Structural Reforms in the Eurozone: A Case of Self-defeating Expectations?

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Abstract This work addresses the implications of agents' expectations about structural reforms in a context characterized by institutional inertia. By means of a stylized small-open economy model encompassing policy-induced barriers to entry in the non-tradable sector, the paper shows that expectations about reforms affect economic performances and alter the incentives for the authorities to implement structural reforms. Moreover, the model shows that it is possible to envisage circumstances under which no set of expectations has the potential for self-fulfillment, thereby creating self-defeating expectations traps. This model sheds light on the recent problems of the Eurozone periphery, characterized by authorities exhibiting a status quo bias against reforms and by a history of self-defeating optimistic expectations about the realization of structural reforms.

1 Introduction

The recent sovereign debt crisis in the Eurozone has ignited an intense debate about the role played by financial investors' expectations, both in the period before the introduction of the euro and after that the sovereign risk premia of some Eurozone countries (the so-called periphery) started surging because of the concerns for a possible break-up of the Economic and Monetary Union (EMU). Several observers

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L. Paganetto (ed.), *Achieving Dynamism in an Anaemic Europe*,
DOI 10.1007/978-3-319-14099-5_6

have questioned whether, as effectively put by Giavazzi and Spaventa (2010), the markets had been too complacent before the crisis or have displayed unwarranted pessimism during the crisis.[1]

Some scholars, such as Fernández-Villaverde et al. (2013) and Reis (2013), have convincingly pointed out that economic convergence was not just affected by expectations in the financial markets: the adoption of the euro boosted widespread confidence in the periphery countries, allowed both their government and private sectors to borrow at relatively low interest rates, and fostered investment in activities with limited productivity growth. This, in turn, lowered the incentives of the authorities to implement structural reforms. As a result, while the "Maastricht variables" converged over time and employment scores temporarily improved, productivity and unit labor costs dynamics failed to conform to those of the core countries and various structural weaknesses remained overlooked (Giavazzi and Spaventa 2010).

Consistently with this narrative, at the origin of the current problems of the Eurozone one can place, paradoxically, the widespread optimistic belief that—thanks to the euro—real convergence would have occurred between the core and the periphery countries. In retrospect, such expectations proved to be self-defeating: the elimination of nominal exchange risk and the ECB anti-inflationary credibility allowed the periphery to borrow at low interest rates, thereby creating incentives to postpone painful fiscal consolidations (Greece, Italy) and structural reforms (Greece, Italy, Portugal, Spain), or boosting aggregate demand and production thanks to the high indebtedness of the household and financial (private) sectors (Ireland, Spain). In a nutshell, the very same belief that real convergence would have occurred between the core and the periphery of the Eurozone created the conditions for the real divergence, mirrored in the large current account imbalances emerged in the last decade (Bonatti and Fracasso 2014).

This work develops a stylized analysis to capture the essence of a situation characterized by self-defeating expectations such as those outlined above. The model is kept general enough to make a point that may apply to the euro crisis but also to other situations where acting on the basis of certain expectations, especially regarding structural reforms and regime changes, creates the conditions for their falsification. The general point made by this work is that there are relevant circumstances under which it is impossible, even in principle, to have a rational expectations equilibrium, namely in which no set of expectations has the potential for self-fulfillment. In these "self-defeating expectations traps", agents have no

[1]Nominal interest rate convergence in the late 90s, the argument goes, was excessively fast and homogenous in the Eurozone, probably because of the optimistic expectations about the positive impact of the euro on the laggard countries. On the contrary, after a period in which the worldwide expansion of credit contributed to preserve low long-term interest rates, sovereign risk premia in the periphery increased by an extent that is hardly reconcilable with the observed changes in the fundamentals of these countries and that most likely reflects very pessimistic expectations. For empirical evidence on the Eurozone sovereign risk premia, see among others Aizenman et al. (2013), De Grauwe and Ji (2012, 2013), Di Cesare et al. (2012).

obvious criterion for forming their expectations about the future and have to face a high degree of indeterminacy. As we shall show, this does not stem from ad hoc assumptions about agents' cognitive biases, information problems and meta-preferences, about which we remain agnostic; rather, it relates to the uncertainty about political reforms that significantly affect the inter-temporal and inter-sectoral allocation of resources.

Moreover, the model offers an original take on the inherent problems of a monetary union among very heterogeneous members. Our model suggests that, in the presence of governments that undertake reforms ensuring real convergence only under extremely stressful circumstances (as a result of a status quo bias that characterizes actual policy-making), optimistic expectations may boost economic performance of laggard countries in early stages of the union, but ultimately undermine the prospects of real convergence and jeopardize the resilience of the union. Conversely, overly pessimistic expectations may add to existing structural problems and worsen economic conditions to a point that forces reluctant authorities to undertake reforms conducive to convergence (this was a counterfactual scenario in the history of the period leading to the crisis in the Eurozone).

This stylized model does not aspire to provide a comprehensive and detailed explanation of recent Eurozone's troubles, nor does it aim at modeling the precise mechanisms through which macroeconomic imbalances grew large in the periphery. Rather, this work aims at providing a formal representation of the rationalization of the Eurozone troubles that has been offered without full-fledge models by various influential scholars such as those mentioned above. This notwithstanding, our main findings are shown to carry over to more sophisticated versions of the model which explore various realistic extensions of the basic set up.

The remainder of the paper proceeds as follows. Section 2 contains a discussion of the relevant literature. The building blocks of the basic model are presented in Sect. 3, while the implications of alternative expectations concerning the future regulatory regimes of the sector producing (internationally) non-tradable goods are discussed in Sect. 4. Section 5 is dedicated to some extensions of the basic model. Section 6 concludes. The mathematical derivations are contained in the Appendix.

2 Relevant Literature

It is widely held that short-term credit and financial developments are affected by market sentiment, hence subject to exuberance, panic, and the like. Yet optimism and pessimism may affect a wider range of economic decisions, such as inter-temporal investment patterns and the sectoral allocation of investment. This is particularly the case when agents have to form expectations about governments' actions in the future and are uncertain about the ability and the willingness of the authorities to undertake economic reforms directed to increase long-term productivity and address structural weaknesses. This is particularly relevant during periods

of profound economic transformation, such as economic transition, currency regime switches, and monetary integration.[2]

The process of designing, approving and implementing structural reforms takes time and is subject to non-economic constraints, which typically make very difficult to predict whether and to what extent reforms will be realized. Even reforms delivering aggregate benefits cannot be assumed to be costless, institutionally neutral, Pareto improving and uncontended. Reforms are "to be consistent with governments objectives outside the field of economic efficiency" and "reform processes have often met political quandaries" (Hoj et al. 2006, p. 88). The realization of reforms resembling more to regime switches than marginal changes[3] depends on discretionary decisions by the authorities who pursue a vast array of goals besides social welfare maximization and face constraints associated with various (often conflicting) concerns. For instance, incumbent authorities make decisions about reforms with a view to preserving social stability, respecting the electoral mandate (Tompson 2009), maintaining the political support of each party in a ruling coalition (Perotti and Kontopoulos 2002), appeasing powerful domestic lobbies (Olson 1965; Drazen 2000; Grossman and Helpman 2001), preventing prospective policy reversals associated with possible reform failure (Aizenman and Yi 1998), and implementing complex compensating transfers across heterogeneous citizens.[4]

Uncertainty is increased further by the fact that short-lived governments care not only for the long-run effects of structural reforms, but also for the transitory path to their full implementation; this makes the timing for implementing reforms dependent on the contingent macroeconomic environment. Hence, even when reforms are expected to produce aggregate benefits in the long run, governments tend to exhibit some institutional inertia and to preserve the status quo.[5]

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[2]Besides monetary unification, the political economy of reforms played a key role also in the debates about economic transition (Roland 2002) and economic development (Rodrik 1996, 2005).

[3]Bianchi (2013) addresses the relationship between monetary policy regimes and agents' beliefs, where regimes differ in the degree of aggressiveness of monetary policy, as reflected in the parameters of the reaction function. Structural reforms extend further than this and impact both on the short- and long-term dynamics of the economy.

[4]Furthermore, policy-makers may face pressure from foreign peers, meet the resistance of domestic bureaucrats, and strive to frame public multi-issue debate in a consistent way.

[5]The observation that policy-making departs from the conventional assumption that the authorities maximize a (continuous) social welfare function is at the core of the field of political economy (Drazen 2000; Persson and Tabellini 2000). The literature on the political economy of reforms and on the persistence of the status quo is extremely vast (see OECD 2010 for an overview). Alesina and Drazen (1991), for instance, argue that lack of reforms may stem from the 'war of attrition' between different groups with conflicting distributional objectives. Reforms may also be hindered by the uncertainty about their aggregate and individual impact (Fernandez and Rodrik 1991; Cason and Mui 2005; Valderrama 2009) or by the authorities' inability to promise credibly compensation to the losers (Jain and Mukand 2003). Bourguignon (2011) shows that the status quo of each heterogeneous individual (Samuelson and Zeckhauser 1988) in the society affects the actual impact of reforms on aggregate welfare: this, as well as reference-dependent preferences (Tversky and

Notably, economic reforms appear extremely important in the process of real convergence among heterogeneous countries sharing the same currency. Indeed, the early debate on the desirability and feasibility of the European monetary union did touch upon the relationship between monetary unification, incentives to undertake reforms, and real economic convergence. Particular attention was attributed to the indirect effects of the prospective monetary union on the real economy through the EMU-related incentives for the authorities to operate structural reforms (see, for instance, Bean 1998a, b; Bentolila and Saint-Paul 2000). On the one hand, governments may recognize that participating in a monetary union eventually requires greater real convergence (in a sort of TINA—There Is No Alternative—argument) and market-base adjustment to asymmetric shocks. On the other hand, the union may deprive governments of some macroeconomic tools which could help to temper the negative short-term effects of reforms, thereby making the adoption of the latter less likely.[6]

As this early debate informed the literature on the costs and benefits of establishing a monetary union among heterogeneous countries, the role of agents' expectations was not directly addressed.[7] More recently, as mentioned in the Introduction, a number of scholars attributed the current worrisome state of some periphery countries to an inefficient allocation of resources due, in retrospect, to misplaced expectations (Giavazzi and Spaventa 2010; Fernandez-Villaverde et al.

(Footnote 5 continued)
Kahneman 1991; Bateman et al. 1997), complicates the analysis on the part of the authorities and favours inertia. A status quo bias is particularly likely to emerge when inaction has invisible opportunity costs whereas reforms are associated with visible upfront costs (Tompson 2009). The institutional set up can also lead to political inertia: Eterovic (2011) shows that the institutions making citizens unable to properly reward politicians tend to produce a status quo bias. Moreover, established socio-economic models are typically characterized by institutional and international complementarities (Acemoglu et al. 2012), which make difficult for the authorities to adopt isolated reforms. Finally, Abiad and Mody (2005) provide evidence that (financial) reforms are conditioned both by the occurrence of economic and political shocks (either as windows of opportunity or as extremely stressful events) and by a gradual learning process that helps dissipate uncertainty (Dewatripont and Roland 1992a, b).

[6]Empirical evidence on the issue is mixed and inconclusive (Belke et al. 2005; Duval and Elsmeskov 2006; Alesina et al. 2011; Cacciatore et al. 2012; Bouis et al. 2012). Contingent economic circumstances and country-specific social preferences have led to very different outcomes in diverse countries: the TINA argument appears to have worked in some countries but not in others.

[7]Agents' expectations did play a role in the Walters' critique to the establishment of fixed exchange rates in the European Community. Sir Alan Walters, a counselor of Ms Thatcher in the 1980s, warned about risk that the presence of nominal interest rate convergence and persistent inflation differentials (leading to diverging real interest rates) could bring about asymmetric transmission of monetary policy and a cyclical de-coupling of the high inflation countries in the union. Walters pointed out that financial market expectations about the nature of the exchange rate regime switch could be inconsistent with the expectations in the labour markets. Along similar lines, Miller and Sutherland (1991) develop a macroeconomic model that allows for a gradual convergence of initially inconsistent expectations.

2013; Reis 2013).[8] Optimism about the state of the economic fundamentals during the convergence process, political myopia and widespread rent-seeking behaviors of those operating in low productivity sectors hindered structural and institutional reforms. Even before the eruption of the debt crisis, many euro-area countries exhibit relatively low productivity levels and growth rates, which can be associated with various barriers to competition and innovation, as well as with a pervasive resource misallocation.[9] While this debate shows an increased awareness about the link between structural reforms and real economic convergence within a monetary union, the role played by agents' expectations about structural reforms has not received due attention yet.

In this work, building on the realistic tenet that governments exhibit reluctance to implement structural reforms (for any of the possible reasons illustrated in Footnote 5) and undertake them only if failing to do so risks jeopardizing social and political stability, we show that expectations about economic reforms may turn out to be self-defeating and that, when certain conditions hold, a self-defeating expectations trap may emerge. This scenario is not due to the agents' imperfect rationality, but is related to some features of the governments' choice about reform: the status quo bias, the lack of commitment devices to overcome policy inertia, and the discontinuity between reform and non-reform alternatives.

Before presenting the model, we would like to stress what distinguishes our analysis from the current debate on the problems affecting the EMU. To start, our issue is not whether financial markets were too complacent before the crisis or too pessimistic during the crisis. Rather, we focus on agents' expectations about those structural reforms that affect the inter-temporal and inter-sectoral allocation of resources and that impact on the process of real convergence among heterogeneous countries in a monetary union. Moreover, we show that self-defeating, rather than self-fulfilling, expectations may occur: if certain conditions are satisfied, the feedback between policymakers' willingness to adopt reforms and agents' expectations about these latter may lead to the disappointment of the expectations.[10]

In this work we adopt a tractable model with limited competition in the product market of the non-tradable sectors (e.g., services) and with government reluctance

[8]For a discussion of the Greek case, see Katsimi and Moutos (2010), Moutos and Pechlivanos (2013).

[9]Coudert et al. (2013) assess real exchange rate misalignments within the Eurozone and find relatively large and persistent ones in the periphery. Forni et al. (2010) and Lusinyan and Muir (2013) analyze the impact of liberalizing protected service sectors in Italy, that is the OECD country with the highest mark-ups in non-manufacturing industries and whose recent economic performance has not been affected by housing and credit bubbles.

[10]Angeletos and La'O (2013) explore the role of incomplete communication and develop a unique-equilibrium, rational expectations, macroeconomic model with individual "animal spirits". Without introducing multiple equilibria, they offer an original microfundation of the observed co-movements of market expectations and market outcomes. While Angeletos and La'O look at co-movements, we analyze the case of self-defeating expectations.

to implement structural reforms.[11] Barriers to entry and competition are still present in several countries and, according to the OECD, have a particularly negative impact on the Eurozone members lagging behind in productivity and GDP growth. Table 1 reports the OECD Regulation Impact Indicators of the barriers to entry in professional and retail services (calculated by the OECD in accordance with the method developed by Conway and Nicoletti 2006) for a number of countries.

This set-up is meant to offer a stylized and realistic analysis to capture the essence of a situation characterized by self-defeating expectations about structural reforms. Clearly, similar arguments (and model extensions) could be developed for other anticompetitive restrictions and for any policy-related market imperfection (e.g. poor financial regulation and monitoring) making the allocation of resources suboptimal (Arnold et al. 2010).[12] To keep the model tractable, we do not address the relationship between market structure and rent-seeking activities (Brou and Ruta 2013) and we exclusively focus on the direct effect of non-tradable product market regulation on the regulated market. Thus, we neglect the indirect effect of service regulation on the downstream tradable sectors (Barone and Cingano 2011) as well as the within-industry reallocation of resources (Bartelsman et al. 2013): doing so would strengthen our results, yet also add unnecessary complexity.

Finally, in the basic model we chose not to discuss the merit of the concerns inspiring the anticompetitive regulatory provisions in the non-tradable sector. Although some restrictions may well be due to agreeable public policy goals—such as tackling market imperfections, we implicitly assume that protection reflects rent-seeking vested interests. This shortcut should not suggest that we consider all anticompetitive regulations as unjustified on any economic and social terms. Yet, as such plausible concerns should be similar across countries, we argue that the observed regulatory heterogeneity across advanced countries in the EMU is likely a symptom of less noble political-economic tensions at the national level.[13]

[11]Despite a deregulation trend across the board (also reported in Duval and Elsmeskov 2006), the Mediterranean periphery countries tend to exhibit higher levels of protection in 2003 and 2008. Djankov (2009) offers an effective overview of the three main theoretical reasons (market failure theory, capture theory, tollbooth theory) to impose (more or less appropriately from a social welfare point of view) burdensome entry requirements.

[12]The range of policy and institutional factors that may limit experimentation and efficient resource allocation is indeed vast. One could think, for instance, of measures that limit the adoption of new technologies as in Krueger (1974) and Krusell and Rios-Rull (1996).

[13]The very fact that most services continued to be offered mainly by national suppliers in the European Union after the 2006 Bolkestein Directive on services provides some evidence of tensions between national regulatory frameworks and international competition (Bertola and Mola 2010). This is in line with the findings of Borchert et al. (2013) who show that although explicit discrimination against foreign providers is low, the allocation of new licenses is opaque and highly discretionary: a variety of restrictions on entry, ownership, and operations continue to affect the international trade in services.

Table 1 OECD regulation impact indicators (barriers to entry)

	Professional services												Retail		
	Accounting			Architect			Engineer			Legal					
	Entry regulations			Entry regulations			Entry regulations			Entry regulations			Barriers to entry		
	1996	2003	2008	1996	2003	2008	1996	2003	2008	1996	2003	2008	1998	2003	2008
Austria	4.4	4.4	4.4	5.3	5.3	4.1	5.3	5.3	4.0	4.5	4.4	4.4	5.5	5.5	3.6
Denmark	2.9	2.3	2.9	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.3	3.5	2.1	2.1	2.8
Finland	3.3	2.8	2.8	1.9	1.5	1.5	0.0	1.0	1.0	0.0	0.0	0.0	3.3	2.8	2.8
Germany	5.6	4.0	4.0	3.1	1.7	2.6	3.4	2.9	2.7	4.5	3.8	3.8	1.8	2.1	2.1
Netharlands	3.7	3.4	3.1	0.0	0.0	0.0	0.0	3.0	0.0	2.8	2.3	4.5	1.3	0.7	2.1
France	3.7	4.3	4.1	2.4	2.0	3.6	0.0	0.0	0.0	2.8	4.0	4.1	5.0	2.6	2.6
Greece	3.9	4.0	4.0	–	3.6	3.6	–	3.6	3.6	3.7	3.7	3.7	4.5	4.2	3.4
Italy	0.0	4.0	3.9	3.0	3.5	3.6	2.4	3.6	3.6	2.7	4.0	4.0	2.5	2.3	2.6
Portugal	2.1	3.5	3.5	2.4	3.2	3.2	3.1	3.7	3.7	3.7	3.7	3.7	3.5	3.0	2.4
Spain	3.3	2.1	2.6	3.1	3.1	3.2	3.1	3.1	3.2	3.7	3.6	3.2	3.0	3.0	3.0
Ireland	3.0	2.4	0.6	0.0	0.6	0.0	0.0	0.6	0.0	2.6	3.8	2.6	0.7	0.9	0.3
UK	4.1	4.2	4.2	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.1	0.0	3.8	2.3	2.3
US	5.2	2.6	2.6	3.5	2.3	0.0	4.8	2.6	0.0	4.9	3.1	3.1	–	3.7	3.7

Source OECD

3 The Basic Model

We model a small-open economy belonging to a currency area (the nominal exchange rate of this economy is irreversibly fixed to one).[14] Two market goods are produced in this economy: an internationally tradable good and an internationally non-tradable good. Hence, in this economy there are firms specialized in the production of tradable goods and firms specialized in the production of non-tradable goods. The tradable good is used as capital in the production of both goods and as consumption good, while the non-tradable good can be only consumed.[15] The international price of the tradable good is exogenously given and firms can freely enter this market, while firms' entry into the non-tradable market is regulated: a firm needs a license issued by the government to operate in this market. This regulatory framework is inherited from the past and, despite its sub-optimality, the government is willing to reform the regulatory framework only if the population (or a relevant portion of it) is hit by serious economic hardship because of it (more on this below).

The economy is populated by households that supply labor, buy consumer goods, accumulate productive assets (physical capital) to be rent to domestic firms, borrow from abroad (or lend abroad) at the exogenously given world interest rate and possess the licenses issued by the government for operating in the non-tradable sector. Both the workforce and the capital stock are mobile across sectors but not across countries. Wages are determined competitively but there is a reservation wage (given by the value of non-market activities) below which market wages cannot fall. Rental rates of capital are determined competitively. Also the prices at which households can cede the use of their licenses to firms that intend to operate in the non-tradable sector are determined competitively.

Time is discrete: we have the present (time 0) and the future (time 1). In period 0, only a limited number of firms are allowed to operate in the non-tradable sector (the government restricts the issuance of licenses), while in period 1 the government can maintain this regulatory regime or change it by granting licenses to everyone willing to pay a fixed fee ("liberalization" of the non-tradable sector). As anticipated, we realistically assume the existence of some institutional inertia due to a status quo bias associated with any of the various reasons illustrated in Footnote 5;

[14]Forni et al. (2010) show that structural reforms in one country of the Eurozone have negligible macroeconomic spillovers to the rest of the area. This justifies the adoption of a small-open economy framework in this work.

[15]As argued by Turnovsky (1997), there is no agreed conclusion on the share of tradables and nontradables in total investment. For some evidence on the issue, see Bems (2008). The extreme assumption that investment consists only of tradable goods is adopted here with two objectives in mind: first, to simplify the set-up, and second, to create a clearer channel through which a tradable-induced learning, as suggested by Rodrik (2008), takes place.

this implies that a regulatory regime change is implemented in period 1 only if the utility of the representative household falls below a certain minimum threshold in the absence of such a change.

Finally, there is no source of random disturbances and agents' expectations can be optimistic (in the sense that they are consistent with the assumption that the government will liberalize in the future the entry into the non-tradable sector) or pessimistic (in the sense that they are consistent with the assumption that the government will keep the initial quantitative restriction to the issuance of licenses required to operate in the non-tradable sector).

3.1 Firms Producing the (Internationally) Tradable Good

In each period t (t = 0, 1), there is a continuum (whose measure is normalized to be one) of identical firms producing the tradable good Y_{Tt} according to the following technology:

$$Y_{Tt} = A_{Tt} K_{Tt}^{1-\alpha} L_{Tt}^{\alpha}, \quad 0 < \alpha < 1, \tag{1}$$

where K_{Tt}, L_{Tt}, and A_{Tt} are, respectively, the capital stock, the labor input and the state of technology (total factor productivity) of the representative firm producing Y_{Tt}. Total factor productivity is a positive function of the capital installed in the tradable sector: $A_{Tt} = K_{Tt}^{\alpha}$. Consistently with this formal set-up, one can interpret technological progress as labor augmenting. This assumption combines the idea that learning-by-doing works in the tradable sector through each firm's capital investment and the idea that knowledge and productivity gains spill over instantly across all firms of this sector (see Barro and Sala-i-Martin 1995). Therefore, in accordance with Frankel (1962), it is supposed that although A_{Tt} is endogenous to the economy, each firm takes it as given, since a single firm's decisions have only a negligible impact on the aggregate stock of capital of the tradable sector.[16]

The profits of the representative firm producing tradables, π_{Tt}, are given by

$$\pi_{Tt} = Y_{Tt} - W_t L_{Tt} - R_t K_{Tt}, \quad t = 0, 1, \tag{2}$$

where W_t is the wage and R_t is the capital rental rate in period t. Notice that the price of the tradable good—which is treated as the numéraire of the system—is exogenously given and normalized to be one.

[16]This amounts to say that technological progress is endogenous to the economy, although it is an unintended by-products of firms' capital investment rather than the result of purposive R&D efforts.

3.2 Firms Producing the (Internationally) Non-tradable Good

In each period t (t = 0, 1), there is a continuum of measure N_t of identical firms producing the non-tradable good Y_{Nt}. This good is not storable and must be immediately consumed. Each firm produces the good according to the following technology:

$$Y_{Nt} = K_{Nt}^{\gamma} L_{Nt}^{\beta}, \quad 0 < \gamma < 1, 0 < \beta < 1, \gamma + \beta < 1, \tag{3}$$

where K_{Nt} and L_{Nt} are, respectively, the capital stock and the labor input employed by the representative firm producing the non-tradable good. Assuming that the non-tradable sector roughly coincides with the technologically stagnant sector of the economy, we rule out the possibility that also in this sector productivity improvements can take place as a result of the positive externalities generated by each single firm's activity.

The net profit (cash flow) π_{Nt} of the representative firm producing non-tradable goods is given by:

$$\pi_{Nt} = P_{Nt} Y_{Nt} - W_t L_{Nt} - R_t K_{Nt} - Q_t, \quad t = 0, 1, \tag{4}$$

where P_{Nt} and Q_t are, respectively, the price of the non-tradable good and the price for the use of the license required to operate in the non-tradable sector at time t.

3.3 Households

There is a continuum (whose measure is normalized to be one) of households who live for two periods. In each t (t = 0, 1), the representative household produces the services C_t that it consumes by combining the tradable and the non-tradable goods according to

$$C_t = \min(\eta C_{Nt}, C_{Tt}), \quad \eta > 0, \tag{5}$$

where C_{Nt} and C_{Tt} are, respectively, the amount of non-tradable good and the amount of tradable good used by the representative household to produce consumer services in t.

In each t (t = 0, 1), the representative household determines its labor supply L_t according to the following rule:

$$L_t = \begin{cases} H & \text{if } W_t \geq \underline{W} \\ 0 & \text{otherwise,} \end{cases} \tag{6}$$

where H is the representative household's total time endowment in every period and $\underline{W}$ stays for the value of non-market activities (and acts as a reservation wage).

The lifetime utility of the representative household is given by

$$U = u_0 + \theta u_1, \quad 0 < \theta < 1, \tag{7}$$

where $u_t = \frac{C_t^{1-\xi}}{1-\xi}$, $0 < \xi < 1$ (t = 0, 1), is the household's period utility function, θ is a time-preference parameter and ξ is the coefficient of relative risk aversion.

The representative household's period budget constraint is:

$$\begin{aligned} K_{t+1} + D_t(1+r) + P_{Nt}C_{Nt} + C_{Tt} &\leq R_t K_t + D_{t+1} \\ &+ N_t\pi_{Nt} + \pi_{Tt} + T_t + (N_t L_{Nt} + L_{Tt})W_t + N_t(Q_t - F), \\ K_0 = \overline{K}, D_0 = 0 \text{ and } N_0 = \overline{N} \text{ given}, &\quad D_2 \leq 0, \quad t = 0, 1, \end{aligned} \tag{8}$$

where K_t are the productive assets held by the representative household in t, D_t are the net foreign liabilities accumulated during period t – 1 by the representative household and carried over into period t with interest r (the exogenously given world interest rate), F is the fixed fee paid to the government by the representative household for each license that it holds in period t, and T_t are the net transfers that the representative household receives by the government in t. Notice that in each period the representative household can sell the right to use the licenses for operating in the non-tradable sector to the firms at a market price of Q_t per unit, and that it is entitled to receive the net profits earned by the firms as dividend payments (it is assumed that each household owns an equal share of all existing firms). Moreover, in (8) it is assumed for simplicity that capital fully depreciates every period, and that at time 0 households have zero net foreign liabilities.

3.4 Government

The government's period budget constraint is:

$$T_t = FN_t, \quad t = 0, 1. \tag{9}$$

At the beginning of period 0, the government restricts the entry into the non-tradable sector by issuing $N_0 = \overline{N}$ licenses required for operating in that sector at time 0. In the following period, the government may preserve the arrangement of the previous period, so that the households can keep $N_1 = \overline{N}$ licenses paying a fixed

fee F per unit to the government, or it can liberalize the entry into the non-tradable sector by granting licenses to everyone willing to pay a fixed fee F per unit.[17]

At the beginning of period 1, the government decides to liberalize if and only if

$$u_1\Big|_{N_1=\overline{N}} < \underline{u} \text{ and } u_1\Big|_{N_1>\overline{N}} \geq \underline{u}, \quad \underline{u} > 0, \tag{10}$$

where $u_1\Big|_{N_1=\overline{N}}$ is the utility level that the representative household can get in period 1 if the entry into the non-tradable sector is not liberalized, u is the minimum utility level that is deemed socially (and politically) acceptable in this economy, and $u_1\Big|_{N_1>\overline{N}}$ is the utility level that the representative household can get in period 1 if the entry into the non-tradable sector is liberalized.

4 Equilibrium, Expectations and Rationality

4.1 Equilibrium Conditions

Markets for labor and for the non-tradable good are purely domestic. Equilibrium in the labor market implies

$$W_t > \underline{W}, \quad t = 0, 1 \tag{11a}$$

and

$$N_t L_{Nt} + L_{Tt} = H, \quad t = 0, 1, \tag{12a}$$

or, alternatively,[18]

$$W_t = \underline{W}, \quad t = 0, 1 \tag{11b}$$

[17]Notice that in this institutional framework the households can directly appropriate the rent created by the government through the issuance of a limited number of licenses for operating in the non-tradable sector. The same equilibrium configuration would emerge in an institutional framework where the government sells the licenses directly to the firms and redistributes the rents to the households through the fiscal transfers. In this alternative framework, at the beginning of period 0, $\overline{N}$ licenses are sold at auction to the firms by the government, thus determining a market price of Q_0 per unit. Then, the government redistributes the revenues to the households $\left(T_0 = Q_0\overline{N}\right)$. At the beginning of period 1, the government may again sell $\overline{N}$ licenses at auction to the firms and redistribute its revenues $Q_1\overline{N}$ to the households, or alternatively it can sell a license to any firm willing to pay a fixed price F for it, thus selling N_1 licenses and redistributing its revenues FN_1 to the households.

[18]The corner solution entails $W_t = \underline{W}$ and $N_t L_{Nt} + L_{Tt} = H$, $t = 0, 1$.

and

$$N_t L_{Nt} + L_{Tt} < H, \quad t = 0, 1. \tag{12b}$$

Equilibrium in the market for the non-tradable good requires:

$$N_t Y_{Nt} = N_t K_{Nt}^{\gamma} L_{Nt}^{\beta} = C_{Nt}, \quad t = 0, 1. \tag{13}$$

The market for the tradable good is internationally integrated. Equilibrium in this market requires:

$$Y_{Tt} = C_{Tt} + K_{t+1} + TA_t, \quad t = 0, 1, \tag{14}$$

where TA_t is the trade account (net exports) in period t.

Equilibrium in the market for productive assets entails

$$K_t = N_t K_{Nt} + K_{Tt}, \quad t = 0, 1, \; K_0 = \overline{K} \text{ given}. \tag{15}$$

The representative firms equalize the value of the marginal productivity of capital to the rental rate of capital and the value of the marginal productivity of labor to the wage:

$$(1 - \alpha) L_{Tt}^{\alpha} = R_t = \gamma P_{Nt} K_{Nt}^{\gamma - 1} L_{Nt}^{\beta}, \quad t = 0, 1, \tag{16}$$

$$\alpha K_{Tt} L_{Tt}^{\alpha - 1} = W_t = \beta P_{Nt} K_{Nt}^{\gamma} L_{Nt}^{\beta - 1}, \quad t = 0, 1. \tag{17}$$

By solving for the output that the representative firm operating in the non-tradable sector produces in equilibrium (see the Appendix), one can obtain from the market-clearing condition (13) that

$$C_{Nt} = N_t Y_{Nt} = \frac{N_t}{W_t^{\beta} R_t^{\gamma}} \left[\frac{(\beta + \gamma) Q_t}{(1 - \beta - \gamma) \Psi} \right]^{\beta + \gamma}, \quad t = 0, 1, \tag{18}$$

where $\Psi \equiv \left(\frac{\beta}{\gamma}\right)^{\frac{\gamma}{\beta+\gamma}} + \left(\frac{\gamma}{\beta}\right)^{\frac{\beta}{\beta+\gamma}}$.

The equilibrium price of the non-tradable good is given by (see the Appendix):

$$P_{Nt} = \frac{W_t^{\beta} R_t^{\gamma} Q_t^{1 - \beta - \gamma}}{(1 - \beta - \gamma)} \left[\frac{(1 - \beta - \gamma) \Psi}{(\beta + \gamma)} \right]^{\beta + \gamma}, \quad t = 0, 1. \tag{19}$$

Solving the optimization problem of the representative household, one obtains that in equilibrium:

$$K_2 = D_2 = 0, \tag{20}$$

$$C_{Tt} = \eta C_{Nt}, \quad t = 0, 1, \tag{21}$$

$$\frac{C_{T0}^{-\xi}}{(\eta + P_{N0})} = \frac{\theta R_1 C_{T1}^{-\xi}}{(\eta + P_{N1})}, \tag{22}$$

$$\frac{C_{T0}^{-\xi}}{(\eta + P_{N0})} = \frac{\theta(1 + r)C_{T1}^{-\xi}}{(\eta + P_{N1})}. \tag{23}$$

Notice that (22)–(23) entails $R_1 = 1 + r$. Moreover, by using (1), (2), (4), (9), (13) and (20), one can derive from the households' budget constraint (8) that in equilibrium

$$K_{T0}L_{T0}^{\alpha} + \frac{K_{T1}L_{T1}^{\alpha}}{1 + r} = C_{T0} + K_1 + \frac{C_{T1}}{1 + r}. \tag{24}$$

4.2 Number of Firms and Price of Licenses in the Non-tradable Sector

If in period t the government restricts the issuance of licenses required to operate in the non-tradable sector, the price that firms are willing to pay for using a license increases up to the point where their profits go to zero. Hence, one has:

$$N_t = \overline{N}, \quad t = 0, 1, \tag{25a}$$

thus obtaining from (18)

$$Q_t = \frac{(1 - \beta - \gamma)\Psi}{(\beta + \gamma)} \left(\frac{W_t^{\beta} R_t^{\gamma} C_{Nt}}{\overline{N}} \right)^{\frac{1}{\beta+\gamma}} > F, \quad t = 0, 1. \tag{26a}$$

In contrast, if in period 1 the government grants licenses to everyone willing to pay a unit price F, the number of firms that intend to operate in the non-tradable sector increases up to the point where their profits go to zero. Hence, one has

$$Q_1 = F. \tag{25b}$$

Thus, from (18) one can obtain

$$N_1 = W_1^{\beta} R_1^{\gamma} C_{N1} \left[\frac{(1 - \beta - \gamma)\Psi}{(\beta + \gamma)F} \right]^{\beta+\gamma} > \overline{N}. \tag{26b}$$

4.3 Pessimistic Expectations

If at time 0 the households expect that the government will restrict the issuance of licenses required to operate in the non-tradable sector also in period 1 (and thus believe that $N_0^* = N_1^* = \overline{N}$), one can use (11a, b)–(24) and (25a)–(26a) to solve for what the households consume, work, invest and borrow in the present (i.e., for $C_{T0}^*, C_{N0}^*, L_0^*, K_1^*, D_1^*$) and for what they plan to consume and to work in the future (i.e., for $C_{T1}^*, C_{N1}^*, L_1^*$). Together, one can solve for the associated $Q_0^*, W_0^*, R_0^*, P_{N0}^*, K_{T0}^*, K_{N0}^*, L_{T0}^*, L_{N0}^*, Y_{T0}^*, Y_{N0}^*, Q_1^*, W_1^*, R_1^*, P_{N1}^*, K_{T1}^*, K_{N1}^*, L_{T1}^*, L_{N1}^*, Y_{T1}^*, Y_{N1}^*$.

Two possible cases can occur.

Suppose that when the future arrives the authorities maintain the restriction on the issuance of licenses for producing non-tradables. In this case, the households' pessimistic expectations are fulfilled and the agents actualize at time 1 the optimal plan made in the previous period, thus consume C_{T1}^* units of tradable good and C_{N1}^* units of non-tradable good, and supply L_1^* units of labor. Their associated utility is u_1^*. All the other variables at time 1 take the values predicted at time 0 ($Q_1^*, W_1^*, R_1^*, P_{N1}^*, K_{T1}^*, K_{N1}^*, L_{T1}^*, L_{N1}^*, Y_{T1}^*, Y_{N1}^*$).

In contrast, suppose that when the future arrives the authorities liberalize firms' entry into the non-tradables sector. In this case, the households' pessimistic expectations are not fulfilled and the agents revise in period 1 the optimal plan made in the previous period on the basis of the pessimistic expectations. One can obtain the values $C_{T1}^{**}, C_{N1}^{**}, L_1^{**}, u_1^{**}, Q_1^{**}, N_1^{**}, W_1^{**}, R_1^{**}, P_{N1}^{**}, K_{T1}^{**}, K_{N1}^{**}, L_{T1}^{**}, L_{N1}^{**}, Y_{T1}^{**}, Y_{N1}^{**}$ which the endogenous variables take in t = 1 when the pessimistic expectations are not fulfilled and agents revise their plans, by using (11a, b)–(21) (where $K_1 = K_1^*$ is given), (25b)–(26b) and the budget constraint (8), which in period t = 1 entails

$$K_{T1}L_{T1}^{\alpha} = C_{T1} + (1 + r)D_1, \qquad D_1 = D_1^* \text{ given.} \tag{27}$$

Typically, $u_1^{**} > u_1^*$ (see the Appendix for a numerical example): by removing in t = 1 the distortion caused by the restriction on the number of firms that may enter the non-tradable sector, the well-being of the representative household at time 1 improves with respect to the case of no liberalization. However, by checking (10) (and noticing that—when households have pessimistic expectations —$u_1\big|_{N_1 > \overline{N}} = u_1^{**}$ and $u_1\big|_{N_1 = \overline{N}} = u_1^*$), one can easily verify that $u_1^{**} > u_1^*$ is a necessary but not a sufficient condition for inducing the government to liberalize the entry into the non-tradable sector at time 1. Indeed, for the authorities to overcome the institutional inertia and trigger a change in the regulatory regime, one needs that both $u_1^* < \underline{u}$ and $u_1^{**} \geq \underline{u}$ hold true.

It follows that, when households' expectations are pessimistic, a necessary and sufficient condition for the liberalization of the non-tradable sector in period 1 is:

$$u_1^{**} \geq \underline{u} > u_1^{*}. \tag{28}$$

Clearly, if (28) holds, it is irrational for economic agents to have pessimistic expectations at time 0 with regard to the possibility of a future liberalization of the regulatory regime governing the non-tradable sector.

4.4 Optimistic Expectations

If at time 0 the households expect that in period 1 the government will stop restricting the issuance of licenses required to operate in the non-tradable sector (and thus believe that $N_0^{\circ} = \overline{N} < N_1^{\circ}$), one can use (11a, b)–(24) and (25b)–(26b) to solve for what the households consume, work, invest and borrow in the present (i.e., for $C_{T0}^{\circ}, C_{N0}^{\circ}, L_0^{\circ}, K_1^{\circ}, D_1^{\circ}$) and for what they plan to consume and to work in the future (i.e., for $C_{T1}^{\circ}, C_{N1}^{\circ}, L_1^{\circ}$). Together, one can solve for the associated $Q_0^{\circ}, W_0^{\circ}, R_0^{\circ}, P_{N0}^{\circ}, K_{T0}^{\circ}, K_{N0}^{\circ}, L_{T0}^{\circ}, L_{N0}^{\circ}, Y_{T0}^{\circ}, Y_{N0}^{\circ}, N_1^{\circ}, Q_1^{\circ}, W_1^{\circ}, R_1^{\circ}, P_{N1}^{\circ}, K_{T1}^{\circ}, K_{N1}^{\circ}, L_{T1}^{\circ}, L_{N1}^{\circ}, Y_{T1}^{\circ}, Y_{N1}^{\circ}$.

Again, two possible cases can occur.

Suppose that when the future arrives the authorities stop restricting the number of firms allowed to produce non-tradables. In this case, the households' optimistic expectations are fulfilled and the agents actualize at time 1 the optimal plan made in the previous period, thus consuming C_{T1}° units of tradable good and C_{N1}° units of non-tradable good, and supplying L_1° units of labor. Their associated utility is u_1°. All the other variables take at time 1 the values predicted at time 0 $(N_1^{\circ}, Q_1^{\circ}, W_1^{\circ}, R_1^{\circ}, P_{N1}^{\circ}, K_{T1}^{\circ}, K_{N1}^{\circ}, L_{T1}^{\circ}, L_{N1}^{\circ}, Y_{T1}^{\circ}, Y_{N1}^{\circ})$.

In contrast, suppose that when the future arrives the authorities do not liberalize the entry into the non-tradable sector and continue to restrict the issuance of licenses required to produce non-tradables $\left(N_1^{\circ\circ} = \overline{N}\right)$. In this case, the households' optimistic expectations are not fulfilled and the agents revise in period 1 the optimal plan made in the previous period on the basis of these expectations. One can obtain the values $C_{T1}^{\circ\circ}, C_{N1}^{\circ\circ}, L_1^{\circ\circ}, u_1^{\circ\circ}, Q_1^{\circ\circ}, N_1^{\circ\circ}, W_1^{\circ\circ}, R_1^{\circ\circ}, P_{N1}^{\circ\circ}, K_{T1}^{\circ\circ}, K_{N1}^{\circ\circ}, L_{T1}^{\circ\circ}, L_{N1}^{\circ\circ}, Y_{T1}^{\circ\circ}, Y_{N1}^{\circ\circ}$ which the endogenous variables take in t = 1 when the optimistic expectations of the households are not fulfilled and agents revise their plans, by using (11a, b)–(21) (where $K_1 = K_1^{\circ}$ is given), (25a)–(26a) and the budget constraint (8), which in period t = 1 entails

$$K_{T1} L_{T1}^{\alpha} = C_{T1} + (1 + r) D_1, \quad D_1 = D_1^{\circ} \text{ given}. \tag{29}$$

Typically, $u_1^{\circ} > u_1^{\circ\circ}$ (see in the Appendix for a numerical example): again, by removing at time 1 the distortion caused by the restriction to the number of firms that can enter the non-tradable sector, the well-being of the representative household improves. However, $u_1^{\circ} > u_1^{\circ\circ}$ is a necessary but not sufficient condition for the

government to change the status quo and liberalize the entry into the non-tradable sector. Indeed, for the authorities to overcome the institutional inertia and trigger a change in the regulatory regime, one needs both $u_1^{\circ} \geq \underline{u}$ and $u_1^{\circ\circ} < \underline{u}$, since—when households have optimistic expectations—$u_1\Big|_{N_1 > \overline{N}} = u_1^{\circ}$ and $u_1\Big|_{N_1 = \overline{N}} = u_1^{\circ\circ}$.

A sufficient condition for the government not to liberalize the non-tradable sector in period 1, thus keeping the number of firms operating in this sector restricted to $\overline{N}$ when the households hold optimistic expectations, is given by:

$$u_1^{\circ\circ} \geq \underline{u}. \tag{30}$$

If condition (30) holds, it is irrational for economic agents to have optimistic expectations at time 0 with regard to the possibility of a future liberalization of the regulatory regime governing the non-tradable sector.

4.5 Self-defeating Expectations

Before proceeding, we propose two definitions.

Definition 1 We say that a set of expectations is *self-defeating* if acting on the basis of these expectations creates the condition for their falsification.

In the model presented here, pessimistic (optimistic) expectations about the possibility of a future regulatory reform are self-defeating if (28) [if (30)] holds: acting on the basis of pessimistic (optimistic) expectations, economic agents invest less (more) than otherwise, thereby reducing (increasing) households' future well-being and generating more (less) pressure on the authorities to implement the reform.

Consistently with Definition 1, not all sets of wrong expectations are self-defeating: we may have expectations whose fulfillment (or disappointment) does not depend on the conduct that they activate.

Definition 2 A *self-defeating expectations trap* is a situation where all possible sets of expectations are *self-defeating* because no set of expectations has the potential for self-fulfillment.

It is straightforward that, whenever both (28) and (30) hold, no rational expectations equilibrium can exist and the economy is in a self-defeating expectations trap. What conditions have to be satisfied in the present model for ruling out the existence of a rational expectations equilibrium? One can easily verify that $u_1^{\circ\circ} > u_1^*$ is a necessary condition for the truth of both (28) and (30). Hence, $u_1^{\circ\circ} > u_1^*$ is a necessary condition for the existence of a self-defeating expectations trap.

It is worth pointing out that the condition $u_1^{\circ\circ} > u_1^*$ is very likely to hold: economic agents tend to invest more in productive assets when they expect that reforms augmenting the efficiency of the economy will be implemented $\left(K_1^{\circ} > K_1^*\right)$

and households' well-being is higher the larger the investment in productive assets in the past. Hence, even if the reforms will be never implemented, households' well-being is higher if economic agents were optimistic about their implementation $\left(u_1^{\circ\circ} > u_1^*\right)$. Thus, there is a real possibility that both (28) and (30) hold (see the numerical example in the Appendix).

5 Three Realistic Extensions of the Model

To show that the previous results carry over to more complex and realistic environments, we develop and discuss three extensions of the basic model.

5.1 Probability of a Regulatory Change

One could argue that the previous discussion applies to the special case in which the representative household attaches probability one (pessimistic expectations), or alternatively probability zero (optimistic expectations), to the possibility that the status quo will prevail and a regulatory change will not be implemented in the future. We can generalize our results considering the case in which the representative household attaches probability q, with $0 \leq q \leq 1$, to the possibility that the number of firms operating in the non-tradable sector will remain restricted to $\overline{N}$ in period 1. In this case, at time 0 the representative household maximizes its expected lifetime utility $U^e = u_0 + \theta\left[qu_1\Big|_{N_1=\overline{N}} + (1-q)u_1\Big|_{N_1>\overline{N}}\right]$, and the economy is still governed by (11a, b)–(21) and (24)–(26a, b), while (22)–(23) must be rewritten as

$$\frac{C_{T0}^{-\xi}}{(\eta + P_{N0})} = \theta\left[q\frac{R_1 C_{T1}^{-\xi}}{(\eta + P_{N1})}\Bigg|_{N_1=\overline{N}} + (1-q)\frac{R_1 C_{T1}^{-\xi}}{(\eta + P_{N1})}\Bigg|_{N_1>\overline{N}}\right], \tag{22a}$$

$$\frac{C_{T0}^{-\xi}}{(\eta + P_{N0})} = \theta(1+r)\left[q\frac{C_{T1}^{-\xi}}{(\eta + P_{N1})}\Bigg|_{N_1=\overline{N}} + (1-q)\frac{C_{T1}^{-\xi}}{(\eta + P_{N1})}\Bigg|_{N_1>\overline{N}}\right]. \tag{23a}$$

By solving the model, one can check that the agents tend to invest more in productive assets if they attach a higher probability to the possibility that reforms augmenting the efficiency of the economy will be implemented: $\frac{\partial K_1^{\#}}{\partial q} < 0$ and $K_1^{\circ} \geq K_1^{\#} \geq K_1^*$, where "#" denotes the value of a variable when the households assign probability q to the absence of any liberalization in the non-tradable sector.

Hence, one has $\frac{\partial u_1^{\#}\Big|_{N_1=\overline{N}}}{\partial q} < 0$ and $u_1^{\circ\circ} \geq u_1^{\#}\Big|_{N_1=\overline{N}} \geq u_1^{*}$: even if the liberalization will never be implemented, households' future well-being is higher if economic agents did attach a higher probability to the implementation of the reform.

If both (28) and (30) hold, the fact that $\frac{\partial u_1^{\#}\Big|_{N_1=\overline{N}}}{\partial q} < 0$ implies that there exists an unique value of $q < 1$, say $\overline{q}$, such that $u_1^{\#}\Big|_{N_1=\overline{N}} = \underline{u}$ if the agents attach probability $\overline{q}$ to the absence of any liberalization. In this case, one has that for $q > \overline{q}$ (i.e., if the households are relatively pessimistic about the possibility that the authorities will liberalize firms' entry into the non-tradable sector), the authorities will implement the liberalization (since $u_1^{\#}\Big|_{N_1=\overline{N}} < \underline{u}$). On the contrary, if the households are relatively optimistic (i.e., if $q \leq \overline{q}$), the authorities will not undertake the reform. In other words, if both (28) and (30) hold, a self-defeating expectations trap emerges even if the households attach probability q to the possibility that the number of firms operating in the non-tradable sector will remain restricted to $\overline{N}$ in period 1.

5.2 Distributive Conflict

In the previous section, we invoked a somehow unspecified institutional inertia as the reason why the authorities are reluctant to change a regulatory framework that is clearly Pareto inferior. The existence of a distributive conflict across heterogeneous agents is one of the possible explanations of this inertia (see Footnote 5 for a discussion), but in the basic model we could not capture the redistributive implications of the liberalization of the non-tradable sector because of the simplifying assumption of a unique representative household. Here, we abandon such setup by recognizing that there may be diverging interests among households concerning the removal of restrictions to the number of firms that can operate in the non-tradable sector.

Hence, we assume that at time 0 the population consists of two groups: a fraction λ ($0 < \lambda < 1$) of the households is endowed with the licenses for operating in the non-tradable sector (the "rentiers"), while the remaining fraction $1 - \lambda$ is not (the "non rentiers"). Assuming that all the rest remains the same as in the basic model, the two groups of households differ solely because of their budget constraint, since the rent due to the possession of the licenses is only part of the rentiers' income:

$$\begin{aligned} K_{t+1}^{s} + D_t^{s}(1+r) + P_{Nt}C_{Nt}^{s} + C_{Tt}^{s} \leq R_t K_t^{s} + D_{t+1}^{s} \\ + N_t \pi_{Nt} + \pi_{Tt} + T_t + (N_t L_{Nt} + L_{Tt})W_t \\ + N_t(Q_t - F), \quad K_0^{s} = \overline{K}^{s}, D_0^{s} = 0 \text{ and } N_0 = \overline{N} \text{ given}, D_2^{s} \leq 0, \ t = 0, 1, \end{aligned} \tag{8a}$$

$$\begin{aligned} & K_{t+1}^{n} + D_{t}^{n}(1+r) + P_{Nt}C_{Nt}^{n} + C_{Tt}^{n} \leq R_{t}K_{t}^{n} \\ & \quad + D_{t+1}^{n} + N_{t}\pi_{Nt} + \pi_{Tt} + T_{t} \\ & \quad + (N_{t}L_{Nt} + L_{Tt})W_{t},\ K_{0}^{n} = \overline{K}^{n}, \\ & \quad D_{0}^{n} = 0 \text{ and } N_{0} = \overline{N} \text{ given}, D_{2}^{n} \leq 0, t = 0, 1, \end{aligned} \tag{8b}$$

where the superscript "s" ("n") denotes the value of a variable controlled by the rentiers (non rentiers). Notice also that total capital stock K_t, net foreign debt D_t, consumption of tradables C_{Tt} and consumption of non-tradables C_{Nt} are now given by $K_t = \lambda K_t^s + (1-\lambda)K_t^n$, $D_t = \lambda D_t^s + (1-\lambda)D_t^n$, $C_{Tt} = \lambda C_{Tt}^s + (1-\lambda)C_{Tt}^n$ and $C_{Nt} = \lambda C_{Nt}^s + (1-\lambda)C_{Nt}^n$, t = 0, 1.

It is straightforward to notice that the rentiers do not like the removal of the restriction to the number of firms operating in the non-tradable sector, since this reform will eliminate the rent that they enjoy as holders of the licenses. The government is realistically assumed to preserve the regulatory regime favoring the rentiers (possibly as a result of some rent-seeking activities by the latter): if and only if the utility of the non rentiers falls below that minimum level which is deemed socially acceptable, the government will accept to lift the barrier to entry into the non-tradable sector. More formally, at the beginning of period 1, the government decides to liberalize if and only if

$$u_1^n\Big|_{N_1=\overline{N}} < \underline{u} \quad \text{and} \quad u_1^n\Big|_{N_1>\overline{N}} \geq \underline{u}. \tag{10a}$$

As in the previous section, a necessary and sufficient condition for liberalizing the non-tradable sector in period 1 when the households expected at time 0 that the government will not liberalize it is:

$$u_1^{n**} \geq \underline{u} > u_1^{n*}, \tag{28a}$$

where u_1^{n**} is the utility level that the non rentiers can achieve in period 1 if the households erroneously believed that the government would not liberalize the entry into the non-tradable sector, and u_1^{n*} is the utility level that the non rentiers can achieve in period 1 if the households correctly believed that the government would not liberalize.

As in the previous section, a sufficient condition for the authorities not to liberalize the entry in the non-tradable sector in period 1 (thus, keeping the number of operating firms restricted to $\overline{N}$), when the households believed at time 0 that liberalization would instead occur, is given by:

$$u_1^{n\circ\circ} \geq \underline{u}, \tag{30a}$$

where $u_1^{n\circ\circ}$ is the utility level that the non rentiers can achieve in period 1 if the households erroneously believed that the government would liberalize the entry into the non-tradable sector.

Again, there is a realistic possibility that both (28a) and (30a) hold, thus realizing a self-defeating expectations trap in a framework of heterogeneous agents with distributive conflicts.

5.3 Possibility of Default

In Sect. 4, we implicitly ruled out the possibility that the households can default on their foreign debt, namely we assumed that $K_{T1}L_{T1}^{\alpha} \geq C_{T1} + D_1(1+r)$ must necessarily hold. Here, we relax this assumption by admitting that the households will honor their entire debt service if and only if this will not prevent them from reaching in period 1 the minimum acceptable level of consumption $\underline{C}$, where $\underline{C}$ is such that $\underline{u} = \frac{\underline{C}^{1-\xi}}{1-\xi}$.

This possibility of partial or total repudiation of the debt on the part of the households can be simply modeled by reformulating u_1 as

$$u_1 = \begin{cases} \frac{C_1^{1-\xi}}{1-\xi} - \zeta Z_1 & \text{if } C_1 \geq \underline{C}, \\ -\zeta Z_1 & \text{otherwise, } \zeta \geq \underline{C}^{-\xi}, \end{cases} \tag{31}$$

where $Z_1, 0 \leq Z_1 \leq D_1(1+\hat{r})$, is the amount of the outstanding debt service repudiated by the households, ζ is a parameter measuring the households' sensitivity to the reputational loss due to the repudiation of Z_1, and $\hat{r}$ (with $\hat{r} \geq r$) is the interest rate at which the representative household can go into debt. It derives from (31) that in period 1 the representative household sets

$$Z_1 = \begin{cases} 0 & \text{if } D_1(1+\hat{r}) \leq K_{T1}L_{T1}^{\alpha} - \underline{C}, \\ \underline{C} + D_1(1+\hat{r}) - K_{T1}L_{T1}^{\alpha} & \text{otherwise,} \end{cases} \tag{32}$$

where it is assumed that $K_{T1}L_{T1}^{\alpha} - \underline{C} \geq 0$ (the households, by repudiating entirely their outstanding debt service, can **at least** reach the minimum acceptable level of consumption) and $\frac{\underline{C}^{1-\xi}}{1-\xi} - \zeta\left[\underline{C} + D_1(1+\hat{r}) - K_{T1}L_{T1}^{\alpha}\right] > 0$ [if the households cannot reach $\underline{C}$ by honoring entirely their debt service, they are strictly better off by repudiating that amount of debt service which is necessary to reach $\underline{C}$ than by paying off entirely $D_1(1+\hat{r})$]. Together with $\zeta \geq \underline{C}^{-\xi}$, this implies that whenever their debt service is excessive (i.e., whenever $D_1(1+\hat{r}) > K_{T1}L_{T1}^{\alpha} - \underline{C}$), it is optimal for the households to repudiate **exactly** that amount of debt service which is necessary to reach $\underline{C}$.

International investors are aware of the possibility that their credits will not be entirely repaid. Hence, the interest rate at which they are willing to lend to the domestic households ($\hat{r}$) may be higher than the world (risk-free) interest rate:

$$\hat{r} = r + \frac{Z_1}{D_1}. \tag{33}$$

In a self-defeating expectations trap, that is when both conditions (28) and (30) hold, the possibility for the households to default on their debt is particularly relevant for the case in which the households' pessimistic expectations about reform implementation in period 1 will be validated. When the households' pessimistic expectations are validated and agents do not have the possibility to default, one has that $C_1^* < \underline{C}$ (see the previous section). Instead, when the households' pessimistic expectations are validated and agents have the possibility of repudiating (partially or entirely) the debt, agents would choose to default whenever it is convenient for them to go excessively into debt in period 0 in the anticipation that they will not repay (partially or entirely) it. More formally, the households will honor entirely their debt service if, in the situation in which at time 1 no debt repudiation will occur and they will consume exactly $\underline{C}$, the marginal increase in utility brought about by the increment in consumption at time 0 obtainable by one additional unit of debt is lower than the future discounted disutility of repudiating that unit of debt (and the interest payment on it), i.e., if and only if[19]

$$(C_0^*)^{-\xi} \Big|_{\substack{Z_1 = 0 \\ C_1 = \underline{C}}} \leq \theta(1+r)\zeta. \tag{34}$$

Condition (34) is necessary for avoiding a default on the households' debt when the households' expectations are pessimistic and the authorities do not liberalize the firms' entry into the non-tradable sector. It is straightforward that (34) holds when the cost of default is relatively large and the households do not discount the future too heavily: under these circumstances, if the households' pessimistic expectations will be validated by the government, they will not default in t = 1 and their utility will be $u_1^* = \underline{u}$. Hence, condition (28) does not hold and there is no self-defeating expectations trap: recalling (10), it is rational to expect that the households' pessimistic expectations will be validated.

In contrast, if (34) does not hold, the households' pessimistic expectations cannot be validated, since—in the absence of the liberalization of the non-tradable sector—the households would default on their debt and their utility in period 1 would be $u_1^* = \frac{C^{1-\xi}}{1-\xi} - \zeta Z_1^* < \underline{u}$, where $Z_1^* > 0$. Being aware that—without the

[19]Notice that C_0^* can be obtained by solving (11a, b)–(21), (23)–(24), (25a)–(26a) and $C_1 = \underline{C}$ in the case in which the households have pessimistic expectations, and by solving (11a, b)–(21), (23)–(24), (25b)–(26b) and $C_1 = \underline{C}$ in the case in which they have optimistic expectations.

removal of the barriers limiting firms' entry into the non-tradable sector—households' utility in period 1 would fall below $\underline{u}$, the government is induced in this period to liberalize the non-tradable sector. In other words, if the cost of default is relatively small and the households discount the future heavily, they tend to augment their consumption in period 0 by increasing excessively their debt, thus going into default and reducing their well-being in period 1 in the absence of a regulatory reform on the part of the government. This will lead the government to implement this reform, thus falsifying the households' pessimistic expectations: again, a self-defeating expectations trap is at work.

6 Closing Remarks

This work addresses the underexplored implications of agents' expectations about structural reforms in a context characterized by institutional inertia, whereby the authorities do not implement reforms unless social welfare falls below a critical (politically and socially sustainable) level. By means of a stylized small open economy with tradable and non-tradable sectors and encompassing policy-induced barriers to entry in the non-tradable sector, this work shows that optimistic (pessimistic) expectations about reforms may boost (weaken) the economic performance of the economy and thus reduce (increase) the incentives for the authorities to implement the reform. In addition, the model reveals that there might be circumstances in which no set of expectations has the potential for self-fulfillment, leaving agents to face a high degree of indeterminacy.

Notwithstanding the stylized nature of the analytical set-up, the focus on the interplay between structural reforms and agents' expectations allows to shed some light on the recent Eurozone problems. To start, the model suggests that, if the authorities exhibit a status quo bias against reforms, expectations about the realization of the reforms may be self-defeating and the disciplining effects of the monetary union may fail to materialize. This seems to be consistent with what observed in a number of Eurozone periphery countries. Furthermore, by identifying the case of self-defeating expectations traps, the model reveals a new kind of problem that may possibly emerge in a monetary union among highly heterogeneous members, that is the risk of not having a rational expectations equilibrium and no obvious criterion for the agents to form their expectations.

Thus, while the literature on the European sovereign debt crisis has explained the turmoil in terms of self-fulfilling prophecies and multiple equilibria in the sovereign debt markets, this work suggests that the limited real economic convergence negatively affecting the prospects of the Eurozone may in fact represent a case of self-defeating expectations about structural reforms. This raises a number of questions that the work does not tackle and could be a venue of further research: did the economic agents miscalculate the reaction functions of the governments in the Eurozone periphery? could they do better, had they taken in due account the status quo bias of the authorities? did the EMU experience a self-defeating expectations

trap? In such a case, how should rational agents have behaved and is there any positive role for the authorities of the European Union? Can international arrangements and numerical rules, such as those contained in the reformed Stability and Growth Pact, reduce the likelihood of self-defeating expectations? Could domestic commitment devices, such as the establishment of independent committees of technicians, work equally well?

Appendix

Derivation of the Equilibrium Output of the Representative Firm Operating in the Non-tradable Sector and of the Equilibrium Price of its Output

We find the cost-minimizing demand functions for L_{Nt} and K_{Nt} by solving

$$\min_{L_{Nt},K_{Nt}} W_t L_{Nt} + R_t K_{Nt} + Q_t \quad \text{subject to} \quad L_{Nt}^{\beta} K_{Nt}^{\gamma} \geq Y_{Nt}. \tag{A.1}$$

From the solution to (A.1), one can derive the cost function of the representative firm producing the non-tradable good:

$$C(W_t, R_t, Q_t, Y_{Nt}) = \begin{cases} \Psi(Y_{Nt} W_t^{\beta} R_t^{\gamma})^{\frac{1}{\beta+\gamma}} + Q_t & \text{if } Y_{Nt} > 0 \\ 0 & \text{otherwise}, \Psi \equiv \left(\frac{\beta}{\gamma}\right)^{\frac{\gamma}{\beta+\gamma}} + \left(\frac{\gamma}{\beta}\right)^{\frac{\beta}{\beta+\gamma}}. \end{cases} \tag{A.2}$$

By solving

$$\max_{Y_{Nt}} P_{Nt} Y_{Nt} - C(W_t, R_t, Q_t, Y_{Nt}). \tag{A.3}$$

One can find the supply function of the representative firm producing the non-tradable good:

$$Y_{Nt} = \begin{cases} \left\{ \frac{P_{Nt}(\beta+\gamma)(W_t^{\beta} R_t^{\gamma})^{\frac{-1}{\beta+\gamma}}}{\Psi} \right\}^{\frac{\beta+\gamma}{1-\beta-\gamma}} & \text{if } P_{Nt} \geq \text{Min } AC(W_t, R_t, Q_t, Y_{Nt}) \\ 0 & \text{otherwise.} \end{cases} \tag{A.4}$$

Notice that $AC(W_t, R_t, Q_t, Y_{Nt})$ is the average cost function of the representative firm operating in the non-tradable sector:

$$AC(W_t, R_t, Q_t, Y_{Nt}) = \begin{cases} \Psi(Y_{Nt}^{1-\beta-\gamma} W_t^{\beta} R_t^{\gamma})^{\frac{1}{\beta+\gamma}} + \frac{Q_t}{Y_{Nt}} & \text{if } Y_{Nt} > 0 \\ 0 & \text{otherwise.} \end{cases} \tag{A.5}$$

Knowing that in equilibrium the representative firm produces the quantity which minimizes its average cost, one can solve

$$\min_{Y_{Nt}} AC(W_t, R_t, Q_t, Y_{Nt}), \tag{A.6}$$

thus obtaining the equilibrium output of the representative firm producing the non-tradable good:

$$Y_{Nt} = W_t^{-\beta} R_t^{-\gamma} \left[\frac{(\beta+\gamma) Q_t}{(1-\beta-\gamma)\Psi} \right]^{\beta+\gamma}. \tag{A.7}$$

Moreover, knowing that in equilibrium the price of the non-tradable good equalizes the minimum of the average cost function, one can use (A.7) to substitute for Y_{Nt} in (A.5), thus obtaining (19).

Numerical Example

Let us assume that $\alpha = 0.7$; $\beta = 0.6$; $\gamma = 0.2$; $\eta = 0.3615336$; $\theta = 0.7986$; $\xi = 0.8636241$; $r = 0.0898415$; $F = 8.3777348$; $H = 42.314599$; $\overline{K} = 49.0208565$; $\overline{N} = 4$; $\underline{u} = 9.784406$, and $\underline{W} = 3.1350538$.

Pessimistic Expectations

Taking the parameter values and initial conditions given above, one can solve for the case in which agents' expectations are pessimistic, thus obtaining: $C_{T0}^{*} = 8.574346$; $C_{N0}^{*} = 23.716595$; $L_0^{*} = H$; $W_0^{*} = 3.616183$; $R_0^{*} = 1.084547$; $N_0^{*} = \overline{N}$; $Q_0^{*} = 10.861741$; $P_{N0}^{*} = 9.159613$; $K_{T0}^{*} = 8.960856$; $K_{N0}^{*} = 10.015$; $L_{T0}^{*} = 6.270824$; $L_{N0}^{*} = 9.010944$; $Y_{T0}^{*} = 32.39491$; $Y_{N0}^{*} = 5.929149$; $K_1^{*} = 42.16378$; $D_1^{*} = 18.343216$; $C_{T1}^{*} = 8.28969$; $C_{T1}^{**} = 8.497391$; $C_{N1}^{*} = 22.929234$; $C_{N1}^{**} = 23.503738$; $N_1^{*} = \overline{N}$; $N_1^{**} = 4.489750$; $Q_1^{*} = 9.36689$; $Q_1^{**} = F$; $L_1^{*} = H = L_1^{**}$; $W_1^{*} = \underline{W}$; $W_1^{**} = 3.138048$; $R_1^{*} = 1 + r$; $R_1^{**} = 1.094759$; $P_{N1}^{*} = 8.17026$ $P_{N1}^{**} = 8.001695$; $K_{T1}^{*} = 7.7848581$; $K_{T1}^{**} = 7.807343$; $K_{N1}^{*} = 8.59473$; $K_{N1}^{**} = 7.652585$; $L_{T1}^{*} = 6.3145995$; $L_{T1}^{**} = 6.3553444$; $L_{N1}^{*} = 8.96338$; $L_{N1}^{**} = 8.0091889$; $Y_{T1}^{*} = 28.28087$; $Y_{T1}^{**} = 28.490536$; $Y_{N1}^{*} = 5.732308$; $Y_{N1}^{**} = 5.2349767$; $u_1^{*} = 9.78428$; $u_1^{**} = 9.8173558$. It is worth to notice that condition (28) is satisfied $\left(u_1^{**} = 9.8173558 \geq \underline{u} = 9.784406 > u_1^{*} = 9.78428\right)$.

Optimistic Expectations

Taking again the parameter values and initial conditions given above, one can solve for the case in which agents' expectations are optimistic, thus obtaining: $C^{\circ}_{T0} = 8.5655285$; $C^{\circ}_{N0} = 23.692206$; $L^{\circ}_{0} = H$; $W^{\circ}_{0} = 3.6328049$; $R^{\circ}_{0} = 1.0898415$; $N^{\circ}_{0} = \overline{N}$; $Q^{\circ}_{0} = 10.898415$; $P^{\circ}_{N0} = 9.2$; $K^{\circ}_{T0} = 9.0208565$; $K^{\circ}_{N0} = 10$; $L^{\circ}_{T0} = 6.3145994$; $L^{\circ}_{N0} = 9$; $Y^{\circ}_{T0} = 32.771011$; $Y^{\circ}_{N0} = 5.9230515$; $K^{\circ}_{1} = 42.39325$; $D^{\circ}_{1} = 18.187768$; $C^{\circ}_{T1} = 8.5185921$; $C^{\circ\circ}_{T1} = 8.3187641$; $C^{\circ}_{N1} = 23.56238$; $C^{\circ\circ}_{N1} = 23.009657$; $N^{\circ}_{1} = 4.5$; $N^{\circ\circ}_{1} = \overline{N}$; $Q^{\circ}_{1} = F$; $Q^{\circ\circ}_{1} = 9.3997928$; $L^{\circ}_{1} = H = L^{\circ\circ}_{1}$; $W^{\circ}_{1} = 3.1416507$; $W^{\circ\circ}_{1} = \underline{W}$; $R^{\circ}_{1} = 1 + r$; $R^{\circ\circ}_{1} = 1.0860535$; $P^{\circ}_{N1} = 8$; $P^{\circ\circ}_{N1} = 8.1703028$; $K^{\circ}_{T1} = 7.8012393$; $K^{\circ\circ}_{T1} = 7.77325$; $K^{\circ}_{N1} = 7.6871134$; $K^{\circ\circ}_{N1} = 8.655$; $L^{\circ}_{T1} = 6.3145994$; $L^{\circ\circ}_{T1} = 6.2832683$; $L^{\circ}_{N1} = 8$; $L^{\circ\circ}_{N1} = 8.9948630$; $Y^{\circ}_{T1} = 28.34038$; $Y^{\circ\circ}_{T1} = 28.1405485$; $Y^{\circ}_{N1} = 5.2360845$; $Y^{\circ\circ}_{N1} = 5.7524142$; $u^{\circ}_{1} = 9.8206926$; $u^{\circ\circ}_{1} = 9.7889524$. It is worth to notice that condition (30) is satisfied $\left(u^{\circ\circ}_{1} = 9.7889524 \geq \underline{u} = 9.784406\right)$.

Since both conditions (28) and (30) are satisfied, this numerical example is consistent with the existence of a self-defeating expectations trap: given the parameter values and initial conditions specified above, no rational-expectations equilibrium can exist.

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