The Price Effects of Enhancing Services Sector Competition in a Large Open Economy

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Abstract

This paper studies the price effects of shocks to the degree of competition. It is motivated by initiatives to enhance competition in services in the European Union. The paper shows that a higher degree of competition in the nontradable goods sector may have adverse implications for international price competitiveness. It highlights four channels through which enhanced competition in the non-tradable goods sector affects the general price level in a large, open economy (lower monopoly rents, lower import prices, higher demand for real money balances, higher wages) and assesses their relative importance algebraically. The conclusions are supportive of the Single Market and point at possible implications for monetary policy.

Keywords: imperfect competition, monetary policy, liberalisation.
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1 Introduction

The degree of competition in many services markets in Europe is relatively low. Therefore, these markets are priority fields of action for the competition authorities.[1] Initiatives by the European Commission promote the completion of a truly Single Market where monopolies, price agreements between suppliers and preferential treatment of domestic suppliers by governments are forbidden by law. Moreover, EU member states are – albeit sometimes hesitantly – liberalising their network industries (telecom, energy, railways, water) and upgrading anti-trust legislation and enforcement.

This paper studies the effects of increasing the degree of competition in the services sector on the aggregate price level. Competition policy is likely to affect output and prices in the sector targeted by the competition authorities, but it may have effects on other sectors as well. In case of a large economy, such as the European Union, there may even be spillovers to other countries. Understanding the macroeconomic consequences of microeconomic reform is of interest to government and central bank policymakers alike. After all, governments do not seek to enhance competition per se, but in order to achieve perceived benefits for the economy as a whole. For monetary policymakers, it is particularly relevant to know how product market liberalisation in a limited number of sectors affects the general price level. See, for instance, ECB (2001).

To address this issue, I build on the framework by Obstfeld and Rogoff (1995, 1996). Their model allows for imperfect competition, short-run nominal rigidities and rich exchange rate dynamics. Obstfeld and Rogoff's basic model is a two-country model with monopolistic competition and a single differentiated tradable good. This framework enables me to take into account that Europe is a large open economy, so that competition policy may affect the current account and the terms of trade.

This paper distinguishes between tradable and non-tradable goods. It allows for imperfect competition in both the tradable and the non-tradable goods sector. It takes into account the fact that the degree of competition in non-tradables (services) markets tends to be lower than the degree of competition in tradable (goods) markets. This is an extension of the literature. This extended model is used to study the impact of an increase in the degree of competition in the non-tradables sector. As in Blanchard and Giavazzi (2001), the elasticity of substitution between products is interpreted as an instrument of competition policy.

[1] See Gonenc, Maher and Nicoletti (2000) en Van Bergeijk and Haffner (1995).

I obtain the following results. First, an increase in the degree of competition in the non-tradable goods sector may have adverse implications for international competitiveness. Intuitively, more competition in the non-tradables sector triggers an increase in labour demand in the non-tradables sector, which causes a bidding up of wages and draws labour from the tradable goods sector, leading to lower tradables output and a higher price for tradables in the new equilibrium. The implication is that deregulating the domestic services sector, via its impact on wages, will make a country *less* competitive internationally.

Second, I highlight the existence of four channels through which an increase in the degree of competition in the non-tradables sector may affect the general price level. Most important is the direct effect via downward pressure on profits margins. For a large country, enhancing competition in the non-tradables sector also affects the general price level via an improvement in the terms of trade and via an increase in the demand for real money balances (more competition leads to a short-run accumulation of net foreign assets. This enables households to increase consumption, which means that real money balances have to increase). These two effects re-inforce the downward impact on the general price level caused by the decline in profit margins. The fourth channel works in the other direction: the expansion of output in the non-tradables sector leads firms to bid up the wage rate, which increases labour costs and has an upward impact on the general price level. I show that, for all realistic parameter values, an increase in the degree of competition in the non-tradables sector reduces the general price level in the domestic economy. This result is supportive of the Single Market project and of the initiatives by EU national authorities to deregulate domestic services markets. I provide an expression for the impact of enhanced competition on the inflation rate in the transitional period between two steady states, which could in principle be used by the ECB to derive the appropriate temporary adjustment of its definition of price stability.

The remainder of this paper is organised as follows. In the next section, the basic model is presented and equilibrium conditions under optimal behaviour by households and firms are derived. Section 3 presents a log-linearised version of the model. Section 4 analyses the consequences of a permanent shock to the degree of competition. Section 5 concludes.

2 The model

2.1 Market structure and preferences

The world consists of two countries of identical size. Both countries are inhabited by a continuum of monopolistic producers. Producers in the Home country are indexed by $z \in [0, \frac{1}{2}]$, producers in the Foreign country are indexed by $z \in (\frac{1}{2}, 1]$. Each of them produces a single tradable good z_T and a single non-tradable good z_N. The markets for tradable and non-tradable goods are characterised by monopolistic competition.

Household preferences are defined over an intertemporal utility function which includes a consumption index, real money balances and work effort:

$$U_t = \sum_{s=t} \beta^{s-t} [\log C_s + \chi \log(\frac{M_s}{P_s}) - \frac{\kappa}{2} L_s^2], \tag{1}$$

where U is the lifetime utility of a representative Home household, C is composite real consumption, M is the amount of nominal money balances held by the representative household, P is a consumption-based price deflator, L is the amount of labour used in production, β is the discount factor, χ is the parameter associated with the utility derived from holding real money balances, κ captures the disutility of work effort and t, s are time subscripts. Time subscripts will be suppressed whenever possible. The expressions for Foreign variables are identical to those found for Home (apart from an asterisk (*) and a different indexation of producers) unless stated otherwise.

Let $c_N(z_N)$ $[c_T(z_T)]$ be a Home household's consumption of good z_N $[z_T]$. Composite non-tradable goods consumption in the Home country is

$$C_N = \left[\int_0^{\frac{1}{2}} [c_N(z_N)]^{\frac{\theta_N - 1}{\theta_N}} \, dz_N \right]^{\frac{\theta_N}{\theta_N - 1}}, \tag{2}$$

where θ_N is the degree of substitutability between non-tradable goods in the Home country.

Tradable goods are sold in the world market. Composite tradable goods consumption in the Home country is defined by

$$C_T = \left[\int_0^{1} [c_T(z_T)]^{\frac{\theta_T - 1}{\theta_T}} \, dz_T \right]^{\frac{\theta_T}{\theta_T - 1}}. \tag{3}$$

where the degree of substitutability between all tradable goods is equal to θ_T, independently of where these goods are produced or consumed, i.e.

$\theta_T = \theta_T^*$. Each of the parameters $\theta_T, \theta_N, \theta_N^*$ is assumed to be larger than one.

The variable P in the utility function (1) is a consumption-based price index (defined as the minimum money cost of purchasing one unit of composite real consumption $C = C_T^{\gamma} C_N^{1-\gamma}$), here given by

$$P = (\frac{P_T}{\gamma})^{\gamma} (\frac{P_N}{1-\gamma})^{1-\gamma}, \tag{4}$$

where γ represents the relative preference of the representative household for tradable over non-tradable goods and P_T (P_N) is the consumption-based price index of tradable (non-tradable) goods in the Home country, given by

$$P_T = \left[\int_0^1 [p_T(z_T)]^{1-\theta_T} \, dz_T \right]^{\frac{1}{1-\theta_T}} \tag{5}$$

and

$$P_N = \left[\int_0^{\frac{1}{2}} [p_N(z_N)]^{1-\theta_N} \, dz_N \right]^{\frac{1}{1-\theta_N}} \tag{6}$$

respectively, where $p_T(z_T)$ is the money price of the tradable good z_T and $p_N(z_N)$ is the money price of the non-tradable good z_N.

There are no impediments to international trade, so that the law of one price holds for each individual tradable good: $p_T(z_T) = X p_T^*(z_T)$, where X is the nominal exchange rate, i.e. the price of one unit of Foreign currency expressed in the Home currency.

There is only one financial asset, an internationally traded riskless real bond denominated in the composite tradable consumption good. Firms are entirely owned by households of the same country. Any firm profits are immediately handed back to the owners. Labour is immobile between countries, so that labour income remains in the own economy. The period budget constraint for a representative household of the Home country is

$$\begin{aligned} P_{T,t} F_t + M_t &= P_{T,t}(1 + r_{t-1}) F_{t-1} + M_{t-1} + \\ &\quad + W_t L_t + \Pi_t - P_{N,t} C_{N,t} - P_{T,t} C_{T,t} - P_{T,t} T_t, \end{aligned} \tag{7}$$

where F_t is the stock of bonds held by the representative household on date t, r_{t-1} is the real interest rate on bonds between $t-1$ and t, W_t is the nominal wage rate, Π_t is firm profits and T_t is a lump-sum tax or transfer. Bonds and taxes are denominated in terms of the composite tradable good.

The government budget is balanced at all times. Moreover, there is no government spending. All seigniorage revenues are redistributed in the form

of tranfers: $0 = T_t + (M_t - M_{t-1})/P_t$. The nominal interest rate i_t is defined by $1 + i_t = (1 + r_t)P_{T,t+1}/P_{T,t}$.

2.2 Maximisation of household utility

Maximising one-period composite real consumption $C_T^{\gamma} C_N^{1-\gamma}$ subject to a nominal budget constraint yields the following expressions for consumption of the composite tradable and non-tradable good in the Home country

$$C_T = \left(\frac{\gamma}{1-\gamma}\frac{P_N}{P_T}\right)^{1-\gamma} C, \tag{8}$$

$$C_N = \left(\frac{1-\gamma}{\gamma}\frac{P_T}{P_N}\right)^{\gamma} C. \tag{9}$$

Similarly, Home demand for an individual (non-)tradable good z_T (z_N) is:

$$c_T(z_T) = \left(\frac{p_T(z_T)}{P_T}\right)^{-\theta_T} C_T, \tag{10}$$

$$c_N(z_N) = \left(\frac{p_N(z_N)}{P_N}\right)^{-\theta_N} C_N. \tag{11}$$

Demand for an individual tradable (non-tradable) good is decreasing in its relative price. The elasticity of substitution θ_T (θ_N) turns out to be equal to the price elasticity of demand for each individual tradable (non-tradable) good.

The representative household maximises life-time utility (1), subject to the period budget constraint (7) which must be satisfied in every single period. The first-order conditions are

$$C_{T,t+1} = \beta(1 + r_t)C_{T,t}, \tag{12}$$

$$C_{N,t+1} = \beta(1 + r_t)\frac{P_{T,t+1}}{P_{T,t}}\frac{P_{N,t}}{P_{N,t+1}}C_{N,t}, \tag{13}$$

$$\frac{M_t}{P_t} = \chi C_t \left(\frac{1 + i_t}{i_t}\right), \tag{14}$$

$$L_t^s = \frac{1}{\kappa}\frac{W_t}{P_t}\frac{1}{C_t}. \tag{15}$$

Equations (12)-(13) are the standard Euler equations for the consumption of tradable and non-tradable goods, respectively. Equation (14) is the money demand equation and equation (15) is the labour supply equation.

2.3 Maximisation of firm profits

The representative firm z is a monopolist in the production of a tradable good z_T and a non-tradable good z_N. The firm uses only one input: labour, which is assumed to be homogeneous. The production processes for tradable and non-tradable goods are assumed to be identical, with constant returns to scale in production

$$y_T(z_T) = \alpha l_T(z_T), \tag{16}$$
$$y_N(z_N) = \alpha l_N(z_N), \tag{17}$$

where α is labour productivity and $y_T(z_N)$ $[y_N(z_N)]$ is output of good z_T $[z_N]$. The goods markets clearing conditions are

$$y_T(z_T) = c_T^w(z_T), \tag{18}$$
$$y_N(z_N) = c_N(z_N). \tag{19}$$

where world demand per capita for a particular tradable good is $c_T^w(z_T) = \frac{1}{2}c_T(z_T) + \frac{1}{2}c_T^*(z_T)$. The labour market is assumed to be competitive. Also by assumption, labour is immobile internationally, but fully mobile between sectors, so there will be a single wage rate W (W^*) in each country.

It is assumed that each firm produces a tradable and a non-tradable good. The goods z_T and z_N are produced in firm z. Firm profits are

$$\Pi(z) = p_T(z_T)y_T(z_T) + p_N(z_N)y_N(z_N) - Wl(z), \tag{20}$$

where $l(z) = l_T(z_T) + l_N(z_N)$. The representative firm z chooses $p_T(z_T)$ and $p_N(z_N)$ in order to maximise total profits (20). It takes aggregate demand for tradable and non-tradable goods (C_T^w, C_N) as given. The first-order conditions yield the optimal pricing rules for the representative firm

$$p_T(z_T) = \left(\frac{\theta_T}{\theta_T - 1}\right)\frac{W}{\alpha}, \tag{21}$$
$$p_N(z_N) = \left(\frac{\theta_N}{\theta_N - 1}\right)\frac{W}{\alpha}. \tag{22}$$

2.4 Competition policy

Following Blanchard and Giavazzi (2001), the elasticity of substitution between different varieties of the Home non-tradable good (θ_N) is interpreted as an instrument of competition policy.[2]

[2]The parameter θ_N can be thought of as being a function of 'deep parameters' representing consumer preferences and competition policy. I assume that consumer preferences do not change over time, so that changes in θ_N reflect changes in competition policy only.

Blanchard and Giavazzi (2001) consider product market deregulation along two dimensions: a reduction in entry costs and an increase in the price elasticity of demand. Intuitively, a government can promote competition by making it less costly for consumers to switch suppliers (so that product demand will become more responsive to differences in the product price) or via a reduction in entry costs (so that new firms will enter the market, offering the same product, but in a different variety or on a different location). In reality, many deregulations are likely to affect both the demand elasticity and entry costs. For instance, when deregulating the taxi market, the Dutch government increased the number of licenses (thus reducing the costs of market entry for firms) and relaxed the rules for choosing a taxi (thus lowering the switching costs for consumers).[3]

In this paper, I analyse deregulation in the non-tradable goods sector. I do not distinguish between different types of competition-promoting government measures. Thus, I study a special case of the different possible forms of product market deregulation presented by Blanchard and Giavazzi (2001).[4] All types of product market deregulation in this sector will be represented by a change in θ_N.

It is important to note that an increase in the parameter θ_N does not have a direct impact on utility, even though θ_N appears in the utility function (via C). The symmetry among producers implies that, in equilibrium, households consume all varieties of the non-tradable good in equal proportions (the same is true for the tradable good):

$$\overline{C}_N = \left[\int_0^{\frac{1}{2}} \left[\overline{c}_N(z_N)\right]^{\frac{\theta_N-1}{\theta_N}} dz_N\right]^{\frac{\theta_N}{\theta_N-1}} = \left[\left[\overline{c}_N(h)\right]^{\frac{\theta_N-1}{\theta_N}}\right]^{\frac{\theta_N}{\theta_N-1}} = \overline{c}_N(h),$$

so that a rise in θ_N does not augment utility directly. However, an increase in the elasticity of substitution between non-tradable products affects the elasticity of demand facing firms (which is also equal to θ_N) and thus reduces

[3] As a result of the deregulation of the Dutch taxi market, customers are allowed to stop a taxi on the road, whereas before the deregulation they had to go to a designated taxi stop and accept the rate offered by the first taxi in line (or walk to the next stop).

[4] The number of firms plays no explicit role in this paper, but it is implicitly assumed to be constant. In Blanchard and Giavazzi (2001), product market deregulation may increase or decrease the number of firms, depending on the mix of particular measures. An increase in the elasticity of demand leads to net exit of firms, whereas a reduction in entry costs leads to net entry of firms. For small changes in the elasticity of substitution, the number of firms remains constant when an increase in substitutability is accompanied by a *proportional* decline in entry costs. This is implicitly assumed here, but it will play no explicit role in the remainder of the paper.

the monopoly power of firms [see the pricing equation (22)]. This will, ceteris paribus, lead to lower prices and higher consumption. Thus, an increase in θ_N may affect utility via its impact on the monopoly power of firms.

3 Loglinearising the model

The model does not yield simple closed-form solutions, due to monopoly pricing and the endogeneity of output. Therefore, the model will be linearised around a symmetric steady state. The first step in this direction is deriving the solution for the initial symmetric steady state.

3.1 A symmetric steady state

In a steady state, all exogenous variables are constant. Steady-state values will be represented by overbars. The steady state world real interest rate is $\overline{r} = (1-\beta)/\beta$.

From the household budget constraint (7), steady state consumption is:

$$\overline{C}_N = \overline{Y}_N, \tag{23}$$

$$\overline{C}_T = \overline{r}\overline{F} + \frac{\overline{P}_T^p}{\overline{P}_T}\overline{Y}_T, \tag{24}$$

where $\overline{P}_T^p$ is the production-based price index of tradable goods in the Home country and $\overline{P}_T$ is the consumption-based price index of tradable goods in the Home country. The latter is affected not only by domestic producer prices $\overline{P}_T^p$, but also by import prices (equivalent to exchange-rate adjusted Foreign producer prices) $\overline{X}(\overline{P}_T^p)^*$.

The starting condition of zero net foreign assets ($\overline{F}_0 = 0$) closes the model in the sense that the solution is uniquely determined.

In order to simplify the algebra, I assume full international symmetry in the initial steady state. Therefore, initially $\theta_N = \theta_N^*$. International symmetry also implies that the production-based price index of tradable goods is equal to the consumption-based price index of tradable goods: $(\overline{P}_T^p)_0 = (\overline{P}_T)_0$.

The steady state values of output and the general price level are

$$\overline{Y}_0 = \frac{\alpha\left[\gamma\left(\frac{\theta_T-1}{\theta_T}\right)\right]^{\gamma}\left[(1-\gamma)\left(\frac{\theta_N-1}{\theta_N}\right)\right]^{1-\gamma}}{\kappa^{\frac{1}{2}}\left[\gamma\left(\frac{\theta_T-1}{\theta_T}\right)+(1-\gamma)\left(\frac{\theta_N-1}{\theta_N}\right)\right]^{\frac{1}{2}}}, \tag{25}$$

$$\overline{P}_0 = \left(\frac{1-\beta}{\chi}\right)\overline{M}_0\frac{1}{\overline{Y}_0}. \tag{26}$$

In a model with tradables only ($\gamma = 1$), equation (25) simplifies to the formula reported by Obstfeld and Rogoff (1995), which corresponds to a similar result obtained earlier by Blanchard and Kiyotaki (1987) in a static closed economy framework.
The real wage rate

$$\frac{\overline{W}_0}{\overline{P}_0} = \alpha\left[\gamma\left(\frac{\theta_T - 1}{\theta_T}\right)\right]^{\gamma}\left[(1-\gamma)\left(\frac{\theta_N - 1}{\theta_N}\right)\right]^{1-\gamma} \tag{27}$$

is increasing in the degree of competition in goods markets. Intuitively, competition pushes down goods prices, which induces a rise in consumption and output. The resulting increase in labour demand forces firms to bid up real wages.
Real profits

$$\frac{\overline{\Pi}_0}{\overline{P}_0} = \left[\frac{\gamma}{\theta_T} + \frac{1-\gamma}{\theta_N}\right]\overline{Y}_0 \tag{28}$$

increase when the level of turnover (i.e. aggregate output $\overline{Y}_0$) increases, when the degree of competition (θ_T, θ_N) decreases and when consumer preferences (γ) shift in favour of the least competitive sector (i.e. in favour of the good with the lowest price elasticity of demand, which is the most profitable good to the firm).

3.2 Loglinearisation

To allow for asymmetries between the two countries, we log-linearise the model around the initial steady state. Define $\widehat{Z}_t = dZ_t/\overline{Z}_0$, that is variables with a hat denote percentage changes from the initial steady state. The linearised price equations for Home are:

$$\widehat{P}_N = -\frac{1}{\theta_N - 1}\widehat{\theta}_N + \widehat{W}, \tag{29}$$

$$\widehat{P}_T = -\frac{1}{\theta_T - 1}\widehat{\theta}_T + \frac{1}{2}(\widehat{W} + \widehat{W}^*) + \frac{1}{2}\widehat{X}, \tag{30}$$

An increase in the degree of competition (θ) in a certain sector leads to a decline of producer prices in that sector. The lower the initial degree of competition (i.e. the higher $\frac{1}{\theta-1}$), the larger the price impact of enhanced competition. A rise in the wage rate at Home leads to a proportional increase

in the non-tradable consumer price subindex in the Home country and to a less than proportional increase in the tradable consumer price subindex in Home and Foreign. An exchange rate movement has an opposite impact on the price of tradables in the two countries.

The linearised labour demand equation is

$$\widehat{L} = \phi_T \widehat{Y}_T + \phi_N \widehat{Y}_N, \tag{31}$$

where

$$\phi_T = \frac{\gamma(\frac{\theta_T - 1}{\theta_T})}{\gamma(\frac{\theta_T - 1}{\theta_T}) + (1-\gamma)(\frac{\theta_N - 1}{\theta_N})}; \qquad \phi_N = \frac{(1-\gamma)(\frac{\theta_N - 1}{\theta_N})}{\gamma(\frac{\theta_T - 1}{\theta_T}) + (1-\gamma)(\frac{\theta_N - 1}{\theta_N})}.$$

Note that $\phi_T + \phi_N = 1$. When $\theta_T = \theta_N$, the expressions simplify to $\phi_T = \gamma$ and $\phi_N = 1 - \gamma$.

4 Product market deregulation

This section studies the impact of product market deregulation in the shielded sector, where the degree of competition is typically lower than in the open sector. More precisely, I focus on a permanent increase in the degree of competition in the Home non-tradable goods sector (i.e. $\widehat{\theta}_N = \widehat{\overline{\theta}}_N$).

I will assume a shock takes place at time $t-1$, when the economy is in the initial steady state. In order to follow the dynamics of the economy after the shock, I will distinguish between the short run and long run. Wages are assumed to be fixed for one period (going from $t-1$ to the short-run equilibrium in period t) and fully flexible thereafter. As in Obstfeld-Rogoff (1995), the economy reaches its long-run equilibrium in $t+1$ and remains in this new steady state thereafter. Thus, there is no Calvo-type staggered price setting. Shocks are assumed to be small. Therefore, by assumption, both the short-run equilibrium and the new long-run steady state are sufficiently close to the initial steady state to justify a linear approximation of the model. The long-run equilibrium is a steady state. Long-run steady state changes are indicated by hatted overbarred variables.

The model´s symmetry admits a simple solution approach. I solve for differences between Home and Foreign variables and for world aggregates. This approach also provides a better insight in the underlying intuition.

I will first analyse the price effects at the sector level in a closed economy, then turn to the impact of competition shocks on the current account, the exchange rate and the terms of trade, and finally discuss the long-run and short-run price impact in an open economy.

4.1 Closed economy

In a closed economy, enhancing competition has the following impact on tradable and non-tradable goods prices:

$$\begin{aligned} \widehat{\overline{P}}_N^d &= [-\frac{1}{\theta_N - 1} + \frac{\phi_N}{2(\theta_N - 1)}]\widehat{\overline{\theta}}_N^d < 0, \\ \widehat{\overline{P}}_T^d &= \frac{\phi_N}{2(\theta_N - 1)}\widehat{\overline{\theta}}_N^d > 0. \end{aligned}$$

The downward impact of higher non-tradables competition on the mark-up for non-tradable goods is the first term in the expression for $\widehat{\overline{P}}_N^d$. The additional labour demand in the non-tradables sector results in a higher wage rate in the entire economy, as labour is mobile across sectors. This is the positive term common to both expressions. Enhanced competition in the non-tradables sector forces down profit margins in the non-tradables sector, but leads to higher real wages economy-wide. Thus, an increase in the degree of competition in the non-tradable goods sector leads to a decline in the price of non-tradables, but to a rise in the price of tradables. The lower the initial degree of competition (θ_N small), the larger the price effects of enhancing competition. An increase in competition in the non-tradables sector (for instance, by deregulating the domestic services sector) will make a country *less* competitive internationally.

Only little research has been conducted on the impact of sector-specific competition shocks on the price of goods in other sectors. ECB (2001) suggests that this indirect price effect is likely to be negative, insofar as inputs for other sectors become cheaper. For instance, deregulation in the energy sector will lower the electricity costs for companies in other sectors. There are no intermediate goods in the present model. Instead, I stress that deregulation in one sector will increase the wage costs for companies in other sectors. Whether or not the increase in labour costs (the 'wage bill') is indeed more important than the decline in the price of intermediate goods (the 'electricity bill') is an empirical matter.

4.2 Impact on current account, exchange rate and terms of trade

The reduced-form solution of the short-run current account is:

$$\frac{d\overline{F}}{(\overline{C}_T^w)_0} = \frac{\theta_T - 1}{D}\frac{\phi_N}{2(\theta_N - 1)}\widehat{\theta}_N^d, \tag{32}$$

where $D = 2 + \overline{r}(1 + \phi_N + \phi_T\theta_T)$. Enhanced competition in the Home non-tradables sector leads to a short-run surplus on the current account. Intuitively, enhanced competition in the non-tradable goods sector leads to a shift in Home demand away from tradable goods, which more than offsets the higher income which arises from higher employment and the higher real wage rate in the Home country. The lower Home demand for tradable goods implies that the short-run current account is in surplus. The short-run current account surplus is larger if the non-tradables sector is *relatively* uncompetitive to start with (i.e. if θ_N/θ_T low). In this case, there will be a larger relative price decline of non-tradable goods, which enhances the demand shift from tradable to non-tradable goods in the Home country.

The short-run exchange rate immediately jumps to its long-run value. The exchange rate response is:

$$\widehat{X} = \widehat{\overline{X}} = \frac{\theta_T - 1}{\theta_T}\left(\frac{\phi_N}{\theta_N - 1}\right)\frac{1}{D}\widehat{\theta}^d_N. \tag{33}$$

A permanent enhancement of non-tradables competition in the Home country ($\widehat{\theta}^d_N > 0$) leads to a depreciation of the Home currency ($\widehat{\overline{X}} > 0$). A depreciation is required, since the lower Home demand for tradable goods must be (partially) offset by higher Foreign demand for tradables.

The increase in producer prices in the Home country's tradable goods sector more than offsets the long-run depreciation of the Home currency. This implies that the Home country's long-run terms of trade improve as a result of enhanced competition in the non-tradables sector:[5]

$$\widehat{\overline{TOT}} = \widehat{\overline{P}}^p_T - (\widehat{\overline{P}}^p_T)^* - \widehat{\overline{X}} = \frac{\phi_N}{2\theta_T(\theta_N - 1)}\widehat{\overline{\theta}}^d_N + \frac{1 + \phi_N}{\theta_T}\frac{\overline{r}d\overline{F}}{(\overline{C}^w_T)_0}, \tag{34}$$

The reason is that the relative scarcity of labour (even with the additional supply) leads firms to bid up the wage rate, so that the price of domestic tradables increases.[6] In the short run, output prices in the Home and Foreign tradables sector are not affected by a change in non-tradables competition, since nominal wages are fixed in the short run. Therefore, the change in the

[5]Note that part of the impact of the degree of competition on the terms of trade works via the short-run re-distribution of wealth. This is in line with the well-known argument by Keynes that a country making international transfer payments will experience a deterioration in its terms of trade.

[6]In the special case of perfect competition in the tradables sector ($\theta_T \to \infty$), there would be no change in the terms of trade. The reason is that under perfect competition all tradable goods producers behave as price-takers.

Home country short-run terms of trade is fully determined by the short-run change in the exchange rate. The depreciation of the Home currency means that the Home country experiences a short-run deterioration of its terms of trade.

4.3 Long-run impact

The aggregate international CPI differential is

$$\widehat{\overline{P}}^d = [-\frac{1-\gamma}{\theta_N - 1} + \frac{\phi_N}{2(\theta_N - 1)}]\widehat{\theta}_N^d - \gamma\widehat{\overline{TOT}} - \phi_T \frac{\overline{r}d\overline{F}}{(\overline{C}_T^w)_0}. \tag{35}$$

Equation (35) shows four channels through which enhanced competition in the Home country ($\widehat{\theta}_N > 0$) affects the general price level. First, enhanced competition in the non-tradables sector has a downward impact on monopoly profits in this sector, which lowers the price of non-tradables goods. The impact on the general price level is proportional to the size of the non-tradable sector and inversely related to the initial degree of competition in this sector, as reflected in the term $-\frac{1-\gamma}{\theta_N - 1}\widehat{\theta}_N^d$. The latter indicates that it is more effective to enhance competition in a sector where firms have a high degree of monopoly power. Second, the expansion of output in the non-tradables sector leads to higher labour demand. The bidding up of wages implies a higher cost of factor inputs for all sectors, which has an upward impact on the general price level, as shown by the term $\frac{\phi_N}{2(\theta_N - 1)}\widehat{\theta}_N^d$. Normally (when $\phi_N \approx 1 - \gamma$), this effect reduces the price impact of the first channel by roughly one half. Third, deregulating the non-tradables sector leads to an improvement in the Home country's terms of trade. The impact on the general price level of the terms of trade improvement is given by $-\gamma\widehat{\overline{TOT}}$. This channel is likely to be relatively small.[7] Fourth, enhanced competition in the non-tradables sector generates a positive wealth effect for the Home country ($d\overline{F} > 0$). The ensuing higher level of consumption implies that demand for real money balances goes up. Therefore, keeping the nominal money supply unchanged, the general price level must go down to restore equilibrium in the money market. This fourth channel is also likely to be

[7] The terms of trade channel will become negligible if $\gamma \to 0$ or $\gamma \to 1$, as can be seen from the fully-reduced form. Intuitively, if the non-tradables sector is very small ($\gamma \to 1$), enhanced competition in the non-tradables sector leads to a negligible change in import prices. Conversely, if the tradables sector is very small ($\gamma \to 0$), even a large decline in import prices will have a negligible impact on the overall price index.

small when compared to the first two channels.[8]

Three channels (lower monopoly rents, terms of trade improvement, higher money demand) go in the direction of a lower general price level, whereas one channel (higher wages) has an upward effect on the general price level.

Realistically, the following constraints may be imposed on the parameters. First, the degree of competition in the world market for tradable goods is larger than in the domestic markets for non-tradable goods, i.e. $\theta_T > \theta_N$. This is in line with Hakura (1998), who empirically finds that both import and export penetration have a significant negative impact on the price-cost margins. Second, the price-elasticity of demand in the non-tradable goods market satisfies the condition $\theta_N > 2$. This follows from Neiss (2001), who finds an average labour income share in GDP of 50% for OECD countries.[9] Most empirical papers find results that correspond to a price-elasticity of demand (θ) in a range between 3.5 and 6. This corresponds to an average mark-up $[1/(\theta - 1)]$ of 20-40%. See Obstfeld and Rogoff (2000) for references. Third, the share of tradables is less than 50% of output, i.e. $\gamma < \frac{1}{2}$. In fact, for Europe, the share of agriculture and industry (which typically produce tradable goods) in total output is some 25%, whereas the share of (mostly non-tradable) services is some 75%.

For this range of values of the model parameters ($\theta_T > \theta_N > 2; \gamma < \frac{1}{2}$), the direct effect on the aggregate price level (lower monopoly rents) will dominate the indirect effect (higher real wage), so that an increase in the degree of competition in the non-tradables sector unambiguously lowers the aggregate price level in the domestic economy. In fact, the minimum decline in consumer prices in response to an increase in competition in the non-tradables sector is equal to *half* the direct impact of the reduced mark-up (the first channel). This result is supportive of the Single Market project and of initiatives by EU national authorities to deregulate domestic services markets.

If competition authorities target the wrong sector [i.e. if they enhance

[8]The real money balances channel will become negligible if $\gamma \to 0$ or $\gamma \to 1$, as can be seen from the fully-reduced form. Intuitively, if the non-tradables sector is very small ($\gamma \to 1$), enhanced competition in the non-tradables sector leads to a negligible wealth transfer ($d\overline{F} \to 0$). Conversely, if the tradables sector is very small ($\gamma \to 0$), a wealth transfer which is large in terms of tradable goods will have a negligible impact on overall consumption (and therefore also on money demand and the general price level).

[9]Labour income gives a lower bound for firm production costs, whereas GDP gives an upper bound for firm sales. If production costs are at least 50% of firm sales, then the average profit margin is not more than 100% of production costs, i.e. $\frac{\theta_N}{\theta_N - 1} - 1 < 1$, which is equivalent to $\theta_N > 2$.

competition in the tradables sector, despite that this sector is relatively unimportant (γ small) and competition in the *other* (non-tradables) sector is very limited (θ_N extremely small)], adverse price effects may occur. In this case, the price rise in the non-tradables sector may outweigh the price decline in the tradables sector. The implication is that further deregulating the tradables sector may be unattractive for countries with a highly protected non-tradables sector. However, this possibility only occurs for implausible parameter values.[10]

At the world level, the terms of trade effects and wealth transfers cancel out. For realistic parameter values, enhanced competition reduces the average world price level:[11]

$$\widehat{\overline{P}}^w = [\frac{\phi_N}{2(\theta_N - 1)} - \frac{1-\gamma}{\theta_N - 1}]\widehat{\overline{\theta}}^w_N. \tag{36}$$

4.4 Short-run impact

The short run is characterised by sticky wages (i.e. $\widehat{W} = \widehat{W}^* = 0$). However, the mark-up for non-tradable goods can change as a result of competition policy. Thus, in this model, contrary to Obstfeld and Rogoff (1995, 1996) and Hau (2000, 2002), wage rigidity does not imply price rigidity *per se*, i.e. short-run non-tradables price changes ($\widehat{P}_N$) need not be zero. The short run (period t) can be seen as a transition period, before the economy reaches its long-run equilibrium. Short-run percentage changes are indicated by hatted variables without overbars.

Since the short-run equilibrium is no steady state, the real interest rate need not be constant. Output is demand-determined in the short run. Therefore, short-run unemployment or labour shortages can occur.

The short-run world price level is:

$$\widehat{P}^w = -\frac{1-\gamma}{\theta_N - 1}\widehat{\theta}^w_N. \tag{37}$$

In the short run, wages only partially adjust to competition shocks.[12] As a

[10] Numerically, if $\gamma = 0.25$ (corresponding to the joint share of industry and agriculture in the gross domestic product in the US and Europe) then the aggregate price level is declining in the degree of competitiveness in the tradables sector, unless $\theta_N < 1.5$. If $\gamma = 0.1$ (roughly corresponding to the share of exports in the US gross domestic product, the share is somewhat higher for Europe) then the aggregate price level is declining in θ_T, unless $\theta_N < 1.7$.

[11] It is easy to show that $\gamma < \frac{1}{2}$ or $\theta_T > \theta_N$ is sufficient for $1 - \gamma > \phi_N$.

[12] Nominal wages are fixed, but real wages are affected by the decline in the general price level.

result, the short-run impact of competition policy on the world price level exceeds its long-run impact [compare formulas (36) and (37)].

The short-run change in the international CPI differential is

$$\widehat{P}^d = \left[-\frac{1-\gamma}{\theta_N - 1} + \frac{\gamma}{D}\left(\frac{\theta_T - 1}{\theta_T}\right)\frac{\phi_N}{\theta_N - 1} \right] \widehat{\theta}_N^d. \tag{38}$$

Enhanced competition leads to a decline in the general price level in the short run. The reason is that the downward price impact of the decline in the profit margin in the non-tradables sector dominates the upward price effect of the wage increase. Thus, increasing the degree of competition in the non-tradables sector has beneficial short-run effects.

The general price decline which follows from the enhancement of competition reflects a more efficient allocation of resources. Therefore, monetary policymakers (in case of Europe: the ECB) should fully accommodate this decline.[13] Enhanced competition permanently lowers the price level, but it will only have a *temporary* effect on the level of inflation.[14] Accommodating the price effect of enhanced competition therefore implies the need for a temporary adjustment of the policymaker's inflation target. In order to derive the appropriate size of the adjustment, monetary policymakers need to distinguish the impact of enhanced competition from other sources of price changes. Equations (35), (36), (37) and (38) can play a useful role in this respect. Combined with an assessment of the length of the transitional period and the timing of the price effects, in principle, the appropiate temporary adjustment of the inflation target can be derived.

5 Conclusion

This paper analyses the aggregate price impact of deregulation in the European non-tradables sector in a dynamic framework. Recent initiatives, both at the European level and in individual EU member states, promote a higher degree of competition. The degree in many non-tradables (services) markets is substantially less than in tradable (goods) markets. Therefore,

[13] In the case of product market deregulation, monetary policymakers will normally respond to second-round effects only. An example of second-round effects is that an initial reduction of inflation due to regulatory reforms may dampen the pressure on nominal wages (via lower inflation expectations). No such second-round effects occur in this model. This implies that monetary policymakers should fully accommodate the price declines which follow from enhanced competition in this paper.

[14] It is important to note that this is not a conclusion of this paper. Rather, it follows by construction of the model: inflation is zero in the new steady state by assumption.

the non-tradables markets are priority fields of action for the competition authorities.

Product market deregulation in one sector may have adverse spillovers to other sectors. More competition in the non-tradables sector triggers an increase in labour demand in the non-tradables sector, which causes a bidding up of real wages, possibly leading to a higher price for tradables in the new equilibrium. The implication is that deregulating the domestic services sector, via its impact on wages, may make a country *less* competitive internationally.

Under realistic assumptions, an increase in the degree of competition in the non-tradables sector lowers the general price level in the domestic economy. This result is supportive of the Single Market project and of initiatives by EU national authorities to deregulate domestic services markets.

I have highlighted four channels through which competition policy may affect the general price level: (1) a decline in profit margins (directly), (2) an improvement in the terms of trade (via import prices), (3) an international wealth transfer (via its impact on the demand for real money balances), and (4) an increase in labour demand (via wages). Whereas the first three channels contribute to lower prices, the fourth channel works in the other direction. Algebraically, the fourth channel reduces the direct price impact of lower profit margins (the first channel) by roughly one-half. The second and third channels are likely to be relatively small.

The model helps the ECB to distinguish the price impact of enhanced competition (which does not, in principle, require a monetary policy response) from other factors which influence the general price level.

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