# International Competitiveness: Product Deregulation and Internal Devaluation

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June, 2015

Preliminary and Incomplete,
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**Abstract**

Echoing recent developments within the Euro area, the paper investigates the role of price- and market-driven policies in enhancing international competitiveness. In a theoretical framework, we investigate the effects of an internal devaluation that reduces labor cost and a product market deregulation that improves market competition on the real exchange rate. These policies affect international competitiveness along the extensive and the intensive margins of trade (i.e. number of firms and relative prices, respectively). We show that both reforms improve international competitiveness of a country through real exchange rate depreciation, even though they work along opposite channels on the two margins of trade. Additionally, the pricing-to-market behavior substantially reinforces the effectiveness of the product market deregulation on trade competitiveness while the opposite holds for the internal devaluation. The former reform generates a competition effect on domestic markups which improves price-competitiveness while the later reform causes a relative-price effect on markups which bring the opposite result.

*JEL classification*: E32, E52, F41

*Keywords*: Competitiveness, Structural Reforms, Pricing-to-market.

*This research was funded by the French Agence Nationale de la Recherche (ANR) under grant ANR-11-JSH1002 01.

# 1 Introduction

Since the beginning of the 2000s, European countries have been confronted to growing divergence in international competitiveness. Peripheral countries (GIIPS, for Greece, Italy, Ireland, Portugal and Spain) experienced a substantial deterioration in trade competitiveness whereas those of Core countries have been rather stable or in slight reduction. This gap has been associated with growing discrepancies in current account positions (i.e. growing current account surpluses in Core countries, primarily Germany, versus sustained trade deficits in GIIPS) all over the 2000s. It also has been enlarged with the financial and sovereign-debt crises experienced from 2008 by GIIPS countries (see ECB, 2012). This divergence in international competitiveness across Core and Peripheral of the Euro Zone is illustrated on Figure 1.

[Insert Figure 1 here]

The upper left panel of Figure 1 displays the weighted average of the Harmonized Competitiveness Indicator (HCI) for those two groups of countries. The HCI, based on the consumer price indices, provides a measure consistent with the real effective exchange rate, which is comparable across countries.[1] It is worth noticing that a rise in the HCI corresponds to an increase in the relative cost of production (and therefore a loss in competitiveness). This figure strikingly highlights a much lower international competitiveness for the GIIPS, relative to the non-GIIPS, in particular over the period 2001-2010. Diverging trends in international competitiveness can also be captured by unit labor costs (UCL, henceforth). The upper right panel of Figure 1 displays the average ULC for the two groups of countries from 2000 to 2013.[2] The figure reports two distinct periods. From 2001 to 2007, GIIPS countries have experienced a strong increase in UCL, despite the moderate or stagnant productivity. Since the 2008 crisis, some of these countries have combined a stronger productivity gains and wage moderation generating a slowdown in UCL (see ECB, 2012; OECD, 2012).

In front of the severity of the crisis, there have been repeated calls to make reforms in view of restoring international competitiveness in GIIPS. For instance, in view of restoring growth in Europe, M. Borroso argues that "[...] the biggest problem we have for growth in Europe is the problem of lack of competitiveness that has been accumulated in some of our Member States, and we need to make the reforms for that competitiveness." (State of the Union Speech, December 2012). It is widely accepted that this competitiveness issue can be addressed with a number of price- and market-driven reforms.

Given the inability – as long as they remain in the Euro Zone – to use external devaluation, some countries have carried out tax reforms so-called "internal devaluation". This price-driven reform attempts to restore trade competitiveness by reducing the relative price of domestic exports, through

[1] The HCI is calculated on "the basis of weighted averages of bilateral exchange rates vis-à-vis the currencies of the trading partners of each euro area country and are deflated by appropriate cost or price indices" (see ECB, 2012). It aims at providing a comparable measure of price and cost competitiveness across countries.

[2] The unit labor cost index (2010 index = 100) is extracted from OECD annual indicators database.

labor cost. As an example, Germany has implemented in 2007 the so-called fiscal devaluation by increasing VAT rate by 3 p.p. which has been partly offset by a reduction in employer social security contributions by 2 p.p.

Non-price competitiveness factors also matter in accounting for external imbalances within Europe (see ECB 2012). For instance, product market deregulation constitutes another avenue to gain on international competitiveness. Intuitively, by removing barriers to entry, boosting firm creation and raising competition, product market deregulation is expected to improve the country's economic performances by helping firms to compete on the international market. The lower left panel of Figure 1 displays the legal barriers to entry in average for GIIPS and non-GIIPS in 2003, 2008 and 2013.[3] The figure shows that barriers to entry are more restrictive for GIIPS countries, even though they tend to be relaxed for both groups of countries over the years.

These empirical facts open the question of how gains in international competitiveness might be achieved. Precisely, one might query how tax reforms (as internal devaluation for instance) or structural reforms (such as product market deregulation) are effective in this purpose.

In the paper, we evaluate the ability of price- and market-driven reforms to improve international competitiveness. We address this question on theoretical grounds. In a context of international competition, cross-border price discrimination is likely to affect the effectiveness of these reforms. Indeed, several empirical studies have shown that "pricing-to-market" behavior has key implications on real exchange rate and therefore international competitiveness (see Burstein and Gopinath, 2014, for a survey). This leads us to ask the following questions. First, how reforms like internal devaluation and product market deregulation do restore international competitiveness? Second, does the extent of market competition affect the effectiveness of these policies?

To answer these questions, we develop a two-country static model with monopolistic competition and endogenous firm entry *à la* Krugman (1980) featuring international trade costs and a sunk firm entry cost. This setup has the advantage to make the distinction between the intensive margin of trade (i.e. the relative price of traded goods) and the extensive trade margin (i.e. the number of exporting firms).

The theoretical framework is enriched with a structure of competition that generates endogenous markups decisions. This allows us to capture a "pricing-to-market" behavior of firms: pricing decisions vary with destination markets, leading to a deviation from the relative purchasing power parity. In our model, each country contains a large number of sectors, each of them being made of a finite number of differentiated firms. While sectors are in a standard CES monopolistic competition setting, within each sector, firms behave like oligopolists, i.e. taking into account the effect that the pricing and quantity decisions of the other firms have on the demand for its own good.[4] Firms

[3]This index is one of the OECD Indicators of Product Market Regulation.

[4]Our market structure is close to Atkeson and Burstein (2008). They show that trade costs and oligopolistic competition are key features to match main empirical facts on trade volume. Devereux and Lee (2001) investigate the gains of trade with a similar competition structure. However, they do not introduce international trade cost, which shut down a potential pricing-to-market behavior. Floetotto and Jaimivich (2008), Colciago and Etro (2010)

discriminate across markets' destination by charging different markups which in turn depend on both the intensive and the extensive margins of trade. The larger the market share of domestic firms, the larger the price-elasticity of demand for each variety, i.e. the lower the markup extracted by each firm. Additionally, when imported varieties are more expensive than domestic ones, the price-elasticity of domestic demand varies in favor of the goods domestically produced, leading to higher domestic markups.[5,6]

Two types of policies are implemented in order to improve trade competitiveness measured by the CPI real exchange rate. First, an internal devaluation is captured by a payroll tax cut, which aims at reducing labor cost from the firm's perspective. Second, a product market deregulation is captured by a firm entry subsidy. One might expect that each policy has differentiated effects on both margins of trade. While internal devaluation is likely to play on the real exchange rate through the intensive margin, product market deregulation is more likely to affect the extensive margin. Besides, in our two-country framework, one country's unilateral tax reform has asymmetric effects on the price-elasticity of demand in each country, making optimal for firms to engage in different pricing-to-market behaviors across destination markets. This ultimately modifies the international transmission of policies on both margins of international competitiveness.

Several results emerge from our analysis. First, both an internal devaluation and a product market deregulation improve international competitiveness of a country: a country assigning payroll tax cuts or firm entry incentives lowers its consumer price index (CPI) relative to abroad which depreciates the real exchange rate. However, both policies work along opposite channels on the extensive and the intensive margins of trade. A product market deregulation improves the market position of domestic firms (extensive margin) despite the deterioration in price-competitiveness (intensive margin). On the opposite, an internal devaluation improves price-competitiveness which contributes to depreciate the real exchange rate. Indeed, a reduction in payroll tax boosts domestic aggregate spending and the demand for imported goods increases substantially more than exports. Second, we argue that the pricing-to-market behavior substantially reinforces the effectiveness of the product market deregulation on trade competitiveness. The intuition behind this result comes from the competition effect on markups: firms entry generates a markup absorption, which is stronger domestically (where the reform took place) than abroad, no matter the producer's citizenship. This depreciates the real exchange rate through two channels. First of all, the aggregate price index falls more domestically than abroad since the relative number of foreign varieties drops. Additionally, we show that variable markups affect the degree of price-competitiveness. Precisely, a strong reduction in domestic markups boosts aggregate expenditures everything else equal. In relative

and Lewis and Poilly (2012) resort to this type of framework in a closed economy.

[5]There are a number of ways to introduce pricing-to-market in a model with international trade costs (see survey by Burstein and Gopinath, 2014). Departing from the CES demand is one option (e.g. for instance Bergin and Feenstra, 2001; Atkeson and Burstein, 2008; Melitz and Ottaviano, 2008; Gust el al., 2010). Alternatively, Corsetti and Dedola (2005) suggest introducing additive distribution costs. In both ways, the price-elasticity of demand is variable and firms adjust their markups across destination.

[6]Mettre une phrase pour dire que l'on se s0intéresse pas à litterature de "incomplete pass through"

terms to abroad, the import demand for foreign goods increases which lessens the deterioration in price-competitiveness mentioned above. On the opposite, the pricing-to-market behavior slightly reduces the ability of the internal devaluation to depreciate the real exchange rate. In that case, the competition effect is not the only factor to affect markups. Indeed, a reduction in payroll tax mostly change the relative price of imported goods. When imported varieties are more expensive than domestic ones, market shares increases for domestic firms. This leads to higher markups for domestic firms, no matter the destination market. This tends to mitigate price-competitiveness in the domestic country.

Finally, we show that the price- and market-driven reforms have opposite effects on welfare. Precisely, a product market deregulation reduces welfare in the domestic country while the foreign country is hardly affected. This comes from the rise in labor driven by firm entry which is not compensated by a positive wealth effect which would boosts consumption.

Our work investigates how structural and fiscal reforms may be used in front of international competitiveness issues. In this respect, it is related to one branch of the literature analyzes the macroeconomics effects of a internal devaluation. Farhi et al. (2013) show that a set of tax instruments can mimic the allocational effects of an external devaluation. Lipinska and von Thadden (2012) argue that the spillover effects of a fiscal devaluation within a monetary union depend on the degree of financial integration.[7] These papers have in common that they focus on the intensive margin of trade, therefore neglecting the endogeneity of firm entry decisions. Eyquem et al. (2014) constitute one exception. They show that a fiscal devaluation in a monetary union framework boosts the range of available varieties. However, their results rely on the interest rate's dynamic. Our stylized model provide us analytical results and we show that under certain conditions, a internal devaluation (a fiscal devaluation as well) might have mitigated effects on the number of firms. The effects of product market deregulation have also been analyzed in the literature. In their seminal paper, Blanchard and Giavazzi (2003) compare the effects of a deregulation on product and labor markets. Since, Ebell and Haefke (2009), Zanetti (2009) or Cacciatore, Duval and Fiori (2012) explore the effects of product market deregulation on macroeconomic performances in a closed-economy setting with equilibrium unemployment. Andrés, Arce, and Thomas (2014), and Fernández-Villaverde, Guerrón-Quintana, and Rubio-Ramírez (2011) investigate the effects of implementing structural reforms in presence of financial constraints or when the economy is at the zero lower bound. However, these papers are built in a closed economy and therefore have no predictions regarding the effects on competitiveness.[8] In an open-economy setting, Eggertsson et al. (2014) evaluate the differentiated effects of product market reforms and labor market reforms on

[7]Fiscal devaluation consists in shifting from payroll taxation to indirect taxation, in the objective of reducing the relative price of the Home good. In this respect, it constitutes one possible way of implementing "internal devaluation". In the paper, we model such a policy through a reduction of the payroll taxation, everything else equal for a given indirect tax rate (the government budget being balanced through endogenous transfer adjustment). In both cases, this amounts assessing the effects of reducing the "labor tax wedge", as long as the tax base on indirect taxation is larger than that of labor (for fiscal devaluation) as empirically the case.

[8]Cacciatore and Fiori (2014) being one exception. [to be developed]

aggregate performances. However, they adopt a “reduced-form” approach of tax policy by modeling them through exogenous price and wage markup cuts, with the potential risk of reaching misleading conclusions. In a monetary union framework, Cacciatore, Fiore and Ghironi (2013) study how monetary policy should accompany the implementation of structural reforms, in both long-run and medium-run perspectives. By contrast, we do not study the (optimal) interplay between the implementation of structural reforms (either price or market driven) and stabilization (monetary) policy, to focus on the effects of such structural reforms *per se*, primarily in terms of competitiveness.

The paper is structured as follows. Section 2 lays out the full model. Section 3 shows the effects of product market deregulation on international competitiveness. Section 4 focus on the impact of an internal devaluation. Section 5 looks at the normative implications of these reforms. Finally, Section 6 concludes.

# 2 The Model

The world consists of two countries. There are $\bar{L}$ households in the Home country and $\bar{L}^*$ in the Foreign country, which correspond to the size of the country. Households choose how much to consume, work and invest shares in domestic firms. The consumption good they purchase is a basket of differentiated goods, with preferences characterized by a taste for variety. In each country, the economy features a two-layer production structure: There is a unit continuum of sectors indexed by $s$ where $s \in [0,1]$ ($s^*$ in the Foreign country). Each sector produces a sectorial good by aggregating Home and Foreign differentiated goods produced by monopolistic competitive firms. Differentiated goods, are indexed by $d$ when they are produced in the Home country − where $d \in \Omega_D \equiv [0,n]$ − and $f \in \Omega_f \equiv [0,n^*]$ in the Foreign one. Finally, the government collects tax revenue on labor and firm entry which are transferred to households through lump-sum transfers.
In what follows, all Foreign country variables are indexed with a star. Home and Foreign countries are symmetric in the sense that they feature the same preferences and technology. When the Foreign decisions are identical to the Home one, we describe only the later.

## 2.1 Households

The representative household in the Home country maximizes her individual utility which reads

$$\mathcal{U}(C,H) = \frac{C^{1-\frac{1}{\psi}}}{1-\frac{1}{\psi}} - \sigma_H \frac{H^{1+\eta}}{1+\eta}, \tag{1}$$

where $\psi > 0$ determines the curvature of the utility function, $\eta > 0$ is the Frisch parameter and $\sigma_H$ is a scale parameter. The household's budget constraint is:

$$PC + I = WH + \Pi + T, \tag{2}$$

where $C$ denotes the aggregate consumption in the Home country at price $P$, $H$ denotes worked hours which provide a nominal wage $W$, $T$ denotes lump-sum transfers from the government (in terms of currency units), $\Pi$ denotes total dividends revenues (from firms) and $I$ denotes investment in domestic firms. Setting $\zeta_d$ as the share invested in a domestic firm (and assuming symmetry among households), it comes that $I = 1/\bar{L} \int_0^n \zeta_d \mathrm{d}d$. In turn, the household perceives an equal share of Home profits $\Pi = 1/\bar{L} \int_0^n \Pi_d \mathrm{d}d$, where $\Pi_d$ denotes the profit from an individual firm.[9] First-order conditions with respect to consumption and labor supply can be summarized in the following Euler equation

$$\sigma_H H^\eta P C^{\frac{1}{\psi}} = W. \tag{3}$$

Note that $\psi$ and $\eta$ governs the strength of the substitution effect. Let consider a rise in labor income. On the one hand, the positive *income effect* exerts an upward pressure on both consumption and leisure. On the other hand, the opportunity cost of leisure in terms of consumption increases. This *substitution effect* makes consumption and leisure move in opposite direction. For a high value of $\eta$ or a low value of $\psi$, the substitution effect is weak therefore aggregate consumption and hours slightly raises with labor income.

## 2.2 Technology

We make the distinction between goods produced at the sectorial level and those produced at a disaggregated (firm) level. This two-layer production structure enables us to capture different degrees of competition across and within sectors. Precisely, the assumption of a limited number of firms within a sector allows to depart from the traditional Dixit-Stiglitz (1977) monopolistic competition setting, to capture the oligopolist behaviors of firms within a sector at the root of endogenous markups.

### 2.2.1 Competition Structure

Following Floetotto and Jaimovich (2008), we suppose that each country features a continuum of sectors of mass 1. In each sector, there is a finite number of firms, each producing one differentiated variety. Individual varieties (from both countries) are combined to produce a sectoral good, the continuum of these sectoral goods being transformed into a final consumption good which is sold to the local households.

**Production of the final good** In Home country, the sectorial goods is denoted by $C_s$ where $s \in [0, 1]$, are bundled by perfectly competing firms into a final consumption good, $C$, according to a CES aggregator such that:

$$C = \left( \int_0^1 C_s^{\frac{\theta-1}{\theta}} \mathrm{d}s \right)^{\frac{\theta}{\theta-1}},$$

[9] In this static model, there is no investment decision in a mutual funds of firms ($I$), as all profits are mechanically invested in domestic firms. Accordingly, introducing a distortionary tax on dividend is pointless. This is no longer the case in a dynamic setting, as shown in Chugh and Ghironi (2011). However, in the corresponding steady-state, the tax on dividends jointly intervenes with the entry tax so that effects can be thought as equivalent.

where $\theta > 1$ is the elasticity of substitution across sectorial goods. Given $PC = \int_0^1 P_s C_s \mathrm{d}s$, with $P$ the consumption price index, the representative final good producer solves her profit maximization program, which yields a demand for sectorial goods and the associated welfare aggregate price index, $P_s$,

$$C_s = \left(\frac{P_s}{P}\right)^{-\theta} C, \quad \text{and} \quad P = \left(\int_0^1 P_s^{1-\theta} \mathrm{d}s\right)^{\frac{1}{1-\theta}}. \tag{4}$$

Anticipating the symmetric equilibrium between sectors, it turns out that $P_s = P$.

**Production of the sectoral good** Each good produced in sector $s$ combines differentiated goods produced domestically and abroad by firms in a monopolistic competition. Therefore, firms have some markup power, which (under conditions we describe below) notably depends on the number of competitors on the market. Let $c_{s,d}$ denote the type-$d$ intermediate goods produced in the Home country and $c_{s,f}$ denote type-$f$ intermediate goods produced in the Foreign country, both being used by the Home sector $s$. At the symmetric equilibrium, $c_{s,x} = c_{s',x}$ for any sector $s, s'$. For the sake of notational clarity, we thus denote $c_x \equiv c_{s,x}$ for $\forall x = d, f$. Therefore, the type-$s$ sectorial good is produced according to the production function:

$$C_s = \mathcal{N}\left(\int_0^n c_d^{\frac{\sigma-1}{\sigma}} \mathrm{d}d + \int_0^{n^*} c_f^{\frac{\sigma-1}{\sigma}} \mathrm{d}f\right)^{\frac{\sigma}{\sigma-1}}, \tag{5}$$

where $\sigma > 1$ is the elasticity of substitution between goods within a sector. Additionally, $\mathcal{N}$ is as:

$$\mathcal{N} \equiv (n + n^*)^{\nu - \frac{1}{\sigma-1}},$$

where $\nu \geq 0$ captures the degree of "taste for variety" by households. A larger number of varieties spreading a certain amount of consumption over a greater number of differentiated products rises household's utility. The larger $\nu$, the more love for variety for the consumer. Notice that $\nu = (\sigma-1)^{-1}$ implies that $\mathcal{N} = 1$, corresponding to the typical CES specification.

The optimal Home demand for differentiated goods produced domestically ($c_d$) and abroad ($c_f$) in sector $s$ (emanating from final good producers) are given by:

$$c_d = \mathcal{N}^{\sigma-1}\left(\frac{p_d}{P_s}\right)^{-\sigma} C_s \left(\frac{P_s}{P}\right)^{-\theta} C, \tag{6}$$

$$c_f = \mathcal{N}^{\sigma-1}\left(\frac{p_f}{P_s}\right)^{-\sigma} C_s \left(\frac{P_s}{P}\right)^{-\theta} C, \tag{7}$$

while the price of the type-$s$ sectoral good is a combination of individual prices (from both countries), $p_d$ and $p_f$:

$$P_s = \mathcal{N}^{-1}\left(\int_0^n p_d^{(1-\sigma)} \mathrm{d}d + \int_0^{n^*} p_f^{(1-\sigma)} \mathrm{d}f\right)^{\frac{1}{1-\sigma}}. \tag{8}$$

Notice that, under symmetry between sectors ($P = P_s$, $\forall s$), this also corresponds to the consumption price index expression. Due to love for variety preferences, with a larger number of firms, the amount to pay in order to get a given utility is lower, such that the welfare-based price index ($P$) decreases (remind that at the symmetric equilibrium, $P = P_s$).

### 2.2.2 Firm Entry and Profit Maximization

Each individual firm produces a differentiated good using labor (domestically supplied). Each variety is supplied on the domestic and the foreign markets, with international trade being subject to iceberg trade costs ($\tau > 1$). As a result, the equilibrium condition for each differentiated Home variety $d \in \Omega_D$ (in sector $s$) is:

$$y_d = \bar{L}c_d + \tau \bar{L}^* c_d^*, \tag{9}$$

where $c_d^*$ denotes consumption of type-$d$ goods in the Foreign country. For the Home country, the production function is such that:

$$y_d = Zh_d, \tag{10}$$

where $h_d$ denotes firm's labor demand used to produce the type-$d$ variety, and $Z$ is the aggregate labor productivity[10]. There is free entry in the manufacturing sector, but firms have to pay a fixed cost to start producing. As standard in the related literature, the fixed entry cost is imputed in labor. In the context of increasing returns to scale, each firm produces one single variety, such that $n$ (resp. $n^*$) corresponds to both the number of Home (resp. Foreign) firms and varieties. The firms program may be decomposed in two steps. First, they take the decision to entry, given the fixed cost of entry they face (which ultimately determines the number of firms in each country). Second, once entered, they maximize the operating profit. As standard, we solve the problem backwards.

Once entered, the Home firm (producing variety $d$) maximizes its operational profit, given by:

$$\Pi_d = \bar{L}p_d c_d + \bar{L}^* p_d^* c_d^* - \tau^w W h_d, \tag{11}$$

under the production function (10) and the demand functions for its good that emanate from the final good sector in each country ($c_d$, from Equation (6) and its equivalent abroad denoted by $c_d^*$), with $\tau^w$ denotes the (gross) payroll labor tax rate.
Solving this profit maximization problem leads to the optimal pricing decisions for the Home and export (Foreign) markets respectively:

$$p_d = \mu_d \tau^w \frac{W}{Z}, \qquad \text{and} \qquad p_d^* = \tau \frac{\mu_d^*}{\mu_d} p_d, \tag{12}$$

where $\mu_d$ and $\mu_d^*$ represent the Home markups extracted on the Home and Foreign-export markets, respectively. As discussed below, markups are endogenously determined by the firm depending on the price elasticity of demand on each markets, and there is no *a priori* reason for them to be equal, i.e. $\mu_d \neq \mu_d^*$. The price setting equations (12) deserve two comments. First, departures from the perfect competition setting come from two sources: payroll taxation ($\tau^w > 1$) and the firms markup behavior ($\mu_d > 1, \mu_d^* > 1$). Second, the price of type-$d$ good that is exported ($p_d^*$) may differ from the local price ($p_d$) for two reasons: *i°)* Trade costs, as the iceberg trade cost is transferred from the firm to the Foreign household (standard mill-pricing strategy), *ii°)* markup differentiation between export and local market, as long as it is optimal for the firm to extract different markup

[10] Note that we assume the same productivity level across sectors.

rates. This last characteristic, reminiscent from a pricing-to-market type behavior of firms, directly comes from our modeling of competition between firms at the sectoral level. This will turn to be key in the international transmission of the tax reforms implemented in the Home country, hence on its trade competitiveness.

Consider now the first step of entry decision. Firm's entry is subject to a sunk entry cost – measured in labor units – made up of regulation costs ($f_R$) and the R&D expenditures ($f_T$), as in Cacciatore and Fiori (2014). We assume that only the regulation cost can be subsidized by the government at a gross rate $\tau^e \geq 0$. Under free entry, firms enter the market until the operational profit is just sufficient to cover the overall entry cost:

$$\Pi_d = \left(f_T + f_R \tau^e\right) W. \tag{13}$$

### 2.2.3 Markups and Pricing-to-Market

Following Atkeson and Burstein (2008) and Jaimovich and Floetotto (2008), we assume that within a given sector, due to the limited number of firms, each firm takes into account the effects of other firms' decisions on the demand for its own good.[11] In this setup, the elasticity of the sectorial price to the firm price, rather than constant, is positively related to the market share of a firm.
Let $\varepsilon_d$ denote the price-elasticity of Home demand for a domestic variety (multiplied by $-1$) such that $\varepsilon_d \equiv -\frac{\partial c_d}{\partial p_d}\frac{c_d}{p_d}$. It can be shown that

$$\varepsilon_d = \sigma - (\sigma - \theta)\, m_d > 0 \quad \text{with} \quad m_d = \frac{p_d^{1-\sigma}}{n p_d^{1-\sigma} + n^* p_f^{1-\sigma}}, \tag{14}$$

where $m_d$ is the market share of a Home firm on its domestic market. Under $\sigma > \theta$, a rise in market share decreases the price-elasticity of demand and therefore boots markups as in Atkeson and Burstein (2008). Notice that the market share $m_d$ can also be interpreted as the elasticity of the sectoral price to the firm price in the Home country: $\varepsilon_d^{Pp} \equiv \frac{\partial P_s}{\partial p_d}\frac{p_d}{P_s}$.
Similarly, the price-elasticity of export (Foreign) demand for a Home varieties is

$$\varepsilon_d^* = \sigma - (\sigma - \theta)\, m_d^*, \quad \text{with} \quad m_d^* = \frac{\left[p_d^*\right]^{1-\sigma}}{n\left[p_d^*\right]^{1-\sigma} + n^*\left[p_f^*\right]^{1-\sigma}}. \tag{15}$$

Notice that markups for Home goods are related to the price elasticities according to

$$\mu_d \equiv \frac{\varepsilon_d}{\varepsilon_d - 1}, \quad \text{and} \quad \mu_d^* \equiv \frac{\varepsilon_d^*}{\varepsilon_d^* - 1}. \tag{16}$$

Several comments can be made from Equations (14)-(16). Under $\sigma = \theta$, i.e. goods are as substitutable within as across sectors, markups defined in Equation (16) are constant (equal to $\sigma/(\sigma-1)$)

[11] We can interpret this setup as a model where firms are in an oligopolistic market and they compete on prices (Bertrand competition).

as in the standard Dixit and Stiglitz's (1977) monopolistic competition model. In a typical calibration, varieties are more substitutable within than between sectors, i.e. $\sigma > \theta$.[12] In that case, markups varie both with the intensive and the extensive margins of trade.

In the closed-economy setup, the firm's market share would be inversely proportional to the number of firms, i.e. $m_d = 1/n$, as in Jaimovich and Floetotto (2008). The intuition of the so-called "competition effect" is straightforward. Given the oligopolistic-type of competition within each sector, a marginal entry raises the price-elasticity of demand addressed to each producer in place, thereby exerting a downward pressure on its markup. One originality of the paper is to bring this feature into the open economy. At each sectoral level, the market share of domestic firms depends on both the number of local but also imported varieties, $n$ and $n^*$ respectively, according to the competition effect mentionned above. In addition, the market share of Home firms on their domestic market vary with the relative price of Foreign goods $p_f/p_d$. When imported varieties are more expensive than domestic ones, market shares increases for domestic firms, or the price-elasticity of domestic demand varies in favor of the goods domestically produced. This leads to higher domestic markups ($\mu_d$ increases with $p_f/p_d$). This effect can be viewed as a "relative-price effect".

As highlighted by Atkeson and Burstein (2008), the combination of endogenous markups and trade costs generate a pricing-to-market behavior: firms price differently the good they sell depending on the destination market. Therefore, markups extracted on each market differ such that $\mu_d \neq \mu_d^*$. This behavior is likely to enrich the effects of tax policy on trade performances, as we investigate further.

## 2.3 Government

Government in each country runs a balanced budget. Absent public spending, collected distortive taxes are rebated to the households as lump-sum transfers, according to the following budget constraint

$$(\tau^e - 1) f_R n W + (\tau^w - 1) n W h_d = \bar{L} T. \tag{17}$$

In our policy experiments, we will consider distortive tax rates as exogenous, balancing the government budget constraint with lump-sum transfers.[13]

## 2.4 Market Clearing Conditions

**The labor market** In each country, labor market is perfectly competitive; accordingly, labor supply is fully used either in the production of manufactured goods or for paying entry costs. Given the technological constraint (10), the labor market equilibrium thus writes:

$$\bar{L} H = n \frac{y}{Z} + n (f_T + f_R). \tag{18}$$

[12] Broda and Weinstein (2006) present empirical evidence that this is indeed the case.

[13] Our framework also enables us to study of the effects of fiscal devaluation (switching from $\tau_w$ to $\tau_c$, for a given value of transfers). As mentioned in the introduction, this is not likely to substantially modifies the results, as long as this amounts reducing the labor tax wedge ($\tau_c \tau_w$ in our terminology).

**Balance of payments** Under financial autarky, the zero trade balance necessarily holds, such that:

$$\bar{L}^* n p_d^* c_d^* = \bar{L} n^* p_f c_f. \tag{19}$$

## 2.5 Closing the Model

**Normalization** We retain the domestic good as numéraire ($p_d = 1$). Let define the terms of trade $s = p_d^*/p_f$ as the export price relative to import prices for the Home country. The real exchange rate is defined a $q \equiv P^*/P$. In addition, as standard in trade models, we define $\phi \equiv \tau^{1-\sigma}$ as measuring the "freeness" of trade. With $\tau > 1$, the freeness of trade is scaled between 0 (autarky) to 1 (free trade). Appendix A summarizes the model's equations.

**Calibration** At the symmetric equilibrium, the two countries are identical in all aspects, $\bar{L} = \bar{L}^*$, $Z = Z^*$ and $\tau^x = \tau^{x*}$ for $x = \{w,\ e\}$. The number of firms in both countries are identical ($n = n^*$) and all goods are sold abroad at an identical price, such that $s = 1$. We assume that the Home country carries out a product deregulation by subsidizing entry (reduction in $\tau^e$) or an internal devaluation by reducing the payroll taxes ($\tau^w$). Both policies generate a deviation of variables from the symmetric equilibrium. The model with endogenous markups cannot be solved analytically such that we carry out a set of numerical exercises in the next sections.[14] Table 1 summarizes the calibrated values.

[Insert Table 1 here]

The elasticities of substitution across goods and across sectors are set to $\sigma = 5$ and $\theta = 2$, respectively, which are line with empirical estimates.[15] Additionally, we need to calibrate one markup in order to deduce the number of firms per sector, $n$. We assume that $\mu_d = 1.3$, which is in the range suggested by Eggertsson et al. (2014) for European countries.[16] The trade costs are set to $\tau = 1.3$, as suggested by Di Mauro and Pappadà (2014) for countries of the Euro Area. In the spirit of Ebell and Hafke (2009), we set the regulation cost by building an index (measured in terms of days) reflecting the number of days and procedure to star an business over the Euro Area. The entry

[14] In the online appendix, we compute analytically the effects of a variation in $\tau^e$ and $\tau^w$ on the two margins of trade when markups are exogenous ($\theta = \sigma$). This simplified model is borrowed from Corsetti et al. (2008).

[15] Broda and Weinstein (2006) estimate the elasticity of substitution among goods at the sectoral level for the US. Their median estimate of the substitution elasticity between 3-digit level goods (corresponding roughly to our $\theta$) is 2.50 over the sample 1972-1988. At the most disaggregated level, their median substitution elasticity (our $\sigma$) is 3.7. However, Anderson and van Wincoop (2004) suggest a range between 5 and 10 for $\sigma$. Benkovskis and Wörz (2014) estimate $\sigma$ to a value close to 2 for the US between 2 and 2.17 for several countries of the Euro Area. Soderbery (2015) suggests estimates of a same range for these countries. Atkeson and Burstein (2008) have a model similar to us and they calibrate $\sigma = 10$ and $\theta$ close to 1, meaning that they allow for a strong pricing-to-market behavior. The online appendix displays some robustness exercises with this calibration.

[16] Based on Høj et al.'s (2007) estimation, Eggertsson et al. (2014) set markups for total private firms to 1.36 for Periphery countries (Italy and Spain) and 1.25 for Core countries (France and Germany). Notice that a markup calibration of 36% also corresponds to the value adopted by Ghironi and Melitz (2005). We provide robustness analysis in the online appendix.

cost correspods to a loss in GDP of 9%, such that $f_R = 0.09\,(y/W)$.[17] Finally, we assume a typical CES preference function by setting $\nu = (\sigma - 1)^{-1}$. In our benchmark calibration, we set $\psi = 1$, such that the income effect and the substitution effect offset each other. The Frisch parameter is set to $\eta = 1$ as usual in the literature and the scale parameter $\sigma_H$ is set to ensure that $H = 0.30$. Finally, country's size and technology ($\bar{L}$ and $Z$) are normalized to unity. In the initial state, the gross payroll tax is set to $\tau^w = 1.34$ (**reference?**) and we assume that there is no entry subsidy such that $\tau^e = 1$.

**International Competitiveness: Some Insights** In this paper, international competitiveness is measured by the real exchange rate, $q$, which captures variations in both the intensive and the extensive margins of trade ($s$ and $n - n^*$, respectively). This can be easily shown by considering a simplified version of our model where markups are exogeneous ($\theta = \sigma$). It follows that the price of any local goods exported abroad is equal to the Home price multiplied by the iceberg trade cost (such that $p_d^* = \tau p_d$, see Equation (12)). The linearized version of the real exchange rate (in deviation from the symmetric equilibrium) is:[18]

$$\hat{q} = \frac{1-\phi}{1+\phi}\left[\underbrace{-\hat{s}}_{(a)} + \underbrace{(\sigma-1)^{-1}\,(\hat{n}-\hat{n}^*)}_{(b)}\right]. \tag{20}$$

Everything else being equal, an reduction in the relative price of exported goods by the Home country boosts its price-competitiveness and raises the real exchange rate (Term $(a)$), thereby improving the international trade competitiveness of this country. Competitiveness also depends on the relative number of Home varieties ($\hat{n} - \hat{n}^*$) as inferred from Term $(b)$: more Home varieties reduces the aggregate price index more domestically than abroad. This, in turn, depreciates the real exchange rate, and thereby improves the Home country's trade competitiveness. Modeling trade costs ($\phi < 1$) is a condition for the two margins of trade to affect the real exchange rate.[19] Variable markups in this setup does not change intuitions, altough it makes the expression of the real exchange rate (20) more complex. In particular, the markup differentiation – inherent to pricing-to-market behavior – also affects trade competitiveness, as we show below.

[17] We compute an entry cost index by using the Global Competitiveness Index Historical Dataset from the World Economic Forum. Following Ebell et Hafke (2009), the index (in days) is measured as

$$\text{entry cost}_{day} = \frac{1}{2}\left(\frac{\text{day + procedures}}{\text{average(day/procedure)}}\right),$$

where "day" gives the number of busines days to start a business and "procedures" gives the number of procedures to start a business. We compute this index on all countries (unweighted) of the Euro Area over the sample 2006-2013. The computed index is 22.82 days.

[18] In what follows, $\hat{x} \equiv \frac{(x - x^{sym})}{x^{sym}}$ denotes the deviation of variable $x$ from the symmetric equilibrium.

[19] Under free trade ($\phi \to 1$), it is straightforward to show that the law of one price holds, as well as purchasing power parity absent any home bias in preferences ($q = 1,\ \forall s$).

# 3 Product Market Deregulation

In this section, we assume that the Home government carries out a product market deregulation by alleviating barriers to entry (i.e. a reduction in $f_R$ through $\tau_e$), the government budget constraint being fulfilled through endogenous transfers adjustments. Starting from the symmetric equilibrium, we first analyze how markups are affected by this market-driven policy and how in turn it alters international competitiveness through the two margins of trade.

## 3.1 Effects of Markups

Figure 2 displays the elasticity (multiplied by 100) of Home and Foreign markups to a 10% entry subsidy implemented in the Home country.[20]

[Insert Figure 2 here]

The markup variation is mostly driven by the competition effect. It is straightforward that a reduction in entry cost boosts entry in the Home country. By intensifying competitive pressures between oligopolistic producers, the arrival of an entrant reduces the market share of incumbents which reduces their markups, as explained with Equations (14)-(16). This competition effect implies that markup rents extracted for both varieties on the Home market ($\mu_d$ and $\mu_f$) decrease substantially. The markup absorption weaker on the Foreign market. Indeed, the price-elasticity of demand is less sensitive to a *marginal* entry when coming from the Home country due to the trade costs ($\mu_d^*$ decreases by less than $\mu_d$). Similarly, Foreign firms suffers by less than Home firms from the markup reduction since the policy is implemented in the Home country ($\mu_f^*$ decreases by less than $\mu_f$). It follows that the relative markup extracted on Foreign consumers increase, for both Home and Foreign firms, i.e. $\mu_d^*/\mu_d$ increases as well as $\mu_f^*/\mu_f$. As we show below, this markup differenciation has an impact on the effectiveness of the policy on international competitiveness.

## 3.2 Effects on International Competitiveness

As mentionned in Section 2.5, product market deregulation affects international competitiveness (measured by $q$) through both the intensive and the extensive margins of trade. In order to understand how pricing-to-market behavior alters the transmission mechanisms of this policy, we compare two setups. In the benchmark model, markups are constant across countries ($\theta = \sigma$). In the full model, firms can discriminate markups across destination ($\theta < \sigma$). Figure 3 displays the elasticity (multiplied by 100) of a set of variables to a 10% entry subsidy implemented in the Home country in both models.

[Insert Figure 3 here]

A first result emerges: following a given product market deregulation, international competitiveness increases *by more* under the pricing-to-market behavior (see Panel ($d$)). To understand the intuition

[20] We set a reduction of $f_R$ by 10% implying that the regulation cost in percentage of GDP is varying from 9% to 8%.

behind this result, we investigate how both margins of trade are affected by this policy.

Panel ($a$) confirms that the number of varieties in the Home country, $n$, increases when its government reduces entry taxes. In the benchmark model ($\theta = \sigma$), the reason is straighforward. A reduction in $\tau^e$ decreases the equilibrium value of the operational profit required to cover the entry cost (Equation 13). This pure "supply-side effect" leads more firms to enter the market.[21] In presence of endogenous markups, $n$ is slightly less sensitive to a product market deregulation. As mentionned above, firm entry generates markup contraction in the Home country due to the competition effect. This moderates the reduction in the operational profit and therefore, less Home firms are needed to restore the free-entry condition.

Given our calibration ($\psi = 1$), the spillover effect of the reduction of $\tau^e$ on the Foreign number of firms is fully attributable to markup endogeneity (see Panel ($b$)). Indeed, $n^*$ does not react to a Home product market deregulation when markups are constant. In that particular case, $\tau^e$ matters for the Foreign number of firms only through the love-for-variety effect captured in expression $(\tilde{P}^*)^{1-\psi}$. This channel is shut down for $\psi = 1$. Pricing-to-market behavior plays a key role to reverse this result. As explained above, product market deregulation reduces the rent that Foreign firms can extract, in particular on their export market ($\mu_f$ decreases by a susbtantial amount). For the given entry cost, this reduces profit opportunities and pushes some firms to exit the market. Therefore, the strong competition effect makes product market deregulation at Home having negative spillover effects on the Foreign number of firms.

Panel ($c$) shows that a market product deregulation also affects the intensive margins of trade, measured by the terms of trade ($s$). The underlying effects can be uncovered from the zero-trade balance equation (19), which in given the optimal demand functions under varying markups, now writes according to:

$$s^{(\sigma+\psi-1)} = \frac{\bar{L}^*}{\bar{L}} \left(\frac{P^*}{P}\right)^{\sigma-\psi} \underbrace{\left(\frac{n}{n^*}\right)}_{(a)} \underbrace{\left(\frac{\mu_d^*}{\mu_f}\frac{\tau^w}{\tau^{w*}}\right)^{\psi}}_{(b)}. \tag{21}$$

In the benchmark model ($\theta = \sigma$), the main driver of the terms of trade is captured by the relative number of firms (Term ($a$)): a rise in $n/n^*$ boosts the relative imports demand by the Foreign country. Everything else equal, this pushes the relative price of exported goods for Home country upwards (i.e. $s$ rises). This reduces Home price-competitiveness and therefore limits the exchange rate depreciation. The rise in the terms of trade is slighty mitigated under pricing-to-market behavior as shown in Term ($b$). As explained above, the competition effect generates a contraction in Home markup for Foreign goods ($\mu_d^*$) relative to its Foreign markup counterpart ($\mu_f$). This strong reduction in Home markups translates into higher purchasing power for domestic households,

[21] Let notice that under the assumption $\eta = 0$ in a model with constant markups, entry tax affects the extensive trade margin only through the resource constraint $n = \bar{L}\tilde{P}C/y$, where the individual output is $y = (f_T + f_R\tau^e)Z/\tau^w\,(\mu - 1)$ and aggregate expenditures are $\tilde{P}C = [Z/(\mu\tau^w)]^{\psi}\,\tilde{P}^{1-\psi}$, where $\tilde{P} = P/p_d$. Under $\psi = 1$, the last expression shows that aggregate expenditures, $\tilde{P}C$, do not vary with the number of firms since the income and the substitution effects offset each other. It results that $n = \bar{L}\,(f_T + f_R\tau^e)^{-1}$.

boosting their aggregate expenditures everything else equal. In relative terms to abroad, the import demand for Foreign goods increases which reduces the terms of trade. We accordingly refer to this as the "aggregate-expenditure effect", captured by Term ($b$). Therefore, variable markups exert an downward pressure on the relative price of exports, $s$. However, the entry effect captured by Term ($a$) is still dominant since the product market deregulation directly affect the extensive margin of trade.

To sum up, a product market deregulation in the Home country boosts international competitiveness in this country through both the extensive and the intensive margins of trade. The boom in Home firm entry relative to the Foreign one reduces the Home welfare-based price index through the typical love-for-variety effect and thus depreciates the real exchange rate. When markups are variables, this direct effect on aggregate prices is reinforced by the mitigated deterioration of the terms of trade.

# 4 Internal Devaluation

An internal devaluation is achieved in the Home market through a reduction in payroll tax $\tau^w$. As previously, we first look at the effects of this policy on markups and then on international competitiveness (in deviation from the symmetric equilibrium).

## 4.1 Effects of Markups

Figure 4 displays the elasticity (multiplied by 100) of Home and Foreign markups to a 10% payroll tax reduction implemented in the Home country.[22]

[Insert Figure 4 here]

As observed in Equations (14)-(16), endogenous markups are driven by two effects: the "competition effect" and the "relative-price effect". The later is the main channel through which an internal devaluation affects markups. Indeed, a payroll tax cut reduces the price of Home goods relative to the price of imported goods ($p_f/p_d$ increases). As explained above, this relative-price effect implies that Home markups for domestic goods ($\mu_d$) increase while markups extracted by Foreign firms on the Home market ($\mu_f$) decrease. Interestingly, this policy enables Home firms to increase their markups, on both local and export markets. The internal devaluation reduces the relative price of imports in the Foreign country, i.e. $p_f^*/p_d^*$ increases. Therefore, internal devaluation raises the market share of Home firms relative to that of their Foreign incumbents ($\mu_d$ and $\mu_d^*$ increase, whereas $\mu_f$ and $\mu_f^*$ decrease).

## 4.2 Effects on International Competitiveness

We now study how the markups adjustments alter the effects the tax reform on both margins of trade in comparison with the benchmark case. Figure 5 displays the elasticity (multiplied by 100)

[22] $\tau^w$ is reduced from 34% to 20%.

of a set of variables to a 10% payroll tax cut implemented in the Home country in a model with constant markups ($\theta = \sigma$) and variable markups ($\theta < \sigma$).

[Insert Figure 5 here]

As shown in Panel ($d$), international competitiveness increases after an internal devaluation, although this effect is slightly mitigated under pricing-to-market. To understand this result, let us first consider the effects on the extensive margin of trade, described in Panels ($a$) and ($b$). Under constant markups and with $\psi = 1$ and $\eta = 0$, internal devaluation would not affect the number of Home firms.[23] For our calibration $\eta = 1$, the number of firms at Home decreases because the substitution effect is weak. In other terms, the raise in wages is translated into a too small increase in hours supply to satisfy the given output per firm. This pushes $n$ downward. This effect is lessens when markups endogenously adjust. The increase in the markups extracted by Home firms (on both destination markets) indeed raises the unit profit on each quantity sold: everything else equal, this enticing firms to enter the Home market. As a result, by raising the market share of the Home firms, internal devaluation improves the country's performances along the extensive margin of trade. Further, this structural reform exerts a negative spillover on the Foreign number of firms, by deteriorating their margin position. Markups extracted by Foreign firms ($\mu_f$ and $\mu_f^*$) are reduced, which reduces the operational profit of the Foreign incumbents, discouraging entry.

Markup endogeneity also modifies the effects of the regulatory reform on the intensive margin since terms of trade decrease by less (see Panel ($c$)). Equation (21) helps us to understand the intuition behind this result. As shown in Term ($a$) in Equation (21), a reduction in $n/n^*$ depresses the relative imports demand by the Foreign country, which improves price-competitiveness ($s$ is pushed downward). The internal devaluation also directly affects the "aggregate-expenditure effect", expressed by Term ($b$) in Equation (21). Indeed, a reduction in payroll tax boosts Home aggregate spendings and therefore the domestic prices for imported goods increase relative to the export prices, which improves price-competitiveness. Pricing-to-market behavior mitigates this effect since, as explained above, $\mu_d^*/\mu_f$ unambiguously increases. Therefore, the reduction in $s$ is lessened by the market share of Home firms.

To sum up, an internal devaluation in the Home country is beneficial international competitiveness of the country, although markups endogeneity reduces the effectiveness of this policy (unlike the product market deregulation). The intensive margin of trade is a key player for this result. As explained above, the price of imported goods relative to exported ones increases after a payroll tax cut, mostly because of the rise in Home aggregate spendings. Endogenous markups mitigates this effect but by a small amount.

[23] Let remind that in that particular case, $n = \bar{L}\left(f_T + f_R\tau^e\right)^{-1}$ and therefore the rise in total aggregate expenditures ($\tilde{P}C$) is exactly compensated by an increase in individual production $y$ such that $n$ remains constant, as for $n^*$.

# 5 Welfare Effects

In the previous section, we argue that gains in external competitiveness can be achieved by pursuing a product market deregulation and an internal devaluation. What are the effects in terms of welfare? The individual welfare in the Home country is measured by the utility function (1) and its counterpart in the Foreign country. Figure 6 compares the welfare elasticity to each policy implemented by the Home country (in a model with pricing-to-market).

[Insert Figure 6 here]

Interestingly, we observe that a 10% payroll tax cut generates is welfare-improving for both countries while entry subsidies reduce welfare at Home and is neutral abroad.

The first result naturally dwells on the direct effect of payroll tax on consumption. A reduction in such taxes has a direct positive wealth effect on Home households since the real wage increase (see Equation (12)) which in turn boosts aggregate expenditures (see Equation (3)). This effect is weaken by the rise in domestic markups, $\mu_d$, which limits the rise in real wage. In the Foreign country, only the markups effect matters: the reduction in domestic markups, $\mu_f^*$, rises the real wage and boosts consumption.

We also show that welfare *decrease* in the Home country after a product market deregulation. A boost in firm entry goes with a rise in labor demand while consumption increases by a little. Indeed, unlike the internal devaluation, entry subsidies do not generate any positive wealth effect on households. For high value of the Frisch parameter, $\eta$, this effect is magnified. When it comes to the spillover effects on the Foreign country, the structural reform is neutral from a welfare perspective, under our calibration. As explained in Section 3, the Foreign number of firms is reduced because of the reduction in markups extracted on the Home market ($\mu_f$). It follows a reduction in Foreign hours which is compensated by a drop in consumption due to the low substitution effect. A high value of $\eta$ magnifies this effect and generates a reduction in welfare abroad.

# 6 Conclusion

TBA

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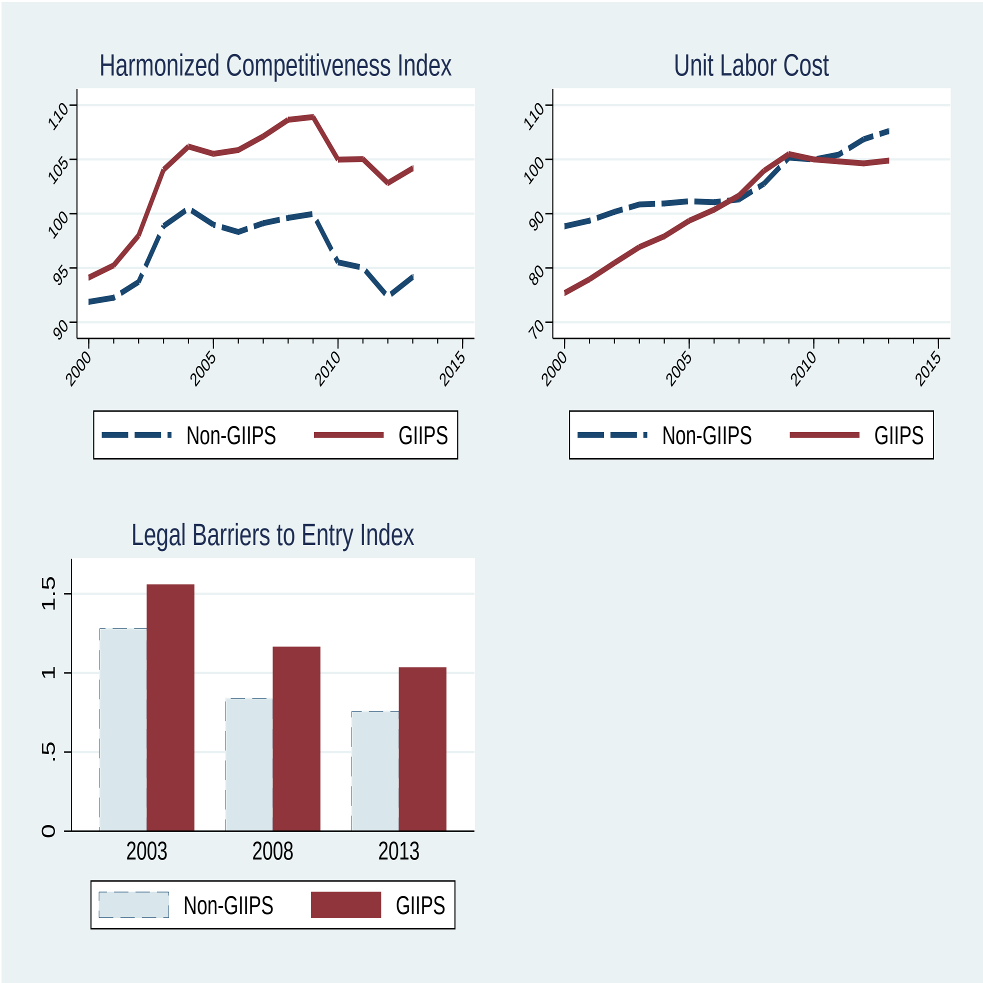
Table 1: **Calibration**

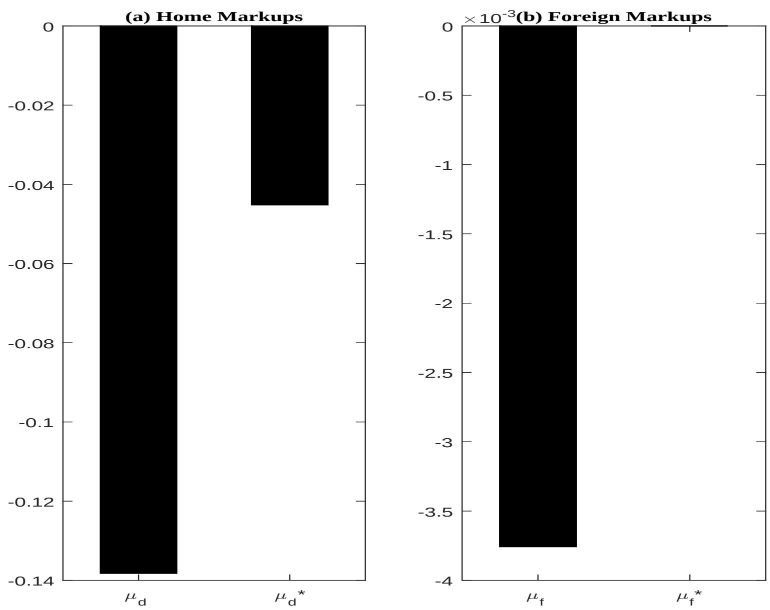
| **Production Function and Preferences** | | Value |
|---|---|---|
| $\sigma$ | Elasticity of substitution btw goods | 5 |
| $\theta$ | Elasticity of substitution across sectors | 2 |
| $\mu_d$ | Markup rate | 1.30 |
| $\tau$ | Trade costs | 1.30 |
| $f_R \times (W/y)$ | Regulation costs in % of GDP | 9.00 |
| $v$ | Love-of-variety degree | $(\sigma - 1)^{-1}$ |
| $\eta$ | Frisch parameter | 1.00 |
| $\psi$ | Curvature of utility function | 1.00 |
| $\sigma_H$ | Scale Parameter ($H = 0.3$) | 8.92 |
| **Normalization** | | |
| $p_d$ | Home goods price (numeraire) | 1.00 |
| $L$ | Country size | 1.00 |
| $Z$ | Productivity | 1.00 |

Figure 1: **International Competitiveness, stylized facts**



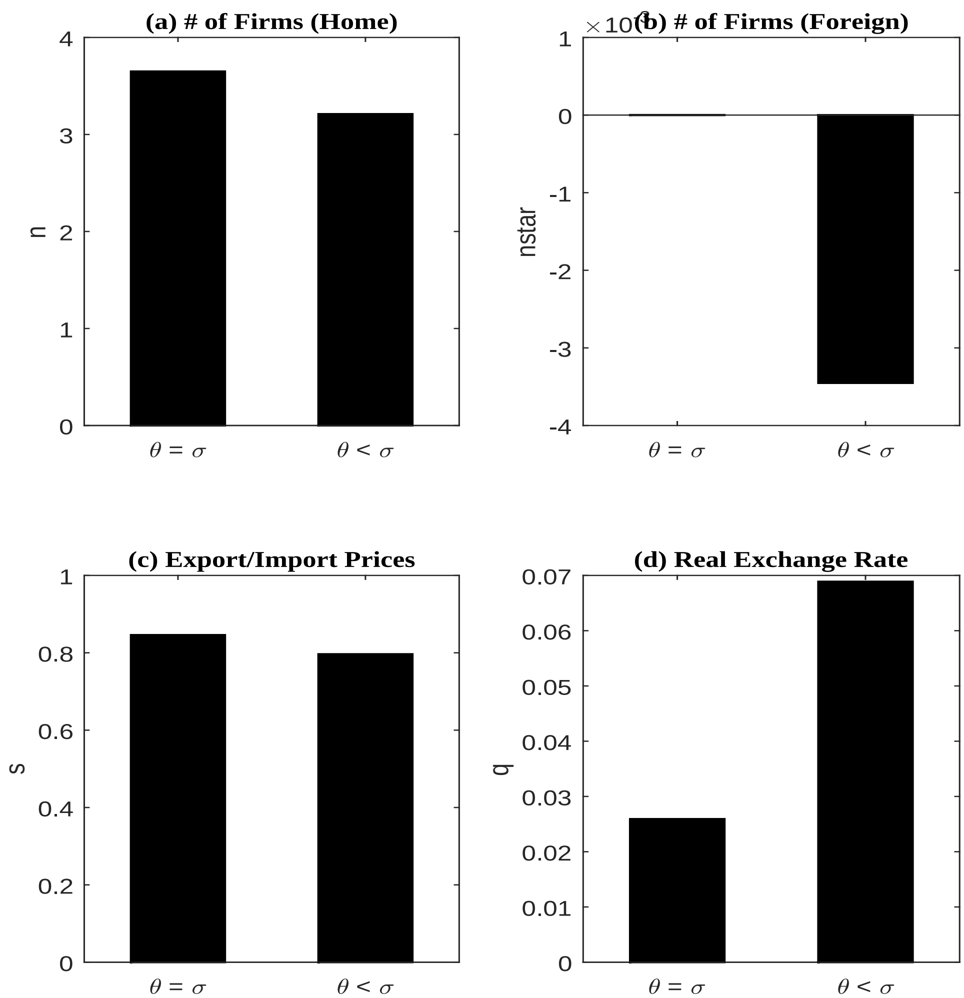

Note: The upper left panel displays the GDP-weighted average of the Harmonized Competitiveness Index for GIPPS countries (solid line) and non-GIIPS countries (dashed line). The upper right panel displays the GDP-weighted average of the Unit Labor Cost for GIIPS (solid line) and non-GIIPS (dashed line). The lower left panel displays the average of the Legal Barriers to Entry index (0: low barriers) for GIIPS (solid red bar) and non-GIIPS (dashed grey bar). GIIPS countries include Greece, Italy, Ireland, Portugal, Spain, while non-GIIPS countries include Austria, Belgium, Finland, France, Germany, Luxembourg, Netherland.

Figure 2: **Product Market Deregulation: Markups**



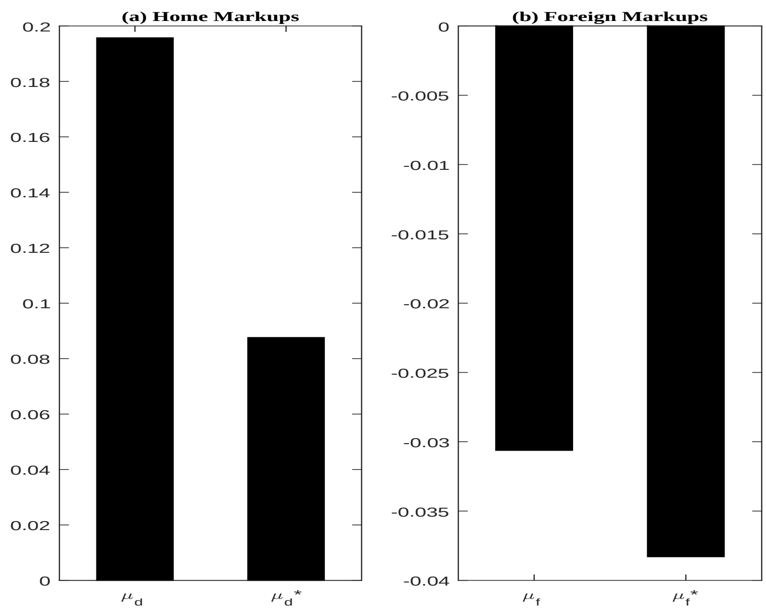

Note: The bars correspond to the percentage deviation from the symetric equilibrium to a 10 percent cut in $\tau_e$.

Figure 3: **Product Market Deregulation: Main Variables**



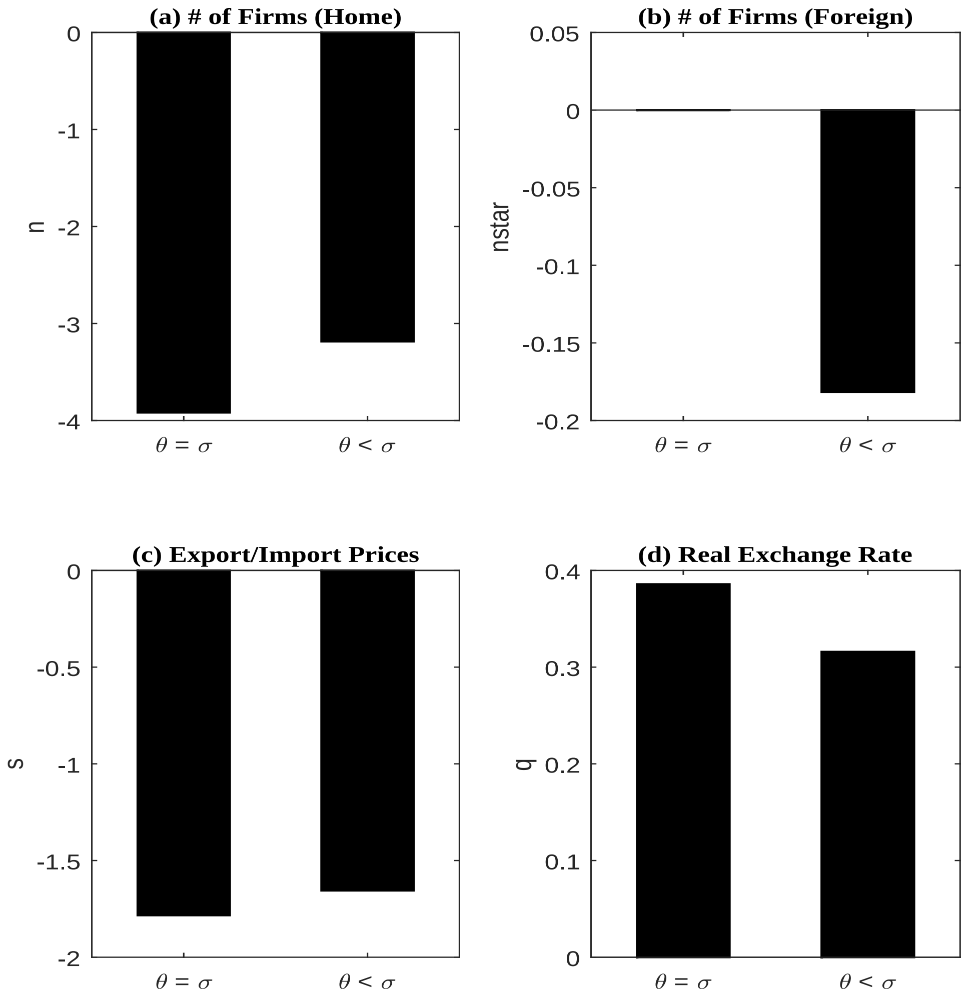

Note: The bars correspond to the percentage deviation from the symetric equilibrium to a 10 percent cut in $\tau_e$.

Figure 4: **Internal Devaluation: Markups**



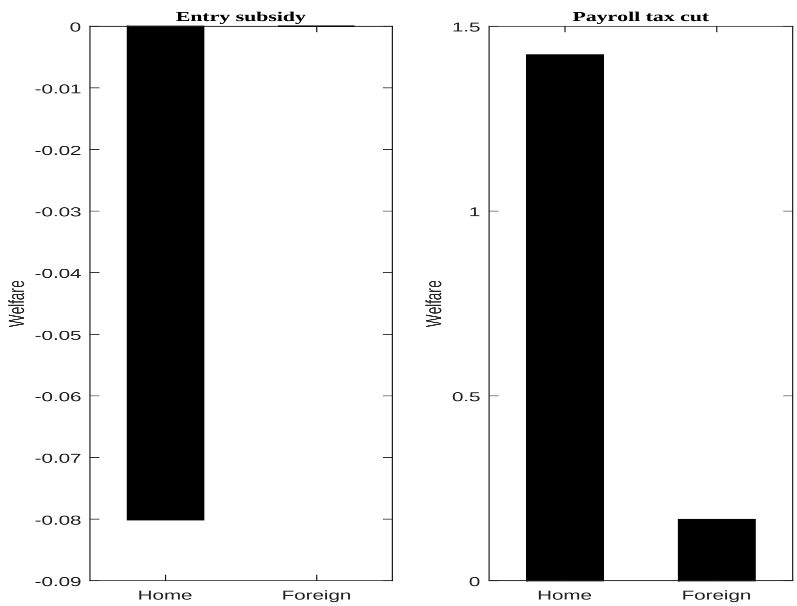

Note: The bars correspond to the percentage deviation from the symetric equilibrium to a 10 percent cut in $\tau_w$.

Figure 5: **Internal Devaluation: Main Variables**




Note: The bars correspond to the percentage deviation from the symetric equilibrium to a 10 percent cut in $\tau_w$.

Figure 6: **Welfare Effects**




Note: The bars correspond to the percentage deviation from the symetric equilibrium to a 10 percent cut in $\tau_e$ (left panel) and $\tau_w$ (right panel).

# A Model's Summary

The model can be summarized as following (see online appendix for details).

$$C_s = C \quad ; \quad P_s = P \quad ; \quad \tilde{P} = P/p_d \quad ; \quad p_d = 1; \tag{22}$$

$$C_s^* = C^* \quad ; \quad P_s^* = P^* \quad ; \quad \tilde{P}^* = P^*/p_f^*; \tag{23}$$

$$\tilde{P} = (n+n^*)^{\frac{1}{\sigma-1}-\nu}\left[n + n^*\left[\frac{p_f}{p_d}\right]^{(1-\sigma)}\right]^{\frac{1}{1-\sigma}} \quad ; \quad \tilde{P}^* = (n+n^*)^{\frac{1}{\sigma-1}-\nu}\left[n\left[\frac{p_d^*}{p_f^*}\right]^{(1-\sigma)} + n^*\right]^{\frac{1}{1-\sigma}}; \tag{24}$$

$$c_d = (n+n^*)^{\nu(\sigma-1)-1}\tilde{P}^{\sigma}C \quad ; \quad c_f = (n+n^*)^{\nu(\sigma-1)-1}\left[\frac{p_f}{p_d}\right]^{-\sigma}\tilde{P}^{\sigma}C; \tag{25}$$

$$c_f^* = (n+n^*)^{\nu(\sigma-1)-1}\left(\tilde{P}^*\right)^{\sigma}C^* \quad ; \quad c_d^* = (n+n^*)^{\nu(\sigma-1)-1}\left[\frac{p_d^*}{p_f^*}\right]^{-\sigma}\left(\tilde{P}^*\right)^{\sigma}C^*; \tag{26}$$

$$\varepsilon_{p_d} = \sigma - (\sigma-\theta)\frac{1}{n + n^*\left[\frac{p_f}{p_d}\right]^{(1-\sigma)}} \quad ; \quad \varepsilon_{p_f} = \sigma - (\sigma-\theta)\frac{\left[\frac{p_f}{p_d}\right]^{1-\sigma}}{n + n^*\left[\frac{p_f}{p_d}\right]^{(1-\sigma)}}; \tag{27}$$

$$\varepsilon_{p_d}^* = \sigma - (\sigma-\theta)\frac{1}{n + n^*\left[\frac{p_f^*}{p_d^*}\right]^{(1-\sigma)}} \quad ; \quad \varepsilon_{p_f}^* = \sigma - (\sigma-\theta)\frac{\left[\frac{p_f^*}{p_d^*}\right]^{1-\sigma}}{n + n^*\left[\frac{p_f^*}{p_d^*}\right]^{(1-\sigma)}}; \tag{28}$$

$$\pi = \bar{L}pc_d + \bar{L}^*p_d^*c_d^* - \tau^w W\frac{y}{Z} \quad ; \quad \pi = (f_T + f_R\tau^e)\,W; \tag{29}$$

$$\pi^* = \bar{L}p_f c_f + \bar{L}^*p_f^*c_f^* - \tau^{w*}W^*\frac{y^*}{Z^*} \quad ; \quad \pi^* = (f_T + f_R\tau^{e*})\,W^*; \tag{30}$$

$$p_d = \left[\frac{\varepsilon_{p_d}}{\varepsilon_{p_d}-1}\right]\frac{\tau^w}{Z}W \quad ; \quad p_d^* = \tau\left[\frac{\varepsilon_d^*}{\varepsilon_d^*-1}\right]\frac{\tau^w}{Z}W; \tag{31}$$

$$p_f^* = \left[\frac{\varepsilon_{p_f}^*}{\varepsilon_{p_f}^*-1}\right]\frac{\tau^{w*}}{Z^*}W^* \quad ; \quad p_f = \tau\left[\frac{\varepsilon_{p_f}}{\varepsilon_{p_f}-1}\right]\frac{\tau^{w*}}{Z^*}W^*; \tag{32}$$

$$y = \bar{L}c_d + \tau\bar{L}^*c_d^* \quad ; \quad y^* = \bar{L}\tau c_f + \bar{L}^*c_f^*; \tag{33}$$

$$\sigma_H H^{\eta}\tilde{P}C^{\frac{1}{\psi}} = \frac{W}{p_d} \quad ; \quad \sigma_H H^{*\eta}\tilde{P}^*\left(C^*\right)^{\frac{1}{\psi}} = \frac{W^*}{p_f^*}; \tag{34}$$

$$\bar{L}H = n\frac{y}{Z} + n\,(f_T + f_R) \quad ; \quad \bar{L}^*H^* = n^*\frac{y^*}{Z^*} + n^*\,(f_T^* + f_R^*); \tag{35}$$

$$\bar{L}^*n\tau p_d^*c_d^* = \bar{L}n^*p_f c_f. \tag{36}$$