Wage Determination, Globalisation, and the Social Value of Leisure

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Abstract
We examine how openness interacts with the coordination of consumption-leisure decisions in determining the equilibrium working hours and wage rate when there are leisure externalities (e.g. due to social interactions). The latter are modelled by making a worker's marginal utility of leisure to be increasing in the leisure time taken by other workers; coordination takes the form of internalising the leisure externality and other relevant constraints (e.g., labour demand), and the extent of openness is measured by the degree of capital mobility. We find that: coordination lowers equilibrium work hours and raises the wage rate; there is a U-shaped (inverse-U-shaped) relationship between work hours (wages) and the degree of coordination; coordination is welfare improving; and, the gap between the coordinated and uncoordinated work hours (and the corresponding wage rates) is affected by the extent and nature of openness.

Keywords: coordination, openness, capital mobility, social multiplier, welfare, work hours

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1. Introduction

One important stylised fact concerning the differences in the evolution of labour market outcomes (productivity, work hours, unemployment, wage rigidity) between the US and Europe is that while Americans work today about as much as in 1970, Europeans work much less. This discrepancy has generated both academic and policy debates. A key question that has arisen is whether this decline in working hours in Europe is responsible for the slowdown in its labour productivity growth. In fact, over the last thirty years productivity per man-hour in Europe grew faster than in the US, but this growth was almost completely offset by the decline in the number of hours worked per worker, suggesting that *Europeans have taken a good portion of their secular increase in income in more leisure, Americans in more consumption* – see Alesina *et al.* (2005), Blanchard (2004) and De Grauwe (2008).

How can the US-EU differences in hours worked per worker be explained? One factor that has been considered is taxation, although evidence on the importance of tax changes is ambiguous. Prescott (2004) and Rogerson (2006) among others suggest that tax changes can account for a substantial part of the differences in hours worked between the US and continental Europe. Blanchard (2004) argues that high labour taxes only explain a fraction of decline in hours worked. At the very least, the tax channel does not appear to be robust: e.g., Scandinavians have higher tax rates and work more hours than people in Continental Europe. Rogerson (2007) and Olovsson (2009) argue that the elasticity of hours worked with respect to taxes depends on the way governments use these taxes, with high taxes causing large decreases in 'market hours' in those activities which have good non-market substitutes.

Alesina *et al.* (2005) focus on the role of cross-country heterogeneity in labour market institutions in determining the observed differences in labour market outcomes. They point out the strong correlation between hours worked and the percentage of population covered by collective bargaining (less than 20% in the US and more than 80% in Sweden, France and Germany) and argue that lower work hours in Europe could be due to unions' influence (hours-wage trade-off). Glaeser *et al.* (2003) and Alesina *et al.* (2005) suggest that cultural differences may also be at play, contrasting the 'leisure culture' of Europeans with the 'workaholic culture' of Americans – the latter resulting from puritan Calvinist heritage. Alesina *et al.* (2005), however, point out that the fact that as late as the late 1960s Europeans worked longer hours than Americans (and the lack of observed correlation between a Protestant heritage and hours of work across countries) suggests that this hypothesis would imply a *reversal of cultures*, and argue that in Europe reductions in work hours might have triggered a social multiplier effect that has led to a stronger decline in hours and resulted in a collective culture of leisure.

Glaeser *et al.* (2003) show that in the presence of positive social interactions, strategic complementarities might arise between individual decisions which in turn give rise to a social multiplier. Most consumers value leisure time more if it is spent together with relatives or friends. An individual's utility from leisure is thus subject to social interactions with other individuals, i.e., a positive externality exists whereby an individual's utility from leisure is higher the higher is the number of people taking leisure. Clearly, this poses a collective action problem whereby the coordination of individual decisions increases social efficiency. In the presence of a social externality, trade unions may act as coordinating agents. This gives a more nuanced view of the role of trade unions for resource allocation and welfare. Traditionally, attention has been focussed on the distortionary role of trade unions on the allocation of resources as they exploit their market power. However, when unions internalise the value of social interactions in leisure time, their overall effect on efficiency is in general ambiguous. Recently, this point has been made in several papers – see, e.g., Alesina *et al.* (2005). Put in this context, differences in hours worked between the US and Europe can be seen as reflecting the degree to which this coordination problem has been overcome, and not intrinsic differences between European and American workers regarding their respective desire for leisure. The stronger role of unions in Europe may have contributed to turn the leisure externality into lower work hours per worker in contrast to the US, where trade unions are much weaker and do not act as their European counterparts in this respect – see Alesina *et al.* (2005) and De Grauwe (2008).

In this paper, we contend that the nature of openness and labour market institutions interact in determining the market outcomes in equilibrium – wages, factor utilisation, as well as labour supply decisions.[1] We examine how the coordination of consumption-leisure decisions affects the wage rate and working hours when consumers/workers value social leisure – i.e. when a worker's marginal utility of leisure is increasing in the amount of leisure taken by other workers – and how this relationship is affected by international openness.

We develop a simple static general equilibrium model of a small open economy in which openness is reflected in different degrees of capital mobility. We capture the externality from social interaction by allowing the marginal utility of leisure to depend positively on the average leisure time and examine how coordination of individual decisions

[1] Apart from labour market institutions, the US and Europe also differ in their extent of international openness.

interacts with openness to yield different labour market outcomes in general equilibrium. Different countries are characterised by different degrees of coordination of labour supply/wage decisions that are related to the organisational forms of industrial relations – of which the degree of centralisation of wage bargaining is just one dimension. Indeed, as clearly emerges from the extensive literature in the area, the extent of coordination in labour markets relates to the degree of corporatism, a key aspect of which is that the unions (or, more broadly, interest organisations) pursue outcomes that are consistent with that of government (Pekkarinen *et al*, 1992).[2] In this spirit, we consider different degrees of coordination where a coordinating agent (union or social planner) internalises: (i) the externality of leisure only; (ii) the externality of leisure as well as the knowledge of the partial equilibrium labour demand facing firms; and (iii) the externality of leisure, firms' labour demand as well as broader macroeconomic constraints in general equilibrium. We refer to these as *basic*, *intermediate* and *full* coordination and provide a comparison between the corresponding general equilibrium solutions and the solution obtained under no coordination.

Our results suggest that, in general, (with and without coordination) a stronger leisure externality results in a lower labour supply and in a higher wage and that this effect is stronger when the leisure externality is internalised by coordination of individuals' labour supply decisions. We show that coordination reduces equilibrium working hours and raises the corresponding wage rate. However, we find a U-shaped (inverse-U-shaped) relationship between hours worked (wages) and the degree of coordination of labour supply decisions. This is consistent with the evidence on the higher work hours in Scandinavian economies relative to less coordinated industrial relations systems in other continental European countries. We also find that the gap between the equilibrium coordinated and uncoordinated labour supply (and the corresponding wage rates) is affected by the extent of globalisation. In particular, for countries that are net importers of capital (and have a positive trade balance) raising the degree of openness increases both the labour supply and the wage rate – although with intermediate levels of coordination labour supply may also reduce. Finally, we find that coordination is welfare improving and that stronger leisure externalities enhance this improvement.

[2] In this context, the degree of coordination of decisions is quite distinct from that of wage bargaining centralisation and can be addressed even within a model in which unions, as wage setting agents, are not explicitly modelled.

The rest of the paper is organised as follows. Section 2 sets out the model. Section 3 derives and compares the general equilibrium solutions under different degrees of coordination of the wage-employment decisions. Section 4 concludes the paper.

2. The model

We model a small open economy producing a freely traded composite/aggregate homogeneous final good under a constant returns to scale technology with capital and labour (man-hours). The labour force and capital endowment are given exogenously. Labour is assumed to be internationally immobile and the extent of globalisation is determined by the degree of capital mobility. Workers/consumers are identical and each is endowed with a fixed amount of capital and man-hours. The former is supplied to the capital market and the latter is divided between work and leisure hours. The representative consumer maximises a utility function in consumption and leisure which captures the externality of leisure across consumers.

2.1. Production and factor demands

Denoting aggregate quantities of output, capital and man-hours by *Y*, *K* and *H* respectively, the production function is $Y = AK^{\lambda}H^{1-\lambda}$, where $0 < \lambda < 1$ and *A* is a scaling constant. Given that all markets are perfectly competitive, factor demand equations are $w = (1-\lambda)A(K^d)^{\lambda}(H^d)^{-\lambda}$ and $r = \lambda A(K^d)^{\lambda-1}(H^d)^{1-\lambda}$, where the superscript *d* denotes demand and *w* and *r* are respectively the price of labour and capital relative to the price of *Y* (*P*) – i.e., they are real wage and rent, respectively; since there is no money in the model, output is used as numeraire and *P* is normalised to unity.

Given that the labour force $\overline{L}$ is fully employed, we write the above equations in per capita terms as

$$y = Ak^{\lambda}h^{1-\lambda}, \quad (1)$$

$$w = (1-\lambda)A(k^d)^{\lambda}(h^d)^{-\lambda}, \quad (2)$$

$$r = \lambda A(k^d)^{\lambda-1}(h^d)^{1-\lambda}, \quad (3)$$

where $y = Y/\overline{L}$, $h^d = H^d/\overline{L}$ and $k^d = K^d/\overline{L}$. By virtue of the constant return to scale technology, perfect competition, and the fact that *P* = 1, the zero profit condition (i.e. $y = wh + rk$) and a one-to-one correspondence between *w* and *r*,

$$r = \lambda(1-\lambda)^{(1-\lambda)/\lambda} A^{1/\lambda} w^{-(1-\lambda)/\lambda}, \qquad (4)$$

are obtainable from (1)-(3).

2.2. Consumption and labour supply

The representative worker's/consumer's preferences are described by a utility function which captures the benefits from social interaction. In the presence of social interactions in leisure, the marginal utility from leisure of an individual depends positively on the average amount of leisure of the individual's peers. Thus, there are strategic complementarities between individual actions (see for example Scheinkman, 2008) that, in this context, result in a social multiplier in the worker's labour supply/leisure decision. In general we may postulate a separable utility function in consumption and leisure[3], $u = v(c) + \ell(e, \tilde{e}, \beta)$, where c is consumption, e is leisure hours, $\tilde{e}$ is the reference group's average leisure time and β measures the importance of social interaction in the preferences. We need v to be concave in c, ℓ to be concave in e and ℓ'_e to be increasing in $\tilde{e}$. We also require the resulting labour supply function for the representative worker, $h = h(w)$ say, to satisfy $h'(w) > 0$ and $h'(w)$ to be increasing in β. Specifically, to obtain closed form solutions, we assume

$$u = \gamma \ln c + (\mu \tilde{e})^{\beta-\alpha} e^{\alpha}, \quad \gamma > 0, \ \mu > 0, \ 0 < \alpha < \beta < 1, \qquad (5)$$

which can be shown to satisfy the required properties as long as the scale parameter μ satisfies $\mu > 1/\tilde{e}$.[4] We normalise a consumer's total endowment of hours to unity and assume that $\tilde{e}$ is the perceived average leisure across all workers. Thus, denoting the representative worker's supply of work hours by h^s, the consumer faces the hours restriction

$$e + h^s = 1. \qquad (6)$$

The internalisation of the leisure externalities in the time allocation decisions of individuals intrinsically rests on the coordination of individual actions. This coordination can be thought of as resulting from the action of a collective agent – for example, a labour union. The nature and extent of coordination typically depends on institutional factors such as the nature of industrial relations and/or government policies. Given the simple setup used here

[3] For similar specifications in the literature, see for instance: Alesina *et al*. (2005) and Groedner and Knieser (2006).

[4] The social interaction effect of leisure operates through $\tilde{e}$ and $(\beta-\alpha)$ determines the extent to which the marginal utility from leisure of an individual depends on the average leisure time enjoyed by others. Since α is kept constant throughout the analysis we refer to β as the relevant parameter. While in some circumstances $\beta \geq 1$ may be plausible, it is not considered here so as to rule out any unfeasible behaviour.

we shall not model explicitly the coordinating agent, but consider nonetheless different cases corresponding to varying degrees of coordination of the labour supply decision – which can be thought of as reflecting different degrees of corporatism characterising the organisational forms of industrial relations of different countries.

2.3. Openness

In order to assess the impact of 'globalisation', we invoke the small open economy assumption with free trade in the final good and some degree of capital mobility.[5] The latter is assumed to be governed by

$$\frac{k}{\bar{k}} = 1 + \delta\left(\frac{r}{r^*} - 1\right), \qquad \delta \geq 0, \tag{7}$$

which for convenience is written in per capita terms, where $\bar{k}$ is a worker's/consumer's endowment of capital, with $k = K/\bar{L}$ and $\bar{k} = \bar{K}/\bar{L}$. This equation is commonly used in the literature and is consistent with the conventional portfolio approach in which the capital flow $\left(k - \bar{k}\right)$ is determined by the interest rate differential $\left(r - r^*\right)$, where r^* is the return to capital (the interest rate) in the rest of the world. δ captures the degree of capital mobility: when $\delta = 0$ capital is internationally immobile, in which case $k = \bar{k}$ and the supply of capital is restricted to the country's endowment; $\delta > 0$ corresponds to partial capital mobility where capital flows are directly determined by the interest rate differential rate; perfect capital mobility is achieved as $\delta \rightarrow \infty$, where $r = r^*$ holds and there may be capital in- or out-flow. In this setup, therefore, δ can be thought as a measure of globalisation.

Since free trade in goods equalises the domestic and foreign price of output, we can continue to disregard the price level (keeping P =1). The following equations show, in per capita terms, the balance of payments condition under capital inflow and outflow (with partial capital mobility) and perfect capital mobility, respectively

$$y - c = -r\left(\bar{k} - k\right) > 0; \qquad r > r^* \text{ and } \bar{k} < k, \tag{8.1}$$

$$y - c = -r^*\left(\bar{k} - k\right) < 0; \qquad r < r^* \text{ and } \bar{k} > k, \tag{8.2}$$

$$y - c = -r^*\left(\bar{k} - k\right); \qquad r = r^* \text{ and either } \bar{k} \geq k \text{ or } \bar{k} < k. \tag{8.3}$$

[5] The international mobility of labour is ruled out by assumption. In addition to imposing an infinitely elastic labour supply at the world wage rate which introduces some 'indeterminacy' problems, it is plausible to conjecture that the strength of the social interaction effect may weaken if, say, labour mobility increases the cultural heterogeneity of workers.

The representative consumer's budget constraint corresponding to the three cases of capital mobility are

$$c = wh^s + r\bar{k}; \quad r > r^* \text{ and } \bar{k} < k, \tag{9.1}$$

$$c = wh^s + rk + r^*\left(\bar{k} - k\right); \quad r < r^* \text{ and } \bar{k} > k, \tag{9.2}$$

$$c = wh^s + r^*\bar{k}; \quad r = r^* \text{ and either } \bar{k} \geq k \text{ or } \bar{k} < k. \tag{9.3}$$

It is worth noting that (9.i) can be obtained from the corresponding (8.i) and the zero profit condition, $y = wh + rk$.

3. General equilibrium solutions

Given our purpose, we focus on obtaining the general equilibrium solution for (*h*,*w*) and examine how it is affected by the extent of globalisation and the strength of the leisure externality, captured by parameters δ and β respectively. To do so, we reduce the model to two equations in (*h*,*w*) by substituting for all other variables in the demand and supply equations for work hours. We then use these to examine the resulting labour market equilibrium and compare equilibria across different scenarios, i.e., no coordination and basic, intermediate and full coordination.

3.1. Demand for work hours

For any given k^d, the partial equilibrium demand for labour is given by (2). From (2), using (4) and (7) and imposing the capital market equilibrium condition $k^d = k$, we obtain

$$h = \bar{k}\left(1 + \delta\left(\frac{\lambda(1-\lambda)^{(1-\lambda)/\lambda} A^{1/\lambda} w^{-(1-\lambda)/\lambda}}{r^*} - 1\right)\right)\left(\frac{(1-\lambda)A}{w}\right)^{1/\lambda}. \tag{10}$$

Equation (10) is the locus of all combinations of *h* and *w* which satisfy demand for work hours in general equilibrium. For given values of r^*, $\bar{k}$, λ and *A* (kept constant throughout the paper), the shape and position of this locus in the (*h*,*w*) space are determined by the extent of capital mobility captured by δ. Figure 1 illustrates this (all figures are presented in Appendix 1). As expected, the locus is downward sloping and convex, reflecting the existence of a trade-off between *h* and *w*. More specifically, a rise in δ rotates the locus anticlockwise at $w = \hat{w}$, the value of *w* that satisfies (4) for $r = r^*$ and corresponds to the perfect capital mobility locus. Thus, $w < \hat{w}$ $(w > \hat{w})$ corresponds to $r > r^*$ $(r < r^*)$ where there is capital inflow (outflow); at higher (lower) values of *h*, i.e. $h > \hat{h}$ $(h < \hat{h})$, there is capital inflow (outflow) since firms are willing to pay a relatively lower (higher) w and hence $r > r^*$ $(r < r^*)$. To see the impact of δ, suppose that δ is small (the thick solid curve) and consider a point where there is capital inflow since $r > r^*$. A rise in δ increases the inflow of capital for the given $\left(r - r^*\right)$. This raises the marginal product of labour and increases the demand for labour. As a result, a rise in δ rotates the locus such that it lies above (below) the original one when there is capital inflow (outflow).

3.2. Supply of work hours and the general equilibrium solution

We derive the supply of work hours under a number of alternative scenarios: (i) the absence of coordination among workers, with each individual finding her own optimal consumption and leisure taking $\tilde{e}$ as given; (ii) a 'basic' level of coordination of consumption-leisure decisions across workers by a coordinating agent – e.g., a trade union – that internalises the leisure externality by setting $\tilde{e} = e$; (iii) an 'intermediate' level of coordination that internalises the leisure externality as well as the knowledge of the partial equilibrium labour demand facing firms (this can be thought of as a firm-level wage setting unions case); and (iv) a 'full' level of coordination that internalises the leisure externality, firms' labour demand as well as broader macroeconomic constraints in general (this can be thought as the corporative 'all-encompassing' unions case). These four different equilibrium regimes (henceforth respectively labelled with a subscript U, B, I and F) are derived in the following subsections under capital inflow and outflow respectively.

3.2.1. Supply of work hours with capital inflow

3.2.1.1. No coordination

On the assumption that each consumer/worker takes w and r as given, the first order condition for maximising the utility function in (5) subject to the hours and budget constraints in (6) and (9.1), is

$$\frac{\gamma w}{wh + r\bar{k}} - \alpha\left(\mu\tilde{e}\right)^{\beta-\alpha}\left(1-h\right)^{\alpha-1} = 0,$$ [6]

from which the corresponding supply function in general equilibrium,

[6] For a given r, this equation yields the individual worker's supply of work hours, $h = h\left(w\right)$ which satisfies $h'\left(w\right) > 0$ and $h'\left(w\right)$ is increasing in β.

$$\frac{\gamma}{h+\bar{k}\lambda(1-\lambda)^{(1-\lambda)/\lambda}A^{1/\lambda}w^{-1/\lambda}}-\alpha\mu^{\beta-\alpha}(1-h)^{\beta-1}=0\,, \tag{11.1}$$

is obtained if we set $\tilde{e}=e=(1-h)$ and replace *r* using equation (4). This equation gives the locus of all combinations of *h* and *w* that satisfy the uncoordinated labour supply equation in general equilibrium with capital inflow. Figure 2 illustrates (11.1) and (10) in the (*h*,*w*) space. Whilst the labour supply locus is independent of the extent of capital mobility – as δ does not appear in (11.1) – the externality parameter β affects its position. In particular, ceteris paribus, a higher β, and hence a larger leisure externality, shifts the locus inwards to the left, as illustrated in Figure 2. This result is consistent with the existence of a social multiplier and can be explained by recalling that points on the supply locus correspond to the maximum utility. For any given point on the locus, (h_0, w_0) say, consider increasing β. The first term on the left-hand-side of (11.1) is unaffected whereas the second term rises. Thus, with a higher β, (h_0, w_0) is no longer optimum since it does not satisfy (11.1); *w* ought to rise above w_0 so as to equalise the two terms in (11.1) and to restore the optimality of h_0. Put differently, the second term captures the marginal utility of leisure which rises with β and induces the individual to work less for a given wage rate.

Figure 2 illustrates how the uncoordinated general equilibrium is affected by changes in δ and β. For a given β, increasing globalization (i.e. a higher capital mobility and hence δ) increases the inflow of capital, raising the marginal productivity of and demand for labour. This is followed by a rise in both working hours and the wage rate, as illustrated by the movement from E_{U1} to E_{U2} or alternatively the movement from E'_{U1} to E'_{U2} in case of a larger β. If – for a given degree of capital mobility and an initial capital stock – the social interaction preference parameter β increases, labour supply reduces resulting in a higher wage and in a lower working hours, as shown by the movement from E_{U1} to E'_{U1} or E_{U2} to E'_{U2}. In summary, when labour supply is not coordinated, (i) comparing two economies with the same preference for social interaction, the one which is more open will have relatively higher wage and work hours; and (ii) comparing two economies with the same degree of openness, the one with a stronger preference for social interaction will have a higher wage and lower work hours.

3.2.1.2. Basic coordination

The 'basic' level of coordination across individuals in deciding optimal wage-hours combinations involves internalising the leisure externality without taking into account firms' behaviour and/or broader 'macroeconomic' factors.[7] Hence, the utility function of the representative worker-consumer is obtained by combining equations (5) and (6) and letting $\tilde{e} = e = (1-h)$ which is maximised subject to the budget constraint in (9.1). Eliminating c from the utility function using (9.1) yields $u = \gamma \ln\left(wh + r\bar{k}\right) + \mu^{\beta-\alpha}(1-h)^{\beta}$. The first order condition for choosing h to maximise u keeping w and r as given is

$$\frac{\gamma w}{wh + r\bar{k}} - \beta\mu^{\beta-\alpha}(1-h)^{\beta-1} = 0,$$

from which the corresponding supply function in general equilibrium,

$$\frac{\gamma}{h + \bar{k}\lambda(1-\lambda)^{(1-\lambda)/\lambda} A^{1/\lambda} w^{-1/\lambda}} - \beta\mu^{\beta-\alpha}(1-h)^{\beta-1} = 0, \tag{12.1}$$

is obtained by replacing r using (4). This equation is the locus of all h and w combinations that satisfy the coordinated labour supply equation in general equilibrium with capital inflow. This locus too is independent of δ (the extent of capital mobility) and comparing (12.1) with (11.1) shows that, relative to the uncoordinated case, coordination leads to a reduction in the supply of work hours at any given wage rate. This occurs because the internalisation of the leisure externality directly implies that the opportunity cost of work is now higher – which is evident by comparing the second terms on the left-hand-sides of (11.1) and (12.1). As a result, the graph of (12.1) in the (h,w) space lies above and to the left of that of (11.1). Consistent with the case with no coordination, and for the same reasons, an increase in β shifts the supply locus to the left, except that the shift is now larger.

Figure 3 illustrates the general equilibrium with basic coordination, and compares it to the uncoordinated case. For a relatively small value of β and a given δ, the effect of coordination results in a move from E_{U1} to E_{B1} (with low openness, i.e. small δ) or from E_{U2} to E_{B2} (with high openness, i.e. large δ). Hence, introducing a basic level of coordination will result in relatively higher wages and lower work hours, and the impact on the latter is stronger the more open is the economy. As discussed above, coordination increases the

[7] This scenario is considered as a benchmark and would fall somewhat short of the actions of a coordinating agent (such as a union) which, even at the lower level of coordination – the firm-level – would plausibly internalised the firm's labour demand, as shall be seen in the next subsection.

opportunity cost of work and shifts the labour supply curve inwards. A higher degree of capital mobility will increase capital inflow and, by increasing the marginal product of labour, will result in a higher wage and in lower work hours. The fall in hours, given the leisure externality, will be higher under coordination than under no-coordination. For a given β, the effect of increasing openness is qualitatively identical to the uncoordinated case. For a given δ, an increase in the social preference parameter β raises wages and lowers work hours. This is seen as moving from E_{B1} to E'_{B1} (with low openness, small δ) or from E_{B2} to E'_{B2} (with high openness, large δ). Whilst qualitatively this result is the same as that obtained under no coordination, quantitatively the same change in β generates a bigger impact when labour supply decisions are coordinated as seen by the movement from E_{U1} to E'_{U1} or E_{U2} to E'_{U2}, respectively. This result reflects the social multiplier effect triggered by the internalization of the leisure externality under coordination, with a higher β reflecting a higher degree of complementarity between individuals' leisure choice.

In summary, comparing two economies with the same preference for social leisure and degree of openness (given δ and β), the one in which workers' consumption-leisure decisions are centrally coordinated will have higher wages and lower work hours. Also, starting with a low level of openness and a weak leisure externality (small δ and β): (i) raising the extent of openness (increasing δ), will increase both wages and work hours in both economies but it is likely that work hours (wages) rise relatively more in the uncoordinated (coordinated) economy; (ii) strengthening the leisure externality (increasing β) increases wage and reduces work hours in both economies but these effects are likely to be relatively larger in the coordinated economy, and the impact on wages will be relatively lower as these economies become more open.

3.2.1.3 Intermediate coordination

If the coordination of workers' consumption-leisure decisions is performed by a collective agent such as a union, it is plausible to postulate that the agent internalises available information concerning firms and the broader aspects of the economy that might impact on workers' employment and income. The extent to which the available information is taken into account can be thought of as reflecting the degree of coordination characterising the country's industrial relations system, with higher levels of coordination embodying a higher degree of encompassment of broader (macro) economic constraints. In this subsection, we shall assume that the coordinating agent internalises the information that firms pay workers their marginal product − i.e., equation (2) − but disregards how r and k are determined and thus takes these as given. If we think of this agent as a union, then this case would correspond to firm-level unions. In this *intermediate* coordination case, the utility of the representative worker-consumer is identical to that used in the *basic* coordination case – i.e., $u = \gamma \ln\left(wh + r\bar{k}\right) + \mu^{\beta-\alpha}\left(1-h\right)^{\beta}$ – which is now maximised subject to the demand for work hours in (2), keeping r and k as given constants.[8] The first order condition is

$$\frac{\gamma\left(1-\lambda\right)^{2} Ak^{\lambda}h^{-\lambda}}{\left(1-\lambda\right)Ak^{\lambda}h^{1-\lambda}+r\bar{k}} - \beta\mu^{\beta-\alpha}\left(1-h\right)^{\beta-1} = 0\,, \tag{13.1}$$

which together with the remaining two equations in h, k and r, i.e. (3) and (7), can be solved to determine their corresponding general equilibrium values in terms of γ, β, λ, δ, A, r^{*} and $\bar{k}$. The solution for w is then obtained using (2). The algebraic expressions for these solutions are rather cumbersome and analytically unwieldy but it can be shown that, with this type of coordination, the optimal values of h (w) is below (above) that obtained in the previous cases.[9] This is shown in Figure 4 (drawn for given δ) by point E_I and comparison with the equilibrium solutions under basic coordination and no coordination, E_B and E_U respectively, shows that $h_I<h_B<h_U$ and $w_I>w_B>w_U$. Hence, by taking into account the trade-off between w and h on the demand curve, intermediate coordination leads to a further reduction in work hours and to a rise in the wage. The reason why in this case hours are lower than in the basic coordination case is that the coordinating agent internalises the (partial equilibrium) trade-off between employment and wage, whereby a lower employment (which reduces income and hence consumption) will be compensated by a higher wage. Analytically, as shown in more detail in Appendix 2, while the marginal utility of leisure is unaffected by coordination – i.e., the second term of left-hand-sides of (12.1) and (13.1) are identical – the marginal utility of consumption is lower under intermediate coordination, as can be seen by comparing the first term of the left-hand-sides of (12.1) and (13.1). Hence, h has to be lower to balance the marginal utilities of consumption and leisure for (12.1) and (13.1) to hold. Figure 4 also shows the effects of a change in β; as expected, the higher is β the lower

[8] Clearly, for any given r and k, choosing h in this context where the coordinator internalises the partial equilibrium demand by the firm, amounts to choosing w. Put differently, the objective function can be written in terms of either h or w when internalising the labour demand function – it is in this sense that this case can be thought of as corresponding to the wage setting firm-level monopoly union.

[9] We do not present the algebraic expressions here (they are available on request) but show the general analytical proofs in Appendix 2.

(higher) will be the optimal work hours (wage rate), resulting in a bigger gap between the coordinated and uncoordinated solutions for w and h.

With respect to the role of international openness, the larger is δ the lower is the optimal h and hence the higher is the corresponding w, as illustrated in Figure 5 (drawn for given β). Consider the initial equilibrium at E_{I1} and let δ rise from δ_1 to δ_2. Ceteris paribus, we move from E_{I1} to E'_{I1}, but the increase in h reduces the utility − as w is kept constant and h is increased; see (13.1). Thus, at E'_{I1} it is desirable for the worker if we reduce h and increase w along the new demand curve associated with a higher δ=δ_2. The new optimal point is shown by E_{I2}, where we have assumed that the rise in openness has increased both w <u>and</u> h, relative to their starting values at E_{I1}, but it should be stressed that whilst $w_{I2}>w_{I1}$ always holds $h_{I2}<h_{I1}$ is also a feasible outcome in this case.

3.2.1.4 Full coordination

In this subsection the coordinating agent is assumed to have full knowledge of the economy and to utilise it when maximising the utility of the representative worker-consumer. This case corresponds to *full* coordination of the consumption-leisure decision and can be thought of as the 'all-encompassing' union case. The utility function is as in the previous cases with coordination − i.e., $u = \gamma \ln\left(wh + r\bar{k}\right) + \mu^{\beta-\alpha}\left(1-h\right)^{\beta}$ − but the internalisation of the macroeconomic constraints now involves maximising u subject to equations (1), (2), (3), (7) and (9.1). In general, these equations together with the first order condition for maximisation form a system of six equations which determine the general equilibrium solution for the six unknowns, y, k, r, w, h, and c. Specifically, the full coordination entails first using equations (1), (2), (3), (7) and (9.1) to find the solutions for y, k, r, w and c in terms of h, and then maximising u subject to these solutions. This yields the optimal, fully coordinated, values of h and w which, for the same values of the parameters and exogenous variables, can be shown to lie between the corresponding values obtained under the basic and the intermediate coordination, i.e., $h_I<h_F<h_B$ and $w_B<w_F<w_I$ hold (see Appendix 2) as illustrated in Figure 6.

The intuition behind the larger working hours and lower wage under *full* coordination relative to the *intermediate* coordination case is that the coordinator now takes into account the effect of work hours (and the associated wage level) on the interest rate and the ensuing capital inflow, and therefore the total size of the capital stock. Recall that, given the trade-off between wage and interest rate in (4), a higher wage results in a smaller interest rate and in a lower capital inflow which, ceteris paribus, reduces the marginal productivity of labour and lowers output. It is taking account of this mechanism, and hence mitigating the negative effect of a higher wage on employment and income that leads the coordinator in this case to set higher hours (and a lower wage) relative to the *intermediate* case.

Thus, what emerges here is an inverse *U*-shaped relationship between wage levels and the corresponding centralisation of wage bargaining, which sheds light on the evidence about the high hours worked in Scandinavian economies relative to those characterising less coordinated industrial relations systems in other continental European countries. This result is also consistent with findings in the literature suggesting that the degree of distortion resulting from unionisation increases with union power at intermediate level of centralisation but then falls again at higher level of centralisation/coordination, as unions internalise the broader macroeconomic implications of their behaviour.[10]

Finally, it can be shown that with full coordination the impact of a change in the extent of openness and importance of social interaction and the capital endowment − measured by δ and β, respectively − is qualitatively identical to that obtained with intermediate coordination and can be illustrated using Figures 4 and 5 above.

3.2.2. Supply of work hours with capital outflow

With capital outflow, the demand for work hours remains the same and can be represented by Figure 1 except that the market equilibrium now occurs at wages above $\hat{w}$ since now $r < r^*$. Also, note that the relevant budget constraint used in this case is given by equation (9.2).

3.2.2.1. No coordination

Following the same procedure as in the capital inflow case, the first order condition for utility maximisation is

$$\frac{\gamma w}{wh + r^* \overline{k}(1-x)\left(1-\delta(1-x)\right)} - \alpha\mu^{\beta-\alpha}(1-h)^{\beta-1} = 0, \tag{11.2}$$

where $x = \dfrac{\lambda(1-\lambda)^{(1-\lambda)/\lambda} A^{1/\lambda} w^{-(1-\lambda)/\lambda}}{r^*}$.[11] (11.2) is the general equilibrium locus of combinations of h and w on the uncoordinated supply. Unlike its counterpart under capital inflow, i.e. (11.1), it depends on the extent of openness through δ and becomes steeper the

[10] The hump-shaped relationship between degree of bargaining coordination and distortions has been amply studied in the literature – e.g. Calmfors and Driffill (1988) and Freeman (1988) focus on employment while Summers *et al.* (1993) and Alesina and Perotti (1997) examine the role of taxation and fiscal policy.

[11] Note that x<1 as long as $r < r^*$.

larger is δ within the relevant range where $w > \hat{w}$.[12] Also, since a rise in β shifts the supply locus to the left, in this case too a higher leisure externality leads to a reduction in work-hours supplied at the same wage. Thus: (i) for any given β, the more open is the economy, the lower are the equilibrium values of *w* and *h*; (ii) for any given δ, the stronger is the leisure externality the lower is the equilibrium *h* and the higher is the corresponding *w*.

3.2.2.1. Impact of coordination

With internalisation of the leisure externality and taking account of equations (5), (6) and (9.2) the objective function is

$$u = \gamma \ln\left(wh + rk + \left(r^{*} - r\right)\bar{k}\right) + \mu^{\beta-\alpha}\left(1-h\right)^{\beta} \ , \tag{14}$$

which will be the same in all coordination cases.

With basic coordination, the first order condition for maximising (14) yields the following general equilibrium supply locus of combinations of *h* and *w*

$$\frac{\gamma w}{wh + r^{*}\bar{k}\left(1-x\right)\left(1-\delta\left(1-x\right)\right)} - \beta\mu^{\beta-\alpha}\left(1-h\right)^{\beta-1} = 0 \, . \tag{12.2}$$

Again, unlike its counterpart under capital inflow – i.e., (12.1) – this locus depends on the extent of openness and its graph is similar to (11.2) in the (*h*,*w*) space except that, for all given parameter values, it lies to its left; however, as in the capital inflow case, a rise β shifts the curve to the left. Thus, as in the capital inflow case: (i) compared with the no-coordination, for any given δ and β, basic coordination reduces the equilibrium value of *h* and raises the corresponding *w*; and, as in the no-coordination case, (ii) for any given β, the more open is the economy the lower are the equilibrium values of *w* and *h*; and (iii) for any given δ, the stronger is the social interaction externality the lower is the equilibrium *h* and the higher is the corresponding *w*.

Moving to intermediate coordination, the objective function in (14) is maximised subject to the demand for work hours in (2) taking as given *r* and *k*. The first order condition is

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[12] It is straightforward to verify that the loci corresponding different values of δ are tangent at $w = \hat{w}$ corresponding to $r = r^{*}$, but become steeper (flatter) the larger is δ as $w > \hat{w}$ ($w < \hat{w}$). Also, for very large values of δ the locus bends backwards at some high value of $w > \hat{w}$ but this occurs above the intersection with demand for the same δ and does not lead to multiple equilibria.

$$\frac{\gamma(1-\lambda)^2 Ak^{\lambda}h^{-\lambda}}{(1-\lambda)Ak^{\lambda}h^{1-\lambda}+rk+r^*(\bar{k}-k)}-\beta\mu^{\beta-\alpha}(1-h)^{\beta-1}=0, \qquad (13.2)$$

which together with (2) , (3) and (7) can be solved to determine general equilibrium values of w, h, k and r. Again, we find $h_I<h_B<h_U$ and $w_I>w_B>w_U$ which are qualitatively identical to the results obtained with capital inflow. In addition, in common with the uncoordinated and basic cases, we find (i) for any given δ, the stronger are social interactions the lower is the equilibrium h and the higher is the corresponding w; and (ii) for any given β, the more open is the economy the lower are the equilibrium values of w and h.

Finally, with full coordination, (14) is maximised subject to the solution of (1), (2), (3) and (7) for y, k, r and w in terms of h. We find the same qualitative results obtained under capital inflow, namely $h_I<h_F<h_B<h_U$ and $w_I>w_F>w_B>w_U$ to hold, supporting the existence of an inverse U-shaped relationship between wages (and a U-shaped relationship between work hours) and degree of coordination. Also, as in the intermediate coordination case, we find that (i) for any given δ, the higher is β the lower is the equilibrium h and the higher is the corresponding w; and (ii) for any given β, the higher is δ the lower are the equilibrium values of both w and h.

3.3 Welfare effects of coordination

In this section we examine the welfare effects of coordination in the labour supply-wage decision of workers. We do this by comparing the values of the maximised utilities corresponding to different cases, denoted with V. We find that, in general coordination increases welfare in that, under both capital inflow and outflow, the higher is the degree of coordination the larger is V – i.e., for any given β and δ, $V_F>V_B>V_I>V_U$ always holds. Also, for any given δ, in all cases V is always increasing in β as expected. Finally, with respect to the role of openness, we find that, for any given β, the higher is δ the larger is V when there is capital inflow. But with capital outflow, this result does not always hold since in this case a rise in δ lowers both h and w and V falls if the net effect of the fall in wage income dominates in the indirect utility function.[13]

[13] Our calculations show that the fall in V due to the rise in openness first emerges with intermediate coordination, as in this case wh falls substantially relative to the other coordination cases.

4. Conclusions

This paper has examined how openness interacts with the coordination of consumption-leisure decisions in determining the equilibrium working hours and wage rate when there are leisure externalities stemming from social interactions.

Coordination takes the form of internalising the leisure externality and other relevant constraints and leads to a lower equilibrium working hours and a higher wage rate. However, the impact of coordination on hours and wage is not monotonic, as we find a U-shaped (inverse-U-shaped) relationship between hours (wages) and the degree of coordination of the labour supply decisions. This result is in line with the empirical observation that, relative to other European countries, the Scandinavian countries which enjoy a more coordinated system of industrial relations have higher work hours.

We also find that the gap between the equilibrium coordinated and uncoordinated labour supply (and the corresponding wage rates) is affected by the extent of globalisation. In particular, for countries that are net importers of capital (and have a positive trade balance) raising the degree of openness increases both the labour supply and the wage rate – although with intermediate levels of coordination labour supply may also reduce. Finally, we find that coordination is welfare improving and that the existence of leisure externality enhances this improvement.

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Appendix 1

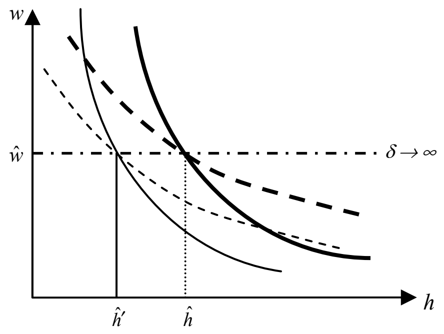

Fig. 1. Demand for work hours in general equilibrium; Solid (broken) lines correspond to small (large) δ; Thinner lines respectively show the effect of lowering $\bar{k}$

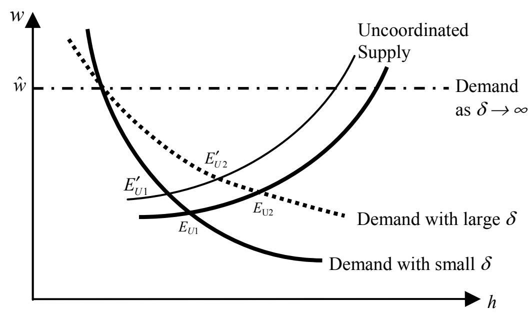

Fig. 2. General equilibrium solution with capital inflow and no coordination; The thinner uncoordinated supply corresponds to a larger β

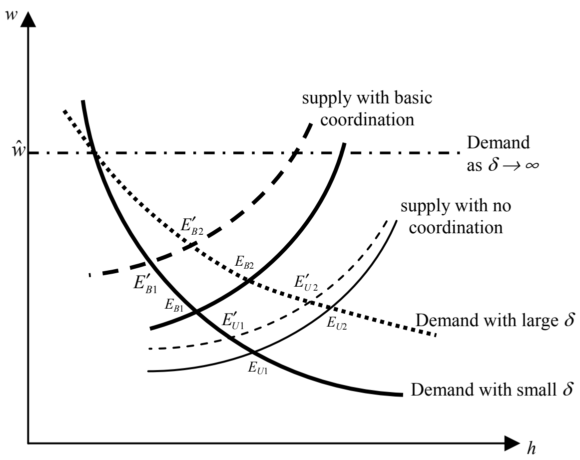

Fig. 3. General equilibrium solution with capital inflow and basic coordination; Broken supply lines correspond to a larger β

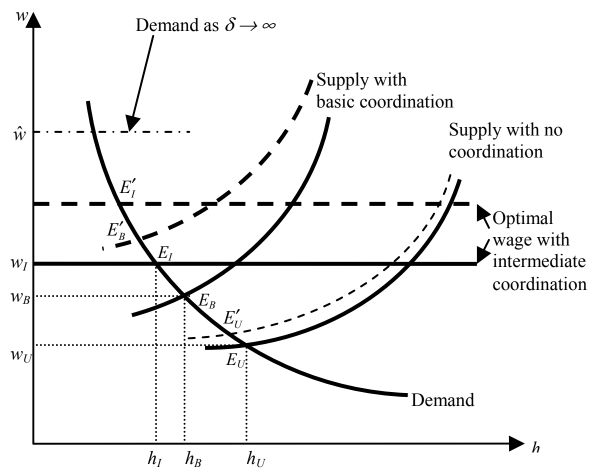

Fig. 4. General equilibrium solution with capital inflow and intermediate coordination; Role of social interaction and comparison with basic coordination and no coordination for a given δ; broken lines correspond to a larger β

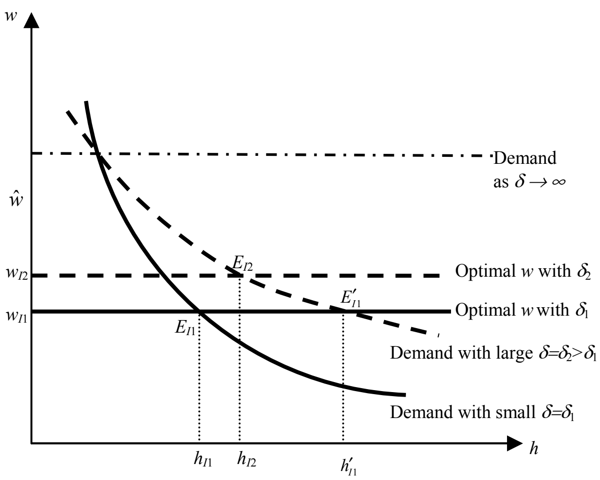

Fig. 5. General equilibrium solution with capital inflow and intermediate coordination; Role of openness for a given β

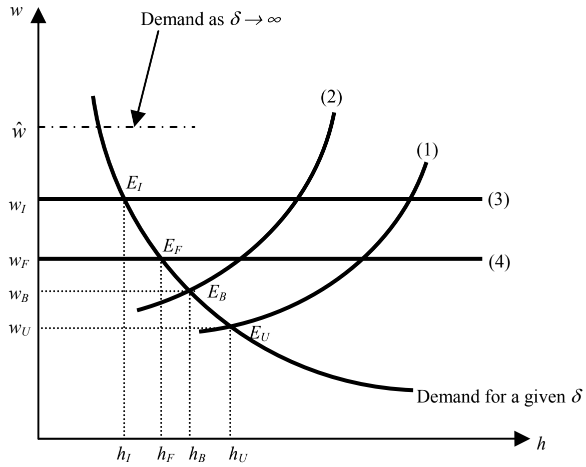

Fig. 6. General equilibrium solution with capital inflow and 'full' coordination; Role of social interaction and comparison with other cases; (1) Supply with no coordination; (2) Supply with basic coordination; (3) Supply with intermediate coordination; (4) Supply with full coordination;

Appendix 2

This appendix proves the existence of a U-shaped relationship between work hours and the degree of coordination, i.e. $h_I<h_F<h_B$. We focus on the capital inflow case but the same approach can be used to show the result holds also when there is capital outflow. For convenience, we replace equations (2), (4) to (7) and (10) respectively with (A1) to (A5) below which, for convenience, rewrite the latter equations in general form and specify the sign of their relevant partial derivatives:

$$w = w(h,k); \quad w_h = -\lambda(1-\lambda)Ak^{\lambda}h^{-(1+\lambda)} < 0 \tag{A1}$$

$$r = r(w); \quad r_w = -\left(\frac{(1-\lambda)A}{w}\right)^{1/\lambda} < 0 \tag{A2}$$

$$u = v(c) + \ell(e); \;\; v_c > 0,\; v_{cc} < 0,\; \ell_e > 0,\; \ell_{ee} < 0 \tag{A3}$$

$$k = k(r); \quad k_r = \frac{\delta\bar{k}}{r^*} > 0 \tag{A4}$$

$$w = g(h); \;\; g_h < 0 \text{ [14]} \tag{A5}$$

The general problem is to choose h to maximise u in (A5), the first order condition (FOC) for which is $v_c \frac{dc}{dh} + \ell_e \frac{de}{dh} = 0$. Since $\frac{de}{dh} = -1$, the FOC can be written as

$$v_c \frac{dc}{dh} = \ell_e \tag{A6}$$

which states the equality between marginal utilities of consumption and leisure due to a change in h.

With basic coordination, we impose the budget constraint in (9.1), $c = wh + r\bar{k}$, and take w and r as given, hence $\frac{dc}{dh} = w$ and (A6) implies

$$v_c w = \ell_e . \tag{A7}$$

With intermediate coordination, we impose $c = wh + r\bar{k}$ as well as $w = w(h,k)$ in (A2) and take k and r as given, hence $c = w(h)\cdot h + r\bar{k}$ and $\frac{dc}{dh} = w + w_h h$. Therefore, (A6) implies

[14] Note that although equation (10) is written such that h is a function of w, the underlying function is monotonically decreasing one and hence the inverse function in (A5) exists.

$$v_c\left(w+w_h h\right)=\ell_e. \qquad \text{(A8)}$$

With full coordination, we impose $c=wh+r\bar{k}$ as well as $r=r(w)$ and $w=g(h)$ in (A4) and (A10). Thus, $c=g(h)\cdot h+r\left(g(h)\right)\cdot\bar{k}$ and $\frac{dc}{dh}=w+g_h h+r_w g_h\bar{k}$, and (A6) implies

$$v_c\left(w+g_h h+r_w g_h\bar{k}\right)=\ell_e. \qquad \text{(A9)}$$

The right-hand-sides of (A7), (A8) and (A9) are identical. Comparing the left-hand-sides of these, it can be shown that (see below)

$$w+w_h h<w+g_h h+r_w g_h\bar{k}<w, \qquad \text{(A10)}$$

which implies the value of h (= 1 – e) which solves

(i) (A8) will have to be lower than that which solves (A7) so as to yield a relatively lower marginal utility of leisure, since $w+w_h h<w$, hence $h_I<h_B$;

(ii) (A9) will have to be lower than that which solves (A7) so as to yield a relatively lower marginal utility of leisure, since $w+g_h h+r_w g_h\bar{k}<w$, hence $h_F<h_B$;

(iii) (A8) will have to be lower than that which solves (A8) so as to yield a relatively lower marginal utility of leisure, since $w+w_h h<w+g_h h+r_w g_h\bar{k}$, hence $h_I<h_F$.

This shows that $h_I<h_F<h_B$.

To ensure that (A10) holds, first note that $w+w_h h<w$ always holds since $w_h<0$ does. Thus we need to establish $w_h h<g_h h+r_w g_h\bar{k}<0$ to ensure (A10). To do so, given that $g_h<0$ and $w_h<0$, we show that $w_h/g_h>1$ and that with constant returns to scale $1>1+r_w\bar{k}/h>0$ holds. These, together with $w+w_h h<w$, are sufficient for (A10) to hold.

That $w_h/g_h>1$ holds can be verified algebraically by comparing derivatives of (10) and (2). However, to retain generality here we invoke intuition to explain the reason why the partial equilibrium demand for work hours in (A1) in the (h, w) space ought to be steeper than the general equilibrium locus in (A5). Consider Figure A below which sketches graphs of two partial equilibrium demands for corresponding to two different levels of capital. Suppose that point D is also on the general equilibrium locus. Let hours drop from h to h' but keep wage intact at w, hence moving to point B. This drop in hours has two effects. First, it increases the marginal product of labour. Hence, if nothing else changes, at B there is excess demand for hours and firms are willing to pay w''. But the drop in hours also reduces the marginal product of capital. This shifts the partial equilibrium demand for capital down in the (k,r)

space. Since the position of supply of capital is not affected, both r and k fall along the supply of capital as demand for capital shifts down. This fall in k, however, shifts the partial equilibrium demand for hours in the (h,w) space down, say, to that shown by (A1′). The point on the general equilibrium locus corresponding to h' will be on (A1′). Thus, the general equilibrium locus will pass through D and D' and will be flatter that any partial equilibrium demand it crosses.

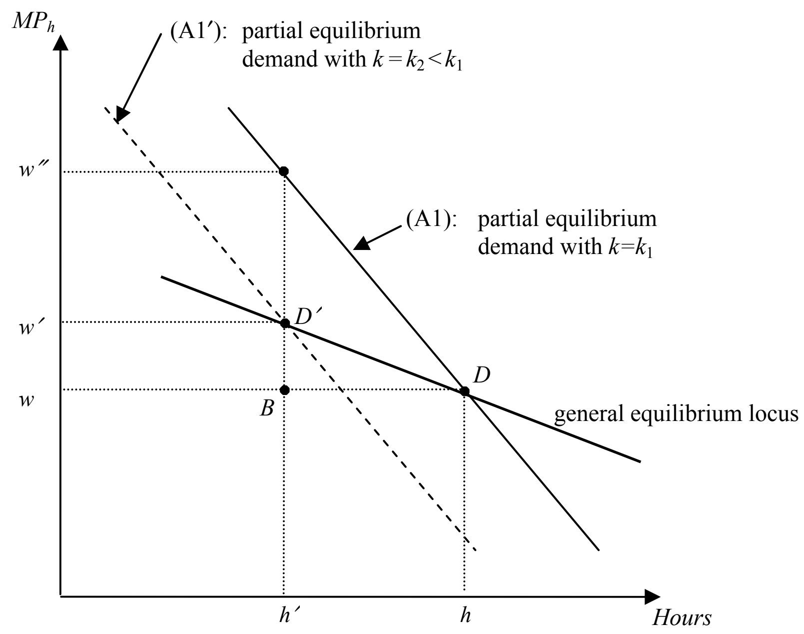

Fig. A. Partial equilibrium demand for hours and the corresponding general equilibrium locus

To show that $1>1+r_w\bar{k}/h>0$, first recall that $r_w<0$ and hence $1>1+r_w\bar{k}/h$ is always satisfied. To verify $1+r_w\bar{k}/h>0$ rewrite it as $-r_w<\left(h/\bar{k}\right)=\left(k/\bar{k}\right)\left(h/k\right)$. With a homogenous, constant returns to scale, production function, perfect competition implies that firms substitute the two factors such that the elasticity of r with respect to w, $\varepsilon_{r,w}$, is a constant equal to the factor cost ratio $wh/rk=\phi$; in this case, with the Cobb-Douglas function in (1), $\varepsilon_{r,w}\equiv-\frac{r_w}{r/w}=\frac{wh}{rk}=\left(1-\lambda\right)/\lambda$ – see equations (2), (3) and (4). This implies $-r_w=h/k<h/\bar{k}$ as required since $k>\bar{k}$ with capital inflow.