Trade and the Redistributive State

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Abstract

According to popular belief, welfare-state arrangements will become unsustainable in face of low-cost competition from abroad. Yet, in contrast to much of the theoretical work which predicts a race-to-the-bottom, empirical studies do not seem to support the notion that globalization is necessarily the demise of the welfare state. Whereas most of the literature approaches the issue of globalization and the redistributive state from a normative angle, this paper provides a political-economy-explanation. It shows that with majoritarian redistribution and endogenous labor supply the impact of globalization on budget-to-GNP ratios is ambiguous, and depends on factor differentials within the population as well as technology parameters. The ambiguity applies even though redistributive tax rates may increase.

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1 Introduction

Low-cost competition from abroad is generally considered a threat to national social policy, in particular to redistribution and the welfare state. The prevailing view in public as well as in science is that competition in social policy implies a race-to-the-bottom: producers not exposed to the burdens of redistribution would gain a competitive edge vis-à-vis their competitors from other countries, to the effect that the former drive the latter out of business. In face of smaller welfare states and less redistribution elsewhere, previous levels of welfare states would become unsustainable. Those in favor of lean government appreciate the outlook; they consider international competition as the ultimate chance for national policy to become emancipated from interest groups; some even see it as a panacea for the taming of the leviathan. Others, however, complain about it as one of the downsides of globalization. In order to avoid a widening of the income distribution, they call for accompanying policy measures which are supposed to ensure that globalization also comes to the benefit of the disadvantaged.[1]

From an economic perspective, the reason for the demise of the welfare state seems to be easily identified: as competition becomes stiffer, deadweight losses increase so that redistribution becomes more expensive. Eventually, the welfare state becomes too costly. Some predict this to happen at the very same time as the need for shielding members of society from adverse terms of trade shocks and for cushioning those who are hurt by the Stolper-

[1]See the most recent book by Stiglitz (2006), e.g. "I do not believe it is tenable to pretend that everything will be fine if we just leave the markets alone. Nor is it tenable to ask workers to have faith that, with enough patience, globalization will make them all better off, even though now they must accept lower wages and decreased job security....without strong government redistributive policies, unskilled workers may well be worse off" (p. 273-74)...."it is the people at the bottom who have been hurt by globalization....; it seems the right thing to do, to lower taxes on them and to increase taxes on those who have been so well served by globalization." (p. 275).

Samuelson (1941) effects associated with low-cost competition from abroad would actually increase (see, for instance, Rodrik, 1997, 1998; Andersen, 2002)[2].

Yet, the perception of international competition inevitably implying a roll back of the welfare state seems to clash with empirical studies, and has recently been challenged in particular by Iversen/Cusack (2000), Kite (2004), Molana et al. (2004) and others. According to them, globalization is consistent with smaller as well as larger governments (relative to GNP). Hence, much of the theoretical research contrasts with empirical evidence, in that it suggests that globalization implies a smaller government, and thus fails to provide an explanation for the observed heterogeneity.

However, strikingly, most of the studies seeing national social policy as being hampered by international competition approach the issue of redistribution from a normative angle (e.g. Sinn, 1998; Spector, 2001; Tanzi, 2002). The long tradition of positive economics in the realm of international economics (and particularly trade policy) notwithstanding,[3] normative perspectives dominate the discussion. In addition, most studies focus on problems of the welfare state as triggered by international factor mobility,[4] while the most recent discussion about globalization and its impact on income (re-)distribution is about low-cost competition as transmitted by product markets.

In fact, taking positive aspects into account may help explain why the effect of international competition on redistributive government is ambiguous, in some cases implying a cut back and in others even an expansion of the welfare state. Therefore, this paper differs

[2]On risk and globalization see Scheve/Slaughter (2004). However, according to McLaren/Newman (2004), the answer to the question whether globalization increases or reduces risk depends on country size.

[3]And despite a number of studies on the political economy of redistribution for closed economies, e.g. Roberts (1977), Meltzer/Richard (1981), Roemer (1998), Breyer/Ursprung (1998), Milanovic (2000), Borck (2005), Harms/Zink (2003). Hillman (2003) provides a survey.

[4]For a political-economy framework see, Hansen (2003) and Bjorvatn/Cappelen (2004).

from the previous, primarily normative, literature on the subject in that it offers a political-economy explanation for redistributive government in the context of low-cost competition along Heckscher-Ohlin lines. From a political-economy perspective redistribution need not be due to considerations of social justice, social insurance or the motivation of helping the less fortunate. Rather, from a positive perspective, redistribution may be simply the outcome of majority voting.[5] By endogenizing the redistributive state via the political process, the paper adopts a genuine public-choice perspective: it is based on the assumption that the majority implements redistribution whenever it seems to be in the median voter's favor.

As far as the political economy is concerned, the approach adopted in this paper is in the tradition of Mayer (1984). However, canonical political-economy models of international trade usually focus on endogenous tariff formation, as does the model by Mayer (1984). Yet, nowadays, and for a great many countries, tariffs have become negligible as a source of revenue (in particular when compared to the social budget) and have lost importance as a means of redistribution. First, tariffs have been cut substantially at the international negotiation table, despite of some tariff peaks and hikes remaining. Second, for a number of countries, tariff revenues are not directly available for social expenditures as they do not accrue on the national but the international level, as is the case for customs unions, and, for instance, the EU; they drop in the international- or supra-national bucket where they are spent. Generally speaking, trade policy is getting increasingly out of reach for national interest groups. Third, many trade impediments do not generate revenue. The recently abolished multifibre agreement (MFA) is a case in point. Gradually, tariffs have been replaced by non-tariff barriers to

[5]See also Buchanan/Yoon (1995), however, with respect to capital income taxation in the presence of economies of scale; on globalization, intersectoral factor mobility and coalition formation see Hiscox (2001) in a historical context.

trade and specific national regulations. Hence, the question is not so much to what extent redistribution via income taxes substitutes for tariff revenues. Rather, the currently more relevant question seems to be how redistribution via income taxes and transfers is affected in light of the fact that the re-distribution implicit in trade restrictions becomes increasingly difficult and thus dwindling.

This is where the paper comes in. By supplementing a Heckscher-Ohlin factor-proportions framework with endogenous labor supply and terms of trade, it identifies incentives faced in majoritarian redistribution. Labor-supply reactions prove to be crucial for redistributive tax rates being positive but incentive compatible in the sense that earnings of the high-skilled contain a skill premium even net of taxes. It shows that even though redistributive tax rates may tend to be higher, redistributive budgets may (relative to GNP) actually be lower. The former effect can be traced back to an externality which mildens any adverse relative price effects of redistributive tax policy due to labor-supply reactions.

In fact, with endogenous terms of trade, part of the burden of redistributive tax policy is being exported and thus borne by the low skilled abroad, which c.p. boosts redistribution. At the same time, however, the adjustment in labor supply works towards a reversal of the specialization pattern and thus tends to lower budget-to-GNP ratios. Which of these countervailing effects on the budget-to-GNP ratio dominates, depends on the ratio of low to high skilled workers in the population. The more similar the countries are in terms of factor proportions, the more likely does the redistributive budget decline relative to GNP.[6]

The approach taken here also differs from Boccard, Ypersele and Wunsch (2003) who (also) examine the political economy of welfare-state arrangements in a trade framework:

[6]Welfare arrangements may also turn out to be sustainable if welfare policies are socially productive. However, in order to focus on the positive aspects we will abstract from this possibility.

in their paper, the majority chooses the welfare-maximizing minimum wage which, due to specialization effects, unambiguously declines as economies open up to trade. Unlike their contribution though, this paper focuses on income policy and thus the traditional channel for redistribution which explicitly refers to the ability to pay principle.

The paper is organized as follows: Section two sets out a benchmark model which includes public-choice aspects of majoritarian redistribution prior to integration with endogenous labor supply. Section three focuses on the impact of trade integration on the budget-to-GNP ratio for a given redistributive policy, however, with the terms of trade determined endogenously. Section four discusses the incentives faced by the low-skilled as regards the redistributive tax rates after trade integration, as well as implications for the (redistributive) budget-to-GNP ratio.

2 The model

Consider an economy populated by a number of high ($\overline{H}$) and low ($\overline{L}$) skilled individuals in proportion $\kappa \equiv \overline{L}/\overline{H}$, with the low skilled in the majority at any point in time so that $\kappa > 1$. Though, in principle, upward and downward mobility on the skill ladder is possible and may occur as wages (and in particular the skill premium) are subject to change, we abstract from the low skilled attaining skills (or the skilled losing know how). The assumption of labor markets being segmented by skill level is legitimized by the fact that education of the work force takes much longer than implementing and adjusting a redistributive tax scheme in favor of the low skilled, and that the latter is standard policy with regard to income inequality in many developed countries. Furthermore, this assumption serves to distinguish as sharply as possible the potential implications of trade integration on redistributive budgets in a public-

choice framework from aspects of educational or labor-market policies.

Both sorts of individuals are assumed to have the following indirect utility function, regardless of skill level

$$V_i = \frac{1}{\gamma}(y_i)^{\gamma} - b_i l_i \tag{1}$$

for $i = H, L$ with y_i disposable income, l_i individual labor supply. Parameter b_i relates to the opportunity costs of labor supply in terms of leisure forgone, while parameter γ indicates how income translates into welfare with the first derivative positive and the second negative, provided that $\gamma < 1$.

Under the one-man-one-vote principle the majority may implement a tax-cum-transfer scheme in its own favor by redistributing income from the high skilled (i.e. those with above average income) to the low skilled (i.e. those with lower earnings). More precisely, it is assumed that earnings of the high-skilled are subjected to a flat tax with the resulting revenues spent on per-capita transfers for the low skilled. The assumption of per-capita transfers follows the observation that transfers rather than negative income taxes are the instruments of social policy in most industrialized countries. Transfers are sometimes even earmarked to be spent on certain items, and thus limited per item and therefore also per head. However, since in the framework presented below there is a multiplicative relationship between the earnings of the high and the low skilled, this sort of redistributive policy implicitly defines a negative income tax. We will come back to this issue in detail in note 10. Since taxes as well as transfers affect incentives to work, labor supply will react, thus affecting the low- to high-skilled labor ratio of the work force. With endogenous labor supply, it thus becomes important to distinguish between majorities in the political realm ($\kappa = \overline{L}/\overline{H}$) and in the market place ($l_L\overline{L}/l_H\overline{H} = l_L\kappa/l_H$). However, in any case (see note 12 for a proof), the

ratio of low- to high-skilled labor supply will be larger than unity, and, in equilibrium, gross wages as well as disposable incomes of the high skilled will be strictly larger than those of the low skilled, despite of the tax-cum-transfer scheme.

Let gross earnings of the high resp. low skilled be denoted by w_H and w_L with the corresponding individual labor supply l_H and l_L. Now, if the low skilled impose a redistributive policy as described in the previous paragraph, a representative high-skilled individual will receive an income net of taxes of $y_H = (1-\tau)\, w_H l_H$, a representative low-skilled individual a transfer-augmented income of $y_L = w_L l_L + v$, with τ the tax rate and $v \equiv \tau w_H l_H \overline{H}/\overline{L}$ the transfers per low-skilled individual. Supposing that utility of each individual is described by the welfare function (1), and assuming that $\gamma = 0.5$ and $b_i = 1$ to simplify the analysis, each individual faces the following maximization problem with respect to the optimal labor supply.

$$V_H = \max_{l_H} \left(2\sqrt{(1-\tau)\, w_H l_H} - l_H \right) \tag{2}$$

$$V_L = \max_{l_L} \left(2\sqrt{w_L l_L + v} - l_L \right) \tag{3}$$

which yields solutions for individual labor supply

$$l_H = (1-\tau)\, w_H \tag{4}$$

$$l_L = w_L - v/w_L$$

Hence, ceteris paribus, redistribution reduces the incentive to work as it lowers the opportunity costs of leisure.[7] This applies to both, high- and low-skilled labor. However, for a full

[7]The distorted labor-leisure choice relates to the welfare costs of redistribution. However, Alesina/Perotti

account of the consequences of redistribution on labor supply the impact on gross earnings has to be included as well. This requires a general-equilibrium analysis accommodating for labor demand in addition to supply, with the former derived from product-market equilibrium.

Let there be two industries which produce goods x_1 and x_2 by use of high- and low-skilled labor according to the following Cobb-Douglas production functions

$$\begin{aligned} x_1 &= L_1^{\alpha} H_1^{1-\alpha} \\ x_2 &= L_2^{\beta} H_2^{1-\beta} \end{aligned} \tag{5}$$

In order to reduce complexity and notational cluttering, we simplify matters by setting $\beta = 1 - \alpha$ with $0 < \alpha < 0.5$. Hence, x_1 (x_2) is high (low) skill intensive. Full employment in the model economy then requires that demand for both skill levels resulting from both of the industries equals (endogenous) labor supply

$$\begin{aligned} L_1 + L_2 &= l_L \overline{L} \\ H_1 + H_2 &= l_H \overline{H} \end{aligned} \tag{6}$$

With labor markets within each skill group characterized by perfect sectoral mobility, the

(1997) point out that taxation may be associated with distortions even if labor supply is inelastic. This is the case if labor markets are imperfectly competitive, for instance, due to unionization. Then, part of the burden of taxation is shifted on employers, thus raising output prices (also of exportables) and trade-balance equilibrium is restored by a fall in the domestic demand for importables, and results in lower income. However, in their framework, tax policy is exogenous.

equilibrium wage for any given skill level (high and low) is the same across industries.

$$\begin{aligned} (1-\alpha)\,(L_1/H_1)^{\alpha} &= \alpha p\,(L_2/H_2)^{1-\alpha} \\ \alpha\,(H_1/L_1)^{1-\alpha} &= (1-\alpha)\,p\,(H_2/L_2)^{\alpha} \end{aligned} \tag{7}$$

with the high-skill intensive good x_1 serving as numéraire so that $p \equiv p_2/p_1$.

As regards product-market equilibrium, we will assume that individuals spend their disposable income according to a Cobb-Douglas function with partial elasticities 0.5 on both of the goods so that expenditures are split equally across goods 1 and 2. Product demand (LHS) thus equals supply (RHS) at relative price p if the following condition holds

$$x_1/x_2 = p = (L_1/H_2)^{\alpha}\,(H_1/L_2)^{1-\alpha} \tag{8}$$

Inserting the relative price p back into the labor-market equilibrium conditions (7) and observing full-employment conditions (6) yields sectoral employment of each skill level. Inserting the latter into the first order conditions for labor demand, we obtain equilibrium wages of the high skilled and the low skilled before redistribution as

$$\begin{aligned} w_H &= \alpha^{\alpha}\,(1-\alpha)^{1-\alpha}\left(\kappa/\left(1-\tau^2\right)\right)^{\alpha/2} \\ w_L &= \alpha^{\alpha}\,(1-\alpha)^{1-\alpha}\left(\left(1-\tau^2\right)/\kappa\right)^{(1-\alpha)/2} \end{aligned} \tag{9}$$

With these wages, optimal individual labor supply according to (4) is thus

$$\begin{aligned} l_H &= \alpha^{\alpha}(1-\alpha)^{1-\alpha}(1-\tau)\left(\kappa/\left(1-\tau^2\right)\right)^{\alpha/2} \\ l_L &= \alpha^{\alpha}(1-\alpha)^{1-\alpha}\left(\left(1-\tau^2\right)/\kappa\right)^{-\alpha/2}\left((1-\tau)/\left(\kappa(1+\tau)\right)\right)^{1/2} \end{aligned} \tag{10}$$

Inserting equilibrium values of sectoral employment into (8) shows that the relative price p is a function of factor supplies, i.e. $p = \left(l_H/\left(l_L\kappa\right)\right)^{1-2\alpha}$ which in turn depend on wages resp. taxes and transfers to the effect that the relative price is determined by the partial elasticity of output with respect to input α and factor proportions κ as well as the tax rate τ.

$$p = \left(\frac{1-\tau^2}{\kappa}\right)^{\frac{1-2\alpha}{2}} \tag{11}$$

with $\partial p/\partial\tau < 0$ and $\partial p/\partial\kappa < 0$, as suggested by economic intuition: the higher the redistributive tax rate and (thus) the more abundant low-skilled labor relative to high-skilled labor (see (10)),[8] the lower is the relative price of the low-skill intensive good. Hence, equilibrium values of variables are determined, except for the optimal redistributive tax rate chosen by the low-skilled majority.

Proposition 1 *With partial elasticities of output with respect to inputs in the second industry the reverse of the first, the optimal redistributive tax rate imposed via majority voting before integration does not depend on factor proportions; it depends on distributional shares within industries though: the larger the distributional share of the low-skilled in the skill intensive production (or, equiv., the larger the distributional share of the high-skilled in the low-skill*

[8]Note that $\partial\left(l_L\kappa/l_H\right)/\partial\tau = \left(\tau/\left(1-\tau^2\right)\right)\sqrt{\kappa/\left(1-\tau^2\right)} > 0$. See also note 12.

intensive production), the higher is the redistributive tax rate.

Proof. Recall the utility function of a representative low-skilled individual (3) with $y_L = w_L l_L + v$ disposable income and $v = \tau w_H l_H \overline{H}/\overline{L}$ transfers due to redistributive taxation. Implicitly, welfare thus depends on the low skilled's own wage as well as that of the high-skilled. Since according to (4) labor supply of the latter is a function of net income, i.e. $l_H \overline{H} = (1-\tau) w_H \overline{H}$, and since the equilibrium relative wage is $w_H/w_L = \sqrt{\kappa/(1-\tau^2)}$, disposable income of a representative low-skilled individual can be rewritten as $y_L = w_L l_L + \tau (w_L)^2 / (1+\tau)$. Inserting equilibrium values for wages and labor supply of the low skilled then yields utility of a representative low-skilled individual V_L as a function of the redistributive tax rate τ: $V_L = \alpha^\alpha (1-\alpha)^{1-\alpha} \left(\left(1-\tau^2\right)/\kappa\right)^{\frac{1-\alpha}{2}} (1+2\tau)/(1+\tau)$. From the perspective of the low skilled, the optimal tax rate is thus the tax rate τ which satisfies the following non-linear equation: $(1-\tau) - \tau(1-\alpha)(1+2\tau) = 0$ which does not contain factor proportions κ, but the partial elasticity α of output with respect to input.[9] The implicit function theorem implies $\tau = f(\alpha)$ with $\tau' = \tau(1+2\tau)/(1+(1+4\tau)(1-\alpha)) > 0$.[10] ■

Hence, considering welfare of the low skilled alone, the "optimal" redistributive tax rate increases in the elasticity α of output with respect to input. However, note that, even though the tax rate is positive throughout the relevant parameter range (that is $0 < \alpha < 0.5$), the low skilled will not expropriate the high skilled. This is because the low skilled face a trade off when redistributing income in their favor: while a higher tax rate ceteris paribus raises

[9] With solution $\tau = (1/(4-4\alpha))\left(\alpha + \left(12 - 12\alpha + \alpha^2\right)^{1/2} - 2\right)$ and the other root economically irrelevant.

[10] The negative tax rate τ_L implicit in the per capita transfers can be obtained by setting $\widetilde{w}_L \widetilde{l}_L = (\widetilde{w}_L)^2 (1-\tau_L) = w_L l_L + v$ with $\widetilde{w}_L = \alpha^\alpha (1-\alpha)^{1-\alpha} \times \kappa^{-(1-\alpha)/2} \left((1-\tau_H)/(1-\tau_L)\right)^{(1-\alpha)/2}$ and $\widetilde{l}_L = \widetilde{w}_L (1-\tau_L)$ wages resp. labor supply with a negative income tax τ_L applied on low-skilled wages and a positive tax rate of τ_H on high-skilled wages. Assuming that $\tau_H = \tau$ as given by the non-linear equation in the proof yields a negative income tax of $\tau_L = -0.17736$, if, for example, $\alpha = 0.4$.

transfers, the resulting adverse effect on labor supply of the high skilled tends to depress wages of the low skilled. Since both inputs are only substitutable within limits, the decline in high-skilled labor lowers the marginal productivity (and thus wages) of the low-skilled for any given level of low-skilled employment. The optimal tax rate exactly balances these two effects $|\partial w_L/\partial\tau| = w_L/(1+\tau)(1+2\tau)$. Therefore, wages of the high skilled net of taxes are definitely positive. In fact, in terms of the skill-intensive good, high-skilled (low-skilled) wages increase (decrease) in the tax rate so that the wage differential actually increases with redistributive taxation, i.e. $\partial(w_H/w_L)/\partial\tau = \left(\tau/(1-\tau)^2\right)\sqrt{\kappa/(1-\tau^2)} > 0$. The latter result is due to the fact that the low-to-high skilled labor ratio supplied to the market is an increasing function of the tax rate, and thus larger than without redistribution, and is in any case larger than unity, given that the low skilled are in the majority.[11,12]

Finally, tax revenues are non-linear in the redistributive tax rate: at low rates, government revenues increase; however, once the tax rate has surpassed a threshold level, they decline, thus being hump-shaped, as is the well known Laffer curve. Note, though, that the "optimal" tax rate is lower than the revenue-maximizing tax rate. The former falls short of the latter because the low-skilled majority will take the (detrimental) effect of a high tax rate on wages of the low-skilled into account when trying to maximize their disposable income.

When the low skilled implement the tax rate which maximizes their disposable income, the

[11] With $\kappa^{eff} \equiv l_L\kappa/l_H$ denoting relative factor supplies, we obtain after inserting optimal labor supplies $\kappa^{eff} = \sqrt{\kappa/(1-\tau^2)} > 1$ for all $\kappa > 1$ and $\partial\kappa^{eff}/\partial\tau > 0$.

[12] Notably, the labor force remains predominantly low skilled, despite of redistribution negatively affecting labor supply of both skill groups: According to (10) $l_L\kappa/l_H > 1$ is equivalent to $\kappa > \left(1-\tau^2\right)$ which holds true for all $\kappa > 1$ and $0 < \tau < 1$. By the same reasoning, wages of the high skilled before tax are higher than those of the low skilled (i.e. w_L). Moreover, majoritarian redistribution along these lines proves to be income-scale preserving: wages of the high skilled remain higher also net of income taxes, that is $w_H(1-\tau) > w_L$: Substitution of w_H by $w_L\sqrt{\kappa/(1-\tau^2)}$ yields $\kappa > \left(1-\tau^2\right)/(1-\tau)^2$ which holds true for all $\kappa > 1$ and $0 < \tau < 1$. The same condition applies to disposable income being higher for the high skilled than for the low skilled.

budget-to-GNP ratio (B/Y) prior to integration attains exactly half the tax rate: inserting equilibrium values of factor supplies and wages into $B/Y = \tau w_H l_H \overline{H} / \left(w_L l_L \overline{L} + w_H l_H \overline{H} \right)$ yields $B/Y = \tau/2$. If, for example, $\alpha = 0.4$, the utility maximizing tax rate is $\tau = 0.46372$, and the resulting redistributive budget reaches 23.186 percent of GNP.

3 The impact of trade integration (per se)

In order to examine the impact of trade integration, we introduce a second country which differs from Home in two respects. Both of them serve to capture the impact of low-cost competition proper. First, we will assume that Foreign is comparatively abundant in low-skilled labor (in terms of head counts). Denoting Foreign variables and parameters with an asterisk, the latter assumption implies that $\kappa^* > \kappa$. For matters of analytical convenience, and without loss of generality, we will furthermore assume that Foreign hosts the same amount of high-skilled individuals but a larger amount of low-skilled individuals. Since in a North-South framework along Heckscher-Ohlin lines it is primarily factor proportions that matter, we can thereby reduce dimensionality and present, for instance, results in two-dimensional graphs. Notwithstanding these differences, we will continue to assume that individual labor supply depends on earnings, and is subject to the same utility function (1) in Foreign as in Home. Second, we will assume that Foreign does not impose a redistribution scheme similar to the one in Home. Rather, in Foreign, (disposable) incomes are purely determined by market forces. This assumption follows from the general concern that national welfare schemes are threatened by competition from abroad (in particular by countries with less redistribution).

Hence, effective factor supplies in Home and in Foreign will differ for two reasons, namely (i) differences in the number of high- and low-skilled individuals and (ii) differences in in-

dividual labor supply as there is no tax-cum-transfer scheme in Foreign. Variables referring to trade integration will be denoted by the superscript ie, with those of Foreign continuing to be distinguished from those of Home by adding an asterisk. Consequently, effective factor proportions in Foreign are $\left(\kappa^{eff,*}\right)^{ie} = \left(l_L^{ie}\right)^* \overline{L}^* / \left(l_H^{ie}\right)^* \overline{H} = \left(l_L^{ie}\right)^* \kappa^* / \left(l_H^{ie}\right)^*$ while those in Home are $\left(\kappa^{eff}\right)^{ie} = l_L^{ie}\overline{L}/l_H^{ie}\overline{H} = l_L^{ie}\kappa/l_H^{ie}$ with $\left(l_L^{ie}\right)^* = w_L^{ie}$ and $\left(l_H^{ie}\right)^* = w_H^{ie}$ versus $l_L^{ie} = w_L^{ie}((2-\tau)\kappa - \tau(1-\tau)(\kappa+\kappa^*))/\left(2-\tau^2\right)\kappa$ and $l_H^{ie} = (1-\tau)w_H^{ie}$ respectively. In trading equilibrium, wages are thus a function of national tax policy as well as factor proportions κ, κ^*, and technology parameter α

$$\begin{aligned} w_H^{ie} &= \alpha^\alpha (1-\alpha)^{1-\alpha} \left(\frac{\kappa+\kappa^*}{2-\tau^2}\right)^{\frac{\alpha}{2}} \\ w_L^{ie} &= \alpha^\alpha (1-\alpha)^{1-\alpha} \left(\frac{2-\tau^2}{\kappa+\kappa^*}\right)^{\frac{1-\alpha}{2}} \end{aligned} \tag{12}$$

The corresponding terms of trade are determined by world supply and demand of high- and low-skilled labor and technology parameter α, i.e. $p^{ie} = \left(\left(l_H^{ie}\overline{H} + \left(l_H^{ie}\right)^* \overline{H}^*\right)\right)^{1-2\alpha} / \left(l_L^{ie}\overline{L} + \left(l_L^{ie}\right)^* \overline{L}^*\right)^{1-2\alpha}$. Inserting equilibrium values of labor supply yields

$$p^{ie} = \left(\frac{2-\tau^2}{\kappa+\kappa^*}\right)^{\frac{1-2\alpha}{2}} \tag{13}$$

Hence, the relative price of the low-skill intensive good x_2 in terms of x_1 is driven by the tax rate and the abundance in terms of low-skilled labor, as was the case before integration. However, and most importantly, for $\kappa^* > \kappa/\left(1-\tau^2\right)$, the relative price decreases as compared to the pre-integration situation, and increases otherwise. Moreover, with trade integration, the relative price proves less sensitive to an increase in the tax rate since $\left|\partial p^{ie}/\partial\tau\right| < |\partial p/\partial\tau|$. While the latter property will become crucial with respect to the "optimal" redistribution

from the perspective of the low skilled, the former is important when it comes to the impact of trade integration, given the tax rate pre-integration.

Thus, before examining the implications of the change in incentives faced by the low skilled, an exploration of the impact of trade integration per se on the redistributive budget seems worthwhile.

Proposition 2 *With tax rates unchanged, the redistributive budget increases relative to GNP for all* $\kappa < \kappa^c|_\tau$ *and decreases otherwise, with the critical factor proportions* κ^c *determined by the identity of (i) individual pre- and post-integration labor supplies and (ii) factor proportions effectively supplied to the market in Home and in Foreign. However, the pivotal ratio of low to high skilled people within the population in Home* $(\kappa^c|_\tau)$ *is strictly smaller than the ratio in Foreign* (κ^*).

Proof. Recall that the budget-to-GNP ratio after trade integration $(B/Y)^{ie}$ depends on factor supplies in trading equilibrium which in turn depend on wages (i.e. $(B/Y)^{ie} = \tau w_H^{ie} l_H^{ie} \overline{H} / \left(w_L^{ie} l_L^{ie} \overline{L} + w_H^{ie} l_H^{ie} \overline{H} \right)$). Substitution of (12) into $(B/Y)^{ie}$ thus yields $(B/Y)^{ie}\Big|_\tau = \left(1 / \left((1-\tau)^2 (\kappa + \kappa^*) + \left(2 - \tau^2 \right) \kappa \right) \right) \tau (1-\tau) (\kappa + \kappa^*)$ for the budget-to-GNP ratio after trade integration as compared to before with $B/Y = \tau/2$. The impact of trade on the budget-to-GNP ratio, that is $\Delta (B/Y) = (B/Y)^{ie}\Big|_\tau - B/Y$, decreases in the skill-ratio differential (κ/κ^*) as $\partial \left(\Delta (B/Y) \right) / \partial (\kappa/\kappa^*) = - \left(1 / \left((1-\tau)^2 + (3 - 2\tau) (\kappa/\kappa^*) \right) \right) \tau (1-\tau)^2 (2-\tau) < 0$ and with $\Delta (B/Y) = 0$ at $\kappa/\kappa^* = \left(1 - \tau^2 \right)$ or $\kappa^c = \left(1 - \tau^2 \right) \kappa^*$ for given κ^*. Hence, $\Delta (B/Y) > 0$ for $\kappa < \kappa^c|_\tau$ and $\Delta (B/Y) < 0$ otherwise. Moreover, inserting $\kappa^* = \kappa / \left(1 - \tau^2 \right)$ (i.e. the relationship between κ and κ^* for which $\Delta (B/Y) = 0$ holds) into l_H^{ie} resp. l_L^{ie} yields l_H resp. l_L according to (10). By analogy, substitution of κ^* by $\kappa / \left(1 - \tau^2 \right)$ yields effective relative labor supplies $\left(\kappa^{eff} \right)^{ie} = \left(\kappa^{eff,*} \right)^{ie} = \kappa / \left(1 - \tau^2 \right)$ in both countries. Notably, $\kappa^c < \kappa^*$,

independent of α: take the impact on the redistributive budget-to-GNP ratio $\Delta(B/Y)$ and insert the equilibrium redistributive tax rate from Section 2. Setting $\Delta(B/Y) = 0$ and solving for (κ^c/κ^*) shows that $(\kappa^c/\kappa^*) < 1$ for all α within the economically relevant parameter range of $0 < \alpha < 0.5$ since $\Delta(B/Y) = 0$ requires $0 < (1-\alpha)$. ■

Hence, the budget increases relative to GNP if countries are sufficiently different in terms of the skill differential, that is if $\kappa/\kappa^* < \left(1-\tau^2\right)$, and decreases otherwise. Notably, the pivotal factor differential in the population is in any case smaller than unity since $\kappa/\kappa^* < \left(1-\tau^2\right) < 1$. Drawing again on the example of $\kappa^* = 2$ and $\alpha = 0.4$ and thus a pre-integration tax rate of $\tau = 0.46372$, κ must be smaller than $\kappa^c = 1.5699$ for the budget to increase relative to gross national product and larger otherwise. Hence, the impact of trade integration on the budget-to-GNP ratio changes sign before the composition of the population in Home replicates that in Foreign.

At any rate, the impact of trade integration per se is ambiguous, and depends on the relative number of low- and high-skilled individuals in the population. Notably, the critical proportion κ^c for which the sign of the impact on the budget changes is the low-to-high-skilled-labor ratio for which the relative price remains unchanged, that is $p^{ie} = p$ at the redistributive tax rate pre-integration, or $\left(\left(2-\tau^2\right)/\left(\kappa+\kappa^*\right)\right)^{(1-2\alpha)/2} = \left(\left(1-\tau^2\right)/\kappa\right)^{(1-2\alpha)/2}$ for that matter. Solving the condition for the absence of terms-of-trade effects for κ yields $\kappa = \left(1-\tau^2\right)\kappa^*$ which is identical to the condition for the budget-to-GNP ratio to remain unaffected by trade integration, and which in the example of $\kappa^* = 2$ and $\alpha = 0.4$ implies $\kappa^c = 1.5699$.

Using the parameter values $\kappa^* = 2$ and $\alpha = 0.4$, Figure 1 depicts the consequences of trade integration per se, with the topmost panel showing the impact on the budget-to-GNP

ratio and the two center panels presenting the individual factor supplies in Home before and after trade integration. Finally, the lower panel summarizes the impact on differential factor endowments effectively supplied to the market in Home as compared to Foreign. For $\kappa^s|_\tau, \kappa^c|_\tau < 1.5699$ Home is, in effect, relatively skill-abundant, while for $\kappa^s|_\tau, \kappa^c|_\tau > 1.5699$ it is, in effect, relatively low-skill abundant, despite of the majority of individuals being low-skilled in Home and despite of relative factor supplies of low- and high-skilled labor being larger than unity, and most importantly, despite of Foreign hosting relatively more low-skilled individuals. The reversal in skill-abundance implies that Home re-specializes: to the left of $\kappa^s|_\tau, \kappa^c|_\tau = 1.5699$ it specializes in skill-intensive production, to the right in low-skill intensive production. At $\kappa^s|_\tau, \kappa^c|_\tau = 1.5699$, Stolper-Samuelson effects and induced effects of taxation just cancel out.[13] Hence, the fact that Foreign lacks welfare arrangements similar to those in Home is not sufficient for the welfare state to shrink in Home.

However, the sensitivity of the relative price of the low-skill intensive good with respect to the tax rate changes, and so do incentives for the low skilled as regards the "optimal" tax rate. The latter implies that budget-to-GNP ratios after trade integration tend to be larger, though the budget-to-GNP ratio may be either smaller or larger as compared to before (trade integration). Yet, in this case it depends on technology parameter α whether the property $\kappa^c < \kappa^*$ is preserved, i.e. whether the reversal of the impact on the budget-to-GNP ratio occurs to the left or to the right of κ^*.

[13] Differences as regards redistribution generate trade though, as is the case for $\kappa = \kappa^*$.

4 Redistributive tax policy with trade integration

Proposition 3 *As economies open up, the optimal redistributive tax rate τ from the perspective of the low-skilled majority tends to increase, albeit not throughout the economically relevant parameter range.*

Proof. With trade integration and under consideration of optimal adjustment in labor supplies, the indirect utility function of the low skilled is $V_L^{ie} = w_L^{ie} + w_L^{ie}\tau\left(1-\tau\right)\left(\kappa+\kappa^*\right)/\left(2-\tau^2\right)\kappa$, with the welfare maximizing tax rate given by the following non-linear equation $(1-\alpha)\,\tau^{ie}\left(2-\left(\tau^{ie}\right)^2\right)\kappa/\kappa^* = \left(2-4\tau^{ie}+\left(\tau^{ie}\right)^2-(1-\alpha)\left(\tau^{ie}\right)^2\left(1-\tau^{ie}\right)\right)(1+(\kappa/\kappa^*))$ which, within the economically relevant parameter range of $0<\alpha<0.5$, $0<\tau^{ie}<1$ defines a unique relationship between τ^{ie} and the factor proportions differential κ/κ^*. Solving the first order condition for the tax rate in trading equilibrium for κ/κ^* and inserting the rate before trade integration yields the combinations of κ/κ^* and α for which chosen tax rates are the same before and after integration. All combinations $(\kappa/\kappa^*,\alpha)$ below this iso-tax curve yield $\tau^{ie}>\tau$, all combinations above result in $\tau^{ie}<\tau$. Figure 2 shows that, for $\kappa<\kappa^*$, there are only few parameter combinations $(\kappa/\kappa^*,\alpha)$ for which the tax rate either remains constant or decreases. By comparison, the shaded area underneath the $\kappa/\kappa^*=1$ line summarizes all combinations for which tax rates increase, given $\kappa<\kappa^*$.[14] ■

E.g. for $\alpha=0.4$ and $\kappa^*=2$, the κ which yields an equivalent tax rate to the situation before integration is $\kappa=2.8294$. However, in this case, $\kappa>\kappa^*$. For parameter values $\kappa<\kappa^*$, the range of values α for which tax rates are lower with as compared to without

[14] For $\kappa>\kappa^*$, the elasticity of output with respect to low-skilled employment in the skill-intensive industry α must be sufficiently large for a decrease to obtain, with α larger the more similar the economies are in terms of the skill ratio of their population. Recall in this context that redistributive tax rates before integration increased in α.

trade integration is comparatively small with $0.45999 < \alpha < 0.5$, in addition countries must be sufficiently similar as regards the skill composition of their population. In the case of $\kappa = 1.5699$, for instance, α must be in the range of $0.495 < \alpha < 0.5$ for tax rates to decrease.

Why is the "optimal" tax rate likely to be larger after integration as compared to before, despite of the competition from abroad, in particular in those situations which are the most relevant with respect to low-cost competition from abroad, that is in which $\kappa < \kappa^*$ holds? The increase is due to an externality of national tax policy in the international context.[15] With endogenous terms of trade, part of the burden of redistributive taxation is exported. It is shifted onto low-skilled labor abroad, which suffers from a decline in earnings. With tax rates higher, disposable income of high-skilled individuals residing in Home is lower, thus implying an increase in the low-to-high skilled labor ratio; in Foreign, the opposite takes place: with Home's skill supply smaller, world supply of high-skilled labor is ceteris paribus smaller as well, and earnings of the high skilled in Foreign are augmented, while earnings of the low skilled in Foreign are depressed.

Hence, Home's effective factor-proportions-curve shifts upwards while the one of Foreign shifts downwards. Both shifts imply a decline in the threshold factor differential for which Home re-specializes:[16] for κ smaller than $\kappa^s|_{\tau^{ie}}$, Home specializes in skill intensive production while for κ larger than $\kappa^s|_{\tau^{ie}}$, Home specializes in low-skill intensive production; however, with $\kappa^s|_{\tau^{ie}}$ declining as the low-skilled majority in Home raises redistributive taxes.[17]

[15] Recall that the adverse relative price effect of tax policy is attenuated in the integrated economy.

[16] Interestingly, the factor-proportion differential for which effective factor proportions in Home are the same as those in Foreign is invariant with respect to the tax adjustment, that is $\left(\kappa^{eff}\right)^{ie} = \left(\kappa^{eff,*}\right)^{ie}$ remains constant at $\sqrt{2}$: calculate the κ for which $\left(\kappa^{eff}\right)^{ie} \equiv \kappa l_L^{ie}/l_H^{ie} = \kappa \left(l_L^{ie}\right)^* / \left(l_H^{ie}\right)^* \equiv \left(\kappa^{eff,*}\right)^{ie}$ holds, and insert the resulting expression, i.e. $\kappa^s = 2(\tau - 1)(\tau - 2)(\tau + 2)/(2 - \tau)$, into either $\left(\kappa^{eff}\right)^{ie}$ or $\left(\kappa^{eff,*}\right)^{ie}$, thus obtaining $\left(\kappa^{eff,*}\right)^{ie} = \sqrt{2}$, if $\kappa^* = 2$.

[17] That is $\partial\kappa^s/\partial\tau^{ie} = -2\left(2\tau^{ie} + 1\right) < 0$.

Even though incentives with respect to the "optimal" tax rate do change and for many parameters imply an increase in the tax rate, the result that the impact on the budget-to-GNP ratio is ambiguous nevertheless remains valid. The ambiguity holds even in those situations in which the tax rate increases, though some qualifications have to be added.

Proposition 4 *The budget-to-GNP ratio increases for all* $\kappa < \kappa^c|_{\tau^{ie}}$ *and decreases otherwise, even if the optimal tax rate is larger in the closed as compared to the open economy. However, integration entails the possibility of* $\kappa^c|_{\tau^{ie}} > \kappa^c|_{\tau}$ *and* $\kappa^c|_{\tau^{ie}} > 1$.

Proof. Solving the budget-impact curve $\Delta(B/Y) = (B/Y)^{ie}\Big|_{\tau^{ie}} - (B/Y)|_{\tau}$ for κ/κ^* and setting $\kappa/\kappa^* < 1$ yields all combinations of α and τ^{ie} which are compatible with the budget-to-GNP ratio remaining constant (and for which $\kappa/\kappa^* < 1$ holds). The resulting inequality implies that for any given tax rate, α must be sufficiently large for $\Delta(B/Y) = 0$ to obtain.[18] Solving, secondly, the first order condition for the optimal tax rate in the open economy for κ/κ^* and setting $\kappa/\kappa^* < 1$ yields all combinations of α and τ^{ie} which are compatible with the first order condition while at the same time $\kappa/\kappa^* < 1$. The latter implies an upper bound on α while the former implies a lower bound on α for $\Delta(B/Y) = 0$ to hold, however, and most importantly, with the set thus defined by both curves non-empty as is shown in the left hand panel of Figure 3 (the grey shaded set $\left(\alpha, \tau^{ie}\right)$). A comparison of points within the set with the corresponding values (α, τ) of the first order condition before integration shows that the effect on the budget-to-GNP ratio is ambiguous, even if tax rates may increase. However, since with trade integration, $\partial(B/Y)/\partial\tau < 0$ for $\tau^B > \left(3(\kappa/\kappa^*) - \sqrt{(\kappa/\kappa^*) + 3(\kappa/\kappa^*)^2} + 1\right)/(2(\kappa/\kappa^*) + 1)$ and $\partial(B/Y)/\partial\tau > 0$ otherwise, with $\tau^{ie} \lesseqgtr \tau^B$, depending on parameter values κ/κ^* and α, the impact curve

[18] Or equivalently, for a given α, tax rates must be sufficiently small.

$\Delta(B/Y)$ may be shifted upwards, in which case the κ^c for which $\Delta(B/Y) = 0$ holds shifts upwards, too. The upward shift implies that the result with tax rates before integration, namely that κ^c/κ^* is strictly smaller than unity for all $\kappa < \kappa^*$, is not preserved. ■

The thin upward sloping curve in the left hand panel of Figure 3 shows the optimal tax rate for any given pre-integration α, the dotted curve the corresponding tax rates in trading equilibrium, assuming in any case that $\kappa/\kappa^* = 1$. For κ/κ^* smaller, tax rates are even larger in trading equilibrium, that is to the right of the dotted curve. The thick line summarizes all combinations of α, τ^{ie} for which the budget-to-GNP ratio remains unaffected, despite of the tax adjustment, and assuming again that $\kappa/\kappa^* = 1$. For κ/κ^* smaller, tax rates must be lower for the relative size of redistributive government invariant to integration. The grey shaded area pools all combinations for which the budget-to-GNP ratio is constant within the parameter range of $0 < \kappa/\kappa^* < 1$. Hence, the effect on the ratio is ambiguous, and depends on parameter values α and κ/κ^*. A comparison of points D (before) and E (after) shows that the ambiguity obtains, even though tax rates may (and for many values of α indeed do) increase. The right hand panel provides a parameterization of both curves, the zero-budget impact curve as well as the first order condition post-integration for various values of α and κ/κ^*. Intersections of both curves identify points of zero-budget impact which are compatible with trading equilibrium and which constitute a welfare-maximum from the perspective of the low skilled. For α low, the budget effect changes sign at $\kappa/\kappa^* < 1$ while for α large the reversal occurs at $\kappa/\kappa^* > 1$.

Drawing again on the example of $\kappa^* = 2$, $\alpha = 0.4$, the upper panel of Figure 4 depicts the consequences of trade integration on the budget-to-GNP ratio with and without tax adjustment, with the adjusted tax rate larger due to the adverse impact on the relative price

being attenuated. Yet, the increase in the tax rate is not sufficient for the budget-to-GNP ratio to increase upon integration. In addition, countries must be sufficiently diverse in terms of skill differentials. Otherwise, the budget-to-GNP ratio decreases, even if tax rates increase. However, in the example of $\kappa^* = 2$, $\alpha = 0.4$, the pivotal κ^c for which there is a reversal in the sign of the budget-impact increases (from point B (before) to point A (after)). The lower panel demonstrates the consequences of the resulting tax increase on relative labor supplies in Home and in Foreign, and with equality of effective factor proportions in Home and in Foreign remaining at $\left(\kappa^{eff}\right)^{ie} = \left(\kappa^{eff,*}\right)^{ie} = \sqrt{2}$. The skill ratio κ^s for which Home becomes relatively low-skill abundant (and thus re-specializes towards low-skill intensive production despite of $\kappa < \kappa^*$) decreases though (from point B (before) to point A (after)).

5 Conclusions

Competition is usually considered as endangering social policy and redistribution in particular as it is presumed to be associated with a race-to-the-bottom. While most of the theoretical research seems to support this notion, empirical studies on the subject seem to be inconclusive as regards the consequences, pointing at a variety of outcomes. However, the common characteristic of most of the theoretical studies forecasting an erosion of the welfare state is that they are normative in perspective. This paper, by contrast, adopts a positive, political-economy, perspective on redistribution and the welfare state. What then, does the process of internationalization of the economy forebode with respect to redistribution? The paper shows that with majoritarian redistribution, the effect of international competition on the redistributive budget-to-GNP ratio is ambiguous. Even the fact that Foreign's competitiveness is primarily based on cheap, low-skilled labor and the lack of a welfare state is

not a sufficient condition for determining the sign of the budget-to-GNP effect. With tax rates obtained before integration, the budget-to-GNP ratio increases if skill ratios within the population are sufficiently different. Otherwise the ratio decreases but the reversal of the sign is in any case within the parameter range of Foreign's population being relatively low-skill abundant as compared to Home's. However, if in the majority, Home's low-skilled may face an incentive to *in*crease rather than decrease redistributive tax rates, despite low-skilled competition from abroad. Notably, this incentive is not merely the result of the majority trying to cushion themselves from adverse Stolper-Samuelson effects and to implement countervailing measures as regards the widening of the income distribution. Rather, endogeneity of labor supply may allow to export part of the burden of taxation, which then is borne by the low skilled abroad. Notwithstanding this incentive, the budget-to-GNP ratio may decline – if the skill composition of the population is sufficiently similar and/or the partial elasticity of output in the low skill-intensive industry with respect to skilled input is sufficiently low. The analysis lends itself to a number of extensions, such as for instance, a comparison of redistribution schemes driven by inequality aversion rather than welfare maximization of the majority, including a comparison of dead weight losses before and after.

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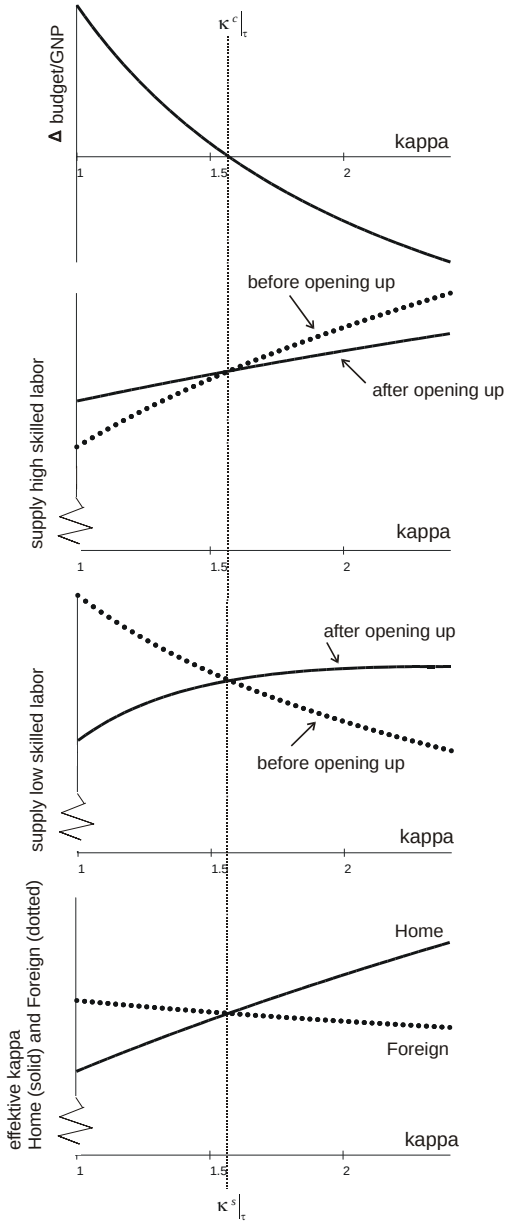


Figure 1: Impact of trade integration on labor supply and the budget-to-GNP ratio

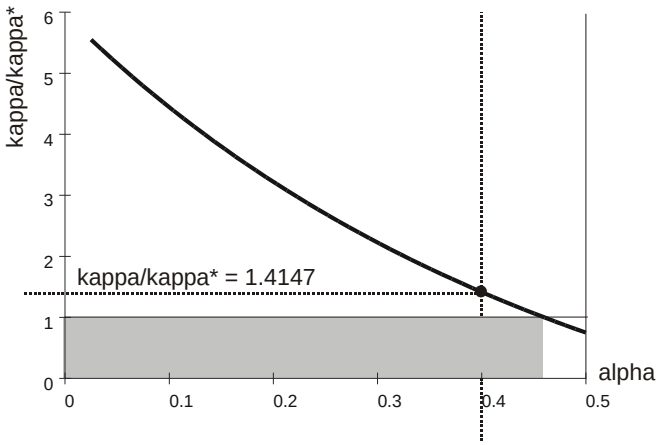


Figure 2: Curve of iso-tax rates in κ/κ^*-α space

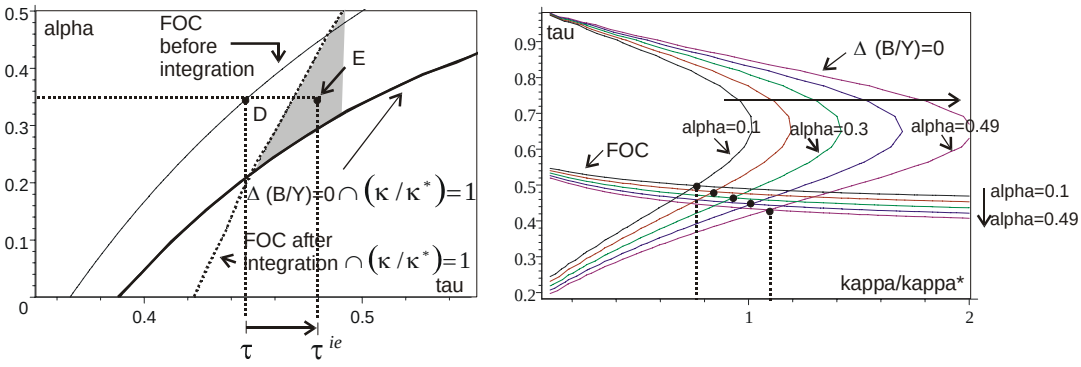
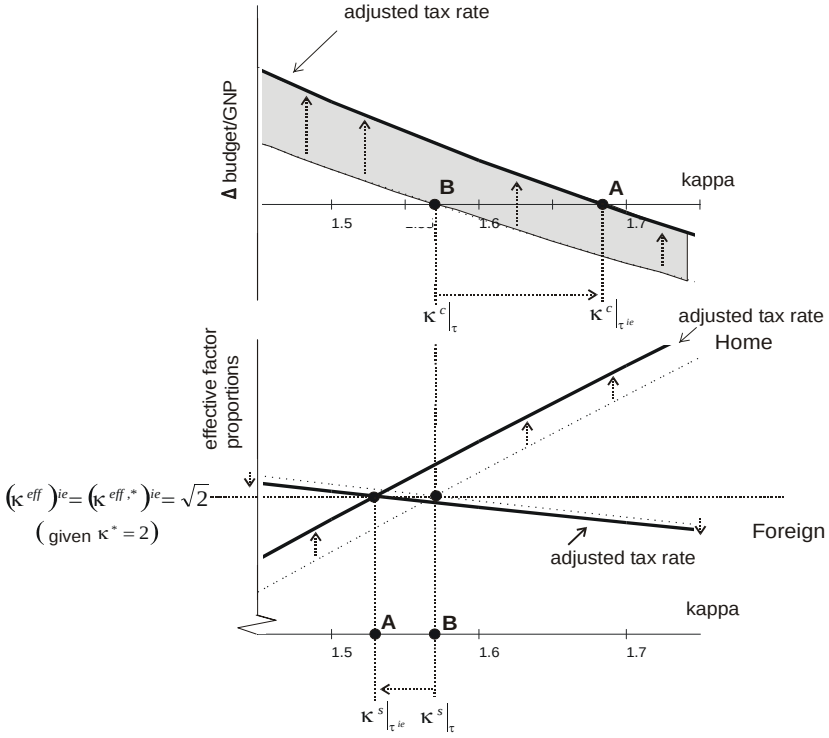


Figure 3: Impact of tax adjustment on budget-to-GNP ratio with trade integration as a function of the partial elasticity α



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