Wedges: Distribution, Distortions, and Market Integration

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Abstract

This paper proposes a stylized model of policy determination and imperfect international integration. Policies that correct laissez-faire market imperfections and/or redistribute welfare in politico-economic equilibrium are subject to both race-to-the-bottom and beggar-thy-neighbor forces. Variation of international market linkages induces patterns of country-specific regulation and deregulation that depend on political and structural features in non-obvious, intuitive, and empirically realistic ways.

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1 Introduction

This paper studies how policy depends on structural and political factors and how it responds to integration of countries defined by political decision power, policy enforcement boundaries, imperfect mobility of some factors, and natural or cultural immobility of some other factors. Within this general framework the analysis is streamlined by assuming homogeneous tastes and technology, hence excluding gains from trade other than those allowed by different factor endowments, and focused by specific attention to policy wedges in labor markets. The model economy is populated by individuals who own heterogeneous amounts of capital, and the research question is that of whether and how policy is influenced by international mobility of capital.

Standard race-to-the-bottom intuition might lead one to expect that tighter integration triggers deregulation, a positive or negative development depending on whether one views regulation as beneficial or detrimental. This paper's modeling perspective offers a more nuanced and arguably realistic set of results. Integration does increase the elasticity of market responses to policies, which tends to reduce regulation. When economic activity can and does move across a country's borders, however, it also implies different politico-economic incentives to distort *laissez faire* markets, in ways that tend to imply tighter regulation in countries where politically decisive individuals gain from tighter international integration. As long as non-distorsive redistribution is ruled out, this is the equilibrium reform pattern, regardless of whether policy's motivation includes correction of *laissez faire* imperfections.

This substantive insight helps interpret political sentiment about globalization and European integration, and can explain why and how tighter integration has not everywhere triggered deregulation. Bertola (2016) shows in theory and verifies in EMU that complete financial integration of countries with different capital intensity triggers heterogeneous labor policy reforms as well as capital flows.[1] The contribution here is more purely theoretical, and its value added hinges on two technical devices that let the paper neatly endogenize policy

[1]The emphasis on heterogeneous factor incomes in that and this paper follows up on Bertola (1993), where factor income shares are influenced by laissez faire imperfections and policies, and Bertola (2004), where labor policies that trade productivity off consumption smoothing have different welfare implications for owners of capital and labor.

and allow for partial international market integration. Supposing that agents differ only in terms of factor endowments and ruling out non-distorsive transfers yields a stylized politico-economic framework of analysis where structural imperfections and distributional motives interact in simple yet flexible and insightful way. Supposing that international capital flows are subject to proportional "iceberg melt" allocation costs makes it possible to study the policy implications of international integration in a framework that allows it vary gradually.

The model's structure and results, outlined in this introductory section, build on standard insights and extend various classic strands of literature. Section 2 sets up the formal structure of an economy where a flexible supply of labor is employed with capital, adopting the tractable functional forms of micro-founded macroeconomic models such as Greenwood, Hercowitz, and Huffman (1988). In such models, policy and imperfections can be represented by inserting wedges between social marginal productivities and marginal utilities (Chari, Kehoe, and McGrattan, 2007). Section 3 outlines how the welfare of individuals within the country depends on such wedges, which in the absence of non-distorsive redistribution in equilibrium can be endogenous to politico-economic mechanisms. Policy may correct *laissez faire* distortions and/or redistribute welfare across agents endowed with different amounts of capital. As in Meltzer and Richards (1981), politico-economic considerations determine the equilibrium balance of aggregate efficiency and distributional considerations. Section 4 studies how structural and distributional issues shape the resulting politico-economic in a closed economy where a fixed aggregate stock of capital is owned in different proportions by the country's citizens. Starting from such factor-ownership heterogeneity within the country, Section 5 models imperfect integration as factor mobility across the borders of heterogeneous countries (trade in good with heterogeneous factor content would have similar implications). A capital stock that is fixed at the level of a wider economic aggregate may be employed in countries different from that of its owner subject to proportional "iceberg transport" productivity losses akin to those used by an abundant literature to model trade in goods, as well as by Martin and Rey (2000) to analyze the financial implications of international market integration.

The paper's tractable formal framework makes it possible to obtain results that generalize those of less flexible policy determination models, and are related but distinct from

familiar ones obtained by the international policy competition literature (reviewed by Wilson 1999, Sinn 2003, Keen and Konrad 2013) that typically only compares the extreme cases of autarky and complete integration. International integration changes the trade-offs faced by country-specific policy wedges, and Section 6 shows that if country-specific policy tends to reduce employment, then tighter integration is associated with deregulation in countries that experience capital outflows, but with more intrusive such policies in countries that experience inflows. Section 7 expands the analysis to address some technical issues specific to the model's novel framework and outlines its relationship to previous work.

Section 8 illustrates the welfare implications of international integration. While integration necessarily benefits the average individuals of heterogeneous countries with perfectly competitive markets, it can have negative welfare implications for individuals that are heterogeneous in the same respects within each country and for this reason favor policies that do not maximize average welfare, as well as for average individuals if enforcement of corrective policies is weakened by international competition. The economic welfare implications of international integration are different across agents, and this can explain why policy can endogenously influence the tightness of integration, as in Mayer's (1984) model of goods trade and tariffs; but they are unlikely to be very large, so non-economic factors can exogenously drive real-life integration processes. Section 9 concludes discussing how the model and possible extensions may help interpret the evidence generated by more or less intense and gradual processes of economic integration.

2 Model setup

Welfare increases in consumption of market goods which, in a static setting, coincides with the income $rk_i + wl_i$ earned by an individual who brings k_i units of capital and l_i units of labor to a factor market where units of these factors sell for r and w, and declines in the amount of labor supplied to the market rather than non-market tasks that yield positive utility (not only leisure, but also production activities that do not use capital.

It greatly simplifies derivation and interpretation of the results to suppose that for all i

preferences have the same non-linear form

$$U(\cdot) = rk_i + wl_i - B(l_i) \tag{1}$$

with $B'(l) > 0$ and $B''(l) > 0$, so that the first-order condition $w = B'(l)$ identifies the same optimal $l_i = l$ for all wage-taking individual. Heterogeneous nonlinear wealth effects would make it impossible to characterize explicitly macroeconomic relationships between factor prices and aggregate factor supplies: hence, following Greenwood, Hercowitz, and Huffman (1988) and other real business cycle models, utility form (1) rules income effects, and implies an increasing relationship between l and w. Because this is not necessarily realistic along the individual intensive margin, in the context of this and other macro models $B(l)$ is best interpreted as the welfare loss entailed by both intensive and extensive labor supply choices by unitary households that can transfer utility among their members; ruling out non-distorsive transfers *across* such units is what allows distorsive policies to be implemented in politico-economic equilibrium.

Production has constant returns as a function of all factors entitled to market income.[2] Denote per capita production $y(al/k_d)k_d$ where l is per capita labor supply, k_d employment of capital per capita, and a an index of productivity: labor's social marginal productivity is $y'(al/k_d)a$, but its unit income

$$w = \xi_\delta \xi_\tau y'(al/k_d)a \tag{2}$$

is distorted away from it by two different multiplicative parameters. One, ξ_τ, indexes a price distortion that shifts income across factors, so that the unit income of capital is

$$r = y(al/k_d) - \xi_\tau y'(al/k_d)al/k_d. \tag{3}$$

The other, ξ_δ, drives a wedge between labor's marginal productivity and private benefits but does not directly influence capital income at given l. Their real-life interpretation is discussed below. Here, it suffices to let them contribute to determining the total income of an agent (individual, or household) who earns income from k_i units of capital and a proportion l_i of

[2]Because there are only two factors, they have to be complementary: higher employment increases capital's marginal productivity. This drives many of the model's predictions. While similar insights are applicable to broader frameworks, to study migration it would be important to allow for substitutability.

one unit of labor, therefore, is

$$\begin{aligned} rk_i + wl_i &= \left(y\left(\frac{al}{k_d}\right) - \xi_\tau y'\left(\frac{al}{k_d}\right)\frac{al}{k_d}\right) k_i + \xi_\delta \xi_\tau y'\left(\frac{al}{k_d}\right) al_i \\ &\equiv c\left(l_i, k_i, al/k_d\right). \end{aligned} \tag{4}$$

3 Policy

To illustrate the welfare implications for agent i of policies that distort economy-wide allocation of labor to market activities it is useful to inspect the first-order condition for maximization of (1) with respect to l,

$$\frac{dc\left(\cdot\right)}{dl} = B'(l). \tag{5}$$

Allowing k_d to depend on l, and denoting

$$\eta_\kappa \equiv \frac{l}{k_d}\frac{dk_d}{dl},$$

the total derivative of the income expression (4) with respect to aggregate l can be written[3]

$$\frac{dc\left(\cdot\right)}{dl} = \left(\frac{1-\left(1-\gamma\right)\xi_\tau}{\xi_\delta \xi_\tau}\left(1-\eta_k\right)\frac{k_i}{k_d} + \left(1-\left(1-\eta_k\right)\gamma\right)\right) \xi_\delta \xi_\tau a y'(al/k_d), \tag{6}$$

where

$$\gamma \equiv -\left(al/k\right)\frac{y''(al/k)}{y'(al/k)} \tag{7}$$

will be treated as a constant parameter in what follows. The results are locally valid for functional forms with variable elasticity and the usual properties, and the derivations below still feature the $y\left(\cdot\right)$ function and its derivatives when this makes them easier to type and

[3]The derivation uses

$$\begin{aligned} \frac{d(al/k_d)}{dl} &= \frac{a}{k_d}\left(1-\eta_\kappa\right), \qquad \frac{d}{dl}\left[y(al/k_d)\right] = y'\left(\frac{al}{k_d}\right)\frac{a}{k_d}\left(1-\eta_\kappa\right), \\ \frac{d}{dl}\left[y'\left(\frac{al}{k_d}\right)\frac{al}{k_d}\right] &= \left(y''\left(\frac{al}{k_d}\right)\frac{al}{k_d} + y'\left(\frac{al}{k_d}\right)\right)\frac{a}{k_d}\left(1-\eta_\kappa\right), \\ \frac{d}{dl}\left[y'\left(\frac{al}{k_d}\right)al\right] &= y''\left(\frac{al}{k_d}\right)\frac{a}{k_d}\left(1-\eta_\kappa\right)al + y'\left(\frac{al}{k_d}\right)a. \end{aligned}$$

interpret.[4] The wage expression (2) appears on the right-hand side of (6), and the preferred aggregate l identified for agent i by (5) satisfies a condition in the form $\omega(\cdot)w = B'(L)$, where

$$\omega(\cdot) \equiv \left[\frac{1-(1-\gamma)\,\xi_\tau}{\xi_\delta\xi_\tau}(1-\eta_k)\,\frac{k_i}{k_d}\right] + \left[1-(1-\eta_k)\,\gamma\right] \tag{8}$$

is a proportional wedge between the market wage and $B'(l)$, the marginal opportunity cost of market work.[5]

To interpret this expression suppose first that $k_i = 0$. For an agent who only draws income from labor, the wedge only includes the second square bracket on the left-hand side of (8). If $(1-\eta_k)\,\gamma > 0$, a lower l increases the wage along a downward-sloping labor demand schedule: starting from the *laissez faire* allocation, this increases labor surplus, which is maximized when the wage exceeds the opportunity cost of labor supply by the monopolistic $(1-(1-\eta_k)\,\gamma)^{-1}$ proportional markup. This policy determination factor is dubbed a "monopoly union effect" in what follows.

If $k_i > 0$, then agent i also considers the impact of employment on capital income. Higher l increases production by $y'(al/k_d)a = w/(\xi_\tau\xi_\delta)$. A given stock of capital would be paid a share γ of that marginal increase in the absence of distortions. When the marginal share of capital is $1-\xi_\tau(1-\gamma)$, and the portion of it that is paid to units owned by agent i is diluted by a proportional increase η_k of total capital, then (3) implies

$$\frac{dr}{dl} = \frac{1-\xi_\tau(1-\gamma)}{\xi_\tau\xi_\delta}(1-\eta_\kappa)\,\frac{w}{k_d}. \tag{9}$$

In expression (8), the first square bracket accounts for k_i units of this marginal income when computing higher l's impact on agent i's income. What follows refers to this as an "ownership effect".

[4]Writing $y(al/k_d) = (al/k_d)^{1-\gamma}$ does make it possible to collect terms in (4), and the resulting expression

$$c(l,k_i,al/k_d) = \left(\frac{1-\xi_\tau(1-\gamma)}{\xi_\delta\xi_\tau}k_i + (1-\gamma)\,k_d\right)\xi_\delta\xi_\tau\,(al/k_d)^{1-\gamma}$$

can help follow the derivations below.

[5]For more general preferences the same wedge would appear in agent-specific first-order conditions for maximization with respect to l of $U(c(l_i,k_i,al/k_d),l_i)$, but nonlinearity of those conditions would make it extremely cumbersome to characterize the economy's politico-economic aggregate equilibrium.

3.1 Structure

It will simplify typography and interpretation below to summarize the role of ξ_δ and ξ_τ in (9) with

$$m \equiv \frac{1-\xi_\tau\left(1-\gamma\right)}{\gamma\xi_\tau\xi_\delta}, \tag{10}$$

which equals unity when $\xi_\delta = \xi_\tau = 1$ and capital earns the baseline income share γ.[6] Using (10) in (8) yields

$$\begin{aligned}\omega\left(\cdot\right) &= \left(1-\eta_\kappa\right)\gamma m\frac{k_i}{k_d} + 1 - \left(1-\eta_\kappa\right)\gamma \\ &= 1 + \left(m\frac{k_i}{k_d} - 1\right)\left(1-\eta_\kappa\right)\gamma.\end{aligned} \tag{11}$$

If $mk_i/k_d = 1$ then the proportional wedge that satisfies the first-order condition for maximization of agent i's income is unitary: the wage (2) corresponds to the effect of l on agent i's total income and consumption, and welfare is maximized when it equals the $B'(l)$ opportunity cost of market work. If $mk_i/k_d \neq 1$ instead, then the total income implications of l differ from the wage in ways that depend on the economy's structure and individual factor ownership.

A deviation from unity of ξ_τ, ξ_δ, and m can represent a variety of contractual and market distortions. An economy where $\xi_\tau \neq 1$ drives a wedge between marginal productivity and the wage, or between marginal cost and price, is most readily interpreted in terms of pricing power in factor or product markets, which distorts labor's income share $\xi_\tau\left(al/k_d\right)y'(al/k_d)/y(al/k_d)$ away from that which would be determined by marginal productivity in perfectly competitive markets. Such pricing distortions or externalities are necessarily present in decentralized equilibrium if technological relationships feature increasing returns to scale, as in endogenous growth models, and paying factors according to their marginal productivity would more than exhaust production. Because $dm/d\xi_\tau = -\left(\xi_\tau\right)^2\left(\xi_\delta\right)^{-1} < 0$, the (11) preferred wedge expression is larger for a smaller ξ_τ: all else equal, it is welfare-improving to boost labor

[6] It can be helpful to see that, using (10), the explicit income expression of footnote 4 reads

$$c\left(l, k_i, al/k_d\right) = \left(\gamma m k_i + \left(1-\gamma\right)k_d\right)\xi_\delta\xi_\tau\left(al/k_d\right)^{1-\gamma}.$$

supply if labor is paid less than marginal product.

A related but conceptually distinct type of distortion is that represented by ξ_δ. If $1-\xi_\delta < 1$, then work contributes to worker's welfare less than to production: for example, suppose that employment entails idiosyncratic yet uninsurable risk, so that labor supplied on a risk-adjusted basis falls short of the marginal productivity paid by competitive employers. If the relevant risk can be diversified in capital income, then $r = y(al/k_d) - y'(al/k_d)al/k_d$, and $dm/d\xi_\delta = -m/\xi_\delta$ again brings the positive total income effects of employment subsidies to bear on the policy wedge (11).

3.2 Politics

Because individual choices would equate $dc(\cdot)/dl$ and $B'(l)$ an allocation with $\omega \neq 1$ requires collectively chosen and enforced policies. From the point of view of a planner interested in maximizing average welfare, many imperfections (such as market thickness externalities in search and matching environments) may motivate structural activation policies. However both the arguments just made and expression (11) show that, in the absence of compensatory transfers, agent-specific policy preferences depend on the relative importance of capital income: structural imperfections that influence m have a smaller impact on ω if k_i is small, and are completely irrelevant if $k_i = 0$. To the extent that utility cannot always be transferred across households by policy-makers, taxes and regulations may well distort the economy's allocation and its aggregate welfare for the purpose of influencing the distribution of welfare.

"Active" labor policies can address market failures that distort factor incomes, but views as to whether and how structural problems should be targeted by policy differ across agents with different income sources. If labor market participation is not rewarded according to its social productivity, it should be subsidized (also in the form of insurance). The immediate impact of such benefits is on workers, but in equilibrium they are shifted to complementary factors of production (if insurance increases labor supply, it also benefits owners of well-diversified capital income). The incidence of the policy on individual welfare is not obvious: in general, it depends on how subsidies are financed; in the model economy considered here, labor market imperfections and corrective policies both matter only for capital income.

Individuals with different k_i prefer different wedges, so it is necessary to specify a political

decision mechanism. Suppose the country's policy is determined by the preferences of a decisive agent who owns a fraction x of the economy's per capita capital.[7] Then, the country's politico-economic equilibrium policy wedge is given by expression (11) with $k_i = xk$,

$$\omega(\cdot) = 1 + (mx - 1)(1 - \eta_\kappa)\gamma.$$

As long as $mx > 0$ the "ownership effect" exerts a positive influence on the policy wedge and on the resulting l, because policy choices internalize the positive implications of employment for capital income. However the wedge exceeds unity, and l is larger than in *laissez faire*, only if $mx > 1$.

3.3 Implementation

The wedge implied by (8) may be implemented by taxes and subsidies or by wage, price, and quantity constraints.[8]. Because in the model's economy all individuals are identical except for their relative wealth k_i, it is straightforward to see how.[9]

A payroll tax or subsidy at rate $1 - \omega(\cdot)$ inserts the appropriate wedge between labor's marginal product and alternative use, and has the welfare implications modeled above if its revenue or cost is shared equally across individuals who, as assumed, have identical preferences and labor endowments. The agent-level optimality condition equates net wages to $B'(l)$ and coincides with the policy optimality condition, so there is no unemployment.

Individual first-order conditions are slack if the policy is enforced by wage constraints. If $1/\beta$ is labor supply's wage elasticity, a minimum wage that exceeds by a proportion $1/\omega$ the market-clearing wage causes involuntary unemployment at rate $1 - l/l_s \approx \log\left(\omega^{-1/\beta}\right) \approx (1 - \omega)/\beta$. Unemployment has the same welfare implications for all agents if households can

[7] An alternative policy determination framework would assign different social welfare weights to agents that are more or well endowed with capital. While substantially equivalent this would require a complete specification of factor endowments' distribution.

[8] The first-order condition may alternatively and equivalently be expressed in terms of specific policy instruments or, as in Bertola (2016), with respect to the ω wedge raher than to l.

[9] It is possible to model some features of a more complicated reality. If not only wealth but also the number of labor units n_i differ across households, policy preferences depend on $k_i/(n_i k_d)$ and $n_i dl_i/dl$. Most qualitative insights remain valid, but implementation would have to deal with heterogeneous and possibly discontinuous policy effects (working hour limitations, for example, may or may not be binding for specific agents).

transfer utility among their employed and unemployed members (as in Merz 1995, Andolfatto 1996, and other real business cycle models). Employment may also be rationed by such quantity constraints as working time limits, minimum annual vacations, or mandatory retirement, which and have the same welfare implications as the wedge they introduce between demand and supply wages.[10]

In the model, distributional considerations and structural imperfections play joint and similar roles in determining the employment level l that satisfies the first-order condition for maximization of the decisive agent's welfare, and in choosing the policy instruments that enforce it in equilibrium. The distributional parameter x would play no role in policy determination if lump-sum transfers could offset the welfare implications of factor-price changes. In shaping policy, however, x plays exactly the same role as the inverse of structural wedge ξ_δ. Increasing employment above its *laissez faire* level is attractive for a relatively wealthy decisive agent (who enjoys the higher productivity and income of the complementary capital she owns), and for the country on average if labor earns less than its marginal contribution but capital does get an appropriate share of it.

The distinction between structural imperfections and policies may be ambiguous in practice. For example, the market power of unionized labor may be treated as a structural imperfection that, from the social point of view, would call for corrective policies. But just like in the absence of compensatory lump-sum transfers subsidizing a natural monopolist can be politically awkward, so the distributional implications of policies that correct distortions need not be politically acceptable, and there can be sound political rationales for policies, such as right-to-strike legislation, that strengthen price and quantity distortions.

4 A closed economy

This and the next sections inspect and interpret the economy's politico-economic equilibrium. It is useful first to illustrate the mechanisms at work when the policy's determination and

[10]Similar wedges arise in dynamic settings: job security provisions reduce productivity and smooth labor income, active labor market policies improve information or search-and-matching processes. The distributional implications of such policies are qualitativel similar to those of this paper's static model but would need to be studied in much less tractable dynamic settings with uninsurable labor income risk and well-diversified capital income.

effects all take place in an economy with a given amount $k_d = k$ of locally owned capital. With $\eta_\kappa = 0$ and $k_i = xk$, the wedge expression (11) reads

$$\omega(\cdot) = 1 + (mx - 1)\gamma, \tag{12}$$

and has a simple and intuitive interpretation. Labor earns a share $1 - \gamma$ of the income produced by higher l, so a markup $1/(1-\gamma)$ would be implied by policy preferences that are wholly driven by "monopoly union" motives. Individuals who own capital also partake of the complementary fraction γ. This "ownership effect" compensates the loss of labor surplus exactly if $mx = 1$, as is the case when policy suits the average individual of an undistorted market economy (or each of x and m differs from one, but policy-makers are not politically motivated to correct a distorted *laissez faire*).

It is instructive to inspect the optimal wedge when $x = 1$ but distortions make m deviate from unity. If $\xi_\delta = 1$, then with $m = (1 - \xi_\tau)/\xi_\tau$ expression (12) yields $\omega = \xi_\tau$, so that $w = f'(\cdot)$ and labor is paid according to its marginal productivity. If $\xi_\tau = 1$, then $\omega = 1 + (1 - \xi_\delta)\gamma/\xi_\delta > 1$ rewards labor more than the *laissez faire* $w = \xi_\delta y'(al/k_d)a$ would, and internalizes to labor supply choices their contribution to capital income.

Figure 1 illustrates the economy's equilibrium for various values of x and a roughly realistic set of other parameters. The function that tallies the welfare loss in income-equivalent units from allocation of each agent's labor unit to production of marketable output rather than to non-employment has the constant elasticity form

$$B(l) = l^{1+\beta}/(1+\beta), \tag{13}$$

In the figure, if $x = 1$ then the policy wedge $\omega = 1 + \gamma(m - 1)$ policy corrects fully the imperfections represented by $m > 1$ (because $\xi_\tau > 1$; $\xi_\delta \neq 1$, as mentioned, would be equivalent to a different x) and l maximizes per-capita average welfare. This entails a 10% wage subsidy and, along the supply curve with unitary elasticity of Figure 1, a similar increase of employment above the *laissez faire*. Such "active" labor policy is predicted for a country with very low wealth inequality and/or efficient non-distorsive redistribution channels (such as suitably monitored local welfare policies). Thus, the model can accommodate countries that tend to adopt active labor market policies, such as Scandinavian ones.

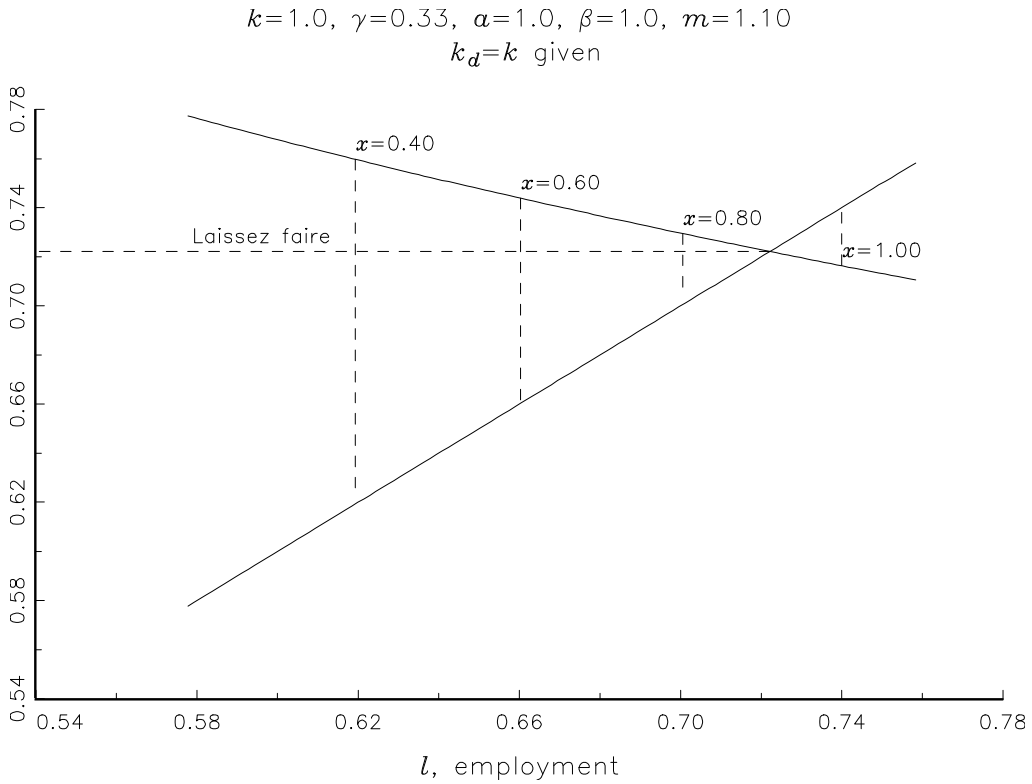

Figure 1: Policy wedges in a closed economy for various values of the decisive-individual relative wealth indicator x.

Because wealth is more unequally distributed than labor income, however, when the decisive agent is the median voter in a democratic policy determination process it is natural to suppose that $x < 1$. In fact, labor income is most often taxed and non-employment subsidized, collective contracts or laws impose minimum rather than maximum wages, and upper rather than lower bounds on working time. Such "passive" policies enforce an $\omega < 1$ wedge, and inspection of (12) indicates that for this to be the case x needs to be sufficiently below unity to offset any implications of the structural imperfections summarized by $m > 1$. For this reason, illustrations and derivations here and below focus on the $mx < 1$ case, and do not always explicitly discuss the symmetric and less realistic implications of $mx > 1$.

For the parameters used in Figure 1, x =80% suffices to more than fully offset the motivation of active labor market policies, and imply a 10% wage tax instead of a similar employment subsidy. Lower values of x further reduce employment in the figure, and it is easy to see in (12) that as $x \to 0$ the distortions that shape capital income become irrelevant to policy determination, and for any m the wedge ω approaches $1 - \gamma$, enforcing the propor-

tional wage mark-up that would be chosen by an economy-wide monopoly union disregarding employment's effect on all non-labor income.

In the reality that the model means to represent, labor policy serves the interests of agents who are not as wealthy as the economy's average. The shortfall below unity of the model's x depends in reality on the extent and persistence of wealth inequality, as well as on possible correlation of wealth and political power. Like the structural features summarized by m, also the political characteristics summarized by x depend on country's culture and history. In determining policy they interact with international economic integration, modeled next.

5 International integration

Suppose it is possible for capital to be employed across the country's borders, but allow units of foreign-owned capital to contribute less than those of the national stock k in determining effective domestic capital k_d. A parameter $\nu \leq 1$ indexes the extent to which this is the case: capital that crosses country boundaries remains equally productive when $\nu = 1$ represents perfect and complete market integration; but $\nu < 1$ proportionally lowers its productivity is lower by that proportion, representing the contractual problems, capital controls, and taxes that in reality imply less than complete integration across (and also within) countries. In the rest-of-the-world economy A, L, and K play the same role as the corresponding lower-case symbols in our country, and the production function implies the same constant-elasticity form for the $f(\cdot)$ function.[11]

The model's country only employs its national capital stock if ν is small (and certainly if $\nu = 0$), but the most interesting implications are those of ν variation within the range that allows at least some international investment. If $k_d > k$, then a stock $K - (k_d - k)/\nu$ of capital is employed in the rest of the world, and its marginal productivity there is $((K + (k - k_d)/\nu)/(AL))^{\gamma-1}$. Because a marginal unit of foreign capital is

[11] Recall that this function measures production per capita and per unit of capital. In the model country, k is average wealth, but the K is not in per capita terms: its size (or that of A) incorporates an indicator of population size. Also, L is treated as a parameter rather than a variable that depends on other countries' policy choices It is possible to let L vary when considering how l and other endogenous variables react to parameter changes. The solution would need to use numerical methods, and would have the same qualitative properties.

equivalent to only $\nu < 1$ units of the domestic capital stock, which has marginal productivity $(k_d/(al))^{\gamma-1}$, there is a proportional spread between the marginal productivities of capital in different countries: net returns are equalized at

$$\nu\left(\frac{k_d}{al}\right)^{\gamma-1} = \left(\frac{K+(k-k_d)/\nu}{AL}\right)^{\gamma-1}, \tag{14}$$

an imperfect arbitrage condition solved by $k_d = al\nu^{\frac{\gamma}{1-\gamma}}\left(al\nu^{\frac{\gamma}{1-\gamma}} + AL\right)^{-1}(k + K\nu)$. Requiring that $k_d > k$ establishes that the model's country employs more capital than it owns if $k/al < \nu^{\frac{1}{1-\gamma}}K/AL$.

It will ease typography and interpretation below to define

$$\lambda(\nu; al, AL) \equiv \frac{al\nu^{\frac{\gamma}{1-\gamma}}}{al\nu^{\frac{\gamma}{1-\gamma}} + AL}, \quad \mu(\nu; k, K) \equiv \frac{k}{k + K\nu}, \tag{15}$$

so that in a country where $k/al < \nu^{\frac{1}{\gamma-1}}K/AL$

$$\frac{k_d}{k} = \frac{\lambda(\nu; al, AL)}{\mu(\nu; k, K)} > 1.$$

Symmetric calculations establish that if $k/al > \nu^{\frac{1}{\gamma-1}}K/AL$ then the country's domestic capital stock is smaller than its national wealth by a factor

$$\frac{k_d}{k} = \frac{\lambda(1/\nu; al, AL)}{\mu(1/\nu; k, K)} < 1.$$

The "iceberg melt" functional form summarizes the sources and resource costs of limited market integration in a way that certainly oversimplifies reality, but delivers a compact and tractable model of partial integration. This makes it easy in what follows to highlight the distributional policy implications of factor incomes and factor mobility.

6 Policy and partial integration

The model's structure does not always imply that both (16) and (14) hold with equality. However the results are most interesting and realistic when both capital mobility and labor policy satisfy interior equilibrium conditions. Hence, it will be best to first characterize policy in this case, postponing discussion of its applicability and of other situations to the next section.

If $k \neq k_d$ and (11) holds the policies chosen by a decisive individual who owns a fraction $x = k_i/k$ of the country's per capital national capital insert a proportional wedge

$$\begin{aligned} \omega(\cdot) &= 1 + \left(mx\frac{k}{k_d} - 1 \right)(1 - \eta_\kappa)\gamma \\ &= \left[mx\frac{k}{k_d}(1 - \eta_\kappa)\gamma \right] + \left[1 - (1 - \eta_k)\gamma \right] \end{aligned} \tag{16}$$

between l's marginal market productivity and non-market utility. The second line of (16) displays the "ownership" and "monopoly" effects in separate square brackets. When $\eta_\kappa > 0$, marginal productivity is a flatter function of l, so the monopoly effect implies a smaller wage mark-up than that resulting from the technological elasticity γ, and capital earns a larger share of the marginal income produced by higher l. Because $k/k_d \neq 1$, the ownership effect takes into account that proportion in computing the decisive individual's share of the economy's domestic capital income.

Inserting $xk/k_d = xk\mu(\cdot)/\lambda(\cdot)$ and $\eta_\kappa = 1 - \lambda(\cdot)$ in (16), the labor policy wedge chosen by a decisive agent who owns a fraction x of the economy's per capita capital is

$$\begin{aligned} \omega(\cdot) &= mx\mu(\cdot)\gamma + 1 - \gamma\lambda(\cdot) \\ &= 1 + \gamma\left(mx\mu(\cdot) - \lambda(\cdot) \right). \end{aligned} \tag{17}$$

The political and structural features of the economy summarized by x and m interact with each other, as in the closed-economy expression (12), but also with the $\lambda(\cdot)$ and $\mu(\cdot)$ expressions defined in (15), which have straightforward interpretations and play interesting roles in shaping the country's policy wedge.

Expression $\lambda(\cdot)$ is the country's share of effective labor, adjusted by a power of ν to ensure that the domestic and foreign factor ratios are appropriately aligned to satisfy the (14) condition. In the policy wedge, it accounts for the fact that "monopoly union" incentive to mark-up the wage above $B'(l)$ are weaker when capital is mobile: in order to maintain equality in (14), a variation of l induces domestic capital variation, with elasticity

$$\eta_\kappa = l\frac{d\ln\left(\frac{\lambda(\nu;al,AL)}{\mu(\nu;k,K)}k\right)}{dl} = 1 - \frac{al\nu^{\frac{\gamma}{1-\gamma}}}{al\nu^{\frac{\gamma}{1-\gamma}} + AL} = 1 - \lambda(\cdot).$$

If λ is smaller, the proportional capital variation triggered by l is larger, and the wage is a

flatter function of employment.

Expression $\mu(\cdot)$ is the country's share of wedge-adjusted total capital. In the policy wedge it accounts for the fact that in choosing country-specific policies the decisive agent disregards the portion paid to foreigners of the additional income generated by higher l, and this weakens the "ownership effect".

The index ν of international integration has obvious implications for country's effective labor and capital relative to the broader economy with which it is imperfectly integrated,

$$\frac{d\lambda(\nu;\cdot)}{d\nu} = \lambda(1-\lambda)\frac{\gamma}{1-\gamma}\nu^{-1} > 0, \qquad \frac{d\mu(\nu;\cdot)}{d\nu} = -\mu(1-\mu)\nu^{-1} < 0, \tag{18}$$

and unambiguously decreases the (17) wedge if $k_d > k$:

$$\frac{d\omega}{d\nu} = \left(-mx\mu\left(\nu;\cdot\right)\left(1-\mu\left(\nu;\cdot\right)\right) - \lambda\left(\nu;\cdot\right)\left(1-\lambda\left(\nu;\cdot\right)\right)\frac{\gamma}{1-\gamma}\right)\nu^{-1} < 0.$$

To see why, consider the decisive individual's incentives to distort l. The "ownership" effect is weaker if $k_d > k$ and some of the additional capital income accrues to foreigners, and the decisive is all the more inclined to choose policies that decrease l below its *laissez faire* level if a larger ν reduces the country's share $\mu = k/\left(k + \nu K\right)$ of the partially integrated market that supplies some its capital. Because the country's policymaker disregards foreign welfare, familiar beggar-thy-neighbor motives are at work: the welfare implications of lower l for individuals who own immobile labor are qualitatively similar to the positive ones of capital income taxes rebated to local citizens in capital-importing countries (Wilson 1999, p.279).

As to the "monopoly union" effect, incentives to reduce employment in a partially integrated country are weaker than in a closed economy when $\lambda(\nu) < 1$ flattens the resulting wage increase. However this familiar race-to-the-bottom deregulation tendency is weakened if $k_d > k$ by a larger ν, which increases a capital-importing country's effective share $\lambda(\cdot)$ of the partially integrated market, and lets its policy exert a stronger influence on equilibrium marginal productivities.

For both reasons, in a capital-importing country a larger ν is associated with a smaller ω wedge. As shown in Figure 2, which uses the same functional forms and parameters as Figure 1, tighter international integration increase employment along the labor supply curve as larger capital inflows increase labor demand, but less than they would if labor policy

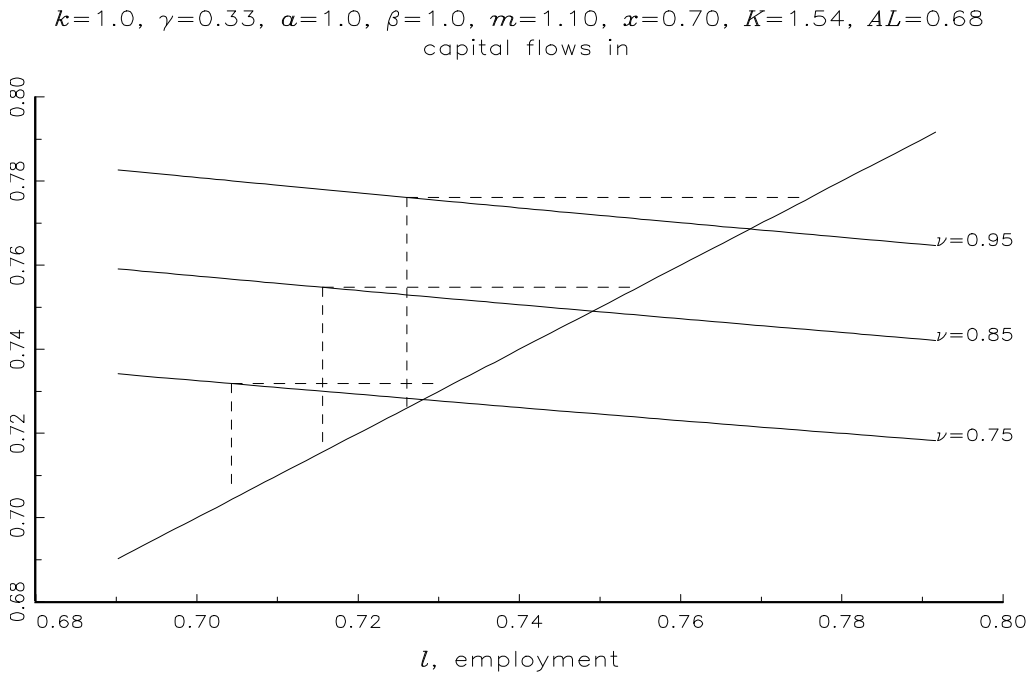

Figure 2: Policy wedges in a partially-integrated capital-importing country, for various values of the ν indicator of foreign-owned capital's relative productivity.

were not reformed in the direction of stronger taxation and/or stricter wage and quantity constraints.

If $k_d < k$, tighter integration symmetrically increases the policy wedge (17). Formally,

$$\frac{d\omega}{d\nu} = \left(mx\mu\left(1/\nu;\cdot\right)\left(1-\mu\left(1/\nu;\cdot\right)\right) + \lambda\left(1/\nu;\cdot\right)\left(1-\lambda\left(1/\nu;\cdot\right)\right)\frac{\gamma}{1-\gamma} \right) \nu^{-1} > 0.$$

The interpretation is also fully symmetric. In a capital-outflow country, beggar-thy-neighbor policy motives strengthen the "ownership" effect: for the decisive agent, a higher l is a way to retain capital and support national rather than foreign labor incomes. The "monopoly union" effect is influenced by $\lambda(1/\nu)$, which in a capital-exporting country falls further below unity when a larger ν increases its capital's productivity abroad and makes it easier for capital flows to react to country-specific policies.

7 From autarky to complete integration

The analytic derivation above show that stronger capital inflows are locally associated with more regulation, and stronger outflows with less regulation, when both capital flows and policy satisfy interior equilibrium conditions. What follows studies the global behavior of policy and capital flows implied by the model, addressing some issues that, while technical, yield insights into the mechanisms at work in the model, and into the relationship between its implications and those of models that only allow for autarky or full integration.

The iceberg-melt functional form yields neat closed form in terms of $\lambda(\cdot)$ and $\mu(\cdot)$ for active capital flows, and supports a simple characterization of interactions between capital flows and policy. But it complicates the analysis when ν is near the boundary of the closed and partially-integrated country configurations. Condition (14) is slack if the country's capital intensity does not differ from the rest of the world's as strongly as to trigger either inflows or outflows of capital, i.e. if

$$\nu^{\frac{1}{1-\gamma}} < \left(\frac{k}{al}\right) / \left(\frac{K}{AL}\right) < \nu^{\frac{1}{\gamma-1}}. \tag{19}$$

Because the endogenous variable l appears in the nonlinear $\lambda(\cdot)$ expression, there is no closed-form representation of this condition in terms of ν and other parameters. In deriving and interpreting analytical results it will be useful to inspect the numerical solutions reported in Figure 3. These use the constant-elasticity labor supply specification (13) and most of the same parameters as in previous figures, but allow for four different configurations of the model country's relative capital intensity and politico-economic structure.

In each panel of the figure, the relationship between the variable on the vertical axis and the ν partial-integration wedge is shown by continuous lines for a relatively capital-poor country, by dashed lines for a country that instead may export rather than import capital, because it is potentially integrated with a different rest-of-the-world entity. To ease comparisons, the autarky l_A is the same, and in each country one of the inequalities in (19) becomes an equality at the same value of ν (set to 0.75 in the figure): the ratio of K/k to $AL/(al_A)$ is $\nu^{(1-\gamma)^{-1}}$ for the country represented by continuous lines, $\nu^{-(1-\gamma)^{-1}}$ in that represented by dashed lines. The figure considers two such pairs of countries, which differ

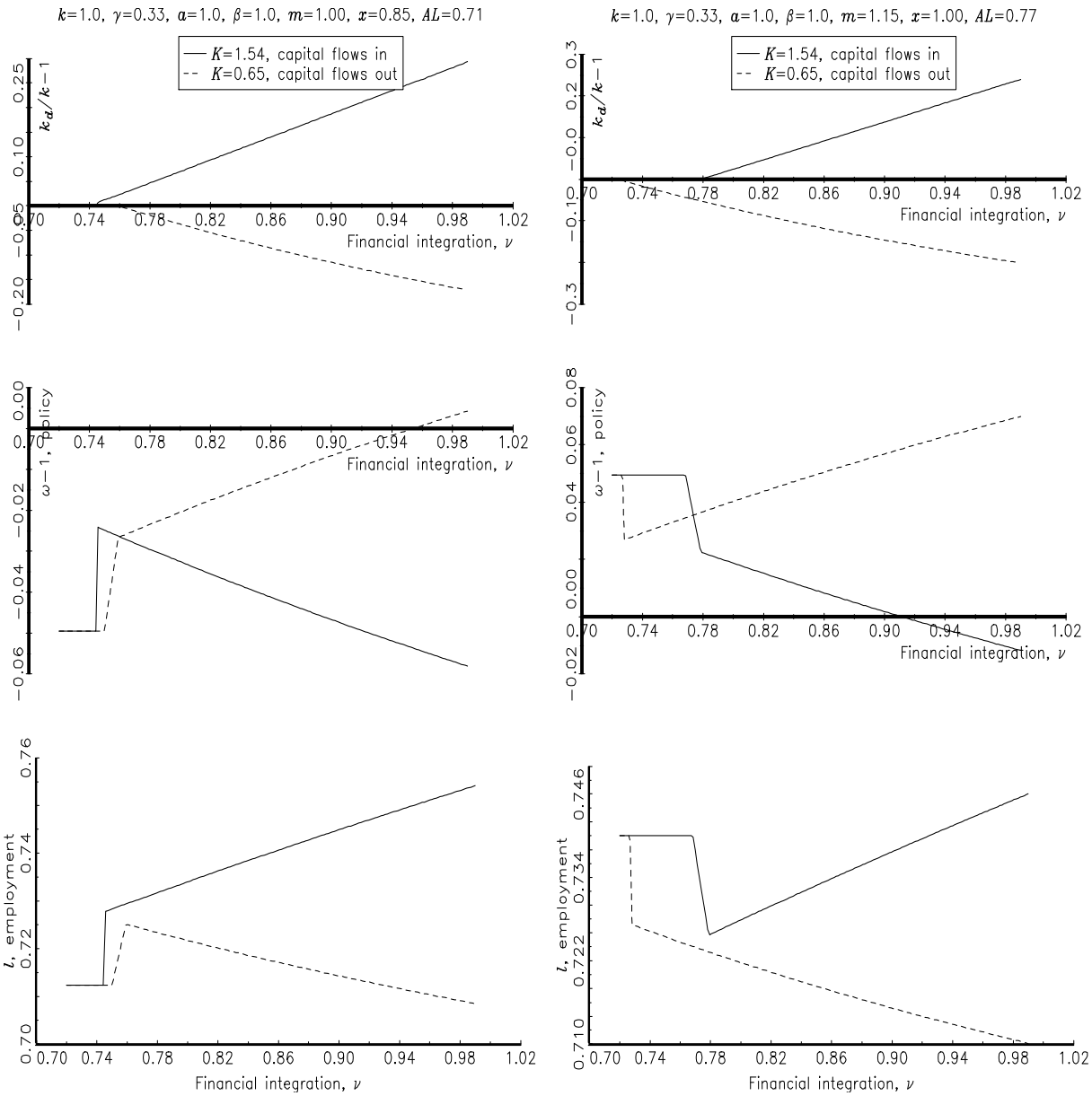

Figure 3: Implications of integration for capital mobility, policy wedges, and employment in four different countries.

along a dimension of particular interest. In the top panel $mx < 1$, so labor policy is driven by maximization of a relatively poor decisive agent's welfare and tends to drive l below its *laissez faire* level. In the right-hand panels, $mx > 1$, and *laissez faire* distortions motivate policy to increase l instead.

The top panels of Figure 3 display the proportional excess of domestic capital over the nationally owned stock. In the regions where $k_d \neq k$, the policy wedges shown in the panel below (where the axis is drawn at the $\omega = 1$ *laissez faire* level) conforms to the analytical result above: the numerical solution satisfies the first order condition (16) and ω moves in the opposite direction to the capital flows amplified by better financial integration. In the next panel down, as in Figure 2, l moves in the same direction as domestic capital, but less than it would if ω did not change.

7.1 Incipient integration

Besides confirming these results Figure 3 offers new food for thought by showing the behavior of policy and employment in the left-most region of the relevant panels, where ν is sufficiently below unity to prevent capital flows in the top panels. In the left-most region of each panel's horizontal axis, ν is low enough to ensure that (14) is slack, so capital does not flow and the wedge (12) is the same across countries in each panel (lower than unity in the left-hand side $mx < 1$ panels, larger in the right-hand panels where $mx < 1$). The transition to the region where (16) holds with equality, however, is very different for capital inflows and outflows.

To see why, note that the decisive agent's welfare is the upper envelope of the values of (1) conditional on no capital flows and on active capital flows. If $mx \neq 1$, its slope with respect to l discretely when $k = k_d$ and η_κ becomes positive, because income changes by a proportion $((mx - 1)\gamma + 1)$ of the wage if there is no capital mobility, and by $\left(\gamma\left(mx\frac{k}{k_d} - 1\right)(1 - \eta_\kappa) + 1\right)$ if k_d responds to capital's marginal productivity. Hence, the first-order condition that underlies (16) cannot identify the optimal policy in situations where one of the (14) conditions holds at zero capital flow, i.e., when

$$\bar{l} = \nu^{-\frac{1}{1-\gamma}} \frac{k}{a} / \left(\frac{K}{AL}\right), \text{ or } \underline{l} = \nu^{\frac{1}{1-\gamma}} \frac{k}{a} / \left(\frac{K}{AL}\right). \tag{20}$$

To see the labor policy implications of this it is helpful to refer to Figure (4), which

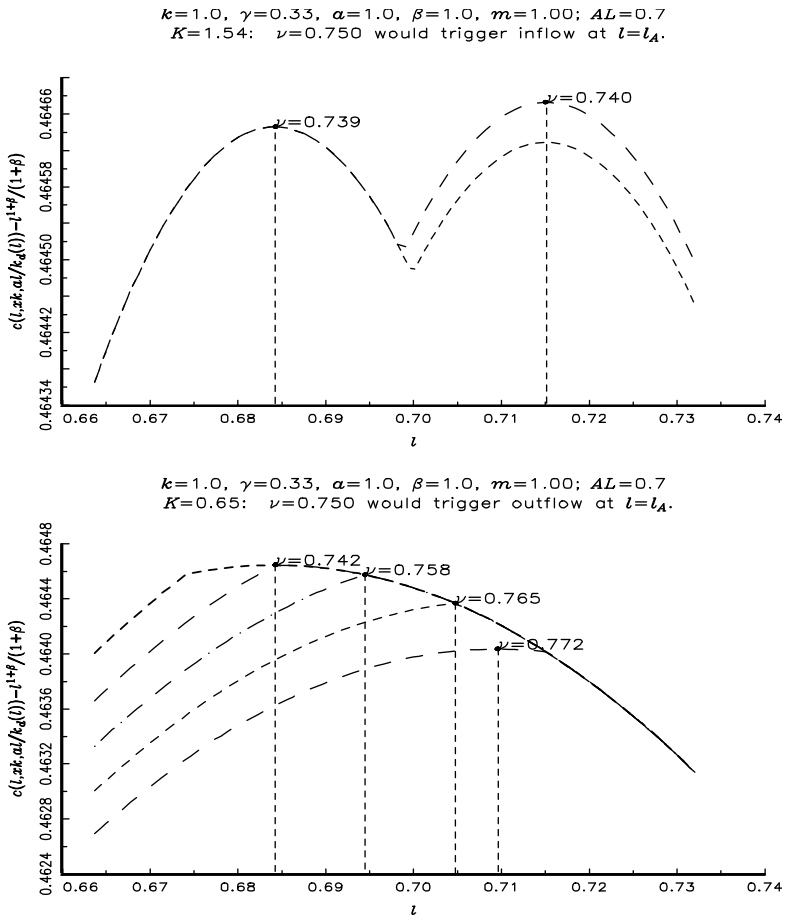

Figure 4: Transitions from autarky to partial integration. The lines plot welfare as a function of l for degrees of integration ν near the one that triggers capital mobility, dots mark maxima.

shows the decisive agent's welfare as a function of employment for various ν values in the neighborhood of the points identified by (20) for the two countries considered in the left-hand panels of Figure 3.

In the top panel the country may experience capital inflows and, because $mx < 1$, the decisive agent's welfare is larger if capital does flow. It is therefore optimal for l to jump to the maximum of the active-flows welfare function as soon as it exceeds the maximum of the closed-economy welfare function: both optimal values satisfy first-order conditions, and because a positive η_κ triggers a step increase of the optimal ω the jump occurs when ν is still below the value that would trigger capital inflows at the autarky employment level l_A. In Figure 3, both deregulation and capital inflow are discretely large at the point where the country ceases to be closed: l becomes larger than l_A as soon as capital begins to flow, and grows larger still as capital inflows further boost the wage at higher ν.

In the bottom panel of Figure 4 the decisive agent's income and welfare are lowered by outflows, so as ν increases welfare is lower conditional on non-zero capital flows. As long as for some l the closed-economy welfare function exceeds the maximum of the integrated welfare, the optimum is at a kink of those functions' upper envelope. At such a corner solution policy preempts capital flows, and is implemented by a wedge that does not satisfy a first-order condition. This explains why just before capital begins to flow in Figure 3 welfare declines and employment increases smoothly in ν: higher employment serves the purpose of retaining capital and supporting the labor income of the decisive agent, and reduces but cannot reverse the adverse factor-price implications of tighter integration.

This complicated reasoning offers a useful opportunity to rehearse more substantive insights. If the incipient flow is incoming, as soon as ν is large enough to let capital flow at the autarky employment deregulation lets a capital poor's decisive agent's income be boosted by capital inflow. If instead the incipient flow is outgoing, it is better to keep employment just high enough to retain capital, and preserve its contribution to the immobile decisive agent's income.

In Figure 4 welfare is more positively influenced by l when capital does flow than in autarky, because with $mx < 1$ the decisive agent's total income weighs labor more than capital: it grows more if a higher l attracts capital and increases the wage relative to capital income**,** declines more if a smaller l accelerates capital outflows. As shown in the right-hand side panels of Figure 3, policy jumps as soon as outflows become positive, but gradually smooths out incipient inflows: for a decisive agent who prefers l to be higher than in *laissez faire* capital outflows are beneficial, capital inflows are damaging, and transitions out of autarky are symmetric to those illustrated in Figure 4.

The policy-shaping role of the "ownership effect" also explains why when $mx \neq 1$, and the country's politico-economic equilibrium is not *laissez faire* in autarky, then ω moves towards unity when capital begins to flow. At such points $k_d = k$, so there is no change of the "ownership effect", but incipient capital mobility lowers λ below unity, weakening the "monopoly union" effect. Thus, any transition out of autarky triggers deregulation. Like the technical details discussed above and illustrated in Figure 4, the race-to-the-bottom implications of capital mobility should not be viewed as a general empirical prediction: because

policy continues to be reformed as ν growth tightens integration, it is not generally true that integrated countries regulate internal markets less than they would in autarky.

7.2 Full integration

The real-life implications of international integration need not be represented well by a comparison between autarky and incipient capital flows, or by the comparison between autarky and complete integration that is most commonly made in the literature. Consider the limit case where $\nu = 1$ collapses the no-flows region (19) to a single point and lets capital flows freely across the country's borders.[12] In that limit situation the "monopoly union" effect is weaker than in autarky, because the elasticity of labor demand is scaled down by $\lambda(1; al, AL) = al/(al + AL)$. This familiar race-to-the-bottom competitive deregulation pressure is stronger for a smaller country. Except in the $\lambda \to 0$ limit, however, it can be more than fully offset by the "ownership effect." Formally, (17) with $\lambda(1; al, AL) = al/(al + AL)$ and $\mu(\nu; k, K) = k/(k + K)$ yields

$$\omega(\cdot) = 1 + \gamma \left(mx \frac{k}{k+K} - \frac{al}{al+AL} \right) \tag{21}$$

as the country's policy wedge under full integration. This expression implies more intrusive policy than in closed economy if it exceeds unity and is larger than its closed-economy counterpart (12), which is the case if

$$mx < \frac{AL}{al+AL} \Big/ \left(\frac{K}{k+K} \right), \tag{22}$$

or if it falls short of unity by more than (12), which is the case if the inequality in (22) is reversed. Two of the four countries shown in Figure 3 illustrate this result. In the left-hand side panels, where $mx < 1$ implies that policy reduces l, the relatively capital-poor country's wedge grows towards unity when capital inflows start, but moves in the opposite direction as ν grows and eventually exceeds its autarky level: as shown and discussed by Bertola (2016),

[12] The model has a well defined interior solution also if $\nu > 1$, which could represent technological phenomena that let foreign investment be more productive in exotic locations than domestically. However $\nu \leq 1$ is realistic if ν represents cultural or legal rather than technological issues encountered by capital income flows across the borders of a country defined by political and institutional rather than technological country-specific features.

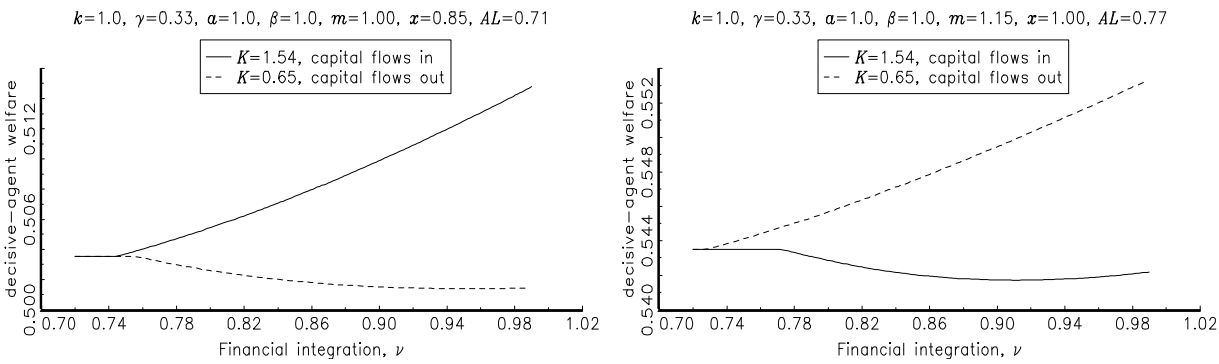

Figure 5: Decisive-individual welfare effect of international integration for the same countries as in Figure 3.

capital-poor large countries can in theory and do in reality regulate labor markets more stringently within integrated economies than they would in autarky. Symmetrically, in the right-hand side panels both wedges initially fall towards unity, but the relatively capital-rich country's thereafter moves in the opposite direction, and eventually supports employment more than in autarky.

8 On welfare

The model's complicated transition out of autarky may be realistic in some specific circumstances: for example, a capital-importing country with $mx < 1$ experiences a step increase of capital and discrete reforms that may be reminiscent of a "Big Bang" double liberalization of both cross-border (financial) and internal (labor) markets. However the technical aspects just discussed are an artifact of the linear "iceberg melt" functional form of foreign-ownership productivity disadvantage, which admittedly conveys an excessively dramatic impression of the difference between zero and even very small capital flows a the same time as it supports a very tractable representation of non-zero capital flows. Because international markets are plausibly always imperfectly active on some margin, the model's more interesting implications are those obtained for regions where ν continuously shapes capital flows and policy.

The same welfare effects that help understand how tighter integration shapes the model's

implications when policy continuously reacts to smooth changes of international integration. In Figure 5, continuous and dashed lines show numerical solutions for the decisive agent's welfare in the same four countries illustrated in Figure 3. The decisive agent's yields useful insights into the possible role of policy in shaping international policy wedges (with capital income taxes, or legal obstacles to capital mobility) as well as to interpret country-specific political attitudes towards exogenous integration forces, and makes it easier to study integration's welfare implications. Because policy adjusts to maintain condition (5), the envelope theorem removes the first-order welfare effect through l of parameter changes. Reforms partly offset the capital flow implications of integration, but do not change the sign of its welfare implications: for the decisive agent, some of the gains or losses are in terms of leisure, and chosen optimally along changing trade-offs. This makes it easy to characterize analytically the slope of the lines plotted in Figure 5: for $k_i = xk$ the welfare effect of ν is

$$\frac{d}{d\nu}\left(c\left(l, xk, al/k_d\right) - B(l)\right) = \frac{\partial c\left(l, xk, al/k_d\right)}{\partial k_d}\frac{\partial k_d}{\partial \nu}. \tag{23}$$

Differentiation of (4), using steps similar to those outlined in footnote 3, and definitions (7) and (10) yield

$$\frac{\partial c\left(\cdot\right)}{\partial k_d} = -\left(mx\frac{k}{k_d} - 1\right)\gamma\frac{l}{k_d}\left[\xi_\delta \xi_\tau y'\left(\frac{al}{k_d}\right)a\right]. \tag{24}$$

The first term on the right-hand side of (23) may be positive or negative. Other things equal, availability of domestic capital has a positive effect on the wage, a negative effect on capital's unit income.

The two effects cancel out in the decisive agent's income and welfare if $kmx = k_d$. In fact, if $x = m = 1$ and $k = k_d$ the welfare being evaluated is that of a representative agent who owns all of the economy's capital, which remains unchanged (to first order) if employment adjusts optimally to the unit income changes implied by factor endowment variation under constant returns to scale. As mx tends to unity from below, the top and bottom panels of Figure 4 converge to each other, and so would their mirror images if mx converged to unity from above.

The sign of (24) more generally is that of $k_d - kmx$: hence, it depends on whether mx is larger or smaller than k_d/k, and whether the (16) policy wedge is below or above unity.

At $k_d = k$, if mx is small, non-labor income does not much matter for the decisive agent's welfare, and $\omega(\cdot) < 1$, then a positive (24) is driven by the higher wage effect of k_d. When $k_d \neq k$ then, as in the derivations above, the "ownership effect" embodied in the policy wedge and in (24) also accounts for the impact of capital variation on foreign income.

In (23), expression (24) multiplies $\partial k_d/\partial\nu$, the sign of which depends on the direction of capital income flows across. Because tighter integration strengthens capital inflows or inflows, its effect on k_d has the same sign as $k_d - k$ (positive if easier capital mobility makes the country's domestic capital grow further above its national stock, negative if instead induces stronger foreign employment of national capital). The modeling device of Section 5 again offers a clean representation of this mechanism. The expressions in (15) imply[13]

$$\frac{\partial}{\partial\nu}\left(\frac{\lambda(\nu;\cdot)}{\mu(\nu;\cdot)}\right) = \frac{\lambda(\nu;\cdot)}{\mu(\nu;\cdot)}\left(\frac{\gamma}{1-\gamma}(1-\lambda(\nu;\cdot)) + (1-\mu(\nu;\cdot))\right)\frac{1}{\nu},$$

so the domestic capital stock $k_d = k\lambda(\nu,\cdot)/\mu(\nu,\cdot)$ grows with ν in this proportion of the national capital stock k if the country experiences capital inflows; if it experiences capital outflows then, using $k_d = k\lambda(1/\nu,\cdot)/\mu(1/\nu,\cdot)$ and $d(1/\nu)/d\nu = -1/\nu^2$, the domestic capital stock symmetrically declines according to the negative of the same expression.

The derivative in (23) is positive and tighter integration is beneficial when $(k_d/k) - mx < 0$ and capital inflows imply $\partial k_d/\partial\nu < 0$, or when $(k_d/k) - mx > 0$ and capital outflows imply $\partial k_d/\partial\nu < 0$.

Because $k_d/k < 1$ in a capital-importing country and $k_d/k > 1$ in a capital-exporting country, tighter integration is certainly beneficial for the decisive agent if $mx = 1$, i.e. no policy needs to be enforced (either because there are no distortions and policy aims to aggregate efficiency, or because distortions suit the decisive agent). For the average agent of an undistorted market economy integration with the rest of the world cannot be bad, and is good whenever different factor endowments generate beneficial opportunities to trade and agent-specific and politico-economic optimality conditions both hold within the economy. The result is a simple application of the standard insight that competitive equilibrium is in

[13] Using

$$\nu\frac{d\log\lambda(\nu;\cdot)}{d\nu} = \frac{\gamma}{1-\gamma}(1-\lambda),\ \nu\frac{d\log\mu(\nu;\cdot)}{d\nu} = -(1-\mu).$$

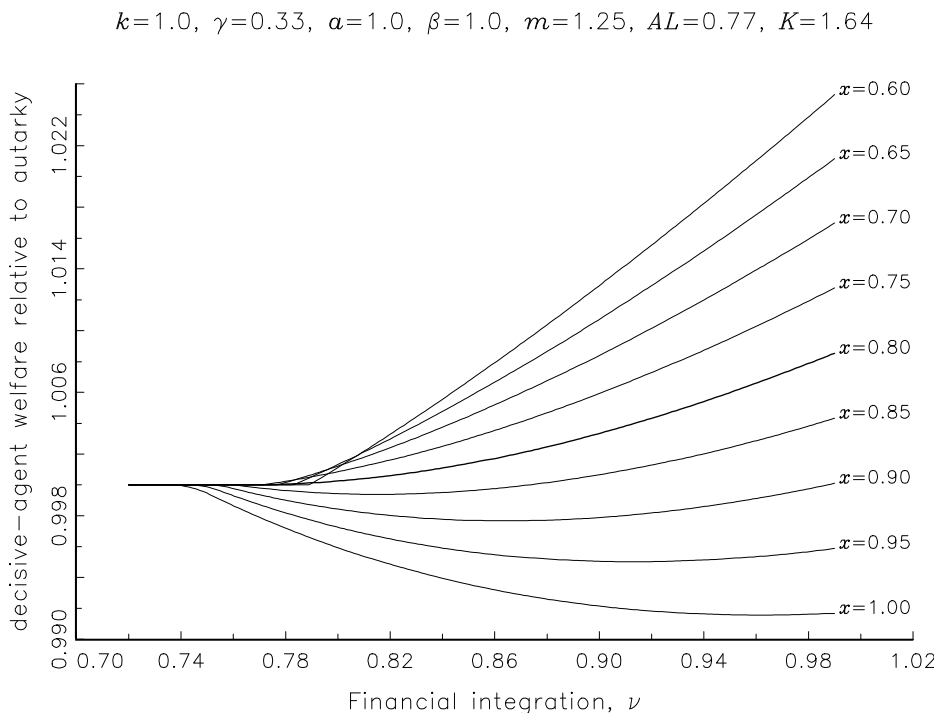

Figure 6: Decisive-agent welfare effect of international integration in a capital-importing country for various values of that agent's relative wealth.

the "core" of an exchange economy: withdrawal from the market of a group of individuals cannot make them all better off on their own, and integration of an economy that behaves as a representative individual cannot make that individual worse off.

But if lump-sum transfers are ruled out (as they must be to understand why policy distorts markets within and across country borders), then integration can damage groups of heterogeneous agents even when it increases average welfare, and is politically problematic when the losers form a decisive majority. More generally, integration need not be beneficial for decisive agents when they are not entitled to its average welfare implications and/or it triggers reforms of policies that increase the country's average welfare.

In a country where $mx < 1$ rationalizes realistic l-reducing policies, tighter integration increases the decisive agent's welfare if capital flows in, but is very likely to decrease it if capital flows out (as well as when l is set at the minimal level that prevents capital outflows). Tighter integration can be beneficial when $mx < 1$ and capital flows out (or when $mx > 1$ and capital flows in) only if the deviation of mx from unity is not so large as to outweigh the average efficiency gains from trade, driven by factor-price changes. A capital-rich country's

decisive individual is damaged by tighter integration if domestic capital as a fraction of national wealth is below the xm index of politico-economic equilibrium policy.

Figure 6 shows, using most of the same parameters as previous figures, that even the large capital flows illustrated in Figure 3 have welfare implications that are easily offset by modest deviations from unity of m and/or x. The figure supposes that $m = 1.25$, so that a representative decisive individual would find it optimal to distort l upwards with "active" policies. The lines plot for various values of x the proportional change of a capital-importing country's decisive agent implied by tighter integration, through stronger capital inflows and changes of the $\omega(\cdot)$ policy wedge. These numerical results confirm and illustrates standard insights and the analytical results obtained above. The lowest line is drawn for for $x = 1$, and shows that tighter integration decreases average welfare through race-to-the-bottom forces: because the benefits of "active" policies spill over to foreign owners of capital, they are not implemented as strongly in an integrated economy as in autarky. Moving upwards to smaller values of x, the lines become U-shaped: while welfare is negatively affected as ν becomes large enough to trigger positive capital inflows (or, initially, inflow-preventing policy changes of the type shown in Figure 4), further integration has positive welfare implications when the foreign-owned portion of domestic capital is large enough to imply that a "passive" beggar-thy-neighbor policy is optimal for the capital-poor decisive agent considered. The thicker line at $x = 0.80$ shows that welfare increases smoothly throughout when $mx = 1$ makes *laissez faire* optimal in autarky as well as at all levels of integration. And the lines above it show that capita inflows have larger positive welfare implications for increasingly poor decisive agents.[14]

These welfare effects could be characterized more precisely, if tediously, and not in closed form outside of the *laissez faire* or autarky special cases. It is more interesting to note that the size of income, production, and welfare impacts of integration must in general be comparable to those of various structural and political features of the model's economy.

[14]Within the country agents whose wealth differs from xk experience similarly shaped and potentially much larger welfare changes. Characterizing how welfare effects depend on variation of factor prices and policy reforms is conceptually and numerically straightforward, but rather cumbersome. Bertola (2016) uses a simple two-classes numerical example, the sign and size of integration welfare effects can obviously different from those experienced by average or decisive agents.

Roughly speaking, if a decisive agent whose wealth differs from average prefers policies that imply a certain variation of a closed economy's capital intensity, then that deviation from average can offset or double the welfare implications of capital flows that induce that variation of domestic capital intensity. As in Figure 1, a 30-40% deviation from average can justify a change of l and labor intensity in the order of 10%, which can be result from integration only if imbalances and cross-border capital-income payments, as a proportion of income and production, are so large as to appear unusual across countries (if not within countries, where households routinely own or owe large multiples of their annual income).

From this point of view, it is useful to discuss briefly not only the direction but also the size of integration's welfare impact. In Figure 6, these span a range of only about 3 percentage points as the country moves from autarky to being integrated fully with a much more capital-intensive rest of the world, an experiment that as shown in Figure 5 has very dramatic implications for capital inflows, employment, and policy. Even as domestic capital increases by some 30% and employment by 10%, hence production by about 20%, welfare gains or losses only reach about 2%. The parameters used in these figure are meant to be only very roughly realistic, but the computations illustrate a more general insight: welfare effects fall short of factor and production changes by an order of magnitude, because they net out the similarly sized but negative implications of foregone leisure and capital income payments.

9 Relevance and extensions

The paper's derivation highlight market integration's policy and economic welfare implications. An interesting question that of the extent to which those implications are politically acceptable, and whether integration may therefore be actively fostered by policy action. The model's answer is positive if $mx \approx 1$, so that policy is not very incisive, or $mx > 1$ in capital-rich countries and $mx < 1$ in capital-poor countries. It would be interesting to see whether in history market barriers were consensually dismantled when the balance of power was uneven in this way within the more or less developed regions of what became unified countries. To the extent that policy tends to reduce employment and production also and

perhaps especially in wealthy countries, however, the model cannot explain integration as an endogenous policy phenomenon. If $mx < 1$ in all countries, tighter integration generates beneficial capital inflows in some countries only as the counterpart of damaging capital flows elsewhere, and cannot be favored by all countries' politically decisive agents.

In reality, market integration may of course be exogenously driven by technological forces or by military conquest. But it can be politically acceptable for all countries, even those where it has negative economic welfare implications for decisive agents, if it is motivated by non-economic factors. Because the size of economic welfare effects is rather small, non-economic motives do not need to be large in order to make integration politically acceptable, and even small variation of political sentiment can make integration politically problematic.

European economic and monetary unification is a case in point. The model predicts that tighter integration should trigger heterogeneous reforms as well as capital flows: labor markets should be deregulated in capital-exporting countries, and be regulated more stringently in countries that experience capital flows. This is indeed what happened in EMU (Bertola, 2016). In capital-rich countries (such as Germany) labor incomes should in theory and were in reality reduced by capital outflows and labor policy deregulation: to the extent that this damages the country's political majority, non-economic motives (such as a desire to achieve consensus on German reunification) had to play a significant role in triggering democratic acceptance of monetary and financial integration with capital-poor countries. A companion paper (Bertola, 2017) outlines the same arguments non-technically and outlines how these insights can help interpret policy developments and political tensions in the European integration and crisis context.

The paper's theoretical derivations more generally highlight interactions between international market integration and coordination of policy-making processes. Should it be possible to aggregate a country's welfare in terms of what is experienced by a representative citizen, the policy competition implied by integration may be good or bad, depending on the objectives of the country's policy-making process. If a benevolent policymaker chooses policies that serve citizens' interests, then coordination usefully prevents a damaging race-to-the-bottom. Subsidiary labor policies distort capital movements like a source-basis capital income tax, and from the aggregate point of view of an average individual have the same unpleasant implica-

tions as that and other policies that, like state aid, the European Union's policy framework aims to control. Efficient policy choices at the integrated economy's level could maximize area-wide welfare, but if agents are heterogeneous this would be a reasonable objective and realistic outcome only if transfers across different countries' politically decisive agents were possible. Policy-makers need not be benevolent, and from the point of view of a representative citizen "coordination is beneficial if and only if the elasticity of the tax base exceeds the policymaker's marginal propensity to waste tax revenue" (Edwards and Keen, 1996). From the point of view of heterogeneous uncompensated agents, what is "waste" is a subjective assessment. Policy-makers who do not maximize a specific individual's welfare can very well look like a Leviathan to her, and the policy constraints imposed by economic integration can be viewed positively or negatively by heterogeneous individuals.

In further work it might be interesting to allow capital to vary not only across the country's policy border but also over time, letting savings and investment maximize a discounted sum of concave transformations of (1). This would allows consumption and savings choices to play a role in determining capital flows and, as in Bertola (1992), policies that influence factor income shares and employment would have different welfare implications for differently wealthy agents. The optimal capital income taxation literature suggests that an economy that reaches a steady state would tend to completely deregulate labor markets: financial imperfections that limit inter-temporal market integration could remove this somewhat implausible implication, and a finite-lives framework would imply that unborn individuals, like foreign investors, do not have a say on the policy conditions under which their capital is employed.

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