreasing) number of workers that manage to keep a job in the traditional sector. This underlines that the case for active labor market policies and generous mobility grants is not only based on allocational considerations. Fairness considerations alone suggest that migrants to the modern sector ought to get compensation for the private sacrifices involved; cf. Rehn (1988, p. 174).¹⁶

Solidaristic pay compression is not the only feasible growth promotion strategy in our model. In fact, the growth path associated with the w^* -policy can also be obtained through a policy of pay-roll subsidies to firms in the modern sector. (Consider the effects of giving firms in the modern sector a subsidy directly proportional to the competitive wage differential.) We will denote this latter strategy "industrial policy". When the two policies are measured out to give the same rate of structural change, and when pay compression is combined with full compensation to movers, they are in fact formally identical. The only cosmetic difference is that under solidarity bargaining movers get compensation when leaving the traditional sector, while industrial policy involves paying out the compensation upon arrival in the modern sector in the form of a (subsidized) wage premia. Furthermore, as industrial policy serves to equalize employers' net wage costs across sectors, the resulting (net) wage level will — as in the case of the w^* -policy — grow at the same rate as capital returns. Also the financing requirements of the government will be the same; in our simple set-up, it is easy to show that full compensation of modern sector workers is just as costly as modern sector pay-roll subsidies.

All this is quite intuitive. Full compensation transforms solidaristic pay compression into a "pull" policy for labor mobility. Moving is then voluntary, just as when modern sector employment is subsidized. With less than full compensation, however, important differences occur. While industrial policy and pay compression

¹⁶As suggested by some of the critics of the solidaristic wage policies carried out in Sweden, actual compensation may have fallen short of the amount implied by a strict compensation principle. See Lindbeck (1975) for a summary of the debate.

still deliver (presupposing that workers always prefer a modern sector job to unemployment in the traditional sector) the same growth rate, they will have different implications for equity and government revenue raising. As pay compression with incomplete compensation means that involuntary movers have to pay part of their mobility costs themselves, it is less costly for the government than industrial policy. From an equity point of view, however, industrial policy has the obvious advantage of never interfering with the mobility condition (8), meaning that utility always is the same for all workers. Before condemning pay compression without compensation as unsolidaristic, we must recognize that a complete welfare analysis also should take into account the effects of increased (distortionary) taxes, made necessary by full compensation. In discussing the relative merits of pay compression and industrial policy, we may also note that international agreements to an increasing extent seem to block a country from subsidizing its own "modern" sector. Though conceptually similar, solidaristic wage policies do not seem to meet any international retaliation.

5. Omissions and extensions

Are our results robust? Let us briefly discuss some of the key simplifying assumptions.

a. Output trade

What are the effects of introducing international trade in our model? Consider the case of a small open economy facing internationally given output prices.¹⁷ At any given instant τ , world prices are $(1, q)$. Perfect competition then implies the zero-profit conditions

¹⁷The following argument owes much to Lucas (1988).

$$(23) \quad 1 \leq B h^{-1} w_m^{\beta} r^{1-\beta}$$

$$(24) \quad q \leq B w_t^{\beta} r^{1-\beta},$$

where the right-hand terms give the unit cost functions corresponding to (1) and (2), B is some function of β , and $w_m = \gamma w_t$. Unit costs in the traditional sector, relative to unit costs in the modern sector, are then $h\gamma^{-\beta}$. Everything else equal, competitive wage premia decrease relative unit costs, while human capital formation works in the other direction.

At any instant, there are three possible competitive equilibria. Consider first the case when $q > h\gamma^{-\beta}$, implying that the price of traditional sector output in terms of modern sector output is higher than the corresponding relative unit cost. Our small open economy will then specialize in the production of traditional sector output (meaning that (24) reduces to an equality, and (23) to a strict inequality). In the converse case, when $q < h\gamma^{-\beta}$, our economy will specialize in modern sector production. Finally, in the knife-edge case when $q = h\gamma^{-\beta}$, we obtain a — at least momentarily — diversified equilibrium, with production taking place in both sectors.

The open economy set-up captures the same story as the closed economy model. In both cases competitive wage differentials represent potential obstacles to growth. These obstacles appear, if anything, even more dramatic in the open economy. Consider two small trading countries, having the same initial human capital stock $h(0)$, but differing in terms of γ . Clearly, the country with the higher value of γ is the one most likely to specialize in the production of traditional sector goods. Thus, initial comparative advantages depend crucially on γ . High- γ countries have a comparative advantage in traditional sector production, while low- γ countries have a comparative advantage in modern sector production. As countries specialize accordingly, low- γ countries will accumulate external learning capital and settle on a path of sustained growth, while high- γ countries get locked

into a stationary equilibrium.

b. International factor mobility

International factor mobility creates new problems. It is probably no coincidence that the concept of solidaristic wage policies was developed at a time when the Nordic countries adopted far reaching capital controls, and when international labor mobility was severely restricted. With internationally mobile production factors, *any* policy aiming at affecting domestic factor prices will of course be hard to implement.

When it comes to capital mobility, however, the difficulties seem surmountable. As long as the union moderates its push for a higher overall wage level (the second leg of the Scandinavian approach to industrial restructuring), the removal of competitive wage premia may generate an *inflow* of foreign capital to the modern sector.¹⁸ Labor mobility is an altogether different story. With foreign and domestic labor being highly mobile across borders, solidaristic wage policies tend to create an inflow of foreign workers to the traditional sector, and an outflow of domestic workers from the modern sector. To be effective, solidaristic wage policies must then be supported by a *fourth* leg, namely measures that limit cross-border flows of workers. While limits on the inflow of foreign workers are conceivable,¹⁹ limits on the outflow of domestic workers have — for obvious reasons — little to recommend.

¹⁸It should be noted, however, that our results on the dynamics of functional factor shares crucially depend on the assumption of a given domestic capital stock. With perfect capital mobility, the domestic capital return must of course evolve in tandem with the international rental rate. It could though be of some use to distinguish between two types of capital, "informed" and "uninformed". Informed capital is used for risky equity investments, requiring good local knowledge. Uninformed capital is used for less risky loans. While uninformed capital flows rapidly across borders, informed capital represents an intrinsically domestic production factor in fixed supply. See Norman (1992) for an elaboration of this view in a Heckscher–Ohlin context.

¹⁹As part of its wage correction policy, Singapore also adopted measures to limit the inflow of low-skilled foreign workers. See Chadha (1991).

c. "Equal pay for equal work"

The external nature of human capital formation in the form of learning-by-doing is the engine that drives our policy analysis. In an environment where human capital accumulation largely depends on workers' investment in education or training, competitive wage differentials will also reflect private returns to education and occupational choices. Across-the-board pay compression then distorts workers' choice of education or occupation.

However, properly devised pay compression may still promote structural change and growth at small costs in terms of educational disincentive effects. In our model workers have identical productive characteristics. In effect, they can be thought of as a pool of homogeneous carpenters (or university professors), requiring a wage premium to incur the cost of moving to the modern sector. In this one-job economy, pay compression simply means that carpenters are paid the same irrespective of their sectoral affiliation, which speeds up industrial restructuring. This form of *intra*-job equalization of wages captures well the solidaristic wage policies actually pursued in Sweden up to the mid-1960s; see Hibbs and Locking (1991). Under the catchy slogan "equal pay for equal work", the Swedish confederation of blue-collar workers squeezed wage differentials within occupations, but not across occupations. To the extent that inter-occupational wage gaps mainly reflect private returns to e.g. education, the resulting wage structure may have promoted industrial restructuring without distorting workers' choice of education and occupation.

In Sweden, the original idea of intra-job wage leveling was transformed in a radically egalitarian direction in the late 1960s. For ideological and political reasons, solidaristic wage policy then became an instrument for a drastic compression of wages *across* occupations and skill groups, thus transforming the notion of equal pay for equal work into something more like "equal pay for *any* work". As such it may have been overly successful. Available empirical studies indicate that the return to

education in Sweden may have fallen by about 50 percent from the late 1960s to the mid 1980s; see Björklund (1986) and Edin and Holmlund (1991). While this decline may have come about for a number of reasons, it is still suggestive of the potential disincentive effects of the "wrong" kind of pay compression.²⁰

6. The demise of the Scandinavian model?

In this paper we have formalized some unorthodox (though highly influential) Scandinavian notions of competitive wage premia as a potential hindrance to growth. We have also argued that solidaristic wage policies (the suggested policy response) may make more economic sense than is commonly believed. Indeed, properly devised pay compression may produce growth *and* a more even development of factor returns. We also demonstrated the close conceptual similarity between pay compression and a general industrial policy of "picking the winners". However, solidaristic wage policies is not a universal formula that a country – whether Scandinavian, European or Asian – can apply to promote economic development and equality at all times. As the nature of external constraints and knowledge formation change over time, so will the appropriate policies to foster growth and structural change.

Today the Scandinavian model is under stress. In Sweden, the highly centralized wage bargaining system dissolved in 1983. As industry and local level bargaining replaced bargaining at the national level, central union authorities lost their instrument to enforce egalitarian wage agreements. As shown by Hibbs and Locking (1991), this led to a reverse trend in pay compression; by 1990 the dispersion of wages was back to the level of the mid 1970s. In Norway the dominant trade union confederation, LO, was challenged in the 1980s, and two competing

²⁰Clearly, our model is not designed to analyze the effects of this second vintage of union egalitarianism. For a general equilibrium treatment of some of the issues involved, see Flam (1987).

confederations grew rapidly in membership. The lesson to be learned seems to lie as much on the political side as on the conceptual one. As originally conceived the idea of solidaristic wage bargaining was not intended as a *carte blanche* for an all-out assault on the wage structure. In violating the first principles and pushing for more than simply equalization of wages among comparable jobs, the union leadership jeopardized the unity of the union movement.

Egalitarian wage policies require a social fabric of a very special variety. A high unionization rate is not enough. The internal cohesion and organizational strength of the union movement must be high. The links between unions and government must be close, with the latter providing the right kind of labor market policies. Although these conditions prevailed in Norway and Sweden in the 1950s and 60s, and may prevail also today in *dirigiste* market economies like Singapore and Taiwan, they are clearly more of an exception than a rule. *Why* these prerequisites come forth in some countries, in some time periods, is a crucial question, well beyond the confines of the present paper.²¹

²¹In fact, this issue is central in the political science literature on whether "social democratic corporatism" (which some argue is the essence of the Scandinavian model) is growth stimulating. See e.g. Lange and Garrett (1985), Jackman (1986) and Hicks (1988). From the viewpoint of economics, Persson and Tabellini (1991a, 1991b) and Saint-Paul and Verdier (1991) provide very interesting perspectives on the interaction of politics and growth. Their emphasis, very different from ours, is on how the degree of equality influences political decision processes, which in turn might have important consequences for growth.

References

- Agell, J. and K.E. Lommerud, (1991), "Union Egalitarianism as Income Insurance", forthcoming in *Economica*.
- Bartelsman, E.J., R.J. Caballero and R.K. Lyons, (1990), "Short and Long Run Externalities", NBER Working Paper No. 3810.
- Björklund, A., (1986), "Assessing the Decline of Wage Dispersion in Sweden". In *The Economics of Institutions and Markets*. Stockholm: IUI.
- Bresnahan, T., (1986), "Measuring Spillovers from Technical Advance: Mainframe Computers in Financial Services", *American Economic Review*, 76, 741–755.
- Caballero, R.J. and R.K. Lyons, (1989), "The Role of External Economies in U.S. Manufacturing", mimeo, Columbia University.
- Caballero, R.J. and R.K. Lyons, (1990), "Internal versus External Economies in European Industry", *European Economic Review*, 34, 805–826.
- Calmfors, L. and J. Driffill, (1988), "Bargaining Structure, Corporatism and Macroeconomic Performance", *Economic Policy*, No. 6.
- Chadha, B., (1991), "Wages, Profitability, and Growth in a Small Open Economy", *IMF Staff Papers*, 38, 59–82.
- Edin, P.-A. and B. Holmlund, (1991), "The Swedish Wage Structure: The Rise and Fall of Solidaristic Wage Policy", mimeo, Uppsala University.

- Flam, H., (1987), "Equal Pay for Unequal Work", *Scandinavian Journal of Economics*, 89, 435–50.
- Freeman, R.B. and J.L. Medoff, (1984), *What Do Unions Do?* New York: Basic Books.
- Griliches, Z. and F. Lichtenberg, (1984), "Interindustry Technology Flows and Productivity Growth: A Reexamination", *Review of Economics and Statistics*, 66, 324–329.
- Hibbs, D. and H. Locking, (1991), "Wage Compression, Wage Drift, and Wage Inflation in Sweden", FIEF Working Paper No. 87, Stockholm.
- Hicks, A., (1988), "Social Democratic Corporatism and Economic Growth", *Journal of Politics*, 50, 677–704.
- Jackman, R., (1986), "The Politics of Economic Growth in Industrial Democracies", *Journal of Politics*, 48, 242–56.
- Jaffe, A.B., (1986), "Technological Opportunity and Spillovers of R & D: Evidence from Firms' Patents, Profits, and Market Value", *American Economic Review*, 76, 984–1001.
- Katz, E. and O. Stark, (1989), "International Labour Migration under Alternative Informational Regimes: A Diagrammatic Approach", *European Economic Review*, 33, 127–42.
- Kierzkowski, H., (1982), "Wage Relativities in an Open Economy",

Weltwirtschaftliches Archiv, 118, 690–705.

Kierzkowski, H., (1984), "Trade Unions, Wage Relativities and Employment", *Australian Economic Papers*, 23, 91–104.

Knies, D. and H. Herberg, (1988), "The Employment Effects of a Rigid Wage Ratio in Small Open Economies with Sector-Specific Capital", *Journal of Institutional and Theoretical Economics*, 144, 671–83.

Krugman, P., (1987), "The Narrow Mowing Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher", *Journal of Development Economics*, 27, 41–55.

Krugman, P., (1991), "History versus Expectations", *Quarterly Journal of Economics*, 106, 651–67.

Landesmann, M. and J. Vartiainen, (1990), "Social Corporatism and Long-term Economic Performance", DAE Working Paper, No. 9020, University of Cambridge.

Lange, P. and G. Garrett, (1985), "The Politics of Growth", *Journal of Politics*, 47, 792–827.

Lindbeck, A., (1975), *Swedish Economic Policy*. London: Macmillan.

Lindbeck, A., (1990), "The Swedish Experience", Seminar Paper No. 482, IIES, University of Stockholm.

Lucas, R.J., (1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22, 3–42.

Matsuyama, K., (1990), "A Simple Model of Sectoral Adjustment", forthcoming in *Review of Economic Studies*.

Moene, K.O. and M. Wallerstein, (1991), "Solidaristic Bargaining", mimeo, University of Oslo.

Mussa, M., (1982), "Imperfect Factor Mobility and the Distribution of Income", *Journal of International Economics*, 12, 125–141.

Neary, J. P., (1978), "Short–Run Capital Specificity and the Pure Theory of International Trade", *Economic Journal*, 88, 488–510.

Norman, V., (1992), *En liten åpen økonomi*. ("A Small Open Economy.") Third edition (forthcoming). Oslo: Universitetsforlaget.

Olson, M., (1982), *The Rise and Decline of Nations*. New Haven: Yale University Press.

Persson, T. and G. Tabellini, (1991), "Is Inequality Harmful for Growth? Theory and Evidence", mimeo, University of Stockholm.

Persson, T. and G. Tabellini, (1991), "Growth, Distribution and Politics", forthcoming, *European Economic Review*.

Ramaswamy, R., (1991), "The Mechanics of Structural Change in the Swedish

Model", mimeo, University of Cambridge.

Rehn, G., (1988), *Full sysselsättning utan inflation. Skrifter i urval*. ("Full Employment without Inflation. Selected Writings.") Stockholm: Tidens Förlag.

Romer, P.M., (1986), "Increasing Returns and Long-run Growth", *Journal of Political Economy*, 94, 1002–37.

Saint-Paul, G. and T. Verdier, (1991), "Education, Growth and Democracy", mimeo, DELTA.

Turvey, R., (ed.) (1952), *Wages Policy under Full Employment*. London.

Williamson, J.G., (1988), "Migration and Urbanization", in *Handbook of Development Economics*, (H. Chenery and T.N. Srinivasan, eds.), vol. 1, Amsterdam: North Holland.