STUDIENZENTRUM GERZENSEE
STIFTUNG DER SCHWEIZERISCHEN NATIONALBANK

Deregulation and the Current Account

Philipp Harms

Working Paper 02.07 Update

Deregulation and the Current Account

Philipp Harms
Study Center Gerzensee and University of Konstanz.*

January 2004

Abstract

We use a dynamic general-equilibrium model to study how removing barriers to competition in the nontraded goods sector affects the current account of a small open economy. We show that the expansion of the nontraded sector that results from such a "deregulation shock" is associated with an accumulation of foreign assets unless the production of nontraded goods is very capital-intensive. We then investigate whether a measure of domestic deregulation does, in fact, help to explain countries' current account balances in recent decades, and find some empirical support for the model's predictions.

JEL Classification: F41, D43, F32.
Keywords: International macroeconomics, nontraded goods, current account, deregulation, imperfect competition.

*Address: Study Center Gerzensee, P.O. Box 21, CH-3115 Gerzensee, Switzerland. Phone: +41 (0)31 780 3108. E-mail: philipp.harms@szgerzensee.ch. This paper has benefited from useful comments by Philippe Bacchetta, Huw Dixon, Matthias Lutz, Jürgen Meckl, Stefan Zink, Klaus Wälde, as well as seminar participants at Konstanz, Lausanne, St. Gallen, the PWIW workshop in Passau, the DEGIT 2002 conference in Cologne, and the EEA 2002 conference in Venice. Of course, I alone am responsible for all remaining errors.

1 Introduction

During the 1990s, industrialized countries made considerable progress in liberalizing and deregulating their economies: while the Uruguay round of the GATT resulted in a substantial abolition of barriers to international trade, many governments also reduced the extent of state intervention and barriers to competition in domestic goods and labor markets. In fact, as reported in a recent study by Nicoletti and Scarpetta (2003:33), "...regulatory reform has been deepest in non-manufacturing where, due to strong economies of scale and pervasive market failures, markets were most restricted by regulations concerning entry, prices and supply. Due to the scarce exposure to trade of these markets, domestic regulatory reform was the main policy tool for stepping up competitive pressures where competition was deemed viable." While this statement certainly applies to the "typical" OECD economy, a closer look at the data reveals considerable differences between individual countries' deregulation efforts in the recent past. This is illustrated by Figure 1, which depicts the evolution of the Fraser Institute's index of the "regulation of credit, labor and business" over the past three decades.[1] The figure shows that, between 1970 and 2000, the value of this index increased substantially for the average high-income OECD country. However, it also reveals that deregulation proceeded much more rapidly in the United Kingdom or the Netherlands than, e.g., in Germany or Italy.[2]

The central claim of this paper is that these developments had an impact on countries' recent current account balances, and that regulatory reform should be taken serious as a force that affects countries' current accounts in the medium run. We think that adding policy-induced changes of market structure to other medium-run determinants of the current account such as fiscal policy, growth and demographic structure is important for at least two reasons: first, it contributes to a clearer understanding of countries' current account balances and the resulting changes of net foreign asset positions, and thus makes it easier to judge the "sustainability" of observed current account deficits. Second, it helps to assess the compatibility of regulatory reform with other policy goals such as "external

[1] The index is published every five years as part of the Fraser Institute's more comprehensive *index of economic freedom* (see Gwartney and Lawson (2002)). It ranges from zero to ten – with a higher value reflecting a less regulated business environment – and captures those aspects of competition which are not related to international trade. Countries' "freedom to exchange with foreigners" is summarized by a separate index.

[2] While Nicoletti and Scarpetta (2003) survey regulatory reform and their impact on economic growth in several OECD countries, Card and Freeman (2002) offer a detailed account of deregulation in the United Kingdom.

balance" or a "stable exchange rate".[3]

To support our claim that deregulation – interpreted as an exogenous change of market structure in sectors whose prices are not determined by world markets – affects countries' current accounts, we first develop a dynamic general equilibrium model in which a perfectly competitive tradables sector coexists with a nontraded goods sector that is initially characterized by monopolistic competition and restricted market entry. Monopoly power drives a wedge between prices and marginal costs, and we analyze the short-run and long-run effects of removing entry barriers on sectoral employment, the real exchange rate, and the current account. Our theoretical analysis suggests that such a "deregulation shock" results in an expansion of the nontradable goods sector and a real depreciation. Moreover, it shows that the changing structure of production and consumption causes a current account surplus unless the nontradable goods sector is very capital intensive. This result is driven by the reallocation of capital and labor into the expanding nontradables sector, but also by consumers' reaction to the anticipated decline of the aggregate price level.

In the second part of the paper, we explore whether deregulation does, indeed, help to explain recent current account balances in high-income OECD countries. It turns out that our model's predictions get some support from the data: using the evolution of the Fraser Institute's deregulation index as a proxy for regulatory reform, we find that countries which implemented stronger deregulation *ceteris paribus* experienced greater current account surpluses (or lower current account deficits) in recent decades.

Our analysis is related to several strands of literature: like Blanchard and Giavazzi (2003) and Ebell and Haefke (2002) we analyze the macroeconomic consequences of enhancing competition. However, unlike these contributions, we assume that labor markets are perfectly competitive, and focus on the open-economy implications of deregulation. Moreover, our framework inherits elements from dynamic "dependent economy" models that focus on the interaction between perfectly competitive traded and nontraded goods sectors.[4] It also benefits from earlier contributions that analyzed imperfectly competitive nontraded goods sectors in a static setting (see, e.g. Dixon (1994)). More recently, Coto-Martinez

[3]There is, for example, a wide-spread presumption that "...a vigorous investment-led recovery in Japan, fueled by deflation and deregulation [...] would probably turn Japan's chronic and deflationary current account surplus into a deficit that mirrored invigorating capital inflows" (Makin, 2001). Our goal is to analyze the theoretical and empirical basis of such a statement.

[4]See the fourth chapters in Obstfeld and Rogoff (1996) and in Turnovsky (1997) for excellent surveys.

(2002) and Coto-Martinez and Dixon (2003) have used dynamic general equilibrium models with imperfect competition to analyze the effects of government expenditure shocks in a small open economy. However, while Coto-Martinez (2002) considers the consequences of changing markups by assuming that aggregate demand elasticities are affected by fiscal policy, we focus on the case where these changes are due to regulatory reform. Finally, our empirical investigation in the second part of the paper closely follows the recent contribution by Chinn and Prasad (2003) who explore medium run determinants of countries' current account balances.[5] Compared to their study, the main innovation of our paper is to include regulatory reform as an additional regressor and to demonstrate that the effect of deregulation is positive and significant.

The rest of the paper is organized as follows: the next section introduces the basic elements of our model. Section 3 analyzes how changing the market structure in the nontraded goods sector affects the allocation of labor, the real exchange rate, and the current account. Section 4 is devoted to our empirical investigation. Section 5 summarizes and concludes. Proofs and a description of our data set are provided in the appendix.

2 The model

2.1 Households

We consider a small open economy that is populated by a continuum of households of total mass one who maximize their utility over an infinite time horizon. Lifetime utility of a household at time t is given by

$$U_t = \sum_{s=t}^{\infty} \delta^{s-t} \frac{C_s^{1-\sigma} - 1}{1-\sigma}. \tag{1}$$

In (1), δ is the household's subjective discount factor, $1/\sigma$ is the intertemporal elasticity of substitution, and C_s aggregates the consumption of a bundle of goods at time s. More specifically, we assume that

$$C_s = (C_s^T)^{\gamma}(C_s^N)^{1-\gamma}, \tag{2}$$

[5]Debelle and Faruquee (1996), Calderon et al. (1999), and Blanchard and Giavazzi (2002) offer related studies.

where C_s^T represents consumption of a single traded good at time s while C_s^N aggregates the consumption of a large (but fixed) number of nontraded goods:

$$C_s^N = \left[\int_0^1 c_s^N(z)^{1/\mu} \, dz \right]^\mu . \tag{3}$$

There are no barriers to international trade and the price of the tradable good is therefore determined by world markets. Using this good as the numeraire, we set its price equal to one at each point in time. With the price of the composite nontraded good in terms of tradables being denoted by P_s^N, we can thus write the consumption–based price index, which is the minimum amount of traded goods required to purchase a unit of the consumption bundle, as

$$P_s = \Gamma (P_s^N)^{1-\gamma}, \tag{4}$$

where $\Gamma \equiv (1/\gamma)^\gamma (1/(1-\gamma))^{1-\gamma}$. Since the foreign price level is assumed to remain constant, (4) also gives the real exchange rate, with a real appreciation (depreciation) generated by a rise (fall) in P.

It follows from (3) that

$$P_s^N = \left[\int_0^1 p_s^N(z)^{1/(1-\mu)} \, dz \right]^{1-\mu} , \tag{5}$$

where $p_s^N(z)$ denotes the price of a nontraded good at time s.

In every period, households inelastically supply one unit of labor, collect profits, and rent capital to firms in the tradable and the nontradable goods sectors. The traded good can be transformed into physical capital using a linear technology. Hence,

$$K_{s+1}^T = (1-\lambda) K_s^T + I_s^T, \tag{6}$$

$$K_{s+1}^N = (1-\lambda) K_s^N + I_s^N, \tag{7}$$

where K_s and I_s denote the stock of physical capital and investment at time s, and where the superscripts T and N refer to the traded and the nontraded goods sectors, respectively. For simplicity, the depreciation rate λ is assumed to be identical for both types of capital.

Models of small open economies with perfect access to international capital markets have the property that, after an unanticipated shock, the capital stock immediately jumps to its new steady state level. This feature is unattractive for two reasons: first, it downplays the technical frictions associated with the installation and dismantling of physical capital. Second, it makes investment implausibly volatile. Open economy business cycle models therefore use the assumption that variations in the capital stock are associated with convex adjustment costs. In this paper, we adopt an alternative, though closely related approach: we assume that sector-specific capital has to be put in place one period before it is used in production, and that the capital stock carried into a given period can be transformed back into traded goods only *after* it has been used for production in this period. Hence, capital is earmarked for the use in a particular sector one period in advance. Imposing such a "time-to-build / time-to-dismantle" constraint amounts to assuming infinite adjustment costs which prevent the sectoral capital stocks from jumping to their new steady state levels immediately after a shock has occurred. Like a convex adjustment cost function, this assumption gives rise to nondegenerate dynamics, but it allows for an analysis that does not rely on a linearized version of the model. This is important since, as we will show below, the new steady state allocation crucially depends on the transition path after a shock, and by linearizing the model one risks distorting both the short-run and the long-run behavior of endogenous variables.

Households have unrestricted access to world capital markets where they can purchase and sell real bonds that pay a constant net interest rate r. The economy's flow budget constraint in terms of traded goods thus looks as follows:

$$B_{s+1}-B_s = rB_s+w_sL_s^T+w_s(1-L_s^T)+R_s^TK_s^T+R_s^NK_s^N+\Pi_s^N-I_s^T-I_s^N-P_sC_s. \quad (8)$$

In (8), B_{s+1} denotes the amount of foreign assets purchased at the end of period s, and the change of this variable $(B_{s+1}-B_s)$ represents the current account balance in period s. L_s^T is the amount of labor employed in the traded good sector, w_s is the wage rate, and $P_sC_s = C_s^T + P_s^NC_s^N$ is the total value of consumption at time s. Since there are no impediments to intersectoral labor mobility, the same wage has to be paid by traded and nontraded goods firms. On the other hand, the capital stocks in the traded and the nontraded goods sectors are determined one period in advance, and the sector–specific rental rates of capital, R_s^T and R_s^N, may therefore differ temporarily if the economy is hit by an unanticipated shock. Finally, Π_s^N are (potentially positive) profits in the nontraded goods sector that accrue to households.

The households' optimal consumption path is characterized by the intertemporal Euler condition

$$\frac{C_{s+1}}{C_s} = \left[\delta(1+r)\frac{P_s}{P_{s+1}}\right]^{1/\sigma} \tag{9}$$

as well as the usual transversality conditions, and optimal investment at time s has to satisfy

$$R_{s+1}^T = R_{s+1}^N = r + \lambda. \tag{10}$$

Note, however, that (10) may be violated ex post if the economy is hit by a non-anticipated shock in period $s+1$ since, by assumption, it takes one period to increase or reduce sector-specific capital stocks.

The expression in (9) has a straightforward interpretation: at each point in time, the marginal rate of substitution between consumption in period s and consumption in period $s+1$ has to be equal to the consumption–based real interest rate which depends on the (constant) interest rate paid on bonds and on the evolution of the price level P. Using the standard assumption that $\delta(1+r) = 1$ and denoting total consumption expenditure by $E_s = P_s C_s$, we can rewrite (9) as

$$\frac{E_{s+1}}{E_s} = \left(\frac{P_s}{P_{s+1}}\right)^{\frac{1-\sigma}{\sigma}}. \tag{11}$$

.

It follows from (2) that, in each period, households allocate a constant fraction of total consumption expenditure to traded goods and nontraded goods, respectively, that is $C_s^T = \gamma E_s$ and $P_s^N C_s^N = (1-\gamma)E_s$.

2.2 Traded goods firms

The traded good is produced by identical firms whose technology is given by

$$Y_s^T = (K_s^T)^\alpha (L_s^T)^{1-\alpha}. \tag{12}$$

Obviously, the firms' optimal choice of capital and labor has to satisfy the following first order conditions:

$$R_s^T = \alpha \left(\frac{L_s^T}{K_s^T}\right)^{1-\alpha}, \tag{13}$$

$$w_s = (1-\alpha) \left(\frac{K_s^T}{L_s^T}\right)^{\alpha}. \tag{14}$$

2.3 Nontraded goods firms

All firms in the nontraded goods sector use the same technology, which is given by

$$Y_s^N(z) = (K_s^N(z))^\beta (L_s^N(z))^{1-\beta}. \tag{15}$$

In (15), $Y_s^N(z)$ denotes the output of firm z at time s, and $K_s^N(z)$ and $L_s^N(z)$ are the amounts of labor and capital employed by that firm.

If every nontraded good is supplied by one (monopolistic) firm, that firm charges the price

$$p_s^{N,re}(z) = \mu \psi_s^N, \tag{16}$$

where $\mu \geq 1$ is the firm's markup over marginal costs ψ_s^N, which follows from profit maximization given the aggregator in (3), and where the superscript *re* indicates that the nontraded goods sector is characterized by *restricted entry*. Marginal costs in the nontraded sector are given by

$$\psi_s^N = \left(\frac{R_s^N}{\beta}\right)^{\beta} \left(\frac{w_s}{1-\beta}\right)^{1-\beta}. \quad (17)$$

Note that, since firms can continuously adjust their factor demands, there are no fixed costs, and – for given factor prices – both marginal and average costs are constant.

If there is free entry of firms, competition results in every firm charging a price equal to marginal costs, i.e.

$$p_s^{N,fe}(z) = \psi_s^N, \quad (18)$$

where fe stands for *free entry.*[6] It follows from (5) that, in a symmetric equilibrium, $P_s^N = p_s^N(z)$, both in case of restricted and of free entry.

Equilibrium in the market for nontraded goods requires

$$\frac{(1-\gamma)E_s}{P_s^N} = (K_s^N)^{\beta}(L_s^N)^{1-\beta}. \quad (19)$$

Substituting this expression into (8) and taking into account that the output of nontradables equals the sum of factor rewards and profit income in this sector yields

$$B_{s+1} - B_s = rB_s + (K_s^T)^{\alpha}(L_s^T)^{1-\alpha} - I_s^T - I_s^N - \gamma E_s. \quad (20)$$

Hence, the evolution of foreign assets is determined by the difference between the economy's production and absorption of traded goods.

[6]Note that, while in the standard monopolistic competition framework profits are eliminated by the introduction of new goods, the number of nontraded goods is constant in our model. However, if entry barriers are removed, the market for each nontraded good becomes contestable, which prevents firms from charging a price above average costs.

3 The effects of deregulation

We will now consider the following scenario: through period 0, the nontraded sector is *regulated*, and every good is produced by a single firm. Further market entry is prevented by the government, and all profits accrue to households. In period 1, the government permanently *deregulates* the nontraded sector by permitting free entry of competing firms, thus removing incumbent firms' monopoly power. This step comes as a surprise, that is, agents have no possibility to adjust their behavior in preceding periods.

3.1 The steady state before and after deregulation

In period 0, the economy is still characterized by monopolistic competition in the nontraded goods sector, that is, $P_0^N = \mu\psi_0^N$. Using (10), (13), (14), (16), (17), and the fact that the sectoral capital stocks and the stock of foreign assets are constant in the steady state, (19) and (20) for period 0 can therefore be written as

$$(1-\gamma)E_0 = \mu\phi\nu(1-L_0^T), \tag{21}$$

$$\gamma E_0 + \Omega = rB_0 + \xi\nu L_0^T, \tag{22}$$

with $\phi \equiv \frac{1-\alpha}{1-\beta}$, $\nu \equiv \left(\frac{\alpha}{r+\lambda}\right)^{\alpha/(1-\alpha)}$, $\Omega \equiv \frac{\phi\lambda\beta\nu^{1/\alpha}}{\alpha}$, and $\xi \equiv \frac{(1-\beta)r+(1-\alpha)\lambda}{(1-\beta)(r+\lambda)}$.

These equations can be used to derive

$$L_0^T = \frac{\gamma\mu\phi + \frac{(1-\gamma)(\Omega - rB_0)}{\nu}}{(1-\gamma)\xi + \gamma\mu\phi}. \tag{23}$$

Note that steady state employment in the traded goods sector decreases in the level of foreign assets B_0. This is due to the fact that, while the capital–labor ratio in this sector is pinned down by the world interest rate, L_0^T is determined by the volume of traded goods output that is necessary to keep B_0 at a constant (steady state) level. Moreover, L_0^T is increasing in μ, that is, a high markup reduces demand for nontraded goods and thus employment in this sector.[7] To simplify the subsequent computations we set $B_0 = 0$.

To determine the new steady state allocation (denoted by the omission of time subscripts), we use the equilibrium conditions

$$(1-\gamma)E = \phi\nu(1-L^T), \tag{24}$$

$$\gamma E + \Omega = rB + \xi\nu L^T, \tag{25}$$

from which we can derive

$$L^T = \frac{\gamma\phi + (1-\gamma)\frac{(\Omega - rB)}{\nu}}{(1-\gamma)\xi + \gamma\phi}. \tag{26}$$

In (26), B represents the stock of assets (or debt) accumulated during the transition to the new steady state, which depends on the households' consumption and investment decisions after the shock. This indicates that the allocation in the new steady state cannot be determined without analyzing the transition path. Hence, to identify the long–run consequences of a deregulation shock, we have to consider the adjustment that is taking place in period 1.

3.2 The transition in period 1

In period 1, the capital stocks in both sectors are predetermined by their old steady state values (i.e. $K_1^T = K_0^T$ and $K_1^N = K_0^N$), while employment in the traded goods sector (L_1^T) possibly differs from its previous level. Hence, it follows from (10), (13), and (19) that

$$(1-\gamma)E_1 = \phi\nu\left(\frac{L_0^T}{L_1^T}\right)^\alpha (1-L_1^T). \tag{27}$$

[7] To show that this also holds for $B_0 < 0$, one has to take into account that, for a level of foreign debt to be sustainable, interest payments on debt must not exceed traded goods output less steady-state investment, i.e. $Y_0^T - \lambda(K_0^T + K_0^N) > -rB_0$. This implies $\xi\nu - \Omega > -rB_0$, which, in turn, is sufficient for L_0^T to increase in μ.

In both sectors, the adjustment of the capital stock takes place in period 1, and the economy reaches its new steady state in period 2. The period-1 market–clearing condition for traded goods is thus given by

$$B_2 = (K_0^T)^\alpha (L_1^T)^{1-\alpha} - [K^T - (1-\lambda)K_0^T] - [K^N - (1-\lambda)K_0^N] - \gamma E_1. \quad (28)$$

In (28), B_2 represents the foreign assets that are accumulated during the transition to the new steady state, i.e. the current account balance in period 1. Since no further adjustment takes place after period 2, we can write $B_2 = B$. Using this result and the constancy of the steady state capital-labor ratio we thus get

$$B = \nu (L_0^T)^\alpha (L_1^T)^{1-\alpha} - \nu^{1/\alpha}\zeta[L^T - (1-\lambda)L_0^T] - \Omega - \gamma E_1, \quad (29)$$

where $\zeta \equiv \frac{\alpha-\beta}{\alpha(1-\beta)}$. Note that ζ is positive (negative) if the traded goods sector uses capital more (less) intensively than the nontradables sector.

3.3 Results

3.3.1 Logarithmic utility

In this subsection, we focus on the special case that instantaneous utility is logarithmic. What simplifies the analysis in this case is the fact that, for $\sigma = 1$, equation (11) implies $E_1 = E$. That is, the value of consumption expenditures jumps to the new steady state immediately after the "deregulation shock" occurs. Together with (21), (22), (24), and (25), the expressions in (27) and (29) form a system of nonlinear equations that determine the endogenous variables E_0, L_0^T, L_1^T, L^T, E, and B. We will now analyze this system to derive the qualitative responses of the current account and of sector–specific employment to a deregulation shock. In a second step we will then consider the evolution of the real exchange rate.

Our first result refers to the current account reaction to the unanticipated deregulation. This reaction is driven by the reallocation of the labor force and by the households' investment and consumption responses, and we show that the sign of the current account balance in period 1 crucially depends on the relative capital intensities of the tradables and the nontradables sector:

Lemma 1 *If $\alpha \geq \beta$, that is, if the production of traded goods is at least as capital-intensive as the production of nontraded goods, the economy runs a current account surplus during the transition to the new steady state. Hence, $\alpha \geq \beta$ implies $B > 0$.*

Proof: See the Appendix.

Note that Lemma 1 provides a sufficient but not a necessary condition for a current account surplus. Hence, as long as the difference between α and β is not too large, it is possible that B is strictly positive although the nontraded goods sector is relatively capital intensive.

Before interpreting the contents of Lemma 1, we present a further result which clarifies how removing the markup affects the short– and long–run allocation of the labor force:

Lemma 2 $L^T < L_1^T < L_0^T$*: After deregulation, employment in the traded goods sector monotonically decreases to its new steady state level.*

Proof: See the Appendix.

The result in Lemma 2 does *not* depend on the two sectors' relative capital intensities: regardless of the sign of $(\alpha - \beta)$, deregulation triggers a reallocation of the labor force from the traded to the nontraded goods sector, and since for a constant world interest rate the steady state capital–labor ratios of the two sectors are not affected by deregulation, this also implies that the capital stock in the non–traded sector expands while it contracts in the tradables sector. The intuition behind this result is straightforward: deregulation lowers the price of nontraded goods, and to meet the resulting higher demand, production of nontradables has to expand, which requires a reallocation of factors towards this sector.

While this reallocation of factors is independent of preference and technology parameters, Lemma 1 shows that its effect on the current account crucially depends on the relative capital intensities in the two sectors, i.e. on the sign of $(\alpha - \beta)$. If $\alpha > \beta$, i.e. if the traded goods sector is relatively capital–intensive, the additional capital required in the expanding nontradables sector is provided by the contracting traded goods sector. Moreover, a portion of the capital that is no longer needed in traded goods production is sold abroad. In the long run, the contraction of employment in the traded goods sector is associated with a reduction of the capital stock and with lower traded goods output. However, interest payments received from abroad enable domestic households to consume more traded goods than the economy produces.

If α is much smaller than β, the expansion of the nontraded sector requires large investments, which are partly financed via the current account and are reflected by the accumulation of foreign debt. Finally, if $\alpha = \beta$, the additional investment in the nontraded goods sector equals the disinvestment in the tradables sector. Nevertheless, the current account balance in period 1 is positive. This can be explained as follows: in the long run, the expansion of the nontraded goods sector requires a reduction in traded goods production. However, in period 1 the capital stock in the tradables sector exceeds the new steady state level, and domestic households take advantage of this by accumulating foreign assets in order to smooth their consumption of tradable goods.

Finally, we consider the evolution of the real exchange rate P_s after the deregulation shock:

Lemma 3 $P < P_1 < P_0$*: After a deregulation shock, the real exchange rate monotonically decreases to its new steady state level, i.e. deregulation results in a real depreciation.*

Proof: See the Appendix.

Since steady state factor prices are pinned down by the world interest rate, the long–run price level apparently decreases as a result of removing barriers to entry (and thus monopoly pricing) in the nontraded goods sector. However, in the short run the capital stocks in both sectors are fixed, and this slows down the adjustment of goods and factor prices.

3.3.2 A numerical example

When interpreting the analytical results of the previous section, we mainly focused on the reallocation of labor and capital and on the role of relative factor intensities. Of course, this does not imply that preferences are irrelevant in determining the sign and size of the current account. On the contrary: the difference between national savings and national investment in the transition period crucially depends on agents' willingness to adjust their consumption path to the anticipated evolution of prices and incomes. The first goal of this subsection therefore is to explore the qualitative and quantitative effects of departing from logarithmic utility and to check whether the above results still hold when the intertemporal elasticity of substitution (IES) is smaller or greater than one.[8]

The second goal is to close a "lose end" left over from our theoretical analysis: Lemma 1 only provided a sufficient condition ($\alpha \geq \beta$) for a current account surplus during the transition to the new steady state, but allowed for the possibility that $B > 0$ even if the nontraded goods sector is relatively capital intensive. This is particularly important since data on labor shares suggest that, in many countries, the production of nontradables is more capital intensive than the production of traded goods. Our theoretical analysis does not tell us how large the difference between capital intensities may actually be for the current account to be positive, and we are therefore interested in the behavior of our model when it is fed with a set of plausible parameter values. [9]

The values of α and β which we use in the subsequent numerical example are based on sectoral labor intensities published by Kakkar (2002, 2003) who, in turn, makes use of the OECD intersectoral database. Computing unweighted averages of Kakkar's national labor share data, we set $\alpha = 0.428$ and $\beta = 0.429$. Hence, the traded goods sector is slightly less capital intensive than the nontradables sector.[10]

Following Stockman and Tesar (1995), we set $\gamma = 0.5$, implying that tradables and nontradables attract equal shares of total consumption expenditures. Using a per-annum interest rate of roughly 4.5 percent and defining a period in our model as a five-year interval, we set $r = 0.25$. For the depreciation rate λ, we take the annual value of ten percent that is used in most studies on (international) real business cycles (see, e.g., Stockman and Tesar (1995)) to compute a five-year depreciation rate $\lambda = 0.4$.

The last parameter we have to select is μ, the initial markup ratio in the nontraded goods sector. While there are data on average markups in manufac-

[8]Estimates provided by Ogaki et al. (1996) suggest that, in industrialized countries, the IES is between 0.5 and one.

[9]Most empirical analyses follow De Gregorio et al. (1994) in defining sectors as *tradable* if more than 10 percent of total production are exported. According to this criterion, agriculture, mining, transportation and manufacturing are classified as tradable goods sectors, while the remaining services are treated as nontradables. Of course, as emphasized by Kravis et al. (1983), there are huge differences in terms of capital intensities within the traded and nontraded goods sectors, respectively.

[10]To explain this somewhat surprising finding one has to take into account that, besides several labor-intensive services, the nontradables sector comprises the construction and real estate industries. Moreover, we want to point out that the averages we use mask substantial differences between countries. Thus, as reported by Kakkar, the nontradables sector is much more labor intensive than the tradables sector in the Netherlands, while the opposite holds for France.

turing industries (see, e.g., Morrison (1989), Roeger (1995) and Oliveira Martins et al. (1996)), we know of no study that identifies markups charged by nontraded goods firms. We therefore choose a rough average of the estimates for the manufacturing sector and set $\mu = 1.25$. Of course, given the lack of data, this choice is quite arbitrary. Moreover, it is audacious to assume that deregulation leads to a reduction of nontraded goods prices by 25 percent across the board. Real world deregulations have been much less radical, and the actual effects on countries' current accounts are likely to be less pronounced. We therefore repeat our exercise for logarithmic utility ($\sigma = 1$) and $\mu = 1.10$.

Given these parameter values, we are mainly interested in the sign and the size of the current account balance as a share of GDP in period 1 (B/Y_1) for different values of the IES. The results for the benchmark parameterization ($\sigma = 1$) as well as for $\sigma = 0.5, 2$, and 5 are given in the first column of Table 1. In addition, we report the time path of employment in the traded goods sector and the evolution of the aggregate price level.

Table 1: A numerical example

	B/Y_1 (in percent)	L_0^T	L_1^T	L^T	P_0	P_1	P
Benchmark	1.79	0.67	0.64	0.63	2.24	2.07	2.00
$\sigma = 0.5$	3.00	0.67	0.65	0.63	2.24	2.06	2.00
$\sigma = 2$	0.95	0.67	0.63	0.63	2.24	2.08	2.00
$\sigma = 5$	0.33	0.67	0.63	0.63	2.24	2.08	2.00
$\mu = 1.10, \sigma = 1$	0.79	0.65	0.64	0.63	2.10	2.03	2.00

Annotations: The benchmark model uses the parameter values $\sigma = 1, \alpha = 0.428, \beta = 0.429, \gamma = 0.5, \mu = 1.25, r = 0.25, \lambda = 0.4$.

The first column of Table 1 reveals that the current account balance is positive for all values of σ, but that it decreases as the IES becomes lower (i.e. as σ increases). The explanation is straightforward: agents' desire to smooth consumption depends on σ, and as the IES decreases, they are less willing to forego current consumption in anticipation of lower future prices. As a result, national saving in period 1 is lower for lower values of the IES, and the current account surplus in the transition period decreases.[11]

Columns 2 – 4 of Table 1 show that, while the initial steady state value L_0^T does not depend on σ, the contraction of the traded goods sector in period 1 is faster for lower values of the IES. The faster expansion of the nontradables sector for high values of σ reflects agents' reluctance to save and their higher consumption of nontraded goods during the transition period. Since this results in a lower level of foreign assets, the production of traded goods (and thus L^T) is slightly higher in the final steady state. However, the differences are so small that they disappear as a result of rounding. Finally, columns 5 – 7 of Table 1 indicate a slower decline of prices for lower values of the IES. Again, this is driven by agents' greater demand for nontraded goods during the transition, which results in a higher price level for the nontraded part of the consumption bundle.

To summarize: while our numerical results show that departing from logarithmic utility has important consequences for the size of the current account balance, they also indicate that deregulation results in a current account surplus even if production in the nontraded goods sector is relatively capital intensive and if the IES is smaller than one. Equipped with these findings we will now turn to the empirical analysis.

4 Deregulation and the current account: An empirical exploration

4.1 Data and methodology

The aim of this section is to test whether deregulation does, indeed, help to explain the behavior of countries' current accounts in the recent past. To achieve this goal, we closely follow the paper by Chinn and Prasad (2003) who regress countries' current account balances (as a share of GDP) on a broad set of economic, demographic and institutional variables. Our main innovation is to include the growth rate of the Fraser Institute's index on the "regulation of credit, labor and business" as an additional regressor. Based on the analysis of the preceding section, we expect this variable to have a positive effect on countries' current

[11] Although our model is too simple to serve as a basis for a serious calibration, it is worth noting that the numbers presented in the first column of Table 1 are of the same order of magnitude as current-account balances usually observed in industrialized countries.

account balances.[12]

The sample we use consists of 20 high-income OECD countries, as defined by the World Bank (2003).[13] Unlike Chinn and Prasad (2003), we do not consider emerging markets and developing countries – mainly because our model's assumptions on capital mobility and the structure of labor markets, which are already quite demanding for industrialized countries, seem even harder to justify when developing economies are analyzed. Moreover, low- and middle income countries have experienced very volatile current accounts in the recent past, being subject both to waves of emerging market frenzy and occasional crises. We believe that, in the data, these phenomena would swamp the effect we are trying to identify, and we therefore focus on the upper end of the international income distribution.

As in Chinn and Prasad (2003), our dependent variable is the current account surplus as a percentage share of GDP, averaged over six non-overlapping five-year time periods (1971-75, 1976-80, 1981-85, 1986-90, 1991-95, 1996-2000). Our focus on this time span and frequency is mainly determined by the availability of the Fraser institute's deregulation index, which goes back to 1970 and has since then been published every five years. Moreover, it is likely that the effect of deregulation takes some time to materialize, and we therefore consider it a potential "medium-term" determinant of current accounts. Finally, the focus on the same sampling frequency as in Chinn and Prasad (2003) makes it easier to compare our results with their findings.

The extent of domestic regulatory reform is captured by the (gross) growth rate of the deregulation index for the different five-year time periods mentioned above (1970-75, etc.). As we will demonstrate below, using differences instead of ratios does not affect our main results.

To enhance comparability with their study, we closely follow Chinn and Prasad (2003) in our choice of control variables:[14] in the benchmark specification we include the government's average budget surplus and the initial level of foreign assets (both as a share of GDP), real per-capita GDP relative to the period average – both linearly and squared –, the average dependency ratio for young and old individuals, the average growth rate of real per-capita income, the standard deviation of the terms of trade, the average ratio of liquid liabilities (M3) over GDP, a standard measure of trade openness (the average sum of exports and

[12] A more detailed description of this index is given in the data appendix. Recall that higher values reflect less regulation. Hence, to avoid confusion, we will use the term "deregulation index" in what follows.

[13] World Bank (2003) lists 24 high-income OECD countries. The reasons for omitting Austria, Korea, Luxemburg, and Portugal are given in the data appendix.

[14] A detailed description of all variables and their sources is given in the data appendix.

imports over GDP), and the average value of the Fraser institute's index of the "freedom to exchange with foreigners", which captures both trade barriers and capital controls. To mitigate omitted variable bias arising from regional and institutional differences we include an EU-membership dummy that is one for periods in which a country was a member of the European Union. Finally, to capture time-dependent effects that are not limited to any particular country, we include dummies for each five-year period.

As discussed more extensively in Chinn and Prasad (2003), the budget surplus should have a positive effect on countries' current accounts (absent Ricardian equivalence). Due to its impact on foreign factor income, a higher level of initial foreign assets should also raise a country's current account surplus. The "stages of development" hypothesis suggests that countries at intermediate levels of per-capita income should experience high current account deficits while poor and rich countries should have surpluses. We therefore expect the coefficient of relative initial income to have a positive sign and the coefficient of squared relative income to be negative. Through its impact on (precautionary) savings, greater terms-of-trade volatility should have a positive effect on the current account balance. On the other hand, a higher portion of very young and very old individuals reduces national savings and should therefore have a negative effect on the current account. Finally, on theoretical grounds, the impact of growth, financial depth, trade openness, and trade restrictions can go either way, and we therefore start our empirical investigation without a clear-cut hypothesis on the sign of these coefficients.

4.2 Results

Before running the regression described in the previous subsection, we look at the relationship between deregulation and average current account balances over the entire 30-year period for which we have data. Of course, the limited number of countries in our sample prevents sensible statistical inference in this case. However, it is instructive to look at the *partial scatterplot* in Figure 2, which reflects the relationship between the gross growth rate of the Fraser Institute's deregulation index between 1970 and 2000 and average current account balances, after controlling for the other potential determinants mentioned above. The plot shows a clear positive correlation, suggesting that, *ceteris paribus*, countries who were bolder in implementing regulatory reforms had greater current account surpluses (or smaller current account deficits) in the recent past.

The first column of Table 2 presents the results of our benchmark regression, using 5-year averages and time dummies to account for the substantial structural shifts that took place between 1970 and 2000. The coefficient of the growth rate of the Fraser Institute's deregulation index is positive and significantly different from zero, supporting the positive influence suggested by Figure 2. Moreover, most other coefficients have the expected sign, and the overall fit of the model, as measured by the adjusted R^2, is satisfactory.

To make sure that our result actually captures the effect of domestic deregulation (as opposed to the dismantling of barriers to international trade and capital flows), we add the growth rate of the Fraser Institute's index of the "freedom to exchange with foreigners" in column 2. In fact, the t-statistic of the deregulation index drops somewhat when we account for both aspects of regulatory reform, but it still meets standard requirements.

We also check whether our result is due to using the growth rate of the deregulation index and replace it by five-year *differences*. Column 3 of Table 2 shows that this does not alter our findings.

There is, however, an important shortcoming that taints the estimation results we have presented so far: data on liquid liabilities over GDP are only available for a subset of industrialized countries. Notably, we do not have data for Belgium, Greece, Spain, and the United Kingdom. Hence, by following Chinn and Prasad (2003) in using liquid liabilities as a measure of financial depth, we were artificially (though not systematically) restricting our sample. In a next step, we therefore replace the liquid liabilities variable by an alternative measure of financial depth, the average volume of domestic credit to the private sector (as a share of GDP). As column 4 of Table 2 indicates, the coefficient of the deregulation index is still positive, but it is no longer significant at an acceptable level if we use this specification. What explains the effect of adding 24 observations?[15] A closer look at the residuals reveals that one observation – Greece in the last five-year interval (1996-2000) – is particularly important in worsening the fit.[16] Column 5

[15]When we ran this regression for the previous (smaller) sample, the coefficient of deregulation was significant, indicating that it is the inclusion of the four additional countries which spoils our results.

[16]The large residual suggests that, given its progress in regulatory reform between 1995 and 2000, the average current account surplus of Greece in this time period was "too low" compared to the model's predictions. The main reason for the widening current account deficit in 1996 - 2000 was a substantial decrease of net current transfers received, which fell from 7.5 billion US dollars in 1997 to 4.1 billon in 1999 and 3.4 billion in 2000. (Oddly there are no balance of payments data available for 1998.) This suggests that, towards the end of the millennium, the Greek current account was driven by exceptional factors which are not captured by our econometric model.

of Table 2 demonstrates that the t-statistic of the deregulation variable returns to an acceptable level if we omit this single data point. This makes us confident that there is a significantly positive effect of deregulation on the current account for the larger part of our sample.

So far, we have used an EU-dummy to reduce omitted variable bias in our estimation. Table 3 reports the results of panel regressions, in which time-invariant, country-specific properties are captured by *fixed effects.* It is well known that such an approach essentially switches off the cross-sectional dimension of the data, focusing on deviations of variables from country-specific means. It is therefore not surprising that the values and even the signs of some coefficients change as we move from Table 2 to Table 3. The first column of Table 3 shows that both domestic deregulation and trade deregulation have a significantly positive effect on current account balances if liquid liabilities are used as a measure of financial depth. This does not change if we use differences instead of growth rates for the deregulation index (column 2). However, if we expand our sample by using domestic credit instead of liquid liabilities, the coefficient and the t-statistic of deregulation drop dramatically (column 3). If we remove the 1996-2000 observation for Greece, the t-statistic increases to 1.35 (not reported in the table), but is still too low to suggest a significant effect. Column 4 of Table 3 demonstrates that deregulation has a significantly positive effect on current account balances as long as we restrict our attention to the time interval 1970-95, omitting the last five-year time period for all countries. What happened between 1996 and 2000? A look at the data indicates that, apart from Greece, there are two countries whose current account balances experienced large swings in this last time period: Switzerland and Norway. In Switzerland, the current account surplus moved from 7.1 percent in 1995 to 14.1 percent in 2000, driven by a massive increase in foreign factor income. In Norway, it increased from 5.5 percent in 1999 to 15.3 percent in 2000. It is noteworthy that the model's fit improves substantially if, in addition to Greece (1996-2000), we omit these two observations (see Column 5 of Table 3). Of course, we have no reason to believe that these data are unreliable. But the results in column 5 of Table 3 suggest that the positive effect of deregulation on the current account re-emerges if we discard data that seem to be driven by exceptional events.[17]

[17]Switzerland probably benefitted from its large stock of foreign assets and the appreciating US dollar in the second half of the nineties. The huge current account surplus of Norway in 2000 is due to a high trade surplus associated with rising oil prices.

5 Summary and conclusions

This paper has shown that removing barriers to entry in the nontraded goods sector of a small open economy leads to a real depreciation and to an accumulation of foreign assets if the nontraded goods sector is not too capital–intensive. The driving mechanism behind these results is the expansion of the nontraded goods sector and the resulting reallocation of the labor force. Combined with the sluggish adjustment of sectoral capital stocks, this leads to an accumulation of foreign assets which finance future traded goods consumption.

In the second part of the paper we have provided some empirical evidence showing that countries in which domestic regulatory reform was more pronounced did, indeed, experience higher current account surpluses (or lower deficits) in recent decades. These results suggest that regulatory reform should be taken serious as a potential medium-term determinant of countries' current account balances. Moreover – and perhaps more importantly – our analysis demonstrates that policies which seem to be targeted at purely domestic variables have important repercussions on trade-related magnitudes such as the current account and the real exchange rate.

While our model could be extended into various directions – considering, e.g., the implications of nontraded investment goods or making alternative assumptions on the degree of capital mobility – an obvious variation would be to depart from the idea of a "deregulation shock" and to analyze the effects of *announced* regulatory reforms. Given that such reforms are rarely implemented overnight, such a modification would certainly move our model closer to reality. Although it is beyond the scope of this paper to fully spell out the details of this alternative scenario, the effects of an announced deregulation seem quite intuitive: in this case, the reallocation of factors would start at the time of the announcement, i.e. *before* entry barriers are actually removed. However, with a sluggish adjustment of capital stocks, dynamics would still be nontrivial, and the sign of the current account balance would still depend on sectoral capital intensities. Hence, we are confident that the basic forces identified in this paper would still be operative if we assumed deregulation to be anticipated.

References

Blanchard, O. and F. Giavazzi: "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets." *Quarterly Journal of Economics 118*, 879-908.(2003).

Blanchard, O. and F. Giavazzi: "Current Account Deficits in the Euro Area: The End of the Feldstein-Horioka Puzzle?" *Brookings Papers on Economic Activity 2*, 147-209.(2002).

Calderon, C., A. Chong and N. Loayza: "Determinants of Current Accounts in Developing Countries" Manuscript, The World Bank.(1999).

Card, D. and R.B. Freeman: "What have two Decades of British Economic Reform Delivered?" *NBER Working Paper 8801*, (2002).

Chinn, M. and E. Prasad: "Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration." *Journal of International Economics 59*, 47 - 76. (2003).

Coto-Martinez, J.: "Markups and the Real Exchange Rate." *University of East Anglia Discussion Paper No. 2002-1,* (2002).

Coto-Martinez, J. and H. Dixon: "Profits, Markups and Entry: Fiscal Policy in an Open Economy." *Journal of Economic Dynamics and Control 27*, 573-597, (2003).

Debelle, G. and Faruquee: "What Determines the Current Account? A Cross-Sectional and Panel Approach" *IMF Working Paper 96/58.*(1996).

De Gregorio, J., A. Giovannini, and H.C. Wolf: "International evidence on tradables and nontradables inflation." *European Economic Review 38*, 1225-1244, (1994).

Dixon, H.: "Imperfect Competition and Open Economy Macroeconomics", in F. van der Ploeg (ed.): *Handbook of Open Economy Macroeconomics*, London, Blackwell. (1994).

Ebell, M. and C. Haefke: "Product Market Deregulation and Labor Market Outcomes." *Studienzentrum Gerzensee Working Paper 08.02*, (2002).

Gwartney, J. and R. Lawson: *Economic Freedom in the World: 2002 Annual Report*, Vancouver (Canada), The Fraser Institute. (2002).

Heston, A., R. Summers and B. Aten: *Penn World Table Version 6.1*, Center for International Comparisons at the University of Pennsylvania (CICUP). (2002).

International Monetary Fund: *International Financial Statistics Yearbook 2002*, Washington DC, International Monetary Fund. (2002).

Kakkar, V.: "Capital-labor ratios and total factor productivity in the Balassa-Samuelson model" *Review of International Economics*, 10: 166 – 176, (2002).

Kakkar, V.: "The relative price of nontraded goods and sectoral total factor productivity: an empirical investigation" *Review of Economics and Statistics*, 85: 444 – 452, (2003).

Kravis, I.B., A.W. Heston, and R. Summers: "The share of services in economic growth" in F.G. Adams and B. Hickman (eds.) *Essays in honor of Lawrence B. Klein*, Cambridge (MA), MIT Press. (1983)

Lane, P. and G.-M. Milesi-Ferretti: "The external wealth of nations: measures of foreign assets and liabilities for industrial and developing countries" *Journal of International Economics*, 55: 263 – 294, (2001).

Makin, J.H.: "Japan needs a current account deficit" *American Enterprise Institute Economic Outlook June 2001*, (2001).

Morrison, C.: "Markup behavior in durable and nondurable manufacturing: A production theory approach" *NBER Working Paper 2941*, (1989).

Nicoletti, G. and S. Scarpetta: "Regulation, productivity, and growth" *Economic Policy*, 8: 9 – 72, (2003).

Obstfeld, M. and K. Rogoff: *Foundations of International Macroeconomics*, Cambridge (MA), MIT Press. (1996).

Ogaki, M., J.D. Ostry, and C.M. Reinhart: "Saving Behavior in Low- and Middle-Income Developing Countries" *IMF Staff Papers*, 43: 38–71, (1996).

Oliveira Martins, J., S. Scarpetta, and D. Pilat: "Mark-up ratios in manufacturing industries: Estimates for 14 OECD countries " *OECD Economics Department Working Paper No. 162* (1996).

Roeger, W.: "Can imperfect competition explain the difference between primal and dual productivity measures? Estimates for US manufacturing." *Journal of Political Economy*, 103: 316–330, (1995).

Stockman, A.C. and L. Tesar: "Tastes and technology in a two-country model of the business cycle: explaining international comovements" *American Economic Review*, 85: 168 – 185, (1995).

Turnovsky, S.: *International Macroeconomic Dynamics*, Cambridge (MA), MIT Press. (1997).

White, H.: "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity". *Econometrica*, 48: 817-838.(1980)

World Bank: *World Development Indicators CD ROM*, Washington (DC), The World Bank. (2003).

6 Proofs

6.1 Proof of Lemma 1

Solving (24) and (25) for E yields

$$E = \phi \left(\frac{rB + \nu\xi - \Omega}{(1-\gamma)\xi + \gamma\phi} \right). \tag{30}$$

Substituting (30) into (27) we get

$$B = \frac{\nu}{r} \left[\frac{(1-\gamma)\xi + \gamma\phi}{1-\gamma} (L_0^T)^{\alpha} (L_1^T)^{(-\alpha)} (1 - L_1^T) - \left(1 - \frac{\alpha\lambda}{r+\lambda} \right) \right]. \tag{31}$$

Recall from (23) that L_0^T is increasing in the markup μ. By substituting (26) and (30) into (29) we get

$$B = \frac{\nu}{\psi} \left[(L_0^T)^{\alpha} (L_1^T)^{(1-\alpha)} + \frac{\alpha(1-\lambda)}{r+\lambda} \zeta L_0^T - \Lambda \right], \tag{32}$$

where

$$\psi = \frac{\phi[(r+\lambda)(1-\gamma) + (1+r)\gamma]}{(1-\gamma)\xi + \gamma\phi} > 0, \tag{33}$$

and Λ is a constant that does not depend on μ. It is easy to see that in (31) B is monotonically decreasing in L_1^T while in (32) B is monotonically increasing in L_1^T. We can thus draw the two equations as curves I and II in Figure A.1, and the point of intersection determines the equilibrium levels of B and L_1^T. We know that $B = 0$ and $L_1^T = L_0^T$ if $\mu = 1$: if the firms didn't charge a markup in the initial steady state, removing barriers to entry would not have any effect, and there would be no accumulation of foreign assets or debt. Hence, for $\mu = 1$, the two curves intersect at $B = 0$. It follows from (23) that the initial level of labor in the traded goods sector

(L_0^T) increases in μ. Hence, if $\alpha \geq \beta$, i.e., if production of traded goods is at least as capital intensive as production of nontradables such that $\zeta \geq 0$, both curves shift upward if the markup becomes greater than one, and the equilibrium level of B that is defined by the point of intersection has to be positive. This implies that the economy runs a current account surplus during its transition to the new steady state. On the other hand, if $\alpha < \beta$, ζ is negative, and curve II may therefore shift downward as a result of raising μ. If this shift dominates the upward shift of curve I, B is negative.

6.2 Proof of Lemma 2

We start by showing that $L^T < L_0^T$: comparing (23) (with $B_0 = 0$) and (26), we can show that $L^T > L_0^T$ iff

$$B < \frac{(1-\mu)\phi\gamma[r + (1-\alpha)\lambda]}{\frac{r}{\nu}[(1-\gamma)\xi + \mu\phi\gamma](r+\lambda)} \equiv \hat{B}. \tag{34}$$

Note that $\hat{B} < 0$ for $\mu > 1$. In Lemma 1 we have shown that $B > 0$ for $\alpha \geq \beta$, which implies that the condition in (34) cannot be satisfied if the traded goods sector is at least as capital intensive as the nontradables sector. Hence $L_0^T > L^T$ if $\alpha \geq \beta$.

On the other hand, the preceding Lemma has shown that B may be negative if $\alpha < \beta$. To show that nevertheless $L_0^T > L^T$, we show that B cannot be smaller than $\hat{B}$ even if $(\alpha - \beta) < 0$. It follows from (31), (32), and (34) that for $B < \hat{B}$ we need

$$(L_1^T)^{1-\alpha} < \frac{1-\gamma}{(1-\gamma)\xi + \mu\gamma\phi}\left(\frac{1}{L_0^T}\right)^{\alpha}\left(\frac{L_1^T}{1-L_1^T}\right) = f_1(L_1^T, L_0^T) \tag{35}$$

and

$$(L_1^T)^{1-\alpha} < \frac{(1-\mu)\gamma\phi\left(1-\frac{\alpha\lambda}{r+\lambda}\right)\Phi}{[(1-\gamma)\xi + \mu\gamma\phi](L_0^T)^{\alpha}} + \frac{\gamma\phi + (1-\gamma)\Omega}{\nu[(1-\gamma)\xi + \gamma\phi](L_0^T)^{\alpha}} = f_2(L_1^T, L_0^T), \tag{36}$$

where Φ is a constant that is independent of μ and positive if $\beta > \alpha$. The functions $(L_1^T)^{1-\alpha}$, $f_1(L_1^T, L_0^T)$, and $f_2(L_1^T, L_0^T)$ are depicted in Figure A.2. If $\mu = 1$, the three curves intersect, since in this case $B = \hat{B} = 0$. If μ becomes bigger than one, $f_1(L_1^T, L_0^T)$ and $f_2(L_1^T, L_0^T)$ shift downward. Figure A.2 illustrates that, in this case, (35) and (36) cannot be simultaneously satisfied. Hence, for $\mu > 1$, $L_0^T > L^T$ even if $\alpha < \beta$.

We can use this result to show that $L_0^T > L_1^T > L^T$: it is easy to see that for (24) and (27) to be jointly satisfied we need either $L_0^T < L_1^T < L^T$ or $L_0^T > L_1^T > L^T$. Since we have already shown that $L_0^T > L^T$ it follows that $L_0^T > L_1^T > L^T$.

6.3 Proof of Lemma 3

It follows from (4) that $P_0 > P_1 > P$ iff $P_0^N > P_1^N > P^N$. Equations (16) to (18) and the fact that $R^N = R_0^N$ and $w = w_0$ imply that $P_0^N > P^N$. To show that $P_0^N > P_1^N$ we use (19), which implies that $P_0^N > P_1^N$ iff $E_0/(1-L_0^T)^{(1-\beta)} > E/(1-L_1^T)^{(1-\beta)}$. In Lemma 3 we have shown that $L_0^T > L_1^T$. Hence $E_0 > E$ is sufficient for $P_0^N > P_1^N$. To show that this condition actually holds we substitute (26) and (30) into (29). Combined with (22) this yields

$$\frac{\gamma E + \Omega}{\gamma E_0 + \Omega} = \frac{r\gamma}{\xi(1+r\gamma)} \left[\left(\frac{L_1^T}{L_0^T} \right)^{1-\alpha} + \frac{\phi}{rL_0^T} \left(1 + \frac{(1-\gamma)\beta\lambda}{\gamma(r+\lambda)} \right) + \frac{\alpha\zeta(1-\lambda)}{r+\lambda} \right], \qquad (37)$$

If $\mu = 1$, we have $\gamma E + \Omega = \gamma E_0 + \Omega$. On the other hand, $(L_1^T/L_0^T)^{1-\alpha}$ decreases as μ becomes greater than one (see Lemma 2) while L_0^T increases. Hence, the term on the RHS of (37) becomes smaller than one, which implies $E < E_0$ and thus $P_0^N > P_1^N$.

To show that $P_1^N > P^N$ we use the nontraded goods sector's marginal cost function (17). Combined with the fact that $(L_s^N/K_s^N) = (1-\beta)R_s^N/(\beta w_s)$, the wage equation in (14), and the fact that $(L_0^N/K_0^N) = (L^N/K^N)$ this implies that $P_1^N > P^N$ iff

$$\left(\frac{L_1^N}{L_0^N} \right)^{\beta} \left(\frac{L_0^T}{L_1^T} \right)^{\alpha} > 1. \qquad (38)$$

It follows from Lemma 2 that this condition is satisfied. Hence $P_0^N > P_1^N > P^N$.

7 Data

7.1 Definitions and sources

Note: Unless otherwise indicated, all *average* variables are unweighted means over the five-year periods 1971-75, 1976-80, ..., 1996-2000. All *initial* variables refer to the year before the start of the respective five-year period, i.e. 1970 for 1971-75 etc. *Growth rates* are computed by dividing the final value by the initial value.

Current account: Current account balance (in percent of GDP). Source: World Bank (2003).

Deregulation (growth): Growth of Fraser Institute's index of the "regulation of credit, labor and business". Scale: 1 – 10 (higher values indicating lower extent of regulation). Source: Gwartney and Lawson (2002). This index is the average of three subindexes reflecting (A) credit market regulations (criteria: percentage of deposits held in privately owned banks, foreign competition in banking sector, percentage of credit extended to private sector, interest controls), (B) labor market regulations (criteria: impact of minimum wages, hiring and firing practices, extent of collective bargaining, extent of unemployment benefits, use of conscripts in the military), (C) business regulations (criteria: extent of price controls, administrative obstacles to starting a new business, time with government bureaucracy, irregular payments). Subindex C whose evolution comes closest to our interpretation of deregulation is only available for the years 1995 and 2000. However, this does not mean that data for previous years are mere averages of the first two subindexes. Instead, "adjusted" data for previous years are computed using a chain-weighting method (see Gwartney and Lawson, 2002:12).
Deregulation (diff.): Change of Fraser Institute's index of the "regulation of credit, labor and business". Difference between value at end of five-year time period and value in year before start of period (1975 - 1970, 1980 - 1975 etc.) Source: Gwartney and Lawson (2002).
Budget surplus: Average overall budget balance, including grants (in percent of GDP). Source: World Bank (2003).
Initial foreign assets: Estimate of initial net external asset position based on adjusted cumulative current accounts (series ACUMCA) divided by GDP (series DGDP). Source: Lane and Milesi-Ferretti (2001).
Initial relative income: Real per-capita income as share of period average. Source: Penn World Tables, version 6.1, see Heston et al. (2002).
Dependency young: Average young age dependency ratio, i.e. the average ratio of people younger than 15 to the working-age population (ages 15-64). Source: World Bank (2003).
Dependency old: Average old age dependency ratio, i.e. the average ratio of people older than 64 to the working-age population (ages 15-64). Source: World Bank (2003).
Growth: Growth rate of real per-capita income. Source: Penn World Tables, version 6.1, see Heston et al. (2002).
Terms of trade volatility: Standard deviation of the terms of trade (Unit value of exports divided by unit value of imports). Source: IMF (2002), lines 74 and 75.
Liquid liabilities: Average liquid liabilities (M3) (in percent of GDP). Source: World Bank (2003).
Private credit: Average domestic credit to private sector (in percent of GDP). Source: World Bank (2003).

Trade openness: Average trade openness, i.e. the sum of exports and imports of goods and services measured as a share of gross domestic product. Source: World Bank (2003).

Trade regulation: Average of the Fraser Institute's index reflecting the "freedom to exchange with foreigners". Scale: 1 – 10 (higher values indicating lower extent of regulation). Source: Gwartney and Lawson (2002).

Trade deregulation: *Growth* of the Fraser Institute's index reflecting the "freedom to exchange with foreigners". Source: Gwartney and Lawson (2002).

7.2 Countries in the sample

Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States.

Note: We initially selected the 24 high-income OECD countries listed by World Bank (2003). We omitted Austria and Portugal since IMF (2002) does not provide terms-of-trade data for these countries. Korea was omitted since it was a *middle-income* country for most of the sample period. Finally, Luxemburg is not included in the sample since – as detailed in Lane and Milesi-Ferretti (2001) – balance of payments data are unreliable for this country.

8 Tables

Table 2: Pooled OLS regression (Dependent variable: Current account balance in percent of GDP)

Constant	-42.66**	-41.96**	-30.71	-16.37	-11.68
	(-2.16)	(-2.13)	(-1.56)	(-1.55)	(-1.22)
Deregulation (growth)	12.49***	11.28***		4.55	5.23*
	(2.86)	(2.81)		(1.64)	(1.91)
Deregulation (diff.)			1.93***		
			(2.80)		
Budget surplus	0.09	0.09	0.09	0.06	0.06
	(1.13)	(1.15)	(1.15)	(0.93)	(0.95)
Initial foreign assets	0.07***	0.06***	0.06***	0.06***	0.06***
	(2.93)	(2.87)	(2.90)	(3.28)	(3.43)
Initial relative income	24.16	21.42	21.85	4.26	-2.94
	(1.33)	(1.15)	(1.18)	(0.41)	(-0.31)
Initial relative income (squ.)	-9.59	-8.47	-8.73	-0.95	2.29
	(-1.22)	(-1.04)	(-1.08)	(-0.19)	(0.50)
Dependency young	-4.91	-7.13	-7.26	-13.44**	-16.70***
	(-0.49)	(-0.70)	(-0.72)	(-1.98)	(-2.51)
Dependency old	4.12	2.09	2.21	-9.08	-9.61
	(0.38)	(0.19)	(0.20)	(-1.09)	(-1.16)
Growth	10.77*	9.60	9.38	4.95	5.03
	(1.79)	(1.57)	(1.57)	(1.04)	(1.07)
Terms of trade volatility	14.46*	16.42**	16.60**	18.67**	18.63***
	(1.81)	(2.03)	(2.07)	(2.58)	(2.65)
Liquid liablities	0.03**	0.03**	0.03**		
	(2.33)	(2.38)	(2.42)		
Private credit				0.02**	0.02
				(1.96)	1.65
Trade openness	0.03*	0.02	0.02*	0.03***	0.03***
	(1.74)	(1.65)	(1.77)	(2.76)	(2.63)
Trade regulation	-0.16	0.05	0.05	-0.03	-0.04
	(-0.48)	(0.15)	(0.16)	(-0.13)	(-0.14)
Trade deregulation		3.09**	3.16**	4.13***	4.29***
		(2.08)	(2.16)	(2.68)	(2.79)
EU dummy	1.44	1.47*	1.43*	1.03	0.86
	(1.64)	(1.71)	(1.67)	(1.25)	(1.06)
Significant time dummies	96-00	none	none	none	none
Adjusted R^2	0.57	0.58	0.58	0.55	0.56
Number of obs.	80	80	80	104	103

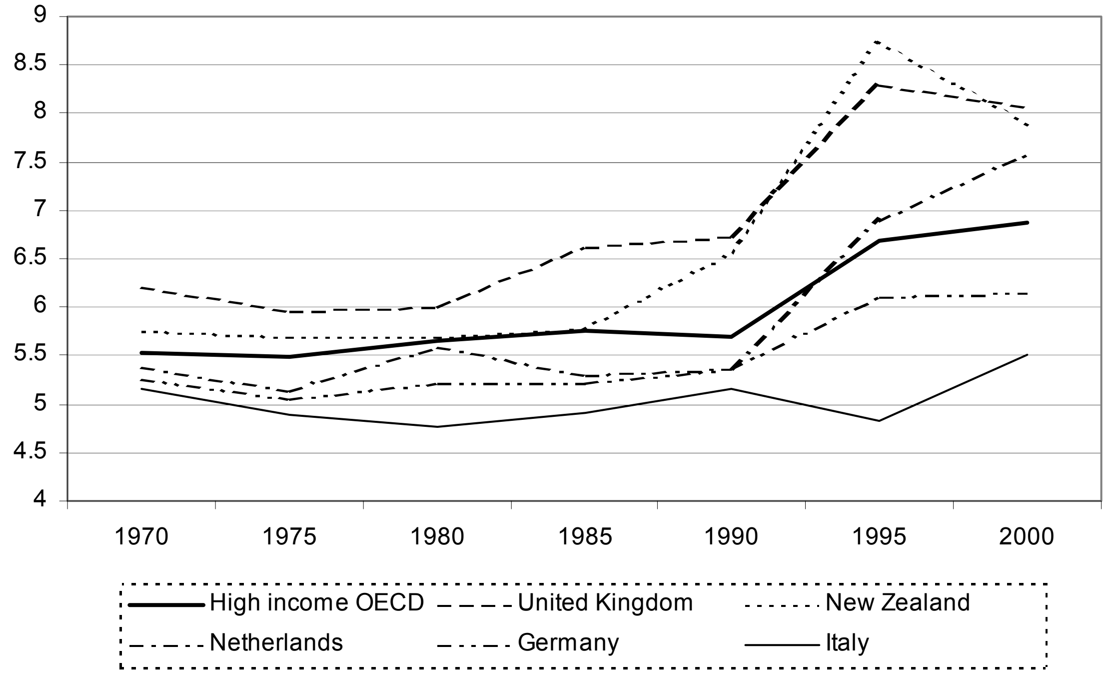
Annotations: Column (5) refers to the regression without the data for Greece (1996-2000). t-statistics are based on White's (1980) heteroscedasticity-consistent covariance-matrix. ***, **, *: significance levels of 1, 5, 10 percent.

Table 3: Fixed effects regression (Dependent variable: Current account balance in percent of GDP)

Deregulation (growth)	9.27**		2.67	8.85**	4.86**
	(2.24)		(1.04)	(2.40)	(2.04)
Deregulation (diff.)		1.58**			
		(2.33)			
Budget surplus	0.25**	0.24**	0.23***	0.18*	0.26***
	(2.19)	(2.14)	(2.67)	(1.70)	(3.26)
Initial foreign assets	0.02	0.02	0.00	-0.02	0.00
	(0.49)	(0.50)	(-0.07)	(-0.58)	(0.02)
Initial relative income	98.58***	99.76***	82.26***	60.66**	45.17*
	(3.00)	(3.07)	(3.17)	(2.10)	(1.83)
Initial relative income (squ.)	-45.13***	-45.60***	-38.50***	-23.63*	-18.51
	(-3.02)	(-3.09)	(-3.04)	(-1.66)	(-1.47)
Dependency young	0.87	0.47	12.88	-5.11	11.59
	(0.05)	(0.03)	(1.04)	(-0.41)	(1.02)
Dependency old	-5.54	-6.09	-37.66*	-21.30	-26.34
	(-0.19)	(-0.21)	(-1.77)	(-0.82)	(-1.39)
Growth	10.03*	9.98*	4.56	6.42	6.27
	(1.75)	(1.74)	(0.95)	(1.35)	(1.36)
Terms of trade volatility	21.13**	20.97**	23.20***	14.86*	16.77**
	(2.58)	(2.58)	(3.41)	(1.88)	(1.99)
Liquid liabilities	-0.01	-0.01			
	(-0.59)	(-0.53)			
Private credit			-0.03**	-0.03**	-0.04***
			(-2.61)	(-2.05)	(-2.97)
Trade openness	-0.10**	-0.11**	-0.06	-0.03	-0.03
	(-2.17)	(-2.24)	(-1.36)	(-0.69)	(-0.69)
Trade regulation	1.03*	1.10*	1.09**	1.16**	1.40***
	(1.86)	(1.97)	(2.52)	(2.57)	(3.12)
Trade deregulation	3.09**	3.19**	4.30***	3.89***	4.26***
	(2.28)	(2.35)	(3.05)	(2.73)	(2.94)
EU dummy	4.07*	3.93*	1.69	0.57	1.57
	(1.75)	(1.70)	(1.23)	(0.38)	(1.24)
Significant time dummies	all	all	all	all	all
Adjusted R^2	0.67	0.67	0.67	0.62	0.65
Number of obs.	80	80	104	86	101

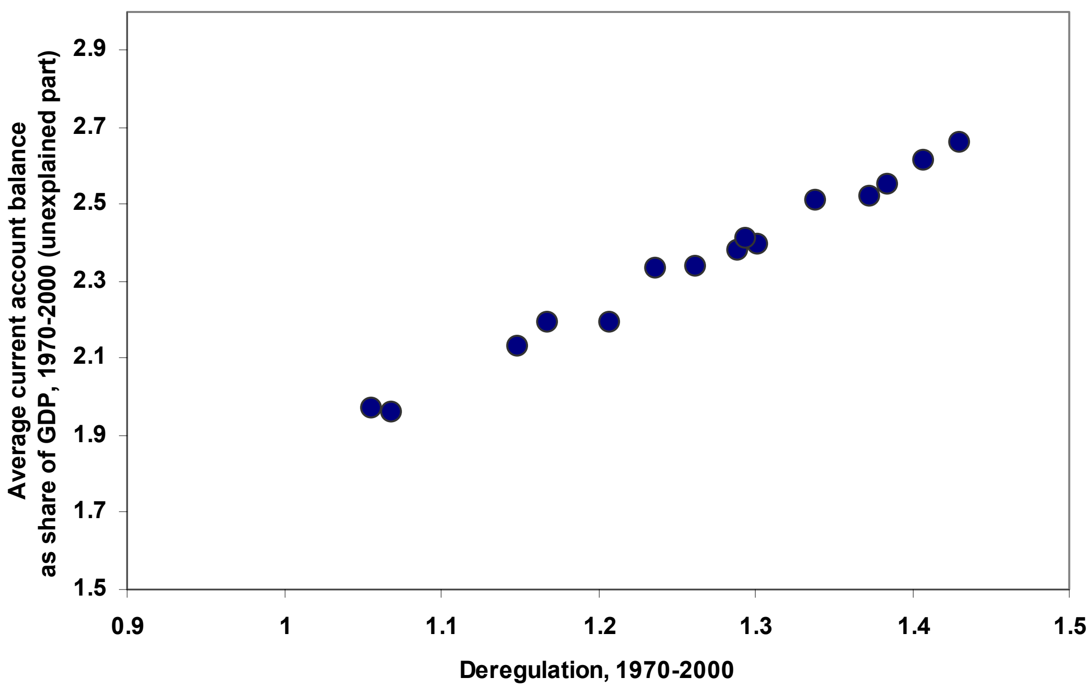
Annotations: Column (4) is based on a regression for the restricted sample (1970 - 1995). Column (5) is based on a sample that omits the 1996-2000 observations for Greece, Norway, and Switzerland. t-statistics are based on White's (1980)heteroscedasticity-consistent covariance-matrix. ***, **, *: significance levels of 1, 5, 10 percent.

Figure 1: The "regulation of credit, labor and business" in high-income OECD countries



Note: The measure of “regulation of credit, labor and business” is published every five years as part of the Fraser Institute's *index of economic freedom* (see Gwartney and Lawson, 2002). It ranges from zero to ten – with a higher value reflecting a less regulated business environment.

Figure 2: Deregulation and the current account, 1970-2000



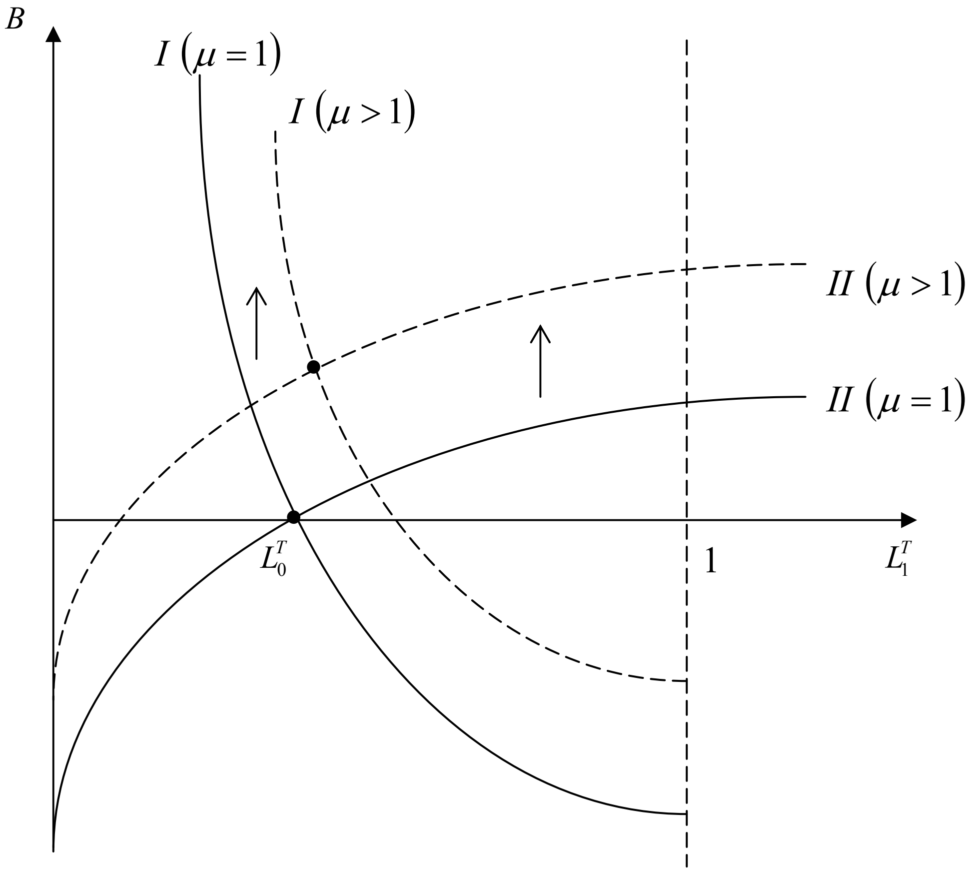


Figure A.1

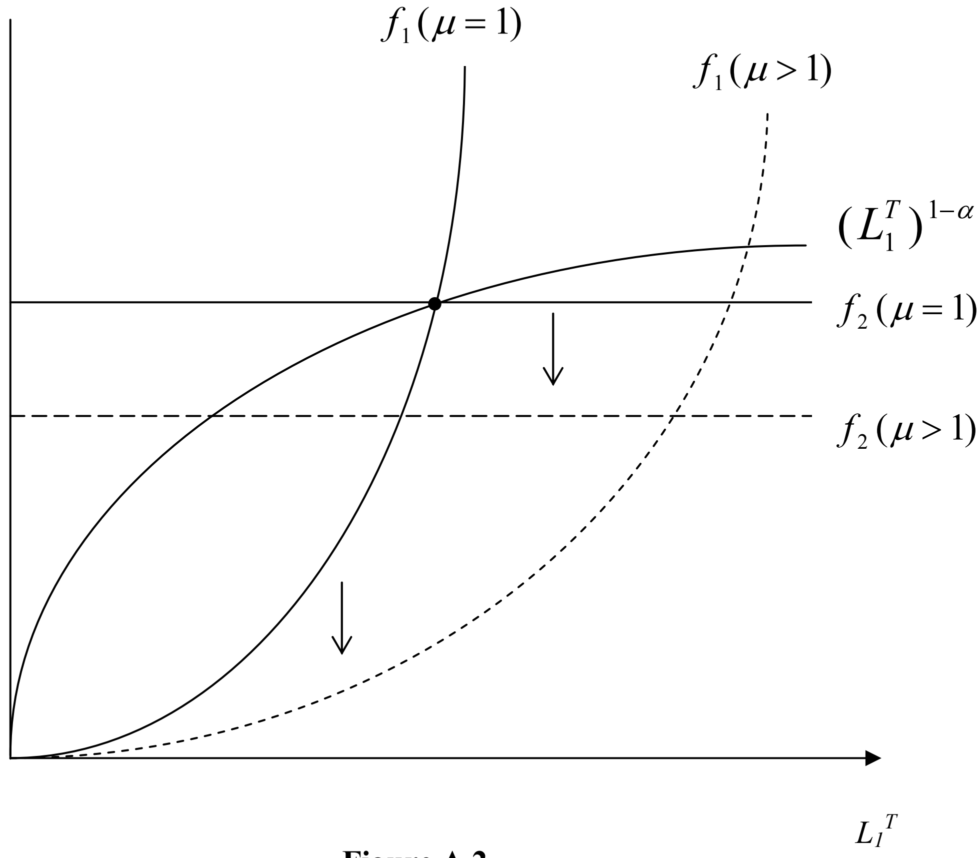


Figure A.2