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WEDGES: DISTRIBUTION, DISTORTIONS, AND MARKET INTEGRATION

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Abstract

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JEL Classification: D33, F02, J08

Keywords: Policy competition, Capital mobility.

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Wedges: Distribution, Distortions, and Market Integration

Giuseppe Bertola *

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Abstract

This paper proposes a stylized model of policy determination and imperfect international integration. A policy wedge aims to correct laissez-faire market imperfections and/or redistribute welfare across heterogeneous agents. Policy is subject to both race-to-the-bottom and beggar-thy-neighbor forces if the country's politico-economic equilibrium interacts with the rest of the world. Variation of international market wedges 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 country-specific structural and political factors and how it responds to market integration across country boundaries. The model's "country" is defined by political decision power, policy enforcement boundaries, imperfect mobility of some factors, and immobility of some other factors. These features may reflect natural or cultural specificities of its territory, however the paper streamlines its analysis by assuming homogeneous tastes and technology, so that gains from trade only arise from different factor intensities, and focuses within that framework on labor market policy. The model economy is populated by individuals who own heterogeneous amounts of capital, and the research question is that of whether and how policy interference in the labor market 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, and this 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, through familiar beggar-thy-neighbor incentives, tend to imply tighter regulation in countries where politically decisive individuals gain from tighter international integration. As long as redistribution requires distortions this is the equilibrium reform pattern induced by tighter international market integration, 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

¹The emphasis in that and this paper on welfare implications for owners of capital and labor follows up on Bertola (1993), where factor income shares and savings are influenced by *laissez faire* imperfections and policies, and Bertola (2004), where labor policies trade

its value added hinges on two technical devices. Supposing that agents differ only in terms of factor endowments and ruling out lump-sum 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" relocation 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 Huffinan (1988). In such models, policy and imperfections can be represented by wedges between productivity and utility margins (Chari, Kehoe, and McGrattan, 2007). Section 3 outlines how the welfare of individuals within the country depends on such wedges, which 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 politico-economic equilibrium in a closed economy where a fixed aggregate stock of capital is owned in different proportions by the country's citizens. Allowing factor intensities to also differ across the country's borders, Section 5 models imperfect capital market integration: 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 introduced by Samuelson (1954) and 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 productivity off consumption smoothing.

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 not only for representative individuals when international competition weakens corrective policies, but also for individuals who favor redistributive policies that do not maximize average welfare. The economic welfare implications of international integration for politically decisive agents can explain how policy endogenously influences 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 . Welfare instead declines in the amount of labor supplied to the market rather than non-market tasks that yield positive utility (leisure, or production activities that do not use the market's capital).

It greatly simplifies derivation and interpretation of the results to suppose that for all i preferences have the same quasi-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, functional form (1) rules income effects, and implies an increasing relationship between l and w . This is not necessarily realistic along the individual intensive margin, so 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 such transfers *across* households rationalizes distortionary policies 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

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

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

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

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 appear in the expression for the total income of an agent (individual, or household) who earns income from k_i units of capital and a proportion l_i of one unit of labor,

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

²Because 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.

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 ,

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

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 written³

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

where

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

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 $y(\cdot)$ function and its derivatives when this makes them easier to type and interpret.⁴ The wage expression (2) appears on the right-hand side of (6), and the preferred

³The derivation uses

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

⁴Writing $y(al/k_d) = (al/k_d)^{1-\gamma}$ 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.

aggregate l identified for agent i by (5) satisfies a condition in the form $\omega(\cdot)w = B'(L)$, where

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

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 right-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

$$\frac{dr}{dl} = \frac{1 - \xi_\tau (1 - \gamma)}{\xi_\tau \xi_\delta} (1 - \eta_k) \frac{w}{k_d}. \quad (9)$$

The first square bracket on the right-hand side of (8) 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".

3.1 Structure

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

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

⁵For 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.

which equals unity when $\xi_\delta = \xi_\tau = 1$ and capital earns the baseline income share γ .⁶ Using (10) in (8) yields the proportional wedge that satisfies the first-order condition for maximization of agent i 's income,⁷

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

If $mk_i/k_d = 1$ this is unity: 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 $\xi_\tau (al/k_d) y'(al/k_d)/y(al/k_d)$ 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 $dm/d\xi_\tau = -(\xi_\tau)^2 (\xi_\delta)^{-1} < 0$, the preferred wedge expression (11) is larger for a smaller ξ_τ : all else equal, it is welfare-improving to boost labor supply if labor is paid less than marginal product.

A related but 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, market employment may entail idiosyncratic yet uninsurable risk, so that labor supplied on a risk-adjusted basis falls short of the marginal productivity paid by competitive employers who can diversify the income of each unit of capital, $r = y(al/k_d) - y'(al/k_d)al/k_d$. Because $dm/d\xi_\delta = -m/\xi_\delta < 0$, the policy wedge (11) is larger when a smaller ξ_δ lets employment subsidies have more positive

⁶It can be helpful to see that, using (10), the explicit income expression of footnote 4 reads $c(l, k_i, al/k_d) = (\gamma mk_i + (1 - \gamma) k_d) \xi_\delta \xi_\tau (al/k_d)^{1-\gamma}$.

⁷The first-order condition may alternatively and equivalently be taken with respect to specific policy instruments or, as in Bertola (2016), to the ω wedge rather than to l .

total income effects.

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. The arguments just made and expression (11) however show that, in the absence of compensatory transfers, agent-specific policy preferences depend on the relative importance of capital income.

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 reduce aggregate welfare in order to influence its distribution. And while labor policies may address market failures, agents with different income sources have different views as to whether and how structural problems should be targeted by "active" measures. If $m > 1$ indicates that the private reward of labor market participation is lower than its social productivity, subsidizing employment increases aggregate efficiency and may appear to benefit workers. But in equilibrium subsidies are at least partly shifted to complementary factors of production. Insurance schemes that increase labor supply without reducing productivity, for example, also benefit owners of well-diversified capital income. While the incidence of such policies on individual welfare generally depends on how subsidies are financed, in the model economy considered here labor market imperfections and corrective policies both matter only for capital income. Structural imperfections that imply a larger m are less relevant to the $\omega(\cdot)$ wedge if k_i is small, and are completely irrelevant if $k_i = 0$.

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.⁸ Then, the country's

⁸An 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.

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 some of 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

In the model's economy all individuals are identical except for their relative wealth k_i . This makes it straightforward to see how taxes and subsidies or wage and quantity constraints may implement the (8) optimality condition.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 $1 - l/l_s \approx \log(\omega^{-1/\beta}) \approx (1 - \omega)/\beta$, with the welfare implications characterized above if households can 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 quantity constraints—such as working time limits, minimum annual vacations, or mandatory retirement—with the same welfare implications as the wedge they introduce between demand and supply.¹⁰

⁹It 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).

¹⁰Job security provisions in models of uninsurable labor income risk and well-diversified capital income (Bertola, 2004) and active labor market policies in search-and-matching mod-

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 the policy instruments that enforce it in equilibrium. The distributional parameter x would be irrelevant to policy determination if lump-sum transfers could offset the welfare implications of factor-price changes. If redistribution does need to distort, then x plays exactly the same policy-shaping 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, for the average individual if in *laissez faire* labor earns less than its marginal contribution but capital does get an appropriate share of it.

In practice, the distinction between structural imperfections and policies may be less than fully clear. For example, the market power of unionized labor may be viewed 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 it can be politically awkward to subsidize a natural monopolist's production, so the distributional implications of policies that correct labor market distortions need not be politically acceptable. There can be sound political rationales for policies, such as right-to-strike legislation, that strengthen rather than reduce such 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 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

els have steady-state distributional implications that are qualitatively similar to those of this paper's static model.

are wholly driven by "monopoly union" motives. Individuals who own capital also partake of the complementary income 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 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* wage 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

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

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*. The model would predict such a labor policy if $x = 1$, i.e. there is very low wealth inequality and/or policy can use the non-distortionary redistribution tools that operate within families. This may represent countries that tend to adopt active labor market policies, such as Scandinavian ones.

Because wealth is more unequally distributed than labor income, however, it is natural to suppose that $x < 1$ when the decisive agent is the median voter in a democratic policy determination process. 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

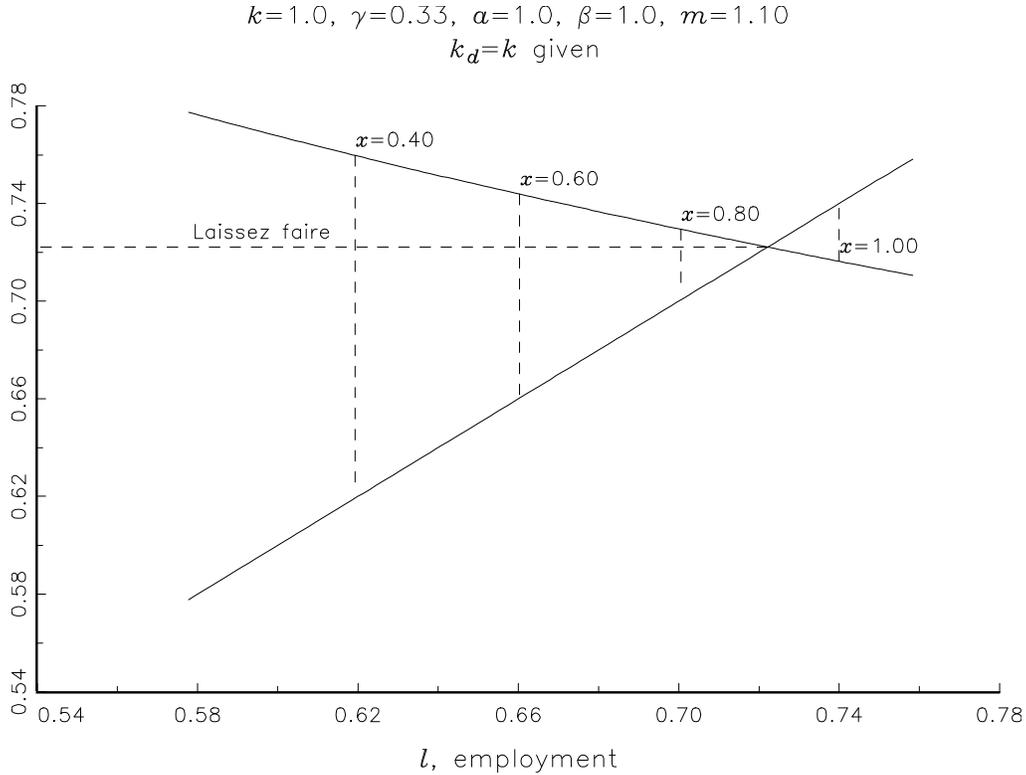


Figure 1: Policy wedges in a closed economy for various values of the decisive-individual relative wealth indicator x .

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 where a "passive" policy wedge $\omega(\cdot) < 1$ reduce the market's labor intensity, and do not always explicitly discuss the symmetric and less plausible 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 implies a 10% wage tax instead of a similar employment subsidy. Lower values of x further reduce employment in the figure. It is easy to see in (12) that as $x \rightarrow 0$ the distortions that shape capital income become irrelevant to policy determination and the wedge ω approaches $1 - \gamma$ for any m , enforcing the proportional 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, "passive" labor policies 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 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, 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 elasticity for the $f(\cdot)$ function.¹¹

The model's country employs only 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 equivalent to only $\nu < 1$ units of the domestic capital stock, its marginal productivity is scale accordingly: net returns are equalized at

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

¹¹Recall 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 use numerical methods and would have the same qualitative properties.

an imperfect arbitrage condition solved by

$$k_d = al\nu^{\frac{\gamma}{1-\gamma}} \frac{k + K\nu}{al\nu^{\frac{\gamma}{1-\gamma}} + AL}.$$

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

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

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" functional form of the international market wedge 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. Because its implications are most interesting and realistic when both capital mobility and labor policy satisfy interior equilibrium conditions, however, 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

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

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. A more positive η_κ lets domestic capital earn a larger share of the marginal income produced by higher l but the ownership effect takes into account that foreigners are entitled to some of it when $k/k_d \neq 1$, and scales accordingly the decisive individual's share of the economy's domestic capital income. The monopoly effect implies a smaller wage mark-up than that resulting from the technological elasticity γ when $\eta_\kappa > 0$ makes marginal productivity a flatter function of l .

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

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

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. These, defined in (15), have straightforward interpretations and play interesting roles in shaping the country's policy wedge.

Expression $\lambda(\cdot)$ is the country's share of an effective total employment measure that adjusts the foreign component by the power of ν implied by the market equilibrium condition (14). In the policy wedge, $\lambda(\cdot)$ 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 $\lambda(\cdot)$ is smaller, then variation of l is associated with a larger proportional capital variation,

and marginal productivity is a flatter function of employment.

Expression $\mu(\cdot)$ is the country's share of the total capital effectively available for domestic production. In the country-specific policy wedge $\omega(\cdot)$ it accounts for a weaker "ownership effect" for the decisive agent of a partially integrated economy, who disregards the portion paid to foreigners of the additional income generated by higher l .

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

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

In turn, these expressions readily imply that if $k_d > k$ then tighter integration unambiguously decreases the (17) wedge:

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

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 agent 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 $\mu = k/(k + \nu K)$ of the partially integrated market that supplies some of its capital. Because the country's policy-maker disregards foreign welfare, familiar beggar-thy-neighbor motives are at work. From the rest of the world's point of view, policy moves too much towards regulation in response to capital inflows, because the welfare implications of a lower l are positive for individuals who own immobile labor, and qualitatively similar to those of capital income taxes rebated to local citizens in capital-importing countries in standard policy competition models (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 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,

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

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, and deregulation has negative welfare implications for foreigners. 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 when both capital flows and policy satisfy interior equilibrium conditions then stronger capital inflows are locally associated with more regulation, and stronger outflows with less regulation. 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 linear "iceberg" functional form of international market frictions yields neat closed form in terms of $\lambda(\cdot)$ and $\mu(\cdot)$ when capital flows are active, 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.

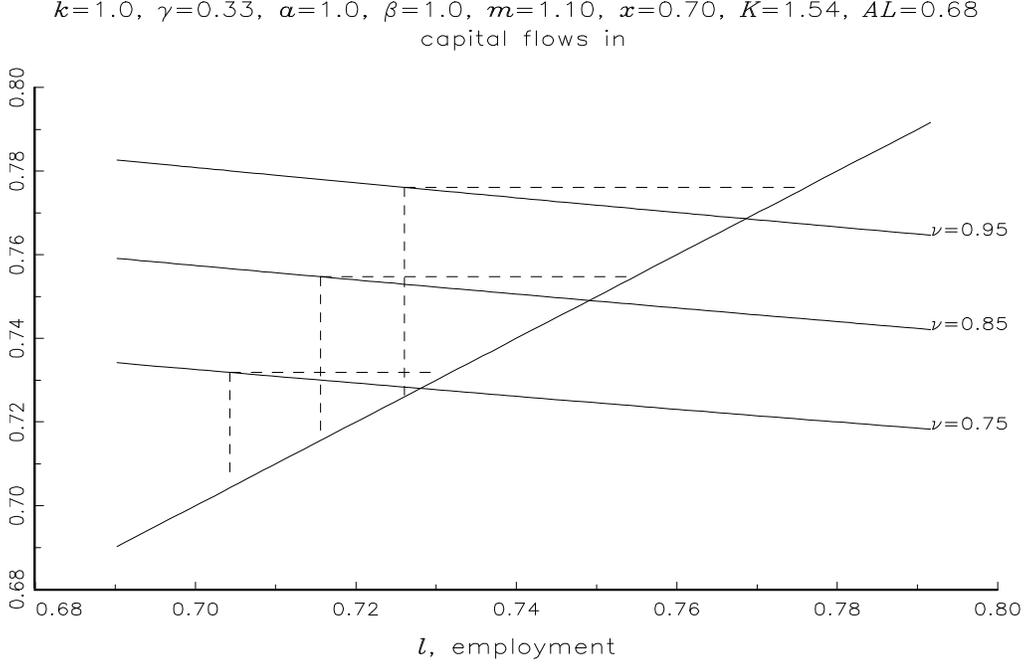


Figure 2: Policy wedges in a partially-integrated capital-importing country, for various values of the ν indicator of foreign-owned capital's relative productivity.

Condition (14) is slack if the country's capital intensity does not differ from the rest of the world's so strongly as to trigger either inflows or outflows of capital, i.e. if

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

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, and 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 K/k to

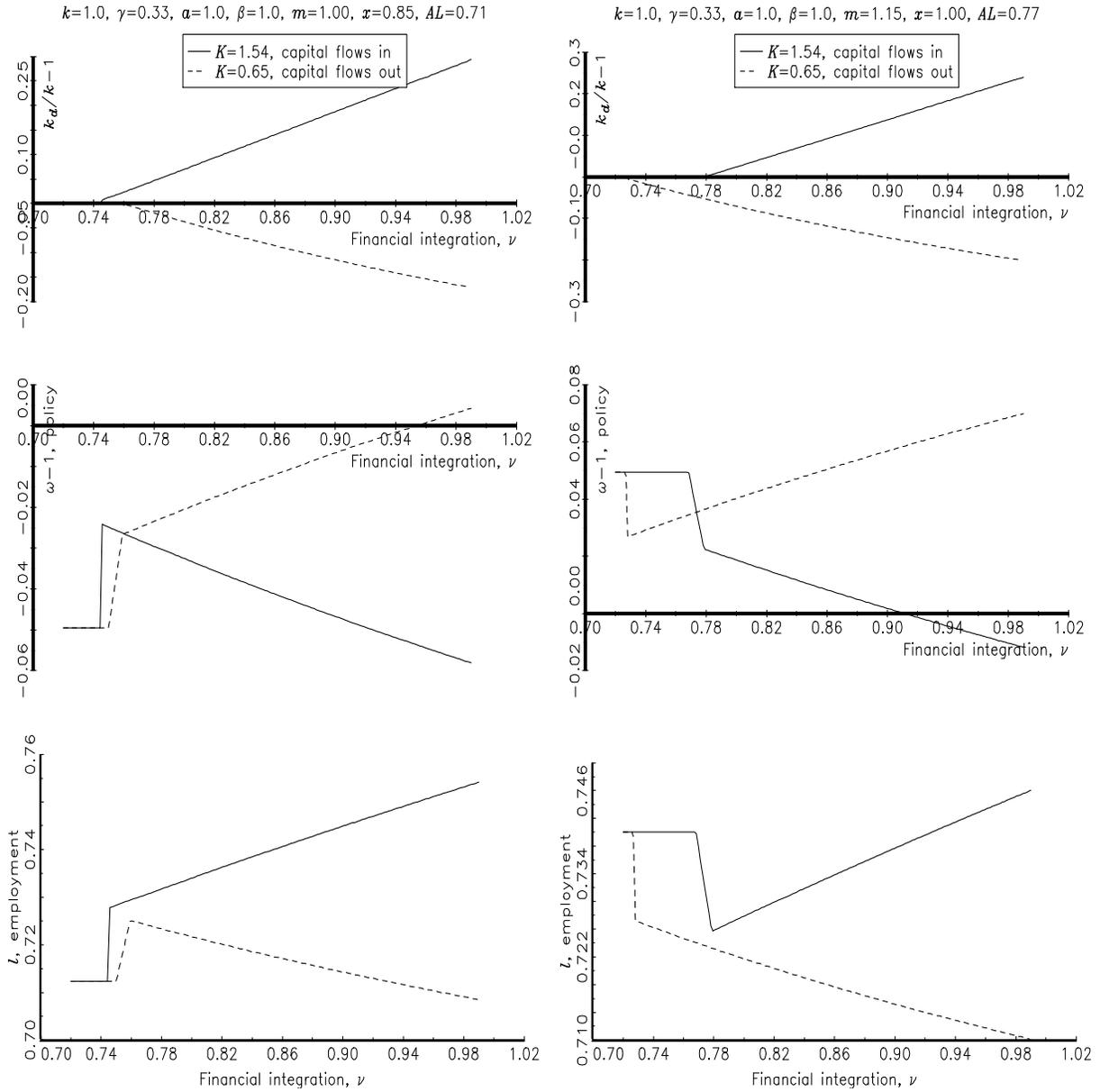


Figure 3: Implications of integration for capital mobility, policy wedges, and employment in four different countries.

$AL/(al_A)$ ratio 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 along a dimension of particular interest. In the left-hand column of panels $mx < 1$, 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 parameters regions where ν is sufficiently below unity to prevent capital flows. In the left-most portions 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. A variation of l changes the representative agent's income by a proportion $(mx - 1)\gamma + 1$ of the wage if there is no capital mobility, and by $\left(mx \frac{k}{k_d} - 1\right)\gamma(1 - \eta_\kappa) + 1$ if k_d responds to capital's marginal productivity. If $mx \neq 1$, the slope of welfare with respect to l changes when $k = k_d$ and η_κ becomes positive. Hence, the first-order condition that underlies (16) cannot identify the optimal

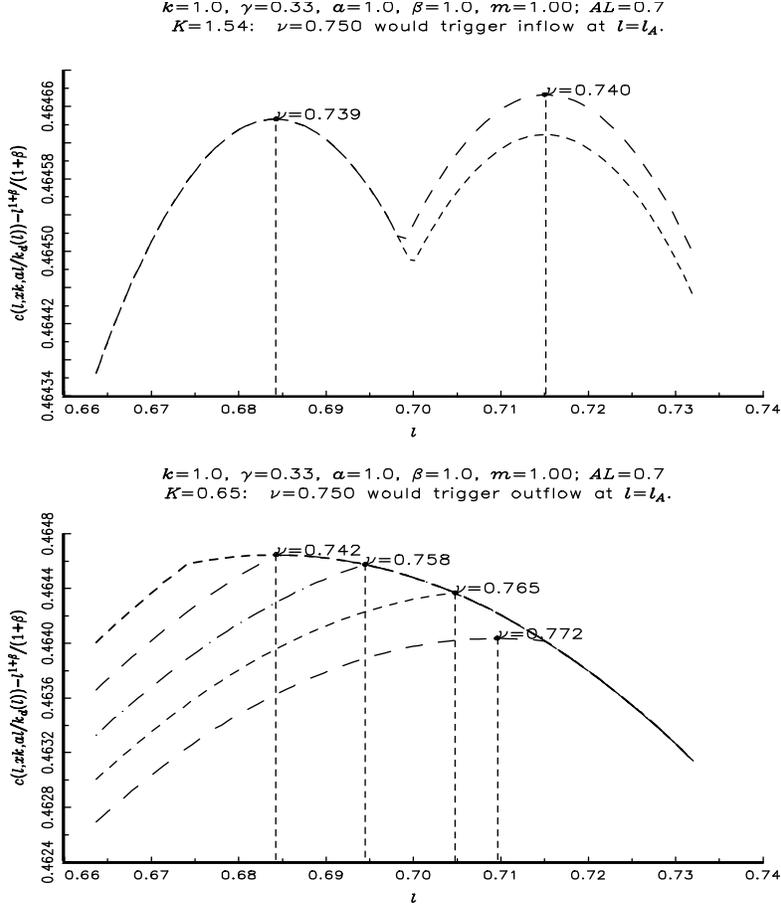


Figure 4: Transitions from autarky to partial integration. The lines plot welfare as a function of l for degrees of integration ν near the one that triggers capital mobility. Dots labeled by ν values mark the maximum of the upper envelope of welfare conditional on zero or active capital flows.

policy in situations where one of the conditions in (14) holds at zero capital flow, i.e., when

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

To see the labor policy implications of these situations it is helpful to refer to Figure (4), which 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 is lowered by outflows when capital begins to flow. This would happen at the critical $\nu = 0.75$ value if policy continued to enforce the autarky level l_A . As long as the closed-economy welfare function at some other l exceeds the maximum of the integrated welfare, however, it is preferable to start deregulating just enough to prevent capital outflows. In this case the optimum is at a kink of the upper envelope welfare function, a corner solution implemented by a wedge that does not satisfy either the autarky or partial-integration first-order conditions. This explains why in Figure 3, just before capital begins to flow, l increases smoothly in ν and welfare declines: 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, deregulation lets a capital poor decisive agent's income be boosted by capital inflow as soon as ν is large enough to let capital flow at the resulting level of l . 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, hence 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 left-hand side panels of Figure 3, policy jumps as soon as inflows become positive, but moves gradually to smother incipient inflows. In the right-hand panels of Figure 3, where $mx < 1$ and the decisive agent 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 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 $k_a = k$, so the "ownership effect" remains unchanged, but incipient capital mobility weakens the "monopoly union" effect. Thus, any transition out of autarky triggers deregulation. Like the technical details discussed above and illustrated in Figure 4, however, the race-to-the-bottom implications of capital mobility are not a general implication of the model: because policy continues to be reformed as ν growth tightens integration, better integrated countries need not all feature less regulated internal markets. The real-life implications of international integration need not be represented well by a comparison between autarky and incipient capital flows.

7.2 Full integration

The comparison between autarky and complete integration that is most commonly made in the literature also oversimplifies more general interactions between international and domestic market wedges. 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 $\lambda \rightarrow 0$ 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

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

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

¹²The model has a well defined solution also if ν exceeds unity. This 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.

counterpart (12), which is the case if

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

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), capital-poor large countries can in theory and may 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 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 double Big Bang liberalization of both cross-border (financial) and internal (labor) markets. The technical aspects just discussed however are an artifact of the linear functional form of the foreign-ownership productivity disadvantage, which delivers a very tractable representation of non-zero capital flows but admittedly conveys an excessively dramatic impression of the difference between zero and even very small capital flows. Because international markets are always albeit imperfectly active, 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

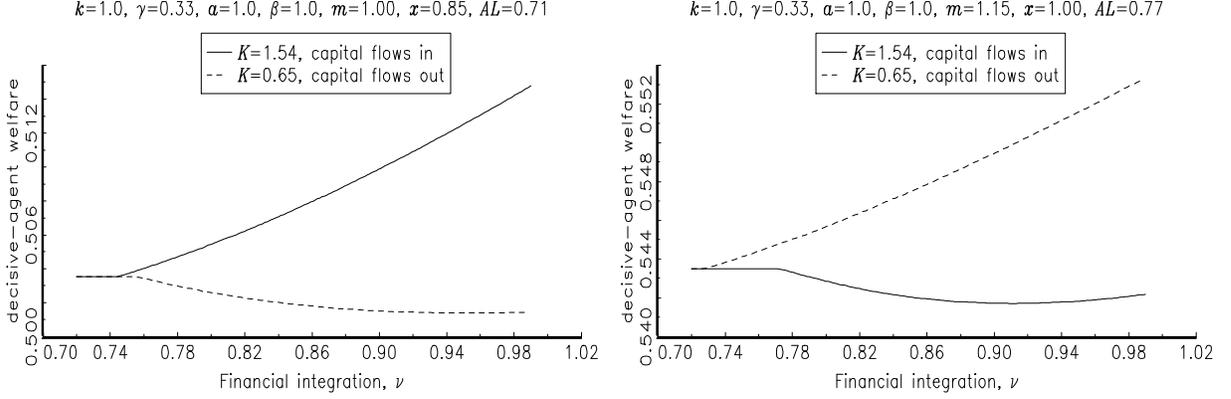


Figure 5: Decisive-individual welfare effect of international integration for the same countries as in Figure 3.

welfare in the same four countries illustrated in Figure 3. 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

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

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

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

for the first term on the right-hand side of (23). This may be positive or negative, because a larger domestic capital stock increases the wage and decreases capital's unit income.

The two effects cancel out in the decisive agent's income and welfare when $kmx = k_d$. If $x = m = 1$ and $k = k_d$ the welfare being evaluated is in fact 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.

In general, the sign of (24) is that of $k_d - kmx$. So it depends on whether mx is larger or smaller than k_d/k , which also determines whether the (16) policy wedge is below or above unity. If mx is small, non-labor income does not much matter for the decisive agent's welfare, $\omega(\cdot) < 1$, and for $k_d \approx k$ expression (24) is positive, reflecting the positive wage effect of a larger k_d . But when $k_d \neq k$ then, as in $\omega(\cdot)$, so in (24) the "ownership effect" also accounts for the fact that some capital income crosses the country's borders.

In (23), expression (24) multiplies $\partial k_d/\partial \nu$, the sign of which depends on the direction of capital income flows. Because tighter integration strengthens capital movements, 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. Differentiation of the expressions in (15),

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

yields

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

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 $d(1/\nu)/d\nu = -1/\nu^2$, then k_d/k symmetrically declines by the same expression with negative sign.

The derivative in (23) is positive, and tighter integration is beneficial, in two cases: that where $(k_d/k) - mx < 0$ and capital inflows imply $\partial k_d/\partial \nu < 0$, and that where $(k_d/k) - mx > 0$ 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. if

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, where the *laissez faire* coincides with the country's politico-economic equilibrium, integration with the rest of the world cannot be bad, and is good whenever different factor endowments generate beneficial opportunities to trade. This is a simple implication of the fact that competitive equilibrium is in the "core" of an exchange economy: just like secession of a group of individuals cannot make them *all* better off on their own, so integration in a wider market of an economy that admits a representative individual cannot make that individual worse off.

However 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 obviously damage groups of heterogeneous agents even as it increases average welfare. The welfare of decisive agents is particularly interesting, because the international wedge ν may be determined by structural and political factors jointly with the internal market wedge ω .

Tighter integration is politically problematic when it damages decisive agents who are not entitled to integration's average welfare implications. If $mx < 1$ rationalizes realistic l -reducing policies, a larger ν certainly increases the decisive agent's welfare if capital flows in, but can very well reduce it if capital flows out, as well as when l is set at the minimal level that prevents capital outflows. Intuitively, tighter integration can be beneficial for a decisive agent who prefers to distort employment downwards and capital flows out if that agent is close enough to average to introduce only a small $\omega(\cdot)$ wedge, and to benefit from the average efficiency gains from trade. Formally, the model offers a neat representation of these insights in terms of the mx index of politico-economic equilibrium policy: a capital-rich country's decisive individual is damaged by tighter integration if domestic capital as a fraction of national wealth is below mx . The same condition also implies that the policy wedge (16) falls short of unity and a "passive" policy configuration tends to reduce l below its *laissez faire* level: in Figure 5, the U-shaped lines in fact begin to increase at the same degree of integration where $\omega - 1$ crosses the horizontal axis in Figure 3.

Figure 6 shows, using most of the same parameters as previous figures, that the welfare implications of partial integration are easily steered by modest deviations from unity of m

$k=1.0, \gamma=0.33, \alpha=1.0, \beta=1.0, m=1.25, AL=0.77, K=1.64$

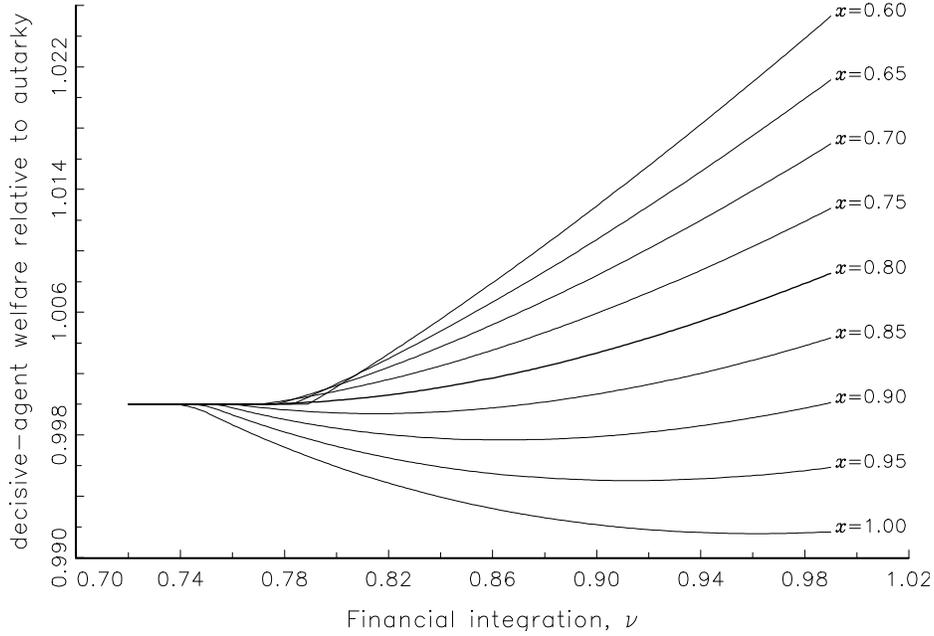


Figure 6: Decisive-agent welfare effect of international integration in a capital-importing country for various values of that agent's relative wealth.

and/or x . 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 illustrations conform to standard insights and confirm the analytical results obtained above. 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 lowest line, drawn for $x = 1$, shows that tighter integration decreases average welfare, in familiar race-to-the-bottom fashion: beneficial "active" policies are weakened when integration lets their positive effects spill-over to foreign owners of capital. Moving upwards to smaller values of x , the lines become U-shaped: welfare declines when ν becomes large enough to trigger positive capital inflows (or, initially, inflow-preventing policy changes of the type shown in Figure 4), but further integration has positive welfare implications once the foreign-owned portion of domestic capital has become large enough to make it optimal for the country's policy to distort l downwards. The thicker line at $x = 0.80$ shows that welfare increases smoothly throughout all levels of integration if $mx = 1$ makes *laissez faire* optimal in autarky, and the lines above it show that integration has increasingly more positive welfare

implications for poorer decisive agents, who benefit from stronger capital inflows and more "passive" policy.¹³

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 income, production, and welfare impacts of integration are in general comparable to those of the model country's structural and political features. 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% deviation of x from unity can justify a change of l and labor intensity in the order of 10%, which can also be a result of international integration (and requires imbalances and cross-border capital-income payments that, as a proportion of income and production, appear unusually large across countries if not within countries, where households routinely own or owe large multiples of their annual income).

In this context, not only the direction but also the size of integration's welfare impact deserves to be discussed. 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. Welfare gains or losses only reach about 2% even as domestic capital and employment increase by some 30% and 10%, respectively (and production grows by about 20% as a result). 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.

¹³Within 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 to illustrate how welfare effects upon a transition from autarky to full integration differ in sign and size across specific individuals.

9 Relevance and extensions

The theoretical derivations above highlight market integration's policy and economic welfare implications. An interesting question that of whether those implications are politically acceptable for all countries' decisive agents, so that integration may be fostered by consensual policies that dismantle such international market boundaries as capital controls or regulatory segmentation. The model's answer is positive not only if $mx \approx 1$, so that policy is mild enough to let decisive agents gain from trade, but also when $mx < 1$ in capital-poor countries and $mx > 1$ in capital-rich 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 is significantly below unity in all countries, then tighter integration can generate beneficial capital inflows only as the counterpart of damaging capital outflows in rich countries, where it will be resented by politically decisive agents.

Market integration may be exogenously driven by technological forces or may not be consensual, as in the case of military conquest. But it can be acceptable in all countries—including those where its economic welfare implications are negative for decisive agents—if it is motivated by non-economic factors. Because the plausible 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 their fluctuations can easily make it problematic. European economic and monetary unification (EMU) 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 before the crisis (Bertola, 2016).

As in any rational equilibrium model, agents do not need to know the whole structure of the economy to behave as they do in equilibrium. When investors respond to profit opportunities, and policy-makers and voters react to labor market performances, the tighter

integration experienced with EMU should in theory and did in reality reduce labor incomes and trigger labor policy deregulation in capital-rich countries (such as Germany). If this damages the country's political majority, then non-economic motives (such as a wish to reunite Germany with other countries' permission) had to play a significant role in the process that led such countries to accept monetary and financial integration with capital-poor countries. To the extent that small fluctuations in such political factors can drive integration and disintegration exogenously, the data track empirically the policy implications analyzed in the present paper. A companion paper (Bertola, 2017) discusses how a model where subsidiary policies pursue distributional objectives helps interpret labor reforms and political tensions in the European integration and crisis context.

Authors and readers of academic papers can and should take a broader perspective. The present paper's derivations can let them discuss whether and how international market integration may call for policy coordination, aimed at preventing the excessive regulation and deregulation implemented by policy-makers who disregard the interests of foreigners.

Subsidiary labor policies distort capital movements like a source-basis capital income tax, and from the point of view of an average individual have the same unpleasant implications as that and other policies that, like state aid, the European Union's policy framework aims to control. If it were possible to aggregate a country's welfare to what is experienced by a representative citizen, then coordination would be unanimously preferable to policy competition if in each country policy-makers served that citizen's interests.

If policy-makers are not benevolent, conversely, 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). The policy competition implied by integration may also be good or bad for heterogeneous agents within each country, because from their point of view "waste" is whatever damages them to benefit others. Policy-makers can very well look like a Leviathan to individuals whose welfare is not maximized by policy, and who therefore may welcome the policy constraints imposed by economic integration. Coordination of policies that compromise among conflicting interests in each country should also be agreeable to those who wield political power in their own countries: labor policies could be chosen at the integrated economy's level by a political process that maximizes the welfare of country-

specific decisive agents. However this would be a reasonable objective and realistic outcome only if cross-border transfers were possible. To make tighter integration politically acceptable, these payments would need to flow from the "middle-class" decisive agents of capital-poor countries to those of capital-rich countries in times of increasing integration, and in the opposite direction when integration becomes more difficult.

Market integration is modeled in this paper in terms of capital mobility but trade in good with heterogeneous factor content would have qualitatively similar implications; in that context, policy wedges could influence inter-sectoral labor reallocation. In further work it might also be interesting to allow capital to vary not only across the country's policy border but also over time. A tractable formalization would let savings maximize a discounted sum of concave transformations of a quasi-linear period utility function of consumption and employment. This would allow consumption dynamics to play a role in determining capital flows and, as in Bertola (1992), would let policies that influence factor income shares and employment 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. Imperfections that limit inter-temporal financial market integration could remove this somewhat implausible implication, and each generation's interests—like those of foreign investors in this paper's static framework—would not be fully accounted for by future policy-setting processes.

References

- Andolfatto, David (1996) "Business Cycles and Labor Market Search" *American Economic Review* 86 (1): 112-132.
- Bertola, Giuseppe (1993) "Factor Shares and Savings in Endogenous Growth," *American Economic Review* 83:5, pp.1184-1198.
- Bertola, Giuseppe (2004) "A pure theory of Job Security and Labor Income Risk" *Review of Economic Studies*, 71:1 43-61.
- Bertola, Giuseppe (2016) "Labor Policies and Capital Mobility in Theory and in EMU" *European Economic Review* 87, 62-77.
- Bertola, Giuseppe (2017) "EMU and Labor Market Policy: Tensions and Solutions" essay contributed to the ECFIN 2016 013/B "Moving closer rather than drifting apart: challenges to economic integration at the global and European level" Research Fellowship initiative.
- Chari, V. V., Patrick J. Kehoe, and Ellen R. McGrattan (2007) "Business Cycle Accounting" *Econometrica* 75:3, 781-836.
- Edwards, Jeremy and Michael Keen (1996) "Tax Competition and Leviathan" *European Economic Review* 40, 113-134.
- Greenwood, Jeremy, Zvi Hercowitz, and Gregory W. Huffman (1988) "Investment, Capacity Utilization, and the Real Business Cycle" *American Economic Review* 78(3), pp. 402-417.
- Keen, Michael, and Kai A. Konrad (2013) "The Theory of International Tax competition and Coordination" in A.J.Auerbach, R. Chetty, M.Feldstein, and E. Saez (eds.), *Handbook of Public Economics Volume 5*, Amsterdam and Oxford: Elsevier, 257-328.
- Martin, Philippe and Hélène Rey (2000) "Financial Integration and Asset Returns" *European Economic Review* 44, pp 1327-1350.

- Mayer, Wolfgang (1984) "Endogenous Tariff Formation" *American Economic Review* 74:5
970-985.
- Meltzer, Allan H., and Scott F. Richards (1981) "A Rational Theory of the Size of Government" *Journal of Political Economy* 89 (5): 914-927.
- Merz, Monika (1995) "Search in the Labor Market and the Real Business Cycle" *Journal of Monetary Economics* 36 (2): 269-300.
- Samuelson, Paul A. (1954) "The Transfer Problem and Transport Costs, II: Analysis of Effects of Trade Impediments" *Economic Journal* 64(254) : 264-289.
- Sinn, Hans-Werner (2003) *The New Systems Competition*, Oxford: Basil Blackwell.
- Wilson, John Douglas (1999) "Theories of Tax Competition" *National Tax Journal* 52:2
269-304.