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Andreas Irmen, Harvard University and CEPR
Berthold Wigger, Universität Mannheim

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

National Minimum Wages, Capital Mobility and Global Economic Growth*

How do national minimum wages affect global economic growth? We address this question in a two-country endogenous growth model with capital mobility that emphasizes a link between wages, savings and growth. We identify the conditions on technology and national preferences that determine whether national minimum wages are a stimulus or an obstacle to growth. Technology matters because it determines the functional distribution of global income as well as output effects associated with the emergence of national unemployment due to minimum wages. Interestingly, differences in national savings propensities do not only affect the strength of the growth effect associated with minimum wages but may even determine its direction.

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Andreas Irmen
Department of Economics
Harvard University
Littauer 200 – North Yard
Cambridge
MA 02138
USA
Email: airmen@fas.harvard.edu

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Berthold Wigger
Department of Economics
University of Mannheim
D-68131 Mannheim
GERMANY
Tel: (49 621) 292 5205
Fax: (49 621) 292 5571
Email: wigger@econ.uni-mannheim.de

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1. Introduction

In recent decades the American and the European economy have become more and more integrated. This has materialized, e.g., in large capital flows and an intensive exchange of technological knowledge. Still, the two economies differ markedly with respect to the organization of their labor markets. While in America wages are flexible and market clearing, European labor markets tend to be governed by union or government imposed minimum wages.[1]

The present paper adopts this stylized difference between America and Europe and asks whether and how European minimum wages affect economic growth. We argue that the answer to these questions requires a global approach.[2] Indeed, we find that with an integrated capital market idiosyncratic features of national labor markets impinge on the distribution of factor incomes and savings not only at the national but also at the global level. This leads to conditions on the technology and national preferences that determine whether European minimum wages are a stimulus or an obstacle not only to European but also to US economic growth.

We make this point in a two-country endogenous growth model with international capital mobility that emphasizes a link between wages, savings, and growth. A binding minimum wage leads to unemployment in Europe. The concomitant decline in the productivity of capital employed in Europe causes a capital outflow

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[1] This view has also been emphasized by, e.g., Krugman (1993, 1995) and Davis (1998a,b).

[2] To the best of our knowledge, implications of minimum wages for endogenous economic growth have been analysed only in the context of a closed economy [see, e.g., Agell and Lommerud (1993), Cahuc and Michel (1996) and Hellwig and Irmen (2001)]. Studies on growth in a global economy, on the other hand, have confined attention to perfect labor markets [see, e.g., Grossman and Helpman (1991), and Rivera-Batiz and Romer (1991)]

which, in turn, raises the productivity of labor in the US and, accordingly, US wages. Hence, similar to Davis (1998a), European unemployment props up wages in America. This leads to an unambiguous increase in the US wage income. In contrast, wage income in Europe may either raise or fall depending on characteristics of the aggregate technology. With savings being closely linked to wage income, we find that the effect of a European minimum wage policy on the evolution of global capital accumulation and growth depends on technological parameters and on American and European propensities to save. Most importantly, if the propensity to save out of wage income is smaller in the US than in Europe, a European minimum wage policy is likely to reduce economic growth both in Europe and in the US.

We establish and discuss our results in the following two sections. Section 2 sets up the model. The equilibrium analysis which generates our main result is then presented in Section 3.

2. The Model

We consider a global economy comprising two countries labelled d for domestic and f for foreign. Both countries are endowed with the same technology and equal in population size, but differ with respect to preferences and the mode of wage determination. While country f has a competitive labor market, wages are determined by a minimum wage policy in country d.

The household sector in both countries has a simple overlapping generations structure à la Samuelson (1956) and Diamond (1965). Each generation is represented by a single individual who lives for two periods. In the first period the individual supplies labor out of her initial labor endowment which is normalized to one and receives wage income. This income is used to consume and to save. In the second period the individual retires and lives on the proceeds of her savings.

An individual born at time t draws utility from young and old age consumption. Lifetime utility is:

$$u_t^i = \ln c_{y,t}^i + \beta^i \ln c_{o,t+1}^i, \qquad i = d, f,$$

where $c_{y,t}^i$ and $c_{o,t+1}^i$ are young and old age consumption in country i, and $\beta^i \in (0,1)$ is a discount factor in country i. Each generation takes the real wage w_t^i in t and the real interest rate r_{t+1}^i on savings from t to $t+1$ as given and maximizes lifetime utility under the constraints:

$$c_{y,t}^i + s_t^i \leq w_t^i L_t^i,$$

$$c_{o,t+1}^i \leq (1 + r_{t+1}^i)\, s_t^i,$$

$$L_t^i \leq \min\{\bar{L}_t^i, 1\},$$

where s_t^i is savings at time t, L_t^i is the actual labor supply, and $\bar{L}_t^i$ is a quantity constraint on employment in country i which is binding whenever $\bar{L}_t^i$ is less than 1. The difference $1-\bar{L}_t^i$ is to be interpreted as the rate of (involuntary) unemployment in country i at t which results from rationing of the representative individual's labor supply in country i.

It is readily verified that savings in country i at t is proportional to the country's wage:

$$s_t^i = \gamma^i\, w_t^i\, L_t^i. \tag{1}$$

Here, $\gamma^i = \beta^i/(1+\beta^i)$ denotes the marginal propensity to save out of wage income. As individuals do not care about leisure, they always supply as much labor as possible:

$$L_t^i = \min\{\bar{L}_t^i, 1\}.$$

In each country identical firms hire the capital stock, K_t^i, and demand labor supplied by the young. Aggregate production in country i at t is determined by $Y_t^i = F\left(K_t^i, A_t^i L_t^i\right)$, where the function F exhibits constant returns to scale and satisfies standard concavity and differentiability conditions. The index A_t^i measures country i's stock of knowledge at t.

In each country firms take factor prices as given. Marginal product pricing leads to:

$$r_t^i = f'\left(k_t^i\right), \tag{2}$$

$$w_t^i = A_t^i\left[f\left(k_t^i\right) - k_t^i f'\left(k_t^i\right)\right], \tag{3}$$

where $k_t^i = K_t^i / A_t^i L_t^i$ denotes the capital intensity in country i and $f(k_t^i) \equiv F(k_t^i, 1)$ with $f' > 0$ and $f'' < 0$.

We associate productivity growth following Arrow (1962) and Romer (1986) with a "learning-by-investing" effect, augmented to allow for perfect international knowledge spillovers.[3] The latter may be motivated by the non-rivalry of new ideas in an integrated global economy. Thus, we assume:

$$A_t^i = K_t^d + K_t^f, \qquad i = d, f. \tag{4}$$

[3] The learning-by-investing model à la Arrow-Romer allows a simple assessment of the impact of a minimum wage policy on savings and growth. However, a close link between savings and growth is also present in other endogenous growth models that feature a more elaborate microstructure. Consider, for instance, the endogenous innovation model with increasing returns due to specialization developed by Romer (1987). In the overlapping generations version of this model, presented by Grossman and Yanagawa (1993), it turns out that the growth rate has the same structural form as in the learning-by-investing model.

This specification implies that at any time both countries have access to the same stock of knowledge.

The two countries differ with respect to the wage setting institutions. While the labor market in country f is competitive, country d implements a binding minimum wage in each period. We assume that the minimum wage at t, $\bar{w}_t$, is a multiple $\mu \geq 1$ of the potential market clearing wage level, w_t^*, that is:

$$\bar{w}_t = \mu\, w_t^*. \tag{5}$$

Product markets in both countries are in equilibrium if:

$$s_t^d = K_{t+1}^d + E_{t+1}, \tag{6}$$

$$s_t^f = K_{t+1}^f - E_{t+1}, \tag{7}$$

where E_{t+1} is that part of savings of country d which is invested in country f. Clearly, if $E_{t+1} > 0$ then country d is a capital exporter, and a capital importer otherwise. Under the assumption of free capital mobility the following no-arbitrage condition must hold:

$$r_t^d = r_t^f = r_t. \tag{8}$$

Considering equation (2), this implies:

$$\frac{K_{t+1}^d}{A_t^d L_{t+1}^d} = \frac{K_{t+1}^f}{A_t^f L_{t+1}^f}. \tag{9}$$

Thus, the capital intensity of both countries must coincide, i.e. $k_t^d = k_t^f = k_t$.

3. Equilibrium Analysis

Given initial levels of foreign assets, E_0, and capital in both countries, K_0^i, the savings functions (1), the factor price conditions (2) and (3), the knowledge evolution equation (4), the product market equilibrium conditions (6) and (7), the no-arbitrage condition (8), labor market clearing in country f, and employment consistent with the minimum wage policy (5) in country d determine an equilibrium in the global economy as a sequence $\left\{s_t^i, c_{y,t}^i, c_{o,t}^i, w_t^i, r_t^i, L_t^i, K_{t+1}^i, E_{t+1}, A_t^i\right\}_{t=0}^{\infty}$ for $i = d, f$.

Upon combining (4) and (9), considering full employment in country f and rationing of labor supply in country d, i.e. $L_t^f = 1$ and $L_t^d = \bar{L}_t \leq 1$ for all t, the following expression for the capital intensity results:

$$k_t = \frac{1}{1 + \bar{L}_t}. \tag{10}$$

Substituting (4) and (10) into (3) we obtain a common equilibrium wage rate for both countries as:

$$w_t^i = \omega(1 + \bar{L}_t)\,(K_t^d + K_t^f), \tag{11}$$
$$\text{with}\ \ \omega(1 + \bar{L}_t) = f\left(\frac{1}{1 + \bar{L}_t}\right) - f'\left(\frac{1}{1 + \bar{L}_t}\right)\frac{1}{1 + \bar{L}_t}.$$

Here, the function ω represents the global external return on capital per unit of employed labor caused by the spillover from capital accumulation on labor productivity. Indeed, if productivity growth stems from (4), global output is given by $Y_t = Y_t^d + Y_t^f = F(K_t^d, (K_t^d + K_t^f)\bar{L}_t) + F(K_t^f, K_t^d + K_t^f)$. In addition, if factor prices are determined by (2) and (3), one finds that the global social return on capital, i.e. the return on an extra unit of capital in either country, is $dY_t/dK_t^i = r_t + \omega(1 + \bar{L}_t)\,(1 + \bar{L}_t)$. Note further that the function ω satisfies

$\omega' = f''/(1+\bar{L}_t)^3 < 0$.

From (5) and (11), one immediately obtains:

$$\omega(1+\bar{L}_t) = \mu\,\omega(2), \tag{12}$$

which implicitly determines a time invariant equilibrium level of employment in country d as a function of μ, i.e. $\bar{L}_t = \bar{L}(\mu)$. This function satisfies $\bar{L}(1) = 1$ and $\bar{L}' < 0$, which follows from implicit differentiation of (12).

We are now in a position to determine the equilibrium growth rate. By adding equations (6) and (7), we find that:

$$s_t^d + s_t^f = K_{t+1}^d + K_{t+1}^f.$$

Substituting for s_t^i using (1) and then considering (11), a recursion relating the stocks of global capital in t and $t+1$ obtains:

$$\omega\,(\gamma^d\,\bar{L} + \gamma^f)\,(K_t^d + K_t^f) = K_{t+1}^d + K_{t+1}^f. \tag{13}$$

From (11) we also infer that the growth rate of the global capital stock coincides with the growth rate of wages and per capita income. Therefore,

$$1 + g = \omega\,(\gamma^d\,\bar{L} + \gamma^f), \tag{14}$$

where g denotes the growth rate of per capita income. Note that as g is independent of time, transitional dynamics are absent in the present model. This implies that after a change in the minimum wage, the economy instantaneously adjusts to a new balanced growth equilibrium.

The following proposition establishes how the minimum wage policy impinges on the growth rate g.

Proposition. Denote $\sigma := \sigma(1+\bar{L})$ the elasticity of substitution between capital and labor in efficiency units and $\varepsilon := \varepsilon(1+\bar{L})$ the output elasticity of labor in efficiency units. Then, it holds:

$$\frac{dg}{d\mu} \gtreqless 0 \Leftrightarrow \gamma^d \left[(1-\varepsilon) \frac{\bar{L}}{1+\bar{L}} - \sigma \right] + \gamma^f \, (1-\varepsilon) \, \frac{1}{1+\bar{L}} \gtreqless 0. \tag{15}$$

Proof: Differentiate (14) with respect to μ to obtain:

$$\begin{aligned} \frac{dg}{d\mu} &= [\omega' \, (\gamma^d \bar{L} + \gamma^f) + \omega \, \gamma^d] \, \bar{L}' \\ &= \left[\frac{\omega'}{\omega} \, (1+\bar{L}) \, (\gamma^d \bar{L} + \gamma^f) + \gamma^d \, (1+\bar{L}) \right] \, \frac{\omega}{1+\bar{L}} \bar{L}'. \end{aligned}$$

Concerning the expression in square brackets, we observe that the term $\omega' \, (1+\bar{L})/\omega$ can be written as:

$$\frac{\omega'}{\omega} \, (1+\bar{L}) = -\frac{1-\varepsilon}{\sigma},$$

with

$$\varepsilon = 1 - \frac{f'}{(1+\bar{L}) \, f} \quad \text{and} \quad \sigma = -\frac{f'}{f} \frac{[(1+\bar{L}) \, f - f']}{f''}.$$

Noting that $\bar{L}' < 0$, the proposition follows. *Q.E.D.*

The proposition emphasizes that the impact of the minimum wage policy in country d on global per capita income growth depends on an intricate relationship between parameters characterizing preferences in both countries and the common technology. To gain intuition for the result summarized by (15), assume, for a moment, that $\gamma^d = \gamma^f$. Then, (15) becomes $dg/d\mu \gtreqless \Leftrightarrow 1 - \sigma - \varepsilon \gtreqless 0$. From this equation it can be inferred that the total effect of a reduction in employment in country d due to the minimum wage policy can be decomposed in an effect on the functional distribution of global income and a global output effect. The former occurs as for a given output a reduction in employment in country d increases the wage rate in both countries (and reduces the global interest rate). The distribution effect is measured by the elasticity of substitution between capital and efficient labor σ. As is well known, the labor share of global income will increase if the elasticity of substitution is smaller than one. However, an increase in the labor share is not sufficient to increase global labor income and, henceforth, savings and growth. This is because a reduction in employment in country d reduces global output, i.e., causes a negative output effect. The output effect is measured by the output elasticity of efficient labor ε. Since ε is the share of global output that accrues to labor in both countries, it measures to what extend global labor income is reduced when global production falls. In sum, for the growth rate to increase (decrease), the technology must be such that the effect of a reduction in employment in country d on the global functional distribution of income in favor of labor more than outweighs (falls short of) the effect on global output that accrues to labor in both countries.

Now consider the case $\gamma^d \neq \gamma^f$. Then, it is immediate from (15) that a minimum wage is more likely to raise g the larger γ^f. The intuition is as follows. The minimum wage policy in country d and the concomitant increase in the wage level in both countries unambiguously raises the wage income in country f. Therefore, the effect of a minimum wage policy on aggregate savings in country f is positive and the effect is the stronger the larger is γ^f. In contrast, the minimum wage policy does not necessarily increase wage income in country d as it reduces employment in country d. Yet, a sufficient condition for this to happen is that the term in square brackets in (15) is negative. The term in square brackets shows the distribution and the output effect that determine the impact of the reduction in employment on aggregate wage income in country d. As a consequence, a minimum wage is more likely to raise g the larger γ^d only if the wage policy positively affects aggregate wage income in country d.

On empirical grounds one may argue that the distribution effect is negligible because σ is considered to be close to 1. Interestingly, even in this case differing propensities to save may be sufficient for a positive impact of the minimum wage policy on global growth. More precisely, assume a Cobb-Douglas technology so that σ is 1 and ε is constant, and consider the impact of a minimum wage policy starting from $\mu = 1$. Then (15) becomes:

$$\frac{dg}{d\mu}|_{\mu=1} \gtreqless 0 \;\Leftrightarrow\; \gamma^f \gtreqless \frac{1+\varepsilon}{1-\varepsilon}\,\gamma^d.$$

Hence, differing propensities to save determine how national minimum wages affect global economic growth in the presence of capital mobility. They do not only affect the strength of the growth effect associated with minimum wages but also determine its direction. In particular, if the foreign propensity to save, γ^f, is sufficiently low relative to its domestic counterpart, γ^d, the minimum wage policy in country d will reduce global economic growth.

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