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Capital Markets Integration and Labor Market Institutions

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Abstract

A major development in recent decades in industrialised countries is the decline in national savings rates. Over the same period, the labour's share of national income has also declined in many industrialised countries. This paper seeks to provide a unified account of these developments. We show that globalization, in the form of increased capital mobility, provides incentives to implement labour market reforms that raise the returns to capital and improve efficiency. Nevertheless, in a world where aggregate savings reflect life-cycle motives and are mainly performed out of labour income, the associated fall in the labour share reduces aggregate savings and the pace of capital accumulation. This inefficient outcome is due to competition for capital between countries generating negative externalities.

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1 Introduction

It is often argued that, in the long-run, deeper economic integration makes everybody better off. The reason is that the benefits from economic integration due to a more efficient allocation of resources emerge in the long-run, while the costs due to sectoral reallocations mainly accrue in the short-run. Still, in the real world we observe persistent opposition to openness and to the so-called globalization process (Rodrik, 1997). While this may be partly due to the slow and painful restructuring processes of the Western economies, this paper identifies, as an additional potential cause, a channel through which the long-run gains from economic integration may be partly dissipated. In particular, we show that economic integration may negatively affect capital accumulation, via endogenous labour market regulation.

We construct a tractable dynamic general equilibrium model where the degree of capital mobility affects the endogenously determined degree of labour market imperfections that have, in turn, a bearing on capital accumulation. We explain labour market institutions as the outcome of a stylized political mechanism, where rational agents make political choices taking into account both the degree of capital mobility and the dynamic effects of their choices on capital accumulation. In this framework, increased capital mobility provides incentives to implement labour market reforms that reduce the share of output accruing to labour and increase the share of output accruing to capital. Although this improves labour market efficiency, in a world where aggregate savings reflect life-cycle motives and are mainly performed out of labour income, a drop in the labour share reduces the pace of capital accumulation, the steady state capital stock, and the steady state lifetime utility.

The implications of the model are consistent with the observed patterns of labour market reforms, labour's shares and savings rates in western economies. A wave of labour market reforms has swept over much of the industrialised countries, especially since the 1990s. Even though in many countries the reform process has not been smooth and uncontroversial, the evidence (Bertola and Boeri, 2001 and Nickell, 2003) suggests that most reforms went in the direction of reducing price and quantity rigidities in the labour market. At the same time, it is well-known from the work of Blanchard (1996) and Poterba (1997) that over the last decades the labour's share of GDP has declined both in Europe and in the US. Only few studies have investigated the determinants of the movements in labour's share. Among these, Harrison (2002) finds that, controlling for various contemporaneous factors, measures of globalization (such as trade shares, exchange rate crises, movements in foreign investment, capital controls) have a negative effect on the share of GDP that accrues to labour. Guscina (2006) and Jayadev (2007) share the same conclusions. The final piece of evidence consistent with the predictions of the model concerns the decline in savings rates observed in most European countries, US and Japan over the same time span. Table 1 (from Jappelli and Padula, 2007) shows that savings rates fell dramatically in the 80's and 90's, with the notable exception of Norway. Even though in some countries savings rates increased back in the early years 2000, they are

	1980	1990	2000	2004
Austria	13.2	14	8.3	7.8
Belgium	20.3	18	13.4	14.1
Denmark	n.a.	11.2	4.8	6.1
Finland	4.1	2.2	-0.9	1.3
France	12.1	7.8	10.8	12.1
Germany	13.4	13.9	9.8	10.8
Ireland	12.1	8.5	10.7	15.1
Italy	25	25.5	12.4	13.9
Netherlands	7.8	11.6	6.7	10.8
Norway	1.5	0.8	4.5	5.9
Spain	11.1	12.3	10.6	10.2
Sweden	7.9	0	2.4	6.8
UK	12.4	8	4.3	5.8
Japan	19.9	14	9.8	5.8
US	10.2	7.8	2.8	4.8

Table 1: Household savings rates. Table from Jappelli and Padula (2007)

generally still well below the 1980 levels.

Thus, the model nicely explains these so far unrelated pieces of evidence in an unified framework. It does so by means of a standard dynamic, general equilibrium, overlapping generations model in which parents and their children are linked by bequests. The households save for retirement and possibly to leave bequests to their children. We assume that a wage floor may be imposed by a central authority, whose preferences over the wage policy are given by a convex combination of the preferences of the young and the old. We provide conditions for a binding wage policy to arise in a closed economy steady state and show that, in this context, a binding wage floor increases the labour share. As in the model savings are determined by life-cycle reasons and are therefore financed by labour income, a higher labour share spurs capital accumulation, provided that savings decisions are not too elastic with respect to the interest rate. We show that for plausible parameters values labour market regulation, though reducing the allocative efficiency on the labour market, raises the steady state welfare of the current young and of all future generations thanks to the positive effect on capital accumulation.[1]

Closed economy results provide an useful benchmark against which we compare the open economy analysis, characterized by full capital mobility and no labour mobility. In this setting,

[1]Relatedly, Uhlig and Yanagawa (1996) shows that raising the labour share in an endogenous growth OLG model leads to faster growth. Bertola (1996) provides an elegant extension of their results to the perpetual youth OLG model.

international capital flows take place if wages – and hence the returns to capital – are different across countries.

We consider the case of two countries strategically interacting with each other and playing a non-cooperative game. In this framework, competition for the services of capital makes symmetric regulated equilibria not sustainable because, in each country, agents have incentives to slightly undercut the rival's wage in order to attract foreign capital. The intensity of competition for capital determines whether a symmetric fully competitive or an asymmetric steady state arises. The intensity of competition for capital, in turn, depends on the elasticity of the demand for capital. For a given interest rate differential, the size of the capital movements increases with the elasticity of the demand for capital.

If competition for capital is intense, the steady state is symmetric and no binding wage floor is implemented in any of the two countries, because of the substantial capital outflows triggered by any unilateral introduction of a wage floor. In this case, the steady state lifetime utility of the households is lower than in the closed economy where the binding wage floor allows to accumulate a larger capital stock

If the demand for capital is relatively inelastic, capital flows are relatively small and labour market regulation, though more costly than in the closed economy case, is still affordable. The steady state equilibrium is then asymmetric with one country having no binding wage floor (and full employment) and the other retaining a binding wage floor (and unemployment). However, the benefits of higher wages spill over to both countries thanks to capital movements that equalize factor prices. In other words, the capital flows from the regulated country boost the demand for labour in the unregulated country and make its domestic minimum wage not binding. As a result, the unregulated country enjoys the same wage as the regulated economy without experiencing unemployment. The lifetime utility of the households living in the regulated country is lower than in the closed economy case, because of the larger cost of labour market regulation. On the contrary, the households living in the unregulated country may be better off provided that the elasticity of the demand for capital is low enough and, consequently, wages are high enough.[2]

This paper is related to two streams of literature. First, it is related to the large body of literature analysing the effects of economic integration on economic outcomes. Bertocchi (2003) analyses the effects of full capital mobility on income and wages in the context of an OLG model. In her setting, where the degree of labour market imperfections is taken as exogenous, openness is always beneficial, even though factor shares may fail to converge. The present paper, where labour market regulation is endogenous, shows that the long-run benefits of deeper economic integration should be weighted against the long-run cost of a slower pace of capital accumulation.[3]

[2]The asymmetric response to market integration in regulated and unregulated economies also appears in the trade model of Davis (1998).

[3]This literature also includes, among others, Bean et al (1998), Beissinger (2001), Krueger (2002), Rodrik (1997), Krugman (1997), Naylor (1998), Zhao (1995), Danthine and Hunt (1994).

Second, this paper is related to the stream of literature that dates back to Wright (1986) and analyses the political economy of labour market institutions in a dynamic framework. Typically, in this literature, labour market rigidities arise in political equilibria either because they allow to extract (or protect) rents due to underlying microeconomic frictions (Saint-Paul, 2000), or as a second-best option under financial market imperfections by providing risk-averse workers with insurance against labour market risks that *laissez-faire* arrangements may be unable to supply.[4] In this paper, instead, labour market regulation arises from workers' attempts to increase their share of output at the expenses of the capital's share of output. As workers become capitalists in the second period of life, they are willing to regulate the labour market only if it allows to shift resources over time at better terms than the market and consequently it allows to increase their permanent income. Moreover, unlike most of the literature dealing with the political economy of labour market institutions, this paper acknowledges the effect of economic integration on the political choices of the agents and let countries strategically interact among each other when regulating national labour markets.[5]

The rest of the paper is organized as follows. Section 2 illustrates the fundamentals of the model economy. Section 3 characterizes the closed economy political steady state. Section 4 explores the open economy and section 5 concludes.

2 The model

We consider two countries, the home country and the foreign country, and analyse their interaction within a simple variant of the standard overlapping generations model with production. We refer to the domestic country, the description of the foreign country being completely analogous.

2.1 Households

A new generation of agents is born every period. Agents live two periods. There is no population growth and one representative agent per generation. When young the agent is endowed with λ units of time and when old his or her time endowment is $1-\lambda$. Income per unit of time is denoted by y. Preferences are assumed to be time separable, with a constant discount factor. The utility from consumption in each period is given by $u(c_t) = c_t^{1-\phi}/(1-\phi)$. The parents derive utility from leaving a bequest b_t to their children: $\nu(b_t) = \psi \times b_t^{1-\phi}/(1-\phi)$, where the term ψ reflects the parent's concern about leaving bequests to her children. This type of bequest motive has been called warm glow, and was first introduced by Andreoni

[4] See Hassler and Rodríguez Mora (1999) and Hassler et al. (2005) for a political economy approach and Bertola (2004), Acemoglu and Shimer (1999), Drèze and Gollier (1993) for an approach with exogenous labour institutions.

[5] Accounting for strategic interaction in a two-country framework has proved useful also in the analysis of the political economy of fiscal policy as in Persson and Tabellini (1992) and Perotti (2001). For a survey on tax competition for mobile capital see Wilson (1999).

(1989). Agents are allowed to invest their savings both at home and abroad. Capital mobility is perfect.

Agents maximize the present discounted value of their lifetime utility and have perfect foresight. Thus, the problem of a young consumer in the home country, labelling foreign variables with a superscript *, reads as follows:

$$\max_{c_t^y, c_{t+1}^o, b_{t+1}, \eta_{t+1}} u(c_t^y) + \frac{1}{1+\theta}\left(u(c_{t+1}^o) + \nu(b_{t+1})\right) \tag{1}$$

$$s.t.$$

$$c_t^y + s_t = \lambda y_t + b_t \tag{2}$$

$$b_{t+1} + c_{t+1}^o = (1-\lambda)y_{t+1} + s_t\left[\eta_{t+1}\left(1 + r_{t+1}^*\right) + (1-\eta_{t+1})(1 + r_{t+1})\right] \tag{3}$$

$$\eta_{t+1} \in [0, 1] \tag{4}$$

where c_t^y, s_t and b_t denote, respectively, consumption when young, savings, and bequests at time t. The domestic and foreign (net) interest rates are denoted respectively by r_{t+1} and r_{t+1}^*. Finally, η_{t+1} is the share of savings invested abroad and θ is the rate at which individuals discount the future.

2.2 Firms

An aggregate good Q is produced in each country by means of a Cobb-Douglas technology that makes use of labour N and capital K. The (net) production function is

$$Q = K^\gamma N^{1-\gamma} - \delta K$$

where $\delta \in [0, 1]$ is the depreciation rate of capital. There is free entry in the market and firms take prices as given. When the economy is closed, firms' conditional demand schedules for labour and capital are standard:

$$N(K, w) = K\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}} \tag{5}$$

$$K(N, r) = N\left(\frac{\gamma}{r+\delta}\right)^{\frac{1}{1-\gamma}} \tag{6}$$

with w and r denoting the domestic wage and interest rate. In the case of full capital mobility, the relevant interest rate is the smallest between the foreign and the domestic rate.

2.3 The labour market

As a binding wage regulation may be introduced in the economy, the labour market may not clear and unemployment may occur.[6]

[6]Of course, labour market regulations involve a number of different policies (such as employment protection, unemployment benefits, minimum wages and centralised bargaining) that have different effects on labour market outcomes. However, at least to some extent they all contribute to set a floor to the wage rate. Minimum wages

To simplify matters, we think of each household as a very large extended family which contains a continuum of members with names on the unit interval. In equilibrium, some members will be unemployed and others employed. To avoid within-cohort distributional issues not arising from heterogeneity in the factor content of agents' income, following Merz (1995) and Andolfatto (1996), we assume that family members perfectly insure each other against fluctuations in consumption.[7]

We also maintain that unemployed workers have available an alternative production technology with constant labour productivity U. In the paper, we will refer to this technology as home production.

Given the capital stock K, the equilibrium in the labour market characterizes as follows. Suppose that $w \geq U$ is the going regulated wage. Then, from (5), $\widehat{K}(w) \equiv \left(\frac{w}{1-\gamma}\right)^{\frac{1}{\gamma}}$ denotes the minimum level of capital that clears the labour market at the wage w, i.e. $\widehat{K}(w)$ is such that $N(K,w) = 1$, for all $K \geq \widehat{K}(w)$. Then, the labour market is in one of the two following regimes.

1. **Full-Employment Regime.** If the capital stock is large enough, namely $K \geq \widehat{K}(w)$, the labour market clears and labour income equals the market clearing wage: $y = w^c(K) \equiv (1-\gamma) K^{\gamma}$. From equation (6), the interest rate is $r(K) = \gamma K^{\gamma-1} - \delta$. Nobody makes use of the home production technology since $U \leq w \leq w^c(K)$.

2. **Unemployment Regime**. If the capital stock is low enough, namely $K < \widehat{K}(w)$, the minimum wage is larger than the competitive wage, i.e. $w > w^c(K)$, and the employment level is pinned down by the labour demand $N(K,w)$. In this regime, a proportion $N(K,w)$ of agents (within each household) work in the firm, and a proportion $(1 - N(K,w))$ work in the backyard. Thus, the labour income per unit of time of a representative household is:

$$y(w,K) = N(K,w)\,w + (1 - N(K,w))\,U = K\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U) + U \qquad (7)$$

   Notice that, taking capital as given, the labour income is increasing in w as long as the wage is lower than $\frac{U}{1-\gamma}$, which is, incidentally, the level at which a monopoly union would set the wage.

Finally, it is worth noting that using (5) and (6), the interest rate can be expressed as

in an obvious way. Unemployment benefits by raising workers' reservation wage. Employment protection and centralised bargaining by raising workers' bargaining power. We discuss an extension of the model that allows for more than one policy instrument in section 4.1.

[7] We abstract from any source of within-cohort heterogeneity that may introduce additional reasons for labour market regulation to arise. For instance, the presence of insiders/outsiders conflicts and/or of uninsurable labour market risk may cloud the analysis by making it more difficult to disentangle the different determinants of labour market regulation.

follows:

$$r(w) = \gamma \left(\frac{1-\gamma}{w}\right)^{\frac{1-\gamma}{\gamma}} - \delta \tag{8}$$

Equation (8) describes the demand side of the capital market and boils down to the usual expression $r(K) = \gamma K^{\gamma-1} - \delta$ when the wage rate is at the competitive level, i.e. $w = w^c(K) \equiv (1-\gamma) K^{\gamma}$, and there is full employment, i.e. $N = 1$. Thus, given w, the demand for capital is flat for $K < \widehat{K}$, and decreasing afterwards. When the minimum wage is binding any increase in K is matched by an identical increase in the employment level N, that leaves the capital-labour ratio constant and allows the firm's FOCs to be satisfied at the same prices w and r. Thus, in the unemployment regime, changes in K do not alter the capital-labour ratio and leave the interest rate unchanged.

3 Closed economy

This section discusses the closed economy case. It first offers an analytical solution for the baseline version of the model where the young work and the old are retired ($\lambda = 1$), utility is logarithmic ($\phi = 1$) and no bequests are allowed for ($\psi = 0$). This is the simplest setting to analyse whether labour market regulation may endogenously arise from the political conflict between the owners of different factors of production and has the merit of being simple enough to deliver a transparent analytical solution. In this baseline case there is a one-to-one relation between agents' age and the factor content of agents' income. Therefore young agents will be often referred to as "workers" and old agents as "capitalists".

Subsection 3.2 will solve the model numerically allowing for a general CRRA utility function, a less restrictive inter-temporal timing of factor income and a less restrictive intra-temporal allocation of factor income.

3.1 Baseline model

We first solve for the *economic* equilibrium (subsection 3.1.1), where the policy variable is taken as exogenous, and then turn to the *political equilibrium* (subsection 3.1.2) where the policy is chosen taking the state variable of the economy, the capital stock, as given. Finally, we solve for the *political steady state* where the economic and political equilibria are mutually consistent.

3.1.1 The economic equilibrium

In this section, we analyse the agents' private decisions taking as given the political outcomes. In particular, we take the sequence of future wages as exogenous and analyse their effect on agents' behaviour. A formal definition of the (closed economy) economic equilibrium follows.

Definition 1. *Given an initial capital stock K_0 and a sequence of wages $\{w_t\}_{t=0}^{\infty}$, an economic equilibrium is a sequence of allocations $\{s_t, c_t^y, c_t^o, K_t, N_t\}_{t=0}^{\infty}$ and factor prices $\{r_t\}_{t=0}^{\infty}$, such* *that, in every period,*

1. *consumers maximize their lifetime utility;*

2. *firms maximize profits, i.e. (5) and (6) hold;*

3. *employment is determined by (5);*

4. *capital and goods markets clear, i.e.* $K_{t+1} = s(w_t, K_t)$ *for all* t.

Assuming $\phi = 1$, $\lambda = 1$ and $\psi = 0$, and given that capital is not allowed to flow across countries, the consumer's maximization problem (1) subject to (2), (3) and (4) delivers the standard saving function $s_t = \frac{1}{2+\theta} y_t$. Therefore, the equilibrium condition $K_{t+1} = s(w_t, K_t)$ reads as follows:

$$K_{t+1} = \frac{1}{2+\theta} y(K_t, w_t) \quad \forall t \tag{9}$$

Given w_t, in each period the labour market is in the Unemployment or Full-Employment Regime depending on the level of the capital stock. If $K_t \geq \widehat{K}(w_t)$ full-employment obtains. Viceversa, if $K_t < \widehat{K}(w_t)$, the economy is in the unemployment regime. Hence, the equilibrium condition (9) can be rewritten as follows:

$$K_{t+1} = \begin{cases} \frac{1}{2+\theta}\left[K_t \left(\frac{1-\gamma}{w_t}\right)^{\frac{1}{\gamma}} (w_t - U) + U\right] & \text{if} \quad K_t < \widehat{K}(w_t) \\ \frac{1}{2+\theta}(1-\gamma) K_t^{\gamma} & \text{if} \quad K_t \geq \widehat{K}(w_t) \end{cases} \tag{10}$$

Since we will confine our analysis to the steady state, we only analyse the *stationary* economic equilibrium where, given a constant minimum wage w, the capital stock is constant as well.[8]

Lemma 1. *The stationary economic equilibrium characterizes as follows:*

1. *If the minimum wage is low enough, i.e.* $w \leq w^c(K^F) \equiv (1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}$, *the equilibrium displays full-employment with* $K^F = \left(\frac{1-\gamma}{2+\theta}\right)^{\frac{1}{1-\gamma}}$.

2. *If the minimum wage is high enough, i.e.* $w > (1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}$, *the economy is in the unemployment regime and the capital stock is given by:*

$$K^A(w) = \frac{U}{2+\theta - \left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)} > 0$$

with $K^A(w)$ *increasing in* w, *for* $w \in \left(w^c(K^F), \frac{U}{1-\gamma}\right)$, *and increasing in* U.

Proof. In appendix. □

[8]For the sake of notational simplicity, in what follows we make a slight abuse of notation, and denote $w^c(K)|_{K=K^F}$ as $w^c(K^F)$.

If the competitive wage, evaluated at the stationary competitive capital stock K^F and denoted by $w^c\left(K^F\right)$, is larger than the regulated wage, a full-employment equilibrium arises. In other words, the competitive stationary capital stock K^F is large enough to make the minimum wage not binding. Therefore, the labour market clears.

Differently, if the minimum wage is larger than the full employment equilibrium wage, unemployment occurs. In this case the equilibrium capital stock depends on the minimum wage in a non monotonic fashion. In particular, it is increasing in the minimum wage if the latter is low enough, (i.e. $w \in \left[w^c\left(K^F\right), \frac{U}{1-\gamma}\right]$) and decreasing otherwise. The reason is that the aggregate labour income is increasing in w if w is lower than $\frac{U}{1-\gamma}$, and decreasing otherwise (see equation (7)). Hence, both aggregate savings and the capital stock have the same shape. Of course, in the unemployment regime the capital stock is increasing in the home production productivity U. The higher U, the higher both the aggregate labour income and savings, and the higher the capital stock.

We now turn to the determination of the political equilibrium.

3.1.2 The political equilibrium

So far, the wage rate has been taken as exogenous. In this section, we determine w as the endogenous outcome of a political mechanism. We now describe the political process through which the minimum wage is implemented.

The timing according to which life unfolds is as follows. At the beginning of period t a minimum wage w_t is agreed upon. Together with the existing capital stock K_t, this determines the labour demand $N\left(K_t, w_t\right)$. If the minimum wage is binding, unemployment occurs and the interest rate $r\left(w_t\right)$ is as described in equation (8). Finally, at the beginning of period $t+1$ the wage w_{t+1} is set and savings are invested.

Given the risk sharing arrangement within households, in this economy heterogeneity is solely driven by age. Preferences upon w_t are shaped by the value functions of the young (the workers) and the old (the capitalists), denoted respectively by $V^y(.)$ and $V^o(.)$:

$$V^y\left(w_t; w_{t+1}, K_t\right) = \ln c^y\left(w_t, K_t\right) + \frac{1}{1+\theta} \ln c^o\left(w_t; w_{t+1}, K_t\right) \tag{11}$$

$$V^o\left(w_t; K_t\right) = \ln c^o\left(w_t, K_t\right) = \ln K_t\left(1 + r\left(w_t\right)\right) \tag{12}$$

where $c^y\left(w_t, K_t\right)$ – first period consumption – does *not* depend on the wage of period $t+1$ due to the log utility assumption that makes it independent of the interest rate.

As to the political process, we maintain that both workers and capitalists are able to intervene in the political arena and affect political outcomes, possibly exerting lobbying activities left unmodeled for simplicity. We capture this assumption by introducing a political aggregator given by the convex combination of the lifetime preferences of capitalists and workers. The weights reflect the relative political power of each group. The political aggregator reads as follows:

$$W\left(w_t; w_{t+1}, K_t\right) = \alpha V^y\left(w_t; w_{t+1}, K_t\right) + (1-\alpha) V^o\left(w_t; K_t\right) \tag{13}$$

where $\alpha \in [0,1]$. The function $W(w_t; w_{t+1}, K_t)$ describes the preference mapping on w_t of the society, given the expectations on w_{t+1} and the capital stock K_t.

Agents choose over constant policy sequences, i.e. the wage is set *once-and-for-all.* This choice allows to get transparent analytical results. Section (3.1.3) discusses the extension of the analysis to an environment characterized by repeated voting. While dynamic voting complicates the analysis, the main results of the paper carry over to this extension.

We now provide formal definitions of the political equilibrium and of the political steady state, denoting the capital stock in place when the political decision is to be made by K_0:

Definition 2. *For each given level of the capital stock, a* ***political equilibrium*** *is a function* $\widetilde{w}(K_0)$ *that maximizes the political aggregator on the set of feasible wages.*[9] *Formally:*

$$\widetilde{w}(K_0) = \arg \max_{w \in \Omega(K_0)} W(w; K_0)$$

In a political equilibrium capital is taken as given. In steady state, however, the capital stock is endogenous and depends on the wage rate (via economic equilibrium). Therefore, a wage w^A is a steady state wage if and only if it generates a capital stock level $K^A(w^A)$ such that, given $K^A(w^A)$, the wage w^A maximizes the political aggregator. Formally:

Definition 3. *A* ***political steady state*** *is a wage* w^A *such that:*

$$\widetilde{w}\left(K^A\left(w^A\right)\right) = w^A.$$

We now turn to the analysis of the conflict of interests between workers and capitalists.

Preferences over the minimum wage

Before discussing the outcome of the political process, let us analyse the preferences of workers and capitalists separately. Let us rewrite the value functions (11) and (12) as follows:

$$V^y(w; K_0) = \ln \frac{1+\theta}{2+\theta} y(w, K_0) + \frac{1}{1+\theta} \ln \left(\frac{y(w, K_0)}{2+\theta} (1 + r(w)) \right) \quad (14)$$

$$V^o(w; K_0) = \ln K_0 (1 + r(w)) \quad (15)$$

where $y(w, K_0)$ and $r(w)$ are given by (7) and (8) in the unemployment regime and by the competitive prices in the full-employment regime. Lemma 2 establishes the conditions under which a conflict of interest emerges between workers and capitalists, i.e. under which the young want to raise the wage above the old most preferred level.

Lemma 2. *Given the existing capital stock* K_0*, there exists a conflict of interest between workers and capitalists if and only if:*

- *The economy is dynamically efficient, i.e.* $\gamma \geq \frac{\delta}{2+\theta+\delta}$,
- *The productivity of the unemployed is not too low, i.e.* $U \in \left[\underline{U}, w^c\left(K^F\right)\right]$

[9] See appendix A for the formal definition of the feasibility requirement.

- *The capital stock lies in the range* $K_0 \in \left[\underline{K}_0(U), \overline{K}_0(U)\right]$

Proof. In appendix. □

The intuition is as follows. Capitalists live off their savings. The higher the interest rate, the happier they are. Given the negative relation between wages and the interest rate (see equation (8)), capitalists always dislike high wages.

On the contrary, workers face a trade-off and may support the introduction of a minimum wage. The above proposition tells us that three conditions are needed for this to be true. *First*, the economy must be dynamically efficient. This implies that the (competitive) stationary capital stock is lower than the level that maximizes aggregate consumption or, equivalently, that the net interest rate is positive.[10]

In this case, it is well-known that the current young (and all future) generations are better off if, *in each period*, resources are transferred from the old to the young in a lump sum fashion, i.e. the reverse of a social security scheme is implemented.[11] Absent other non-distortionary tools, the introduction of a binding minimum wage mimics this scheme, as it raises the labour (first period) income and decreases the interest rate (second period income).

The binding minimum wage, however, introduces inefficiencies in the labour market. The *second* condition takes care of the size of the efficiency losses. If U is sufficiently high, i.e. $U \geq \underline{\underline{U}}$, the fall in aggregate production is not high enough, from the point of view of the young, to outweigh the gains that derive from the introduction of a minimum wage.

The last condition $K_0 \in \left[\underline{K}_0(U), \overline{K}_0(U)\right]$ is more technical and is required by the *once-and-for-all* wage setting assumption. It makes sure that workers' preferred wage is feasible i.e. it is binding in steady state.

[FIGURE 1 ABOUT HERE]

Figure 1 depicts the conflict of interest. The dashed-dotted line represents the minimum *constant* wage implementable in steady state as a function of K_0. Capitalists always support the lowest possible wage, and therefore their preferred wage is represented precisely by the dashed-dotted line. The solid line represents workers' preferred *feasible* wage $w^y(K_0, U)$, which turns out to be non decreasing in K_0.

If K_0 is low enough, namely lower than $\underline{K}_0(U)$, the feasibility constraint is binding and the feasible wage chosen by the young is the competitive wage $w^c\left(K^F\right)$ that would emerge in a competitive steady state. As K_0 goes up, the preferred wage of the young increases because – from equation (7) – the elasticity of income with respect to the wage goes up as

[10] In this setting, the condition for a dynamically efficient economy, i.e. $\gamma \geq \frac{\delta}{2+\theta+\delta}$, is satisfied for empirically plausible parameter values (see table 2 in section 3.2). Moreover, according to Abel et al. (1989), western economies are likely to be dynamically efficient.

[11] The reason is that the market transfers resources from the second to the first period at a rate equal to $\frac{1}{1+r}$, while the reverse of the social security scheme provides a rate equal to 1. Thus, if $r > 0$, the latter scheme raises the permanent income of the young and makes them better off.

well and raises the benefits of an increase in the wage rate (the cost remaining the same). When $K_0 \in \left[\underline{K}_0(U), \overline{K}_0(U)\right]$ young agents support a wage larger than the one supported by the old and a conflict of interest exists.

As K_0 grows larger the conflict must eventually disappear, because the competitive wage goes up and becomes larger than the monopoly union wage $\frac{U}{1-\gamma}$, while the wage supported by the young is always smaller than the static monopoly wage.

Autarchic political equilibrium

Having described the preferences of the two types of agents, the characterization of the political equilibrium is immediate. The political aggregator, given by a convex combination of the preferences of the workers and the capitalists, looks as follows:

$$W(w; K_0) = A + \alpha \frac{2+\theta}{1+\theta} \ln y(w; K_0) + \left(1 - \alpha \frac{\theta}{1+\theta}\right) \ln(1 + r(w)) \tag{16}$$

where $A = \alpha \ln \frac{1+\theta}{2+\theta} - \alpha \frac{1}{1+\theta} \ln(2+\theta) + (1-\alpha) \ln K_0$ does not depend on the wage.

Figure 2 depicts the wage that maximizes (16), denoted by $\widetilde{w}(K_0, U, \alpha)$ and fully characterized in appendix A (lemma 3). Figure 2 and figure 1 are obviously identical if workers are the dictators, i.e. $\alpha = 1$. As α goes down the interests of the old are weighted more, the set $\left[\underline{\underline{K}}_0(U, \alpha), \overline{\overline{K}}_0(U, \alpha)\right]$ – where binding regulation takes place – becomes narrower and $\widetilde{w}(K_0, U, \alpha)$ shifts down. The same happens as U goes down.

[FIGURE 2 ABOUT HERE]

3.1.3 The steady state

In steady state the economic equilibrium and the political equilibrium must be mutually consistent. Figure 3 depicts both the economic and the political equilibria, i.e. the schedules $K^A(w)$ and $\widetilde{w}(K, U, \alpha)$. The unique steady state lies at the point where $\widetilde{w}(K, U, \alpha)$ and $K^A(w)$ cross. Proposition 1 characterizes the steady state wage.

[FIGURE 3 ABOUT HERE]

Proposition 1. *If workers have enough political power ($\alpha > \underline{\alpha}(U)$), the economy is dynamically efficient $\left(\gamma \geq \frac{\delta}{2+\theta+\delta}\right)$ and the productivity of the home production technology is large enough $\left(U \in \left[\underline{\underline{U}}, w^c\left(K^F\right)\right]\right)$, then:*

1. *The steady state wage $w^A(U, \alpha)$ is larger than the wage that would arise in a fully competitive OLG economy;*

2. *Workers' lifetime utility is larger in the regulated steady state than in the fully competitive steady state.*

Proof. In appendix. □

Proposition 1 first spells out the conditions under which a binding minimum wage is implemented in steady state. The first requires that workers have enough political power. The second that the economy is dynamically efficient. The third that U is high enough. These conditions, and their economic intuition, follow directly from lemma 2 that states that workers are in favour of a binding wage regulation only if the economy is dynamically efficient and unemployment is not too costly. We will not discuss them again.

Less obvious is the second point of proposition 1 that states that the steady state welfare of the current young and all future generations is higher in case a binding minimum wage is in place. The reason, intuitively, is as follows.

Under dynamic efficiency, the welfare of the current young and all future generations is increasing in the steady state capital stock.[12] It follows that a binding minimum wage has a positive impact on workers' steady state welfare because, by raising their permanent income and savings, it fosters capital accumulation and eventually leads to a higher steady state capital stock.

Of course, the introduction of a binding minimum wage generates inefficiencies that prevent output to be maximized. The fall in production is, however, decreasing in the home production productivity U. Therefore, if U is not too low, the negative effect of labour market distortions does not offset the positive effect of a higher capital stock. Thus, young agents manipulate factor prices and achieve a higher steady state welfare despite the inefficiencies introduced in the labour market.

Finally, let us briefly discuss the implications of restricting agents to choose over constant policies at time zero. This assumption implies that agents do take into account the future, albeit in a specific way. They expect next period policy (the wage rate) to vary 1:1 with the current policy. In the terminology of Krusell et al. (1997), this implies that the *policy outcome function*, i.e. the function describing the law of motion of the policy variable, takes the simple form $w_{t+1} = w_t$, instead of the more general formulation $w_{t+1} = \Psi(w_t)$, where the wage at time $t+1$ depends on the previous period wage through the (unknown) function $\Psi(\cdot)$. It follows that $\frac{\partial w_{t+1}}{\partial w_t} = 1 > 0$ in the first case, and $\frac{\partial w_{t+1}}{\partial w_t} = \Psi'(w_t)$ in the second. In words, restricting the choice to a constant policy sequence implies that an increase in the current wage induces a rise in next period wage as well (at a rate equal to 1), hence it generates a benefit in the first part of life and a cost in the second. Would that be true also in the case of sequential voting, i.e. would $\Psi'(w_t) > 0$? In this simple OLG framework the answer is positive. An increase in period t minimum wage raises current savings and the next period capital stock. In turn, a larger capital stock in $t+1$ raises the demand for the minimum wage as it makes labour income $y_{t+1}(w_{t+1}, K_{t+1})$ more responsive to changes in the wage (see equation (7)). This means that $\Psi'(w_t)$ is positive. Thus, also under sequential voting a (marginally) larger wage has a positive impact on the well-being of the agents when young and a negative impact on their well-being when old.

[12]For a formal proof see, e.g., Obstfeld and Rogoff (1996) pages 164-167.

3.2 The full-blown model: a numerical analysis

In this section we provide a numerical characterization of the full-blown version of the model that allows for a general CRRA utility function ($\phi \neq 1$), and relaxes the conditions that it is only the young who receive labour income ($\lambda < 1$) and only the old who own capital ($\psi > 0$). The aims of this exercise are twofold. First, the numerical analysis provides a robustness check of the results obtained under less general parametric assumptions; second, it gives a flavour of the quantitative size of the effects for reasonable parameter values.

Calibration. With respect to demographics, as in Auerbach and Kotlikoff (1987) and Ríos-Rull (1996), agents are assumed to be born at age 20 and die at age 73, so that each period lasts 27 years. Moreover, following Ríos-Rull (1996), we assume that agents retire at age 65. Thus, agents work 27 years when young (from age 20 to age 46) and 19 years when old (from age 47 to 65) implying that the amount of labour supplied when old is 70.37% of the amount supplied when young: $(1-\lambda)/\lambda = 19/27 = 0.7037$. This sets $\lambda = 0.5870$.

The discount rate is $\theta = 0.3436$ which implies an annual discount rate of 0.01, close to the estimate of 0.011 of Hurd (1989). The depreciation rate is $\delta = .7497$, which gives a depreciation of 0.05 on a yearly basis (Ríos-Rull, 1996). We set α, the political power of the young, equal to 0.5 meaning that the old and the young have the same political power, consistently with the fact that in the model there is an identical mass of young and old individuals. The share of capital in aggregate income in the perfectly competitive case is set, following Bertola (1996), equal to 0.4.

There are three remaining crucial parameters to calibrate. The first is U, the wage earned when unemployed, which we interpret as home production. Gronau (1980) estimates the value of home production for U.S. wives. He finds that it exceeds 70% of the family's money income after taxes, ignoring the value of home production due to the work at home of the husband. Given the small number of hours husbands report they work at home, it seems reasonable to set U equal to 80% of the competitive wage rate.

The second crucial parameter is ψ the parameter which measures the parent's concern about leaving bequests to her children. A study by Gale and Scholz (1994) uses direct data on transfers and bequests in order to the compute the flow of intergenerational wealth transfers. Including trusts and life insurance in bequests from parents to children, the relative size of bequests is 1.06% of total private wealth. Including also a half of gifts to children or grandchildren in bequests from parents to children as disguised bequests, the relative size of bequests becomes 1.22%. I use this number as a target variable in order to set ψ.

Finally, we need to choose a value for ϕ, the coefficient of relative risk aversion, which governs the interest elasticity of savings and corresponds to the inverse of the intertemporal elasticity of substitution. Direct estimates of the latter tend to fall in the range 0.1-0.67. This evidence suggests a value of ϕ that varies from 10 to 1.5.[13] We assume a value of 3 in our

[13] Using micro-data, Barsky et al. (1997) estimate an intertemporal elasticity of substitution of 0.18 implying

Parameter	Description	Value	Reference
	Length of each period	27 years	Ríos-Rull (1996)
	Death Age	73 years	Ríos-Rull (1996)
	Retirement Age	65 years	Ríos-Rull (1996)
λ	Time endowment of the young	0.5870	Ríos-Rull (1996)
θ	Time discount rate	0.3436	Hurd (1989)
δ	Depreciation rate	0.7497	Ríos-Rull (1996)
α	Political power of the young	0.5	
γ	Competitive capital share	0.4	Bertola (1996)
U	Home production productivity	$0.8 \times w^c$	Gronau (1980)
ψ	Bequest concern	$8e-18$	Gale and Scholz (1994)
$1/\phi$	Intertemporal elasticity of substitution	1/3	Attanasio et al. (1995)

Table 2: Parameter values in the baseline case

baseline calibration, but then also experiment with alternative values. Table 2 summarises the parameter values in the baseline case.

Results. Table 3 reports the results for the baseline parametrisation. The first column reports the value of the risk aversion parameter ϕ. The second reports the ratio of the regulated to the competitive steady state wage. A ratio larger than unity shows that a binding minimum wage is implemented in steady state. In our baseline case, a binding minimum wage

ϕ	w^A/w^c	*LS Ratio*	u	K^A/K^F
3	1.0923	1.0327	0.1050	1.1160

Table 3: Baseline case: results for $\phi = 3$

does arise in steady state and is 9.23% larger than the competitive wage. The implied labour's share is 3.27% larger than the labour's share that would arise in the competitive steady state (column 3). The distortion introduced in the labour market has two additional effects. First, column 4 shows that it generates a sizeable 10.5% unemployment rate; second, larger wages allow to accumulate more capital. Column 5 shows that the capital stock in the regulated steady state is 11.6% larger than the capital stock that would arise in the competitive steady state. Overall, Table 3 suggests that for reasonable parameter values a binding minimum wage is supported in steady state, with substantial effects on factors' shares, unemployment and capital accumulation.

a coefficient of relative risk aversion slightly above 5, while the estimates of Attanasio and Weber (1995) range between 0.4 and 0.67 implying a coefficient of relative risk aversion between 1.5 and 2.5. Using macro-data, Hall (1988) concludes that the intertemporal elasticity of substitution ($1/\phi$) is likely below 0.2.

Let us briefly discuss how the results depend (i) on the value of the intertemporal elasticity of substitution; (ii) on the time-profile of the labour supply; (iii) on the share of capital held by the young.

Table 4 shows how the incentives to regulate the economy are affected by the value of the intertemporal elasticity of substitution. A binding minimum wage is supported in steady state in the whole range of empirically plausible values of ϕ that, as reported above, go from 1.5 to 10. Notice that larger ϕ's provide larger incentives to introduce a minimum wage. The reason is clear. A value of ϕ larger than unity implies a negative interest elasticity of savings. Thus, the larger ϕ the larger the increase in savings triggered by a drop in the interest rate. It follows that a larger ϕ provides stronger incentives to regulate the labour market because it makes its beneficial side – the larger capital accumulation – bigger. In Table 4, it is also interesting

ϕ	w^A/w^c	*LS Ratio*	u	K^A/K^F
1	1.0000	1.0000	0.0000	1.0000
2	1.0134	1.0068	0.0214	1.0118
3	1.0923	1.0327	0.1050	1.1160
4	1.1597	1.0417	0.1390	1.2469
5	1.2145	1.0432	0.1492	1.3830
6	1.2556	1.0412	0.1471	1.5069
7	1.2838	1.0380	0.1391	1.6076
8	1.3016	1.0346	0.1292	1.6829
9	1.3123	1.0315	0.1195	1.7370
10	1.3187	1.0289	0.1108	1.7755

Table 4: Numerical results for $\phi \in [1, 10]$

to notice that while the steady state regulated wage and capital stock (columns 2 and 5) are monotonically increasing in ϕ relative to their competitive counterparts, the unemployment rate and the labour share start declining after a while (from $\phi \geq 7$). The reason is that for ϕ large enough the increase in the capital stock more than offsets the increase in the minimum wage and raises both employment and GDP relative to labour income.

In the full-blown version of the model we have relaxed the condition that it is only the young who receive labour income. This turns out to make it more likely that a binding minimum wage is implemented in steady state. The obvious reason is that when also the old receive labour income they are less adverse to an increase in the wage compared to the case where they only receive capital income. This effect more than offsets the fact that with $\lambda < 1$ the positive effect of the minimum wage on capital accumulation is smaller. Finally, by introducing bequests, we have allowed the young to have an empirically plausible share of capital. A larger concern for leaving bequests to children, i.e. a larger ψ, reduces the incentives to implement a binding minimum wage. The reason is that a larger minimum wage reduces the interest rate and the steady state bequests that agents leave (and receive).[14]

4 Capital markets integration

We now turn to a two-country world where capital is fully mobile, labour completely immobile[15] and countries *strategically* interact with each other.[16]

Under these assumptions, competition for the services of capital rule out symmetric regulated equilibria. The reason, very much as in a Betrand-like game, is that in each country agents have incentives to slightly undercut the rival's wage in order to attract foreign capital.

Whether a symmetric (fully competitive) or an asymmetric steady state arises depends on the intensity of competition for capital which, in turn, depends on the elasticity of the demand for capital (proof in appendix).

If the elasticity is large even small interest rate differentials generate large capital outflows. Thus, the steady state is symmetric and no binding minimum wage is implemented in any of the two countries, because any unilateral introduction of the wage floor is very costly due to the large capital outflows. This implies that the open economy steady state wage is at the competitive level in both countries. By symmetry, interest rates are also equal in both countries and no capital flows take place in steady state. Thus, the open economy symmetric steady state fully replicates the *closed* economy *competitive* steady state. The lifetime utility of the households is lower than in the closed economy case where a binding wage floor allows to accumulate a larger capital stock.

Differently, if the demand for capital is relatively inelastic, capital flows are relatively small and labour market regulation, though more costly than in the closed economy case, is still affordable. The steady state equilibrium is asymmetric as one country has no binding wage floor and full employment while the other retains a binding wage floor and unemployment. However, the benefits of higher wages spill over to both countries thanks to the capital movements that equalize factor prices.

The reason is that the unregulated country enjoys a positive interest rate differential with respect to the regulated country and is therefore able to attract capital from abroad. Capital keeps flowing to the unregulated economy until its labour market becomes *fully competitive.* This must be the case as, in the unemployment regime, the demand for capital is flat and the

[14] Sensitivity analysis (available from the author) shows that the results hold good for a wide range of values of ψ and λ. Similarly, analogous results obtain for different values of the capital share γ.

[15] The assumption of no labour mobility is made for simplicity. Allowing for migration, while complicating the analysis, does not change the result that globalisation reduces the incentives to regulate the labour market. Labour mobility actually reinforces the incentives to deregulate the labour market because it triggers an inflow of workers which increases the supply of labour and reduces labour income.

[16] An example of strategic interaction among countries can be found in the motivation of the rejection of the Social Charter (adopted in 1989 by all other EEC member states) by the UK Prime Minister Mr. John Major: "*Europe can have the Social Charter. We shall have employment. [...] Let Jacques Delors accuse us of creating a paradise for foreign investors; I am happy to plead guilty.*" Cited in Rodrik (1997).

interest rate is pinned down by the wage rate (see equation 8). Therefore capital flows do not arbitrage away the interest rate differential. Rather, they increase the capital stock and shift the labour demand up until the minimum wage becomes non binding and the economy gets back to perfect competition. When this happens the gap between the regulated and unregulated country interest rates gets instantaneously closed and the capital flows stop. Since interest rates are back in line, the capital stock per worker K/N and the wage rate w must be equalized as well.

However, capital *per capita*[17] must be larger in the country *where there are no unemployed workers*, implying that GDP per capita in that country is larger as well. The reason is that labour market distortions have been wiped away by capital inflows and full-employment has been restored in that country.[18] Summing up, in the unregulated country the rise of the capital stock allows the labour market to clear and the minimum wage to become non binding. Thus, in the unregulated open economy there is full-employment and no inefficiencies arise. This, combined with the fact that the stock of capital per worker K/N is identical in the two countries implies that both the stock of capital *per capita* and GDP *per capita* are larger in the unregulated economy. In other words, GDP per capita is larger in the unregulated economy because capital flows allow the unemployed to get back to work and the economy to get rid of the deadweight loss due to the binding minimum wage.[19]

Therefore, in steady state the unregulated country enjoys capital inflows that raise the competitive wage up to the regulated level. The latter is, however, lower than the closed economy level and decreases as the elasticity of the demand for capital grows larger.[20] Hence, the steady state lifetime utility of the households in the regulated country is always lower than the steady state closed economy level because of the larger cost of labour market regulation. The unregulated country households, however, may be better off if the elasticity of the demand for capital is low enough because this implies that the regulated country wage floor (and consequently their wage level) is large enough.

Summarizing, capital markets integration provides incentives to *reduce* labour market regulation because of its larger cost due to the capital outflows. If the elasticity of the demand for capital is large, this is enough to warrant reversion to perfect competition in both countries.

[17] Capital per capita, i.e. capital per young household, is different from the capital-to-labour ratio, i.e. capital per worker, whenever there is unemployment.

[18] GDP per *worker* remains identical in the two countries. Capital flows raise capital per capita while leaving capital per worker unchanged.

[19] The same mechanism is at work in the case of a *small* open economy that is able to undercut the foreign regulated wage (and enjoy capital inflows) without triggering any reaction from the rest of the world. A small open economy enjoys the same wage level as the rest of the world (only ε-smaller) without suffering from unemployment thanks to capital inflows it attracts. However, if the rest of the world is perfectly competitive, the small open economy case is equivalent to the case of two countries strategically interacting with each other with a *highly* elastic demand for capital, as upon integration the small country reverts to perfect competition.

[20] In particular, the regulated country wage and capital stock approach the competitive levels as the elasticity grows large, and the closed economy (regulated) levels as the elasticity becomes small (see appendix for details).

Otherwise, the steady state equilibrium is asymmetric with the unregulated country enjoying full unemployment with a wage between the competitive level and the autarchic regulated level. From a quantitative point of view, it is interesting to remark that numerical simulations (not reported for brevity) show that for plausible parameter values (i.e. for ϕ between and 2 and 10 and for values of the other parameters as in table 2) asymmetric equilibria never arise.

Proposition 2. *Perfect capital mobility lowers the incentives to regulate the labour market. Despite the efficiency gains, the steady state lifetime utility of households may not increase.*

4.1 Discussion of extensions

As this model is highly stylised, it is worth discussing the role of two assumptions: the absence of policy instruments other than the wage and the focus on steady states.

More than one policy instrument. In this paper, the wage rate is the only policy instrument considered. This is a limitation that needs to be discussed. A natural option, for instance, is to consider the role of a savings subsidy, as this instrument may be combined with capital market integration to make agents internalize the externality on capital accumulation.

Imagine that upon opening the borders each country has to decide both over labour market regulation and a savings subsidy financed via taxes on labour income. How does a (symmetric) equilibrium characterise in a context where countries strategically interact among each other? Very much as in the previous analysis, countries have incentives to raise their interest rate slightly above the rival's level in order to attract capital. This triggers a race that reduces labour market regulation and raises savings subsidies. The race stops only when the after-tax minimum wage becomes equal to the reservation wage U. To be more precise, the minimum wage will be set at a non-binding level and therefore the *gross* wage rate will be at the competitive level; the *after-tax* wage will be driven down to the reservation wage level U by the labour income taxes needed to finance the savings subsidy. Thus, after-tax wages are smaller (and interest rates larger) than in the no-subsidy case.

In this symmetric case, in equilibrium factor prices are equalised and capital does not flow across borders. However, savings and the capital stock may go up or down relative to the closed economy case depending on the interest elasticity of savings. As discussed above, estimates of the inverse of the inter-temporal elasticity of substitution – that governs the interest elasticity of savings – tend to fall in the range 0.1-0.67. This evidence suggests that the interest rate elasticity is negative,[21] and implies that savings and the capital stock decrease further down when savings subsidies are allowed for.

Thus, the pattern of labour market regulation and savings does not change when one allows for savings subsidies, i.e. openness still reduces the incentives to regulate the labour

[21] Direct estimates of the interest rate elasticity range from negative, insignificant or trivially small (see e.g. Blinder, 1981; Blinder and Deaton, 1985; Bosworth and Burtless, 1992; Hall, 1988; Skinner and Feenberg, 1990) to quite large (Boskin, 1978 found the elasticity to be around 0.4).

market and reduces the pace of capital accumulation.

It would also be interesting to analyse the joint effects of labour market regulation and other policy tools (e.g. government debt, pension systems). We would also like to have the degree of capital market integration endogenously determined. These extensions would be of obvious policy relevance and would allow to shed light on the pattern of complementarity/substitutability between different policies and their effect on capital accumulation and on the reward of the factors of production. However, their breadth lies beyond the scope of this paper and we leave it for future research.

Transition. As we do not solve for the transition and compare welfare across steady-states, one may wonder whether capital market integration may affect the welfare of initial generations during the transition to the new steady state differently compared with the welfare of future generations close to the new steady state. Let us discuss again the symmetric case which is the one more likely to arise under plausible parameter values. The intuitive answer is that, along the transition path, capital market integration indeed reduces the welfare of *all* future generations, *except the current old one.* The mechanism is as follows. Upon integration the wage drops to the competitive level while the capital stock is still at its regulated steady state level. Given *that* level of capital, the young are either on the upward sloping part of their value function ($\alpha < 1$) or at the top ($\alpha = 1$), which implies that a decrease in the wage rate harms them. Globalisation drives the wage away from the level that maximises the well-being of the first young generation and reduces their welfare. Thus, despite the efficiency gains, even the first young generation loses from capital market integration, though less than the generations that are closer to the new steady state who earn an even lower (competitive) wage because of capital decumulation.

5 Final Remarks

This paper analyses the long-run effects of capital markets integration explicitly accounting for its impact on labour market regulation. We do so within a two-country OLG model where labour market institutions are modelled as a wage floor and rational individuals choose labour market policies taking into account both the dynamic effects on capital accumulation and the interaction with capital mobility.

We first provide conditions for the minimum wage to arise in the closed economy steady state. The first requirement is dynamic efficiency. The reason is that (for plausible parameter values) larger wages spur capital accumulation while dynamic *in*efficiency already implies overaccumulation. The second condition involves the size of the production losses generated by the minimum wage. The third requires workers to have enough political power. For reasonable parameter values, binding minimum wages are supported in steady state generating a 10.5% unemployment rate.

We then allow capital to move across borders at no cost in a two-country setting. We assume that countries strategically interact among each other and play a non-cooperative game. We show that capital markets integration always provides incentives to reduce labour market rigidities and restore labour market efficiency.

Two equilibrium configurations can arise in steady state, depending on the elasticity of the demand of capital. A large elasticity generates fierce competition and induces a symmetric equilibrium with both countries' wages at their competitive level. When the elasticity of the demand for capital is low, an asymmetric equilibrium arises where one country has no binding wage floor and full employment, while the other country retains a binding wage floor and unemployment. In both cases, openness always reduces labour market regulation but does not necessarily increase the steady state lifetime utility of the households as the drop in the labour share slows down capital accumulation.

It is worth pointing out that, for simplicity, we have purposefully left out of the picture important features of the real economies that make economic integration beneficial, such as international trade, labour mobility and, particularly in this framework, policy coordination. Therefore, the goal of this paper is not to suggest that openness is harmful. Rather, it is to highlight a simple channel through which the long run positive effects of economic integration may be partly dissipated if uncoordinated policies are implemented. Whether this provides incentives to delegate policies to supranational authorities is left for future research.

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A Proofs

Lemma 1.

Proof. Item 1 of the lemma derives directly from imposing the steady state condition $K_{t+1} = K_t$ on the law of motion of the economy (equation (10)) for the case $K_t > \widehat{K}(w)$. It is easy to check that $K^F = \left(\frac{1-\gamma}{2+\theta}\right)^{\frac{1}{1-\gamma}}$ and that $K^F \geq \widehat{K}(w) \Longleftrightarrow w \leq w^c\left(K^F\right) = (1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}$.

Item 2 is proved by imposing the steady state condition $K_{t+1} = K_t$ on the law of motion of the economy (equation (10)) for the case $K_t < \widehat{K}(w)$. This shows that

$$K^A(w) = \frac{U}{2+\theta - \left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)}$$

Simple algebra shows that $K^A(w) \leq \widehat{K}(w) \Longleftrightarrow w \geq (1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}$ and that $\frac{\partial K^A}{\partial w} = \frac{U\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}\frac{U-(1-\gamma)w}{\gamma w}}{\left[2+\theta-\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)\right]^2} > 0$ if $w \in \left[w^c\left(K^F\right), \frac{U}{1-\gamma}\right]$.

In order to show that $K^A(w) > 0$ for any $w \geq w^c\left(K^F\right)$, notice that

$$K^A(w)\,|_{w=w^c\left(K^F\right)} = K^F > 0$$

and that

$$\lim_{w\to\infty} K^A(w) = \frac{U}{2+\theta} > 0$$

Since $\frac{\partial K^A(w)}{\partial w}$ is positive if $w \in \left[w^c\left(K^F\right), \frac{U}{1-\gamma}\right]$ and negative for $w > \frac{U}{1-\gamma}$, it follows that $K^A(w) > 0$ for $w > w^c\left(K^F\right)$ as shown in Figure **??**.

Finally,

$$\frac{\partial K^A}{\partial U} = \frac{2+\theta-\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}w}{\left[2+\theta-\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)\right]^2} \geq 0$$

for $w \geq w^c\left(K^F\right)$, since the numerator is increasing in w and equals zero at $w = w^c\left(K^F\right)$. □

Lemma 2.

Proof. In order to identify the conditions under which a conflict of interests between the young and the old takes place, we need to analyse their preferences over the set of *feasible* wages. A binding minimum wage is feasible if, once chosen, it will be binding also in steady state. The feasibility condition is needed because of the assumption that a *constant* wage w is voted upon.

1. **Feasible wages.** A binding minimum wage set at time 0 is feasible if it will be binding also in steady state, i.e. if on top of being (weakly) larger than the going competitive wage $w^c(K_0)$ (and of the backyard wage rate U), it is also larger than the steady state competitive wage $w^c\left(K^F\right)$.[22] Thus, the set of feasible wages $\Omega(K_0)$ is given by:

$$\Omega(K_0) = \left\{w : w \geq \max\left\{w^c(K_0), w^c\left(K^F\right), U\right\}\right\}$$

Recalling that $U < w^c\left(K^F\right)$ and using Lemma 1, the set can be rewritten as follows:

$$\Omega(K_0) = \left\{\begin{array}{l} w \geq w^c\left(K^F\right) \text{ for } K_0 < K^F \\ w \geq w^c(K_0) \text{ for } K_0 \geq K^F \end{array}\right\}$$

In words. If $K_0 < K^F$ then any $w \geq w^c\left(K^F\right)$ is feasible. This is because if $K_0 < K^F$ the economy converges to K^F if $w < w^c\left(K^F\right)$ (see Lemma 1). Thus any wage floor smaller than $w^c\left(K^F\right)$ is not feasible because it will be eventually non binding. Differently, if $K_0 \geq K^F$, a wage w is feasible only if $w \geq w^c(K_0) \geq w^c\left(K^F\right)$. Notice that the latter inequalities imply that the economy converges to $K^A(w) \geq K^F$ and that $K_0 < \widehat{K}(w)$. Moreover, from Lemma 1, $K^A(w) \leq \widehat{K}(w)$. Now observe that

[22] Another way of seeing it is that there is no capital stock such that the wage floor is not binding, i.e. $\nexists K_t$ such that $K_t < \widehat{K}(w), \forall K_t \in \mathcal{K}(K_0, w)$.

$K_t \leq \max\{K_0, K_A(w)\}$ for all t, if $w \geq w^c\left(K^F\right)$. This further implies that $K_t \leq \widehat{K}(w)\ \forall t$, which means that a minimum wage $w \geq w^c(K_0)$ is (weakly) larger than the competitive market-clearing wage in each period, thus also in steady state, meaning that it is feasible. The set of feasible wages is depicted in figure 4. Finally, notice that as U diminishes and approaches $\underline{\underline{U}}$, the interval $\left[\underline{K}_0(U), \overline{K}_0(U)\right]$ becomes narrower and the schedule $w^y(K_0, U)$ shifts down. At $U = \underline{\underline{U}}$ the only point contained in the interval is K^F and $w^y(K_0, U)\mid_{K_0=K^F} = w^c\left(K^F\right)$.

2. **Preferences of the old.** It is straightforward to check that the value function of the old is decreasing in w, i.e.
$$\frac{\partial V^o(w; K_0)}{\partial w} = \frac{\partial \ln(1 + r(w))}{\partial w} < 0$$
thus, they would always implement the lowest possible wage, i.e. the competitive wage.

3. **Preferences of the young and conflict of interest.** Given the existing capital stock K_0, the most preferred wage of the young is given by:
$$w^y(K_0, U) = \arg\max_{w \in \Omega(K_0)} V^y(w; K_0)$$
Therefore, a conflict of interest between the young and the old exists whenever the young are willing to raise the wage above the level preferred by the old and the chosen wage is feasible. Given the previous results, necessary conditions for this happens are:
$$\frac{\partial V^y(w; K_0)}{\partial w}\mid_{w=w^c\left(K^F\right)} \quad > \quad 0 \text{ if } K_0 \leq K^F \tag{17}$$
$$\frac{\partial V^y(w; K_0)}{\partial w}\mid_{w=w^c(K_0)} \quad > \quad 0 \text{ if } K_0 > K^F \tag{18}$$

   (a) Consider first the case $K_0 \leq K^F$. In case of a *binding* minimum wage, the derivative with respect to the wage of the value function of the young, given the initial capital stock K_0, is[23]
$$\frac{\partial V^y}{\partial w} = \frac{\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}}{1+\theta}\left(\frac{2+\theta}{K_0\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)+U} K_0 \frac{U-(1-\gamma)w}{\gamma w} - \frac{1}{1+r(w)}\right) \tag{19}$$
After some algebra (and taking into account that $\frac{w^c\left(K^F\right)}{(2+\theta)}\left(\frac{1-\gamma}{w^c\left(K^F\right)}\right)^{\frac{1}{\gamma}} = 1$, because $\left(\frac{1-\gamma}{w^c\left(K^F\right)}\right)^{\frac{1}{\gamma}} = \left(\frac{1-\gamma}{(1-\gamma)\left(K^F\right)^{\gamma}}\right)^{\frac{1}{\gamma}} = \frac{1}{K^F}$ and from Lemma 1 we know that $\frac{w^c\left(K^F\right)}{(2+\theta)} = K^F$), we can claim that equation (19) is (weakly) positive when evaluated at $w = w^c\left(K^F\right)$ if and only if
$$K_0 \geq \underline{K}_0(U) \equiv \frac{\frac{U}{2+\theta}}{1 + r\left(w^c\left(K^F\right)\right) - \left[1 + \frac{1+r\left(w^c\left(K^F\right)\right)}{\gamma}\right]\frac{w^c\left(K^F\right)-U}{w^c\left(K^F\right)}} \tag{20}$$
Now we have to make sure that $0 < \underline{K}_0(U) \leq K^F$. First, notice that $\underline{K}_0(U) > 0$ if and only if
$$U > \underline{U} \equiv w^c\left(K^F\right)\frac{1 + \frac{1+r\left(w^c\left(K^F\right)\right)}{\gamma}(1-\gamma)}{1 + \frac{1+r\left(w^c\left(K^F\right)\right)}{\gamma}} < w^c\left(K^F\right) \tag{21}$$
Second, $\underline{K}_0(U) \leq K^F$ if and only if
$$U \geq \underline{\underline{U}} \equiv w^c\left(K^F\right)\left(1 - \gamma\frac{r\left(w^c\left(K^F\right)\right)}{1 + r\left(w^c\left(K^F\right)\right)}\right)$$
with $\underline{\underline{U}} > \underline{U}$. Notice that $\underline{\underline{U}} < w^c\left(K^F\right)$ if and only if $r\left(w^c\left(K^F\right)\right) > 0$, i.e. if the economy is dynamically efficient.

   Summarizing, in the case $K_0 \leq K^F$, a conflict of interest exists if and only if the two following conditions hold:
$$U \in \left(\underline{\underline{U}}, w^c\left(K^F\right)\right)$$
$$K_0 \geq \underline{K}_0(U)$$

[23]The analysis of the second order condition is in the proof of lemma 3.

However, notice also that, by construction, $\underline{\underline{U}}$ is such that $\underline{K}_0(U) = K^F$ if $U = \underline{\underline{U}}$, and therefore from equations (19) and (20):

$$\frac{\partial V^y(w;K_0)}{\partial w}|_{K_0=K^F, w=w^c(K^F)} \geq 0 \Longleftrightarrow \begin{cases} U \geq \underline{\underline{U}} \\ K_0 \geq \underline{K}_0(U) \end{cases}$$

This is so because $U = \underline{\underline{U}}$ implies that $K_0 = K^F = \underline{K}_0(U)$ and, from equations (19) and (20), $\frac{\partial V^y(w;K_0)}{\partial w} = 0$. Moreover, $U > \underline{\underline{U}}$ implies that $K_0 > \underline{K}_0(U)$, being $\frac{\partial \underline{K}_0(U)}{\partial U} < 0$ as shown below, and therefore again from equations (19) and (20) $\frac{\partial V^y(w;K_0)}{\partial w} > 0$.
Hence, a further necessary and sufficient condition (which will turn out to be useful later on) for a conflict of interest is:

$$\frac{\partial V^y(w;K_0)}{\partial w}|_{K_0=K^F, w=w^c(K^F)} > 0$$

Finally, note that

$$\frac{\partial \underline{K}_0(U)}{\partial U} = \frac{1}{2+\theta} \frac{-\frac{1}{\gamma}\left[1 + r\left(w^c\left(K^F\right)\right)(1-\gamma)\right]}{\left[\left(1 + r\left(w^c\left(K^F\right)\right)\right) - \left[1 + \frac{1+r(w^c)}{\gamma}\right] \frac{w^c(K^F) - U}{w^c(K^F)}\right]^2} < 0$$

and that

$$\begin{aligned} \lim_{U \to \underline{\underline{U}}^+} \underline{K}_0(U) &= +\infty \\ \underline{K}_0(U)|_{U=w^c(K^F)} &= \frac{1}{1+r\left(w^c\left(K^F\right)\right)} \frac{w^c\left(K^F\right)}{2+\theta} = \frac{K^F}{1+r\left(w^c\left(K^F\right)\right)} \end{aligned}$$

(b) Consider now the case $K_0 > K^F$. A conflict of interest exists if $w^y(K_0) > w^c(K_0)$. The derivative of the value function of the young, evaluated at $w = w^c(K_0) = (1-\gamma)K_0^\gamma$ is:

$$\frac{\partial V^y}{\partial w} = \frac{K_0^{-1}}{1+\theta}\left(\frac{2+\theta}{(1-\gamma)K_0^\gamma} K_0 \frac{U - (1-\gamma)(1-\gamma)K_0^\gamma}{\gamma(1-\gamma)K_0^\gamma} - \frac{1}{1+r\left(w^c\left(K_0\right)\right)}\right) \tag{22}$$

and is positive if

$$K_0^{1-\gamma}\frac{U-(1-\gamma)^2 K_0^\gamma}{1-\gamma} > \frac{\gamma(1-\gamma)K_0^\gamma}{1+r\left(w^c\left(K_0\right)\right)}\frac{1}{(2+\theta)} \tag{23}$$

From the previous item of this proof we know that, if $U > \underline{\underline{U}}$, then $\frac{\partial V^y}{\partial w}|_{w=w^c(K_0)} > 0$, evaluated at $K_0 = K^F$. What if $K_0 > K^F$? Notice that the above RHS is increasing in K_0, while the LHS is first increasing in K_0 (for $K_0 < \left(\frac{U}{(1-\gamma)^2}\right)^{\frac{1}{\gamma}}$) and then decreasing. Therefore, $\frac{\partial V^y(w;K_0)}{\partial w}$ must eventually become negative, since the RHS increases and the LHS will eventually decrease.
Hence, in the case $K_0 > K^F$, if $U > \underline{\underline{U}}$, there is a $\overline{K}_0(U) > K^F$ such that for all $K_0 \in \left[K^F, \overline{K}_0(U)\right]$ a conflict of interest exists.[24] By totally differentiating 23, it is straightforward to check that $\frac{\partial \overline{K}_0(U)}{\partial U} > 0$. See picture 1.

We have established that, given dynamic efficiency, necessary and sufficient conditions for a conflict to arise are the two following conditions:

$$U \in \left[\underline{\underline{U}}, w^c\left(K^F\right)\right] \tag{24}$$

$$K_0 \in \left[\underline{K}_0(U), \overline{K}_0(U)\right] \tag{25}$$

This further implies (from item (a) of this proof) that a conflict exists if and only if:

$$\frac{\partial V^y(w;K_0)}{\partial w}|_{K_0=K^F, w=w^c(K^F)} > 0$$

In figure 1 as $U \to \underline{\underline{U}}$, the schedule $w^y(K_0, U)$ shifts downward and the interval $\left[\underline{K}_0(U), \overline{K}_0(U)\right]$ collapses to a singleton, i.e. $\left[\underline{K}_0(U), \overline{K}_0(U)\right] \to \left[K^F, K^F\right]$ and $\frac{\partial V^y(w;K_0)}{\partial w}|_{K_0=K^F, w=w^c(K^F)} = 0$.

Finally, is dynamic inefficiency *sufficient* for *no* conflict to arise? The answer is positive. To prove it, suppose first that $K_0 = K^F = K^{GR}$ where $K^{GR} \equiv \left(\frac{\gamma}{\delta}\right)^{\frac{1}{1-\gamma}}$ denotes the golden rule capital stock that maximizes

[24] Given the behavior of the RHS and the LHS the threshold must also be unique.

aggregate steady state consumption in the competitive economy. Notice that $K^F = K^{GR} \Leftrightarrow \gamma = \frac{\delta}{2+\theta+\delta}$. Evaluating (22) at $w^c(K_0)$ we have that[25]

$$\frac{\partial V^y(w;K_0)}{\partial w} = \frac{K_0^{-1}}{1+\theta}\left((2+\theta)K_0^{1-\gamma}\frac{U-(1-\gamma)^2 K_0^\gamma}{1-\gamma} - \frac{\gamma(1-\gamma)K_0^\gamma}{1+r(w^c(K_0))}\right)$$

Hence, sign of depends on *sign* $\left((2+\theta)K_0^{1-\gamma}\frac{U-(1-\gamma)^2K_0^\gamma}{1-\gamma} - \frac{\gamma(1-\gamma)K_0^\gamma}{1+r(w^c(K_0))}\right)$. Using the fact that if $K^F = K^{GR} = \left(\frac{\gamma}{\delta}\right)^{\frac{1}{1-\gamma}}$ then $\gamma = \frac{\delta}{2+\theta+\delta}$ and $\gamma\left(K^{GR}\right)^\gamma = \delta$, we have that at $K_0 = K^{GR}$:

$$\frac{\partial V^y(w;K_0)}{\partial w} = 0$$

since

$$\begin{aligned}
(2+\theta)K_0^{1-\gamma}\frac{U-(1-\gamma)^2K_0^\gamma}{1-\gamma} &= \frac{\gamma(1-\gamma)K_0^\gamma}{1+r(w^c(K_0))}\\
(2+\theta)K_0U - (2+\theta)K_0(1-\gamma)^2K_0^\gamma &= \gamma((1-\gamma)K_0^\gamma)^2\\
\frac{2+\theta}{\gamma K_0^{\gamma-1}+2+\theta}\frac{U}{1-\gamma} &= (1-\gamma)K_0^\gamma\\
\frac{2+\theta}{\delta+2+\theta}\frac{U}{1-\gamma} &= \frac{2+\theta}{\delta+2+\theta}K_0^\gamma\\
U &= (1-\gamma)K_0^\gamma
\end{aligned}$$

Basically, what happens is that the interval $\left[\underline{\underline{U}}, w^c\left(K^F\right)\right]$collapses into a singleton and therefore $U = \underline{\underline{U}} = w^c(K_0)$. Of course, if $K_0 > K^F$ using the same logic as in item B of this proof, it follows that $\frac{\partial V^y(w;K_0)}{\partial w} < 0$.[26]

Hence, dynamic *efficiency* is necessary to a have a conflict because under dynamic *inefficiency* both intervals $\left[\underline{\underline{U}}, w^c\left(K^F\right)\right]$ and $\left[\underline{K}_0(U), \overline{K}_0(U)\right]$ are empty and no conflict arises. □

Lemma 3. *The minimum wage $\widetilde{w}(K_0;U,\alpha) = \arg\max_{w\in\Omega(K_0)} W(w;K_0)$ is such that:*

1. *$\widetilde{w}(K_0;U,\alpha)$ is non decreasing in K_0, U and α and it is bounded from above by the monopoly union wage $\frac{U}{1-\gamma}$.*
2. *There exists a threshold level of the political power of the workers $\underline{\alpha}(U)$, such that, if $\alpha > \underline{\alpha}(U)$, there exists a set $\Pi(U,\alpha) \equiv \left[\underline{\underline{K}}_0(U,\alpha), \overline{\overline{K}}_0(U,\alpha)\right]$ such that $\widetilde{w}(K_0;U,\alpha) > \max\left(w^c\left(K^K\right), w^c(K_0)\right)$ for all $K_0 \in \Pi(U,\alpha)$.*

Proof. 1. We characterize the interior solution of the problem $\max_{w\in\Omega(K_0)} W(w;K_0)$, which delivers the binding regulated wage, as a function of K_0, α and U. The political aggregator (16) is readily rewritten, neglecting constant terms, as follows:

$$\begin{aligned}
W(w;K_0,U) &= \alpha\frac{2+\theta}{1+\theta}\ln\left[K_0\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)+U\right] + \left(1-\alpha\frac{\theta}{1+\theta}\right)\times\\
&\quad \times\ln\left[1+\gamma\left(\frac{1-\gamma}{w}\right)^{\frac{1-\gamma}{\gamma}}-\delta\right]
\end{aligned}$$

where

$$\frac{\partial W(w;K_0,U)}{\partial w} = \alpha\frac{2+\theta}{1+\theta}\frac{K_0}{y(w;K_0)}\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}\frac{U-(1-\gamma)w}{\gamma w} - \left(1-\alpha\frac{\theta}{1+\theta}\right)\frac{\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}}{1+r(w)}$$

At the interior maximum $\widetilde{w}$ the FOC must hold:

$$\alpha\frac{2+\theta}{1+\theta}\frac{K_0}{y(\widetilde{w};K_0)}\frac{U-(1-\gamma)\widetilde{w}}{\gamma\widetilde{w}} - \left(1-\alpha\frac{\theta}{1+\theta}\right)\frac{1}{1+r(\widetilde{w})} = 0 \qquad (26)$$

[25] Recall that we already know that, if the economy is dynamically inefficient, there exists no $\underline{\underline{U}} < w^c\left(K^F\right)$ such there is conflict for $K_0 < K^F$. Hence we just need to show that there is no conflict also for $K_0 \geq K^F$.

[26] It is always the case that $\frac{\partial V^y}{\partial w} < 0$ if $K^F > K^{GR}$ (keeping $K_0 = K^{GR}$) since in that case the labour income share $1-\gamma$ is even larger.

Inspection of (26) ensures that any critical point $\widetilde{w}$ is smaller than $\frac{U}{1-\gamma}$ if $\alpha < 1$ *and* θ is finite. The intuition is that a wage equal to $\frac{U}{1-\gamma}$ maximizes the utility of the young only if they do not care about the future, i.e. $\theta \to \infty$. Hence, it can be a maximum of the political aggregator only if $\alpha = 1$ and $\theta \to \infty$. Otherwise, $\widetilde{w}(K_0, U, \alpha) < \frac{U}{1-\gamma}$.
We check the SOC by taking the derivative of (26) with respect to w, at $\widetilde{w}(K_0, U, \alpha)$:

$$\begin{aligned}\frac{\partial^2 W(w; K_0, U)}{\partial w^2} &= -\alpha \frac{2+\theta}{1+\theta} K_0 \left(\frac{\gamma U}{(\gamma \widetilde{w})^2} \frac{1}{y} + \frac{(U-(1-\gamma)\widetilde{w})^2}{(\gamma \widetilde{w})^2 y^2} K_0 \left(\frac{1-\gamma}{\widetilde{w}} \right)^{\frac{1}{\gamma}} \right) - \\ &\quad - \left(1 - \alpha \frac{\theta}{1+\theta}\right) \frac{\left(\frac{1-\gamma}{\widetilde{w}}\right)^{\frac{1}{\gamma}}}{(1+r(\widetilde{w}))^2} \end{aligned} \tag{27}$$

Clearly (27) is negative, making sure that no critical point is a minimum. Being $W(w; K_0)$ a continuous function, if an interior maximum $\widetilde{w}(K_0, U, \alpha)$ exists, it is unique.
If $\frac{\partial W(w;K_0,U)}{\partial w}$ turns out to be negative for all $w > \max\left(w^c\left(K^F\right), w^c(K_0)\right)$, the political aggregator is decreasing in w and the competitive wage is implemented (corner solution).
By totally differentiating (26) with respect to $\widetilde{w}$ and K_0 we get:

$$\frac{d\widetilde{w}(K_0, U, \alpha)}{dK_0} = -\frac{\frac{\partial^2 W(K_0,U)}{\partial w \partial K_0}}{\frac{\partial^2 W(K_0,U)}{\partial w^2}} = -\frac{1}{\frac{\partial^2 W}{\partial w^2}} \frac{\alpha(U-(1-\gamma)\widetilde{w})}{\gamma \widetilde{w}} \frac{2+\theta}{1+\theta} \frac{U}{(y(\widetilde{w}; K_0))^2} > 0 \tag{28}$$

which is positive being $\frac{\partial^2 W}{\partial w^2}|_{w=w^c} < 0$ (by (27)) and $\widetilde{w}(K_0, U, \alpha) < \frac{U}{1-\gamma}$.
Moreover, $\widetilde{w}(K_0, U, \alpha)$ positively depends on U. By totally differentiating,

$$\frac{d\widetilde{w}(K_0, U, \alpha)}{dU} = -\frac{1}{\frac{\partial^2 W}{\partial w^2}} \frac{(1-\gamma) + \gamma K_0 \left(\frac{1-\gamma}{\widetilde{w}}\right)^{\frac{1}{\gamma}}}{\gamma (y(\widetilde{w}; K_0))^2} > 0$$

Finally, it is easy to check that

$$\frac{d\widetilde{w}(K_0, U, \alpha)}{d\alpha} > 0$$

2. Under which conditions does the above described interior maximum exists? Intuitively, in the range of U and K_0 where a conflict exists, the political aggregator must have an interior maximum if α is large enough. Of course, if $\alpha = 1$ then $\widetilde{w}(K_0, U, \alpha) = w^y(K_0, U)$. Let us then find a lower bound for α, such that the interior maximum exists.
Since a conflict exists if and only if $\frac{\partial V^y(w;K_0)}{\partial w}|_{K_0=K^F, w=w^c(K^F)} > 0$ (under dynamic efficiency, see lemma 2), we check the condition under which the derivative of the political aggregator (26) is positive, evaluated at $w = w^c(K_0)$ with $K_0 = K^F$, i.e.

$$\alpha \frac{2+\theta}{1+\theta} \frac{K^F}{w^c(K^F)} \frac{U-(1-\gamma) w^c\left(K^F\right)}{\gamma w^c(K^F)} - \left(1 - \alpha \frac{\theta}{1+\theta}\right) \frac{1}{1+r(w^c(K^F))} > 0$$

which is true if

$$\alpha > \underline{\alpha}(U) \equiv \frac{(1+\theta) w^c\left(K^F\right)}{(2+\theta) K^F \frac{\left(U-(1-\gamma)w^c\left(K^F\right)\right)}{\gamma w^c\left(K^F\right)} (1+r(w^c(K^F))) + \theta w^c(K^F)} \tag{29}$$

It is easy to check that $\underline{\alpha}(U) < 1$ if $U \in \left[\underline{\underline{U}}, w^c\left(K^F\right)\right]$. Thus, if $\alpha > \underline{\alpha}(U)$, there exist a non-empty set $\left[\underline{\underline{K}}_0(U, \alpha), \overline{\overline{K}}_0(U, \alpha)\right] \subseteq \left[\underline{K}_0(U), \overline{K}_0(U)\right]$ such that $\widetilde{w}(K_0, U, \alpha) > \max\left(w^c\left(K^F\right), w^c(K_0)\right)$ (see picture 2). Of course the two sets are equal if and only if $\alpha = 1$. It is immediate to check that the lower α the narrower the set $\left[\underline{\underline{K}}_0(U, \alpha), \overline{\overline{K}}_0(U, \alpha)\right]$. The same happens if U goes down.

□

Proposition 1.

Proof. We first prove the existence and uniqueness of the steady state wage $w^A(U, \alpha)$ and then show that the welfare of the young is increasing in w for $w \in \left[w^c\left(K^F\right), w^A(U, \alpha)\right]$.

Part 1. Figure 3 depicts both the economic and the political equilibria. The unique steady state lies at the crossing point between the economic equilibrium $K^A(w)$ and the political equilibrium $\widetilde{w}(K, U, \alpha)$.
Notice that the schedule $K^A(w)$ goes through the point $\left(w^c\left(K^F\right), K^F\right)$ since, if the competitive wage is

implemented, the economic equilibrium implies that the capital stock is at the competitive level. Moreover, for any $w > w^c\left(K^F\right)$, the function $K^A(w)$ lies above the dotted-dashed line that delimits the set of feasible wages, because along the $K^A(w)$ schedule any $K \geq K^F$ is an unemployment equilibrium in which $w \geq w^c(K)$. In words, w is larger than the competitive wage implied by the capital stock $K^A(w)$ represented by the dotted-dashed line, i.e. $w > w^c\left(K^A(w)\right)$. This implies, under the assumptions that guarantee that the set $\left[\underline{\underline{K}}_0(U,\alpha), \overline{\overline{K}}_0(U,\alpha)\right]$ is non empty, (i) that the $K^A(w)$ and $\widetilde{w}(K,U,\alpha)$ must cross and (ii) that both the steady state wage and the capital stock are larger than the competitive ones.[27]

Part 2. The steady state welfare of the young is given by

$$\begin{aligned} V^y(w,K(w)) &= \ln c^y(w,K(w)) + \frac{1}{1+\theta}\ln s(w,K(w))(1+r(w)) \\ &= \frac{2+\theta}{1+\theta}\ln y(w,K(w)) + \frac{1}{1+\theta}\ln(1+r(w)) + \ln\frac{1+\theta}{2+\theta} + \frac{1}{1+\theta}\ln\frac{1}{2+\theta} \end{aligned}$$

Therefore

$$\frac{dV^y(w,K(w))}{dw} = \frac{\partial V^y(w,K(w))}{\partial w} + \frac{\partial V^y(w,K(w))}{\partial K}\frac{\partial K(w)}{\partial w}$$

where it is straightforward to check that $\frac{\partial V^y(w,K(w))}{\partial K}\frac{\partial K(w)}{\partial w} \geq 0$ for $w \leq \frac{U}{1-\gamma}$. As to the term $\frac{\partial V^y(w,K(w))}{\partial w}$ we have that:

$$\frac{\partial V^y(w,K(w))}{\partial w} = \frac{2+\theta}{1+\theta}\frac{1}{y(w,K(w))}K(w)\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}\frac{U-(1-\gamma)w}{\gamma w} - \frac{1}{1+\theta}\frac{\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}}{1+r(w)}$$

we know that at $w = w^A$ the FOC (26) must hold, and therefore if $\alpha < 1$ it must be the case that $\frac{\partial V^y(w,K(w))}{\partial w}|_{w=w^A} > 0$, because the young are always willing a larger wage than the society as a whole. However, since the SOC (27) is negative at any w that satisfies the FOC, making sure that the function $\frac{\partial V^y(w,K(w))}{\partial w}$ does not cross the zero threshold from below, it must be the case that $\frac{\partial V^y(w,K(w))}{\partial w} > 0$ for any $w \in \left[w^c\left(K^F\right), w^A\right)$ which implies that $\frac{dV^y(w,K(w))}{dw} > 0$ for $w \in \left[w^c\left(K^F\right), w^A\right)$. □

Lemma 4. *There exists a level of γ, call it $\gamma^*(\theta,\delta,U)$, such that below γ^* the steady state equilibrium is symmetric and above γ^* it is asymmetric.*

Proof. What are the conditions under which a competitive and symmetric steady state may emerge in the open economy? To answer this question, we analyse the incentives of the young to raise the wage above the competitive level, when the foreign *regulated* wage is fixed at the competitive level (both countries are in steady state).

If the domestic country raises the wage above the foreign level, capital outflows take place until the rate of remuneration of capital is equal in the two countries and the *effective* (as opposed to the regulated) foreign wage, denoted by $\widehat{w}^*$, equals the domestic regulated level, i.e. $\widehat{w}^* = w$. For this to happen, an amount of capital equal to $\widehat{K}^* - s_0^*$ flows from the domestic to the foreign country, where s_0^* denotes the stock of savings accumulated in the foreign country and $\widehat{K}^*$ the level of capital such that foreign effective wage equals the regulated domestic level, i.e. $\widehat{w}^* = w$.

From the first order conditions of the firm, imposing that the labour market clears, i.e. $N = 1$, the demand for capital is $K^* = \left(\frac{\gamma}{\min(r,r^*)+\delta}\right)^{\frac{1}{1-\gamma}}$. If the domestic wage is larger than the foreign level, then $r < r^*$. Thus, being $r(w) = \gamma\left(\frac{1-\gamma}{w}\right)^{\frac{1-\gamma}{\gamma}} - \delta$, the foreign demand for capital as a function of the domestic wage reads as follows

$$\widehat{K}^*(w) = \left(\frac{w}{1-\gamma}\right)^{\frac{1}{\gamma}}$$

Notice that the elasticity of the demand for capital is $\frac{1}{\gamma}$. Hence, the lower γ the more costly to regulate the domestic labour market in terms of capital outflows.

[27] Given their shapes, $\widetilde{w}(K,U,\alpha)$ and $K^A(w)$ must cross only once. Uniqueness may also be demonstrated by showing that the mapping of w on itself, i.e. the function $\widetilde{w}(K(w);.)$ admits at most one fixed point, because *at any fixed point* $\frac{\partial \widetilde{w}(K(w);.)}{\partial w} < 1$.

We are now in the position to analyse the maximization problem of a domestic young agent:

$$\begin{aligned}
V^y(w;K) &= \max_w \frac{2+\theta}{1+\theta}\ln\left[K\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)+U\right]+ \\
&\quad +\frac{1}{1+\theta}\ln\left(1+r(w)\right) \\
&\quad s.t. \\
r(w) &= \gamma\left(\frac{1-\gamma}{w}\right)^{\frac{1-\gamma}{\gamma}}-\delta \\
K &= s_0-\left(\widehat{K}^*(w)-s_0^*\right) \\
\widehat{K}^*(w) &= \left(\frac{w}{1-\gamma}\right)^{\frac{1}{\gamma}}
\end{aligned}$$

Substituting the constraints in the objective function, we get:

$$\begin{aligned}
V^y(w;K) &= \max_w \frac{2+\theta}{1+\theta}\ln\left[\left(s_0-\left(\left(\frac{w}{1-\gamma}\right)^{\frac{1}{\gamma}}-s_0^*\right)\right)\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)+U\right]+ \\
&\quad +\frac{1}{1+\theta}\ln\left(1+\gamma\left(\frac{1-\gamma}{w}\right)^{\frac{1-\gamma}{\gamma}}-\delta\right)
\end{aligned}$$

The marginal change in the value function of the young following an increase in w is:

$$\begin{aligned}
\frac{\partial V^y(w;K)}{\partial w} &= \frac{2+\theta}{1+\theta}\frac{1}{y(w,K_0)}K_0\left(\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}-\frac{1}{\gamma}(1-\gamma)^{\frac{1}{\gamma}}w^{-\frac{1}{\gamma}-1}(w-U)\right)- \\
&\quad \frac{2+\theta}{1+\theta}\frac{1}{y}-\left(\left(\frac{1-\gamma}{w}\right)^{\frac{1}{\gamma}}(w-U)+U\right)\frac{1}{\gamma w}\left(\frac{w}{1-\gamma}\right)^{\frac{1}{\gamma}} \\
&\quad -\frac{1}{1+\theta}\frac{1}{1+r(w)}\left(\frac{1-\gamma}{\gamma}\gamma(1-\gamma)^{\frac{1-\gamma}{\gamma}}w^{-\frac{1-\gamma}{\gamma}-1}\right)
\end{aligned}$$

Evaluating $\frac{\partial V^y(w;K)}{\partial w}$ at a competitive steady state with $K=K^F$ and $w=w^c\left(K^F\right)$

$$\begin{aligned}
\frac{\partial V^y(w;K)}{\partial w}|_{K_0=K^F,w=w^c\left(K^F\right)} &= \frac{2+\theta}{1+\theta}\frac{1}{w^c}K^F\left(\frac{1-\gamma}{w^c}\right)^{\frac{1}{\gamma}}\left(\frac{U-w^c(1-\gamma)}{\gamma w^c}\right)- \\
&\quad -\frac{2+\theta}{1+\theta}\frac{1}{w^c}\left(\left(\frac{1-\gamma}{w^c}\right)^{\frac{1}{\gamma}}(w^c-U)+U\right)\frac{1}{\gamma w^c}\left(\frac{w^c}{1-\gamma}\right)^{\frac{1}{\gamma}}- \\
&\quad -\frac{1}{1+\theta}\frac{1}{1+r(w^c)}\left(\frac{1-\gamma}{w^c}\right)^{\frac{1}{\gamma}}
\end{aligned}$$

Therefore, $\frac{\partial V^y(w;K)}{\partial w}|_{K=K^F,w=w^c\left(K^F\right)}=$

$$\begin{aligned}
&= \frac{2+\theta}{1+\theta}\frac{1}{w^c}\left[K^F\left(\frac{1-\gamma}{w^c}\right)^{\frac{1}{\gamma}}\left(U-w^c(1-\gamma)\right)-\left((w^c-U)+U\left(\frac{w^c}{1-\gamma}\right)^{\frac{1}{\gamma}}\right)\right]\frac{1}{\gamma w^c}- \\
&\quad -\frac{1}{1+\theta}\frac{1}{1+r(w^c)}\left(\frac{1-\gamma}{w^c}\right)^{\frac{1}{\gamma}}
\end{aligned}$$

Comparing $\frac{\partial V^y(w;K)}{\partial w}$ to the expression derived in the closed economy case, a (negative) extra term appears, namely $\left((w^c-U)+\left(\frac{w^c}{1-\gamma}\right)^{\frac{1}{\gamma}}U\right)$. Notice the following:

1. The term $\left(w^c\left(K^F\right)-U\right)+U\left(\frac{w^c\left(K^F\right)}{1-\gamma}\right)^{\frac{1}{\gamma}}=w^c\left(K^F\right)-U+U\times K^F$ is decreasing in γ as the competitive steady state capital stock $K^F=\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{1}{1-\gamma}}$ (and therefore also the competitive steady state wage $w^c=(1-\gamma)\left(\left(K^F\right)^\gamma\right)$ goes to zero when γ approaches one, because the term $\frac{1-\gamma}{2+\theta}$ is smaller than one and $\frac{1}{1-\gamma}$ goes to infinity.

2. If γ equals the golden rule level $\gamma = \gamma^{GR} \equiv \frac{\gamma}{2+\theta+\delta}$, we know that in the closed economy case $\frac{\partial V^y(w;K)}{\partial w} = 0$ evaluated at $K = K^F = K^{GR}$ and $w = w^c$ (see proof of lemma 2). It follows that in the open economy case it must be that $\frac{\partial V^y(w;K_0)}{\partial w} < 0$, because of the extra negative term. By continuity for γ slightly larger than the golden rule level, $\frac{\partial V^y(w;K)}{\partial w} < 0$ as well.

3. If γ gets close to one the term $-\left((w^c - U) + \left(\frac{w^c}{1-\gamma}\right)^{\frac{1}{\gamma}} U\right)$ goes to zero because:

   (a) The difference $(w^c - U)$ vanishes as the term $(w^c - U)$ cannot become negative (U acts as a wage floor, thus $U \leq w^c$), and $w^c = (1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}$ goes to zero, thus $w^c - U = \max(w^c - U, 0)$.

   (b) The term $U\left(\frac{w^c(K^F)}{1-\gamma}\right)^{\frac{1}{\gamma}}$ goes to zero as $\left(\frac{w^c(K^F)}{1-\gamma}\right)^{\frac{1}{\gamma}} = \left(\frac{(1-\gamma)\left(\frac{1-\gamma}{2+\theta}\right)^{\frac{\gamma}{1-\gamma}}}{1-\gamma}\right)^{\frac{1}{\gamma}} = \left(\frac{1-\gamma}{2+\theta}\right)^{\frac{1}{1-\gamma}} = K^F$ which goes to zero when γ approaches one, because the term $\frac{1-\gamma}{2+\theta}$ is smaller than one and $\frac{1}{1-\gamma}$ goes to infinity.

Thus, there must exist a level of γ, call it $\gamma^*(\theta, \delta, U) > \gamma^{GR}$, such that if $[0, \gamma^*]$ the equilibrium is symmetric while above γ^* the equilibrium is asymmetric.

Notice that if $\gamma = \gamma^*$ a competitive steady state equilibrium obtains in both countries and the lifetime utility of the households is lower than in the closed economy case in both countries. By continuity, in the unregulated country, the lifetime utility of the households is lower than in the closed economy case also for γ slightly larger than γ^*. On the other side, if γ is close enough to one, the unregulated country enjoys the same wage as in the closed economy without suffering from unemployment. Therefore, in this case, the steady state lifetime utility of the households must be larger than in the closed economy.

Finally, the steady state lifetime utility of the households in the regulated country is always lower than in the closed economy because of the capital flows associated to labour market regulation.

□

B Figures

Figure 1: **Conflict of interest.** In the interval where $K_0 \in \left[\underline{K}_0(U), \overline{K}_0(U)\right]$ the wage preferred by the young, denoted by $w^y(K_0, U)$, is larger than the (dashed-dotted) competitive wage preferred by the old.

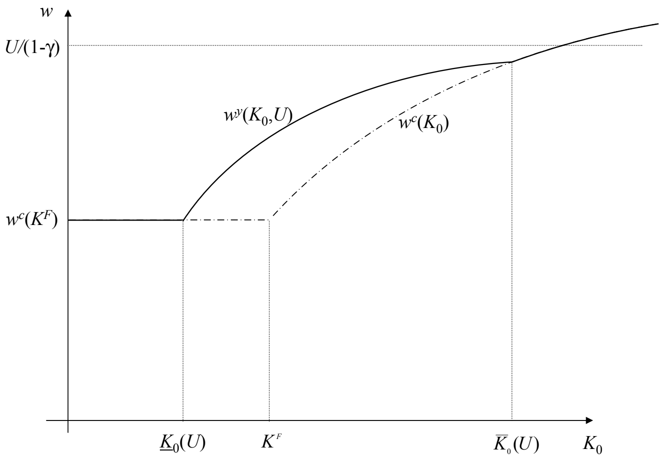

Figure 2: **Autarchic Political Equilibrium.** Solid line: economy preferred wage $\widetilde{w}(K_0, U, \alpha)$ as a function of the capital stock. Dashed-dotted line: minimum *feasible* constant wage implementable.

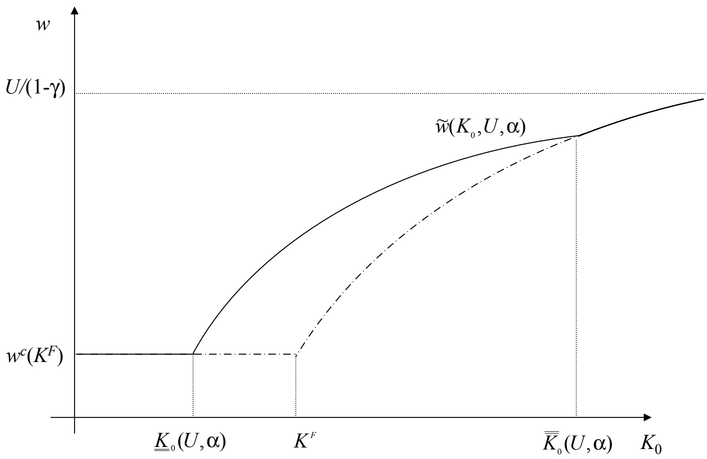

Figure 3: **Autarchic Steady State.**

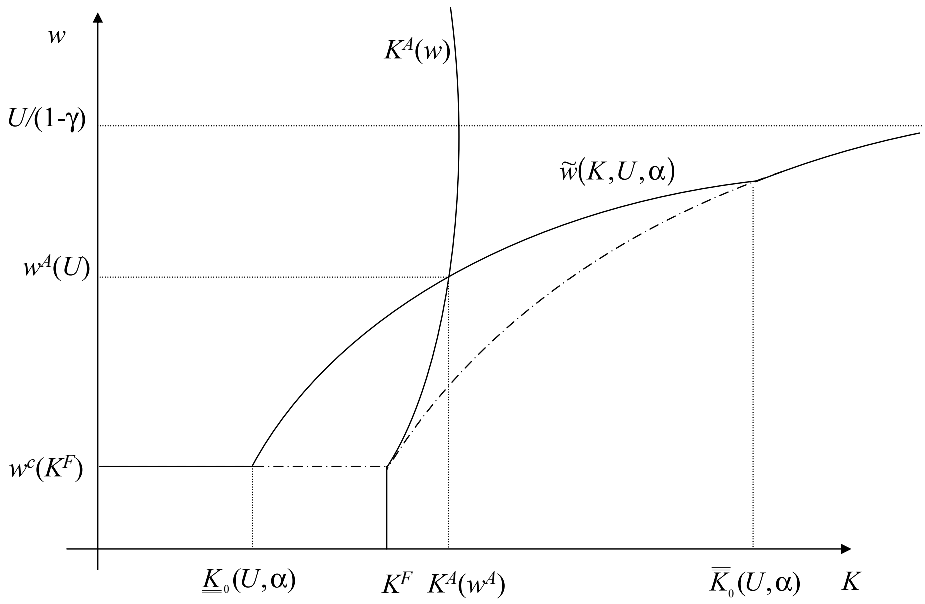

Figure 4: Feasible wages