Corporate bailouts in a globalized economy*

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Abstract

This paper explores how economic integration influences the decision by national governments to bail out manufacturing firms. We develop a 2-country model of generalized oligopoly with heterogeneous firms and trade costs. High-cost firms are eligible for a bailout while low-cost firms are profitable. Our model shows that trade liberalization and capital mobility influence both political benefits of a bailout and its cost relative to the cost of a laissez-faire policy. Through tax competition, capital mobility might increase the indirect cost of a bailout and encourage governments to prefer a laissez-faire policy. Moreover, a marginal decline in trade costs that does not affect the export status of high-cost firms always makes governments more prone to adopt a bailout decision.

Keywords: soft budget constraint; tax competition; heterogenous firms; trade costs; firm location.

JEL classification: F12; F15; D21; H25.

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1 Introduction

A firm – or any institution – is faced with a soft budget constraint if it expects to be bailed out in case of financial trouble. This creates a moral hazard problem as the expectation of a bailout can erode managers' effort and thereby encourage failure.[1] Originally developed by Kornai (1979, 1986), the concept of soft budget constraint (hereafter SBC) was first designed to describe the behavior of governments in centrally planned and transition economies.[2] However, the recent crisis period resulted in a widespread policy of industry bailout in most of the developed countries, in addition to tremendous rescue plans in the financial and banking sector. The most emblematic example is certainly the federal bailout for America's Big Three automobile companies in 2009, but many rescue plans have been decided in other countries and industrial sectors over the past decades.[3] These examples corroborate the claim by Kornai, Maskin and Roland (2003, p. 56) that "*the effects of the SBC syndrome are clearly perceptible in the traditionally capitalist part of the world as well*". One reason is that some determinants like the political desirability of a bailout are not proper to a particular economic or political system (Robinson and Torvik, 2009). Politicians may be motivated by electoral and partisan concerns to grant subsidies to companies in financial trouble to save jobs (Kornai, 2001). In addition, policy-makers may be concerned by the 'too big to fail' argument when failures cause negative spillovers on the rest of the economy.

The soft budget constraint phenomenon has been studied mainly in a closed economy framework (Kornai, Maskin and Roland, 2003). This is clearly a limit of the literature because corporate bailouts in well-established market economies have been taking place over the two last decades in a new context of globalization characterized by both increasing capital mobility and trade openness. Our paper aims at analyzing how corporate bailout decisions, through their cost and political benefits, can be shaped by these two driving forces of globalization.

[1] For example, firms might under-invest in order to become unprofitable and obtain subsidies (Segal, 1998).

[2] Kornai, Maskin and Roland (2003) provide a detailed review of the soft-budget constraint literature.

[3] Even in the European Union where state aids are forbidden as soon as they threaten to distort competition by favouring certain undertakings or the production of certain goods (article 107 of the TFEU), governments can bailout firms through the so-called State aids for rescuing and restructuring firms in difficulty. According to Chindooroy, Muller and Notaro (2007), 86 rescue and restructuring State aid cases were approved by the Commission between 1995 and 2003, in various sectors and mostly in western countries. For additionnal examples of bailouts in developed countries over the period 1980-2008, see Kornai (2009).

The economic and financial crisis are obviously likely to make the least productive firms more vulnerable, hence encouraging governments to avoid them going bankrupt. However, we argue that globalization may be another powerful driver of bailouts, through its influence on governments' incentive to rescue businesses. Indeed, the bailout decision being the result of a trade-off between some benefits and costs, one has to consider that both are impacted by the degree of trade openness and the capital mobility. For instance, it is largely accepted that the political benefits enjoyed by governments from bailing out business depend on the size of the firms and the number of jobs that may potentially be saved thanks to the governments' financial support[4]. Moreover, the size of the firms is likely to be different depending on whether they are able to export and get access to new markets, which ultimately depends on the level of trade costs. In other words, we argue that the 'too big to fail' argument is endogenous to the level of trade costs. In the same vein, the cost for governments to provide bailouts depends on their capacity to collect tax revenues, which in turn depends on the intensity of international tax competition and ultimately on the degree of economic integration.

Surprisingly, despite the public policy implications of this question, very few works provide an analysis of the possible impact of economic integration on the frequency of bailout policies. The empirical literature on bailouts does not link them to globalization but rather aims at assessing the operating performance of firms before and after bailout (Jiang, Kim and Zhang, 2014) or characterizing which types of firms are more likely to be rescued (Faccio, Masulis and McConnell, 2006). On the theoretical side, contributions are also very scarce. An important contribution by Qian and Roland (1998) explores the determinants of the SBC in the context of federal economies. They show that by inducing fiscal competition among local governments, *"factor mobility increases the opportunity costs of bailout and then serves as a commitment device"* (Qian and Roland, 1998, p. 1143). However, the role played by trade liberalization is ignored. More recently, Alexeev and Jang (2010) introduce a SBC model within Melitz's (2003) framework of international trade with heterogeneous monopolistically competitive firms. By raising the average level of effort and reducing the number of firms eligible for a bailout, the authors show that trade liberalization moderates the inefficiencies produced by the SBC. However, the bailout policy is considered as exogenous. In addition, the authors ignore the market distortions that bailout policies are reputed to generate. In Europe, such distortions on prices and market shares legitimate that all state aids for rescue and restructuring must be authorized

[4]The connections between managers and politicians at the origin of these political benefits are described in Faccio, Masulis and McConnell (2006).

by the European Commission sometimes by requiring compensatory measures.

Our theoretical contribution considers the role played by trade openness and market distortions in the evaluation of the expected costs and benefits of a bailout policy. We develop a trade and location model with two symmetric countries and heterogeneous firms. To keep the model tractable and consider the bailout as an endogenous policy decision, the heterogeneity of firms is modelled in a simple way.[5] Some firms are domestic and immobile, while others are mobile and owned by foreign investors residing in a third country. They all compete on the same oligopolistic market. Importantly, foreign firms are always profitable because they are run by market-oriented managers. In contrast, domestic ones are run by politically-connected managers and might be eligible for a bailout. Our model thus captures two important features. Firstly, as documented by Faccio, Masulis and McConnell (2006), politically-connected firms exist in developed countries, and are more likely to be rescued by the government. Secondly, capital invested in these firms is often partially state-owned and might therefore be less footloose than capital invested in competing multinational firms. Finally, our model exhibits various interactions embedded in a sequential game à la Qian and Roland (1998). In a first stage, politically-connected managers choose to exert either a high or low effort. A high effort can be viewed as restructuring the firm. In contrast, a low effort results in financial difficulties for the firm so that it cannot survive without a bailout. In the latter case, the government has to decide in a second stage whether to rescue the firm through a full exemption of the corporate tax (*bailout policy*) or to let it go bankrupt (*laissez-faire policy*). Importantly, we retain a "too big to fail" argument by assuming that political benefits from a bailout accruing to the government are proportional to the size of firms, or equivalently, to their total labor force. In a third stage, governments non-cooperatively levy a lump-sum tax on all profitable firms. The two last stages describe the location choice of foreign investors and the market outcome.

In line with Qian and Roland (1998) but for a different reason, our model confirms the disciplining effect of capital mobility and tax competition. We also conclude on a non-univocal relationship between trade liberalization and the decisions to bail out, because trade costs can influence the relative cost of a bailout and its political benefits in various ways.

Firstly, the trade cost level influences political benefits through its impact on the export status of firms and, *in fine*, on their size. When trade costs are high (hereafter, *trade regime 1*), a firm eligible for a bailout is not competitive enough to export and

[5] We model firm heterogeneity in a similar way as Okubo, Picard and Thisse (2010).

bilateral trade is exclusively driven by foreign and efficient firms located in each country. It is only once trade costs reach a lower threshold value (hereafter, *trade regime 2*) that the former begins to export as well. Depending on whether trade regime 1 or 2 prevails, the impact of trade liberalization on the size of firms eligible for a bailout goes in opposite directions: it increases with a fall in trade costs when they are exporters whereas it shrinks when they only serve the domestic market because of fiercer competition. As a result, trade liberalization reduces (resp. increases) political benefits from a bailout under *trade regime 1* (resp. *trade regime 2*).

Secondly, as argued by Slaughter (2008), the evaluation of the cost of a bailout policy must account for the way foreign and footloose competitors located in the country may react to such a distortion. In our model, a bailout policy maintains a higher number of domestic competitors on the market. Mobile firms are more responsive to a rise in taxation. This increased responsiveness leads governments to set lower taxes and extract less tax revenues if they rescue firms than if they adopt a laissez-faire policy. Importantly, the relative cost of a bailout – compared to a laissez-faire policy – is larger when firms eligible for a bailout become exporters.

By combining these effects, we obtain our main findings. When trade regime 1 prevails, the gradual decline in trade costs makes the bailout policy more and more likely. Indeed, the decrease in the relative cost of a bailout more than compensates the fall in its political benefits. When the two countries switch from trade regime 1 to trade regime 2, the laissez-faire policy becomes more likely because of a sudden rise in the relative cost of the bailout. Lastly, as trade integration deepens further, incentives to bail out domestic firms unambiguously grow because the relative cost of a bailout shrinks while its political benefits increase.

The remainder of the paper is organized as follows. The model is described in Section 2. Section 3 is devoted to the presentation of production and consumption outcomes for a given spatial distribution of mobile firms and for given policy decisions. This allows us to identify the range of trade cost values corresponding to each trade regime and to analyze how competition effects are influenced by the decision to rescue firms or not. In Section 4, we describe the location equilibrium and the tax competition outcome in our benchmark case (trade regime 2), for a given policy decision regarding firms eligible for a bailout. In Section 5, we analyze the determinants of the bailout decision by governments across each trade regime. Section 6 provides robustness checks and extensions.

2 The Model

The economy consists of two countries, labelled $i = A, B$, equally populated by $L_A = L_B = L/2$ individuals.[6] There are two factors of production – labor and capital – and two sectors, which are always active in the two countries. Each individual in country i provides one unit of labor and is endowed with an equal share of capital. These factors are employed in the country of residence of the individual. The stock of domestic capital is completed by foreign capital owned by individuals living outside the economy. Contrary to domestic capital, foreign capital is mobile and can be invested either in country A or B. While labor can either be employed in a manufacturing sector (M sector) or a traditional sector (T sector), capital is only needed in the former.

Following Haufler and Wooton (2010), the M sector is characterized by a maximum number k of oligopolistic firms producing a homogenous good x. Exporting this good involves a per-unit cost of τ units of numeraire. These firms enjoy increasing returns to scale. A fixed quantity of capital that we normalize to unity and one local manager are always required to start production. Moreover, they may differ in two respects. Firstly, firms relying on domestic capital are immobile whereas those using foreign capital are mobile.[7] Secondly, depending on the origin of the capital of the firm they run, the managers' profile is not the same. Managers of foreign firms are market-oriented: they always exert a high effort resulting in a low marginal cost so that their firm is profitable. In contrast, domestic firms are run by managers that are 'connected politically' with the government. These managers know that their firm can potentially be bailed-out in case of financial trouble. Therefore, they can choose among two levels of effort: a low effort results in a high marginal cost of production so that the firm becomes eligible for a bailout and survive if and only if this bailout is implemented, whereas a high effort leads to the same marginal cost as foreign firms and guarantees their profitability without any governmental support[8]. To summarize, *domestic and immobile firms* run by politically-connected

[6] Countries are assumed to be identical in all respects in order to control for any comparative advantage.

[7] The wave of privatization that began in developped countries in the late 1970s is not completely achieved (see Bortoletti and Faccio, 2009). As a result, in many countries, capital invested in former state-owned firms is still mostly owned by the government and less footloose than capital invested in competing multinational firms. With our modelling strategy regarding the manufacturing sector, we try to build a model that fits this context.

[8] In an extension, we model the marginal cost of politically-connected firms as a continuous function of the effort level. Our main results regarding the determinants of the bailout decision are qualitatively unchanged (see section 6).

managers compete with *foreign and mobile firms* run by market-oriented managers on the same oligopolistic market[9].

In the T sector, firms produce the numeraire commodity z under perfect competition using workers only. Specifically, one unit of labour is required to produce one unit of output, so that wages are equalized to one in this sector.

Note that our modelling of the labor market shares many common assumptions with footloose capital models (Henderson and Thisse, 2004) : labor supply is inelastic, immobile across countries but mobile across sectors and the numéraire sector is always active in both countries. We make two additional assumptions. For convenience and to avoid the modelling of two distinct labor markets, managers and production workers are perfect substitutes. It allows all wages to be equalized to unity. Thus, our approach voluntarily abstracts from wage considerations in order to focus on the role of employment for the bailout decision. Secondly, we ensure that whatever the bailout decision and the resulting market outcome, the total labor supply is high enough to make production possible. These two assumptions are explicitly described in the Appendix 1.

In the following, we describe in more detail the different types of manufacturing firms (section 2.1) and the sequence of interactions between firms and governments (section 2.2).

2.1 Manufacturing firms and the government

We set the total number of domestic firms to n ($n/2$ in each country). Their managers are linked to the government and they can choose among two alternatives. The first one consists in making a high effort which can be interpreted as 'strongly restructuring'. In this case, the firm enjoys a low marginal cost that we normalize to zero, is profitable and thus subject to lump-sum taxation by the government. Alternatively, the manager can exert a low effort. In this case, the marginal cost is equal to m, with $m > 0$ and the workforce of the firm is then maintained. These high cost firms are considered as eligible for a bailout. We model this bailout in a simple way by assuming that it takes the form of a full tax exemption, a common mean to rescue firms (Kornai, Maskin and Roland, 2003, Shleifer and Treisman, 2000, Kornai, 2001).[10] Without such a tax exemption, high

[9] In a previous version of the paper, we consider that a share $\gamma \in (0;1)$ of domestic firms are run by market-oriented managers while the remaining share is run by politically-connected managers. The forces at work are enriched, without consequences for the main results of the model.

[10] Tax exemptions fall in one of the categories of means of rescue listed by Kornai, Maskin and Roland (2003). This category consists of fiscal means, that can either take the form of subsidies or tax concessions.

cost firms go bankrupt.

In addition to their wage, politically-connected managers also enjoy non-monetary benefits that differ depending on the choice of effort they make. By non-monetary benefits, we consider all advantages resulting from their relationship with some members of the government, which gives them political influence. These benefits are assumed to be higher, the larger the number of workers employed in the firm. Specifically, each politically-connected manager receives (net of effort) benefits equal to E times the number of workers employed. Let ℓ denote the total labor force (including the manager) in a high-cost firm. Thus, a politically-connected manager receives $E \cdot \ell$ if he exerts a low effort and a bailout is granted, and E if he exerts a high effort since in this case $\ell = 1$. This is in line with Qian and Roland (1998) who assume that benefits are higher when managers exert a low effort and the government decides to rescue the ailing firm. Otherwise, the bailout decision can not arise at the equilibrium as it would always be individually optimal to make a high effort. This assumption is consistent with the fact that managers of domestic firms being immobile, they are more likely to take care of local employment. Moreover, this modeling strategy is a simple way to render the bailout decision endogenous to the number of jobs in the manufacturing sector (see section 5). Specifically, our model captures the 'too big to fail' argument that contributes to explain why governments often choose to rescue the largest firms.

The remaining $k - n$ foreign firms are run by market-oriented managers. They feel entirely responsible for the survival of the firm and thus always exert a high effort inducing a zero marginal cost. As these firms are profitable, they are subject to lump-sum taxation by the government of the hosting country. Recalling that capital invested in these firms is mobile, their capital owners will thus compare the net profits across the two countries and decide to invest where the net-return to capital is the highest.

2.2 Sequence of events

Our model contains various forms of interactions embedded in the following sequential game (see Figure 1), which shares common features with Qian and Roland (1998):

Stage 0 [*Effort choice of politically connected managers*]. Politically connected managers choose a high or low level of effort given the value of non-monetary benefits they enjoy, and anticipating the outcome of all subsequent stages.

Stage 1 [*Bailout or laissez-faire policy*]. If a low effort is chosen at stage 0, govern-

The two other categories are credit and the various indirect methods of support.

ments decide independently whether to rescue high-cost firms through a full tax exemption (*bailout policy*), or to let them go bankrupt (*laissez-faire policy*)[11]. When doing so, they perfectly anticipate the tax competition outcome, the location of foreign firms and the resulting market outcome.

Stage 2 [*Taxation of firms*]. Governments simultaneously and non-cooperatively choose the level of lump-sum tax levied on all low-cost firms, given decisions taken at stages 0 and 1. At this stage, governments perfectly anticipate the location of foreign firms as well as the market outcome.

Stage 3 [*Location of foreign firms*]. Foreign capital owners decide whether to invest in country A or B given the observed levels of taxation in each country and anticipating the market outcome.

Stage 4 [*Production and consumption*]. Surviving firms make their output choices and consumption takes place. The remaining firms go bankrupt.

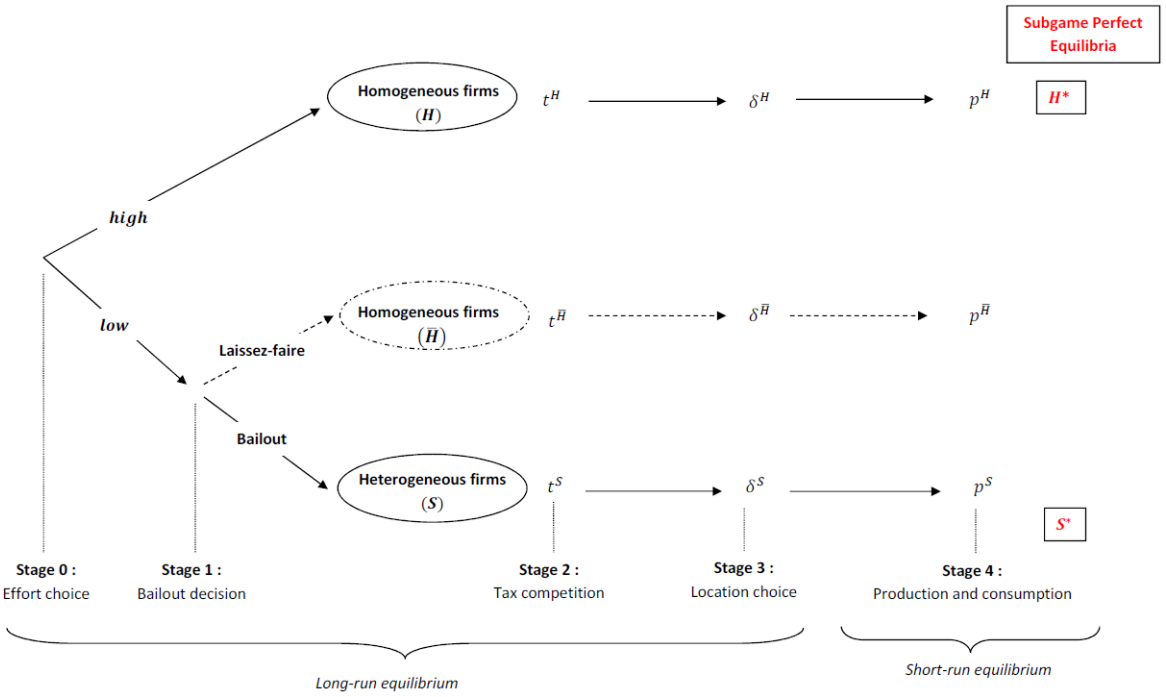

Figure 1: The structure of the game

[11] Politically-connected firms being immobile, there is no reason to consider a non-cooperative behavior regarding the bailout decision.

As we can see from Figure 1, the sequential game consists of 4 or 5 stages depending on the effort choice made by politically-connected managers.[12] Importantly, decisions taken at stages 0 and 1 will lead to three potential decision paths denoted by $\theta \in \left\{H, \bar{H}, S\right\}$, where H and $\bar{H}$ refer to a laissez-faire policy (or hard-budget constraint) and S stands for the bailout scenario (or soft budget constraint). Among these three potential outcomes, only decision paths H and S in solid lines are perfect subgame equilibrium candidates. Assume first that managers perfectly anticipate a bailout. As $E \cdot \ell > E$, they will prefer to exert a low level of effort because they will enjoy higher non-monetary benefits than if they exert a high effort. Consider now that they anticipate a laissez-faire policy. Then, it is always optimal for politically-connected managers to exert a high level of effort as it yields a positive non-monetary benefit E. Otherwise, the firm goes bankrupt, managers lose their job and thus receive no benefit. The decision path $\bar{H}$ in dotted lines is therefore off the equilibrium path. Nevertheless, we need to evaluate the outcome along this decision path in order to determine which one of the decision paths S or H will be the subgame perfect equilibrium of the game (see section 5).

The solution to such a sequential game is given by a subgame perfect Nash equilibrium that we obtain by backward induction beginning with the last stage of the game.[13]

3 Short-run equilibrium (stage 4)

In this section, we analyze how production and consumption choices made in the last stage are influenced by the bailout vs. laissez-faire decision. We call it the short-run equilibrium as it describes the production and consumption outcomes for a given spatial distribution of foreign firms.

3.1 Consumption

Individuals share identical preferences given by a quasi-linear utility function:

$$u_i^\theta = a x_i^\theta - \frac{1}{2}\left(x_i^\theta\right)^2 + z_i^\theta \qquad \forall\ i \in \{A, B\} \text{ and } \theta \in \left\{H, \bar{H}, S\right\} \tag{1}$$

where x_i and z_i stand for the consumption of the manufacturing good and the numeraire, respectively.

[12] As governments are the active players in both stages 1 and 2, assuming the tax policy and the bailout or laissez-faire policies as simultaneous decisions has no incidence on our results.

[13] Because of the symmetry of our model, this equilibrium outcome is the same in each country.

Let T_i^θ stand for tax revenues from all low-cost firms that are redistributed equally and in a lump-sum fashion to the consumers in each country. Their amount will vary depending on the decision of governments to rescue ailing firms or not. The budget constraint for a representative consumer in each country i is then:

$$\begin{aligned} 1+\bar{z}+\frac{T_i^\theta}{L/2}+\frac{n}{2}\frac{\rho_i^{l,\theta}}{L/2} &= z_i^\theta + p_i^\theta x_i^\theta \text{ if } \theta \in \{H\} \\ 1+\bar{z}+\frac{T_i^\theta}{L/2} &= z_i^\theta + p_i^\theta x_i^\theta \text{ if } \theta \in \left\{\bar{H}, S\right\} \end{aligned}$$

where the wage is equal to unity, p_i is the price of the good produced in the M-sector, $\rho_i^{l,\theta}$ is the after-tax return to capital invested in domestic firms that are low-cost and $\bar{z}$ is the individual endowment in the numeraire. Importantly, individuals receive no income from capital when managers of domestic firms exert a low effort. Indeed, in such a case, two scenarios can occur. If governments adopt a laissez-faire policy ($\theta = \bar{H}$), the decision to produce would induce a negative net return to capital. Thus, firms go bankrupt and individuals earn no capital income. If governments instead decide to rescue these firms through a tax exemption ($\theta = S$), we assume that the bailout just allows firms to survive.[14] However, in section 6, we also provide results when this assumption is relaxed and some capital revenues from bailed out firms are redistributed to residents.

Utility maximization leads to the individual inverse demand function with respect to the manufacturing good

$$p_i^\theta = a - x_i^\theta \tag{2}$$

Aggregating the demand over all consumers yields market demand curves for each country i in the oligopolistic industry :

$$X_i^\theta = \frac{L}{2}\left(a - p_i^\theta\right)$$

3.2 Production

We assume manufacturing firms compete in quantities. Before describing their output choices, two comments are in order.

Firstly, it is worth stressing that the number of competitors on the market, and thus the toughness of competition vary with the effort choice of managers and the bailing-out

[14] For the sake of simplicity, we do not explicitly model the profitability condition. However, we ensured that this can be done by attributing reasonable values to the demand parameter a.

decision of governments (see Table 1).

	$\theta = H$	$\theta = \bar{H}$	$\theta = S$
Surviving firms	k low cost firms	$k-n$ low cost firms	$k-n$ low cost firms n high cost firms
Dying firms	0	n high cost firms	0

Table 1: Number and type of firms

The first path occurs when politically-connected managers decide to exert a high effort given their anticipation of a laissez-faire policy ($\theta = H$). As a result, there will be oligopolistic competition among k low-cost firms, among which n domestic firms and $k-n$ foreign firms. Along the second path, politically-connected managers exert a low effort while the government adopts a laissez-faire policy ($\theta = \bar{H}$). In this case, the n domestic firms exit the market and competition is relaxed. The last path describes the bailout policy ($\theta = S$), and gives rise to oligopolistic competition among k heterogenous firms: n domestic high-cost firms, and $k-n$ foreign low-cost firms. Therefore, unlike Alexeev and Jang (2010), our model accounts for the effects of a bailout policy on the market outcome as each configuration described above will lead to specific prices and quantities.

Secondly, the level of trade liberalization shapes output decisions. Indeed, recall that the cost incurred by a firm for exporting each unit of the manufacturing good is equal to τ units of the numeraire.[15] Because of these trade costs, firms are able to segment their markets by choosing the quantities to sell on the domestic and the foreign market independently.

We are now equipped to describe the product market outcome. Let $x_{ii}^{c,\theta}$ and $x_{ij}^{c,\theta}$ denote the output choices made by a firm located in country i. They depend on the marginal cost c – ($c \in \{l, h\}$ for low and high levels) – as well as the number of surviving firms through $\theta \in \left\{H, \bar{H}, S\right\}$. Before-tax profits made by low-cost and high-cost surviving firms are described by equations 3 and 4 respectively:

$$\pi_i^{l,\theta} = p_i^\theta x_{ii}^{l,\theta} + \left(p_j^\theta - \tau\right) x_{ij}^{l,\theta} - 1 - r_i^{l,\theta} \text{ with } \theta \in \left\{H, \bar{H}, S\right\} \quad (3)$$

$$\pi_i^{h,S} = \left(p_i^S - m\right) x_{ii}^{h,S} + \left(p_j^S - m - \tau\right) x_{ij}^{h,S} - 1 - r_i^{h,S} \quad (4)$$

where the wage of the manager is equal to unity and $r_i^{c,\theta}$ is the gross return to capital. The value of $r_i^{l,\theta}$ will be endogenously determined in the long run. By contrast, $r_i^{h,S}$ is

[15] This captures all frictions making bilateral trade costly including transport costs or administrative barriers to the free mobility of goods between countries.

negative or equal to zero implying that, at best, the gross operational profits just allow to cover the labor cost in the long run. Thus, in the absence of tax exemption, investing in a high cost firm would induce a negative return to capital.[16]

Maximizing (3) and (4) with respect to quantities, we get the following output levels for a low-cost firm:

$$x_{ii}^{l,\theta} = \frac{L}{2} p_i^{\theta} \text{ and } x_{ij}^{l,\theta} = \frac{L}{2}\left(p_j^{\theta} - \tau\right) \text{ with } \theta \in \left\{H, \bar{H}, S\right\} \tag{5}$$

and for a surviving high-cost firm:

$$x_{ii}^{h,S} = \frac{L}{2}\left(p_i^{S} - m\right) \text{ and } x_{ij}^{h,S} = \frac{L}{2}\left(p_j^{S} - m - \tau\right) \tag{6}$$

Equilibrium prices are obtained by inserting the equilibrium output choices (5) and (6) in the market clearing conditions. Let δ_i^{θ} denote the share of foreign firms located in country i under θ, then equilibrium prices are as follows:

$$p_i^{\bar{H}} \equiv \frac{a + \tau\delta_j^{\bar{H}}\left(k - n\right)}{k + 1 - n} \tag{7}$$

$$p_i^{H} \equiv \frac{a + \tau\left[\frac{n}{2} + \delta_j^{H}\left(k - n\right)\right]}{k + 1} \tag{8}$$

$$p_i^{S} \equiv \frac{a + mn + \tau\left[\frac{n}{2} + \delta_j^{S}\left(k - n\right)\right]}{k + 1} \tag{9}$$

These expressions capture the distorsive effect of a bailout policy on the market prices. Firstly, observe that the degree of toughness of competition is captured by the denominator of each expression. Secondly, $p_i^S > p_i^H$ at the symmetric location equilibrium ($\delta_j = 1/2$). Indeed, the average marginal cost is higher under bailout policy because high-cost firms survive. Moreover, $p_i^{\bar{H}} > p_i^H$ at $\delta_j = 1/2$, because the number of competitors is lower when governments let high-cost firms go brankrupt. Finally, as the number of surviving firms resulting from $\bar{H}$ differs from the one arising from S and H, the price responsiveness to the spatial distribution of foreign firms varies accordingly. Specifically, we verify that $dp_i^{\bar{H}}/d\delta_j > dp_i^H/d\delta_j = dp_i^S/d\delta_j$.

We now determine the trade feasibility conditions ensuring that exporting is always profitable for firms along the two equilibrium paths $\theta \in \{H, S\}$. We obtain the following condition for the low-cost firms located in i:

$$x_{ij}^{l,H} > 0 \qquad \forall\ \tau < \tau^H = 2\frac{a}{k+2}$$

[16] In section 6, we discuss the robustness of our results when this hypothesis is relaxed.

and the same condition applies for firms located in country j.[17] The trade feasibility condition ensuring that high-cost firms export is given by:

$$x_{ij}^{h,S} > 0 \qquad \forall\ \tau < \tau^S = 2\frac{a - m\,(k - n + 1)}{k + 2}$$

with $\tau^S > 0$ for all $a > a_{\min} \equiv m\,(k - n + 1)$.[18]

Clearly, these two threshold values can be ranked in the following manner:

$$\tau^S < \tau^H$$

Thus, the level of trade costs affects the distribution of surviving firms on the export market as stated by Lemma 1.

Lemma 1 *Let us define trade regime 1 by* $\tau \in \left(\tau^S, \tau^H\right)$ *and trade regime 2 by* $\tau \in \left(0, \tau^S\right)$. *Then:*

- *Under trade regime 1, low-cost firms are exporters while high-cost firms only serve their domestic market;*
- *Under trade regime 2, all firms serve both markets.*

Starting from the highest possible level of prohibitive trade cost (that is, τ^H), trade liberalization will first allow low-cost firms to export and it is only once trade costs reach a lower threshold value (that is, τ^S) that high-cost firms rescued by the government will also begin to export.

4 Tax Policy and Location under Trade Regime 2: Laissez-faire vs. Bailout

In the following subsections, we consider trade regime 2 as a benchmark case to solve both the location and the tax competition equilibria. We compare the impact of a laissez-faire policy *versus* that of a bailout policy on the location of foreign firms (section 4.1) and on the tax competition outcome (section 4.2). In section 5, we study the effect of trade liberalization on the bailout decision and the effort chosen by the politically connected managers (stages 1 and 0) for *both* trade regimes.

[17] The model being symmetric, all trade feasibility conditions are evaluated at $\delta_i^\theta = \delta_j^\theta = 1/2$ and apply also to firms located in country j.

[18] Hereafter, this condition is considered as fulfilled.

4.1 Location equilibrium (stage 3)

As in Haufler and Wooton (2010), the stock of foreign capital is fixed and equal to the number of foreign firms $(k-n)$. The equilibrium rental rate to capital absorbs all the positive after-tax profits. As governments non-cooperatively impose a lump-sum tax t_i^θ on low-cost firms set up within their respective jurisdictions, the after-tax return to capital invested in low-cost firms in country i $(\rho_i^{l,\theta})$ is given by:

$$\rho_i^{l,\theta} = r_i^{l,\theta} - t_i^\theta \tag{10}$$

with

$$r_i^{l,\theta} = p_i^\theta x_{ii}^{l,\theta} + \left(p_j^\theta - \tau\right) x_{ij}^{l,\theta} - 1$$

Owners of foreign capital decide to invest in the most profitable country. Therefore, the location of foreign firms is governed by the spatial difference in net returns to capital $\Delta^{l,\theta} = \rho_A^{l,\theta} - \rho_B^{l,\theta}$. After inserting equilibrium prices and quantities in (10), we obtain:

$$\Delta^{l,\theta} = \begin{cases} t_B - t_A - L\tau^2 \dfrac{\left(2\delta_A^\theta - 1\right)(k-n)}{k+1} \text{ for } \theta \in \{H, S\} \\ t_B - t_A - L\tau^2 \dfrac{\left(2\delta_A^\theta - 1\right)(k-n)}{k-n+1} \text{ for } \theta = \bar{H} \end{cases}$$

The location equilibrium for each θ can be defined as the share of foreign firms located in country A (δ_A^θ) such that $\Delta^\theta = 0$, that is:

$$\begin{aligned} \delta_A^{\bar{H}} &= \frac{1}{2} - \frac{1}{2}\frac{k-n+1}{L\tau^2(k-n)}\left(t_A - t_B\right) \\ \delta_A^H = \delta_A^S &= \frac{1}{2} - \frac{1}{2}\frac{k+1}{L\tau^2(k-n)}\left(t_A - t_B\right) \end{aligned} \tag{11}$$

The above location equilibria are the result of two forces.

The first one is standard and depicts a pro-competitive effect. When a country hosts new firms, incumbent firms face more competitors in their domestic market and fewer in the other one. Thus, the domestic price falls while it rises in the other market (see equations 7, 8 and 9). Because domestic sales generate more revenues in the presence of trade costs, this effect acts as a dispersion force $(d\Delta^{l,\theta}/d\delta_A^\theta < 0)$.[19]

The second force results from the impact of the tax wedge on the location choice.[20] A unilateral rise in corporate taxation in country i leads to an outflow of firms $(d\delta_i^\theta/dt_i^\theta < 0)$.

[19] Interestingly, this effect is proportional to the number of surviving firms (captured by the terms $k-n+1$ and $k+1$). This number being the same under $\theta \in (H, S)$, the location equilibrium is identical.

[20] Despite their lump-sum form, taxes distort the investment choice through the spatial distribution of foreign firms.

Moreover, as competition is fiercer when $\theta = S$, firms are more responsive to positive tax variations and the tax base erosion effect is stronger. Thus, our model displays a relationship between the bailing out decision and the ability to collect tax revenues. We also verify that the tax base elasticity (defined as $\varepsilon_i^\theta = -\partial\delta_i^\theta/\partial t_i^\theta \cdot t_i^\theta/\delta_i^\theta$) increases when trade costs fall because prices become less and less responsive to the spatial distribution of firms. In other terms, gradual trade integration weakens the pro-competitive effect, increasing the weight of taxes in the capital location choice.

4.2 Tax competition (stage 2)

Governments choose their tax policy non-cooperatively and independently. We assume that their objective is to maximize:

$$F_i^\theta = \mathbf{R}_i^\theta + \varphi \mathbf{E}_i^\theta$$

where $\mathbf{R}_i^\theta$ denotes the overall net income of residents, $\mathbf{E}_i^\theta$ stands for total non-monetary benefits received by politically-connected managers and $\varphi > 0$ is a parameter aimed at capturing how much the government specifically cares about them. Interestingly, as $\mathbf{E}_i^\theta$ incorporates the labor force employed by domestic firms in the manufacturing sector, φ can also be viewed as the extent to which governments care about those jobs.

Each component of this objective function varies across the decision paths θ. The overall income of residents is given by:

$$\begin{aligned}
\mathbf{R}_i^H &= \frac{L}{2}(1+\bar{z}) + t_i^H\left[(k-n)\,\delta_i^H + \frac{n}{2}\right] + \frac{n}{2}\rho_i^{l,H} \\
\mathbf{R}_i^\theta &= \frac{L}{2}(1+\bar{z}) + t_i^\theta\left[(k-n)\,\delta_i^\theta\right] \text{ for } \theta \in \{\bar{H}, S\}.
\end{aligned}$$

The first term stands for the labor income and the initial endowment in numeraire. The second term denotes tax revenues redistributed in a lump-sum fashion to residents, and the third term in $\mathbf{R}_i^H$ stands for the net return to capital invested in low-cost domestic firms (see eq. 3).

The number of production workers employed by domestic high-cost firms is $m\left(x_{ii}^{h,S} + x_{ij}^{h,S}\right)$. Total employment in each domestic firm – including the manager – is therefore equal to $\ell = 1 + m\left(x_{ii}^{h,S} + x_{ij}^{h,S}\right)$ when $\theta = S$ whereas it is equal to 1 when $\theta = H$.[21] Therefore, the total external beneits accruing to politically connected managers is defined as:

$$\begin{aligned}
\mathbf{E}_i^S &= \frac{n}{2}\left[1 + m\left(x_{ii}^{h,S} + x_{ij}^{h,S}\right)\right] E \\
\mathbf{E}_i^H &= \frac{n}{2} E
\end{aligned}$$

[21] Recall that there are no external benefits when $\theta \in \tilde{H}$ since domestic high-cost firms go bankrupt.

In the following, we present the tax outcome under laissez-faire (section 4.2.1) and bailout (section 4.2.2) policies.

4.2.1 Tax equilibrium under laissez-faire policy

In this subsection, we describe how the tax outcome depends on the effort choice of politically-connected managers.

Politically-connected managers exert a high effort

Let us first assume that politically-connected managers exert a high effort in stage 0. All firms being efficient and profitable, no public intervention is needed in stage 1 which is equivalent to a laissez-faire policy ($\theta = H$). Hence, the first-order condition for each government at stage 2 is:

$$\frac{d\boldsymbol{F}_i^H}{dt_i^H} = \underbrace{\delta_i^H (k-n)\left(1-\varepsilon_i^H\right)}_{+/-} + \frac{n}{2} + \frac{n}{2}\underbrace{\frac{\partial \rho_i^{l,H}}{\partial t_i^H}}_{-} = 0 \tag{12}$$

The first term captures the taxation effect on tax revenues collected from foreign firms. For a given tax base, a marginal increase in t_i^H raises tax revenues redistributed to residents. Nevertheless, this effect can be counterbalanced by a tax base effect capturing the capital outflow that results from a marginal increase in t_i^H. The total effect will be positive (resp. negative) if the tax base elasticity is lower (resp. higher) than 1. The second term gives the tax revenues collected from domestic firms. The last term captures the effect on the net return to capital invested in domestic firms. Evaluated at the location equilibrium, this net return to capital amounts to:

$$\rho_i^{l,H} = r^{l,H} - \frac{1}{2}\left(t_i^H + t_j^H\right) + \frac{1}{4}\frac{\left(t_i^H - t_j^H\right)^2}{L\tau^2} \tag{13}$$

with

$$r^{l,H} = \frac{1}{4}L\frac{4a(a-\tau) + \tau^2\left(k(k+2)+2\right)}{(k+1)^2} - 1.$$

Observe that both a higher average tax rate and a lower tax wedge between countries reduce the after-tax return on capital, as in Ottaviano and Van Ypersele (2005). Derivating (13) with respect to t_i^H, we verify that a unilateral rise in business taxation in country i always reduces the net return to capital ($\partial \rho_i^{l,H}/\partial t_i^H < 0$).

Solving the first order condition for each government and crossing the reaction functions, we obtain:

$$t_i^H \equiv t^H = L\tau^2\frac{2k-n}{2(k+1)} \;\forall\; i \in \{A, B\} \tag{14}$$

Politically-connected managers exert a low effort

Let us now consider the case where politically-connected managers exert a low effort in stage 0 and governments choose the laissez-faire policy in stage 1. Given that all domestic firms exit the market, there is no income from domestic capital and the government's objective function sums up to maximization of tax revenues from foreign firms. Therefore, at stage 2, the government's first-order condition is:

$$\frac{d\boldsymbol{F}_i^{\bar{H}}}{dt_i^{\bar{H}}} = \underbrace{\delta_i^{\bar{H}}\left(k-n\right)\left(1-\varepsilon_i^{\bar{H}}\right)}_{+/-} = 0$$

Interestingly, the impact of a marginal rise in business taxation on tax revenues has a different magnitude than when $\theta = H$. As argued above, the capital outflow induced by a marginal rise in taxation (and thus, the tax base elasticity) is now lower because competition is relaxed by the liquidation of high-cost firms.

After solving the first-order conditions, we obtain the following tax equilibrium:

$$t_i^{\bar{H}} \equiv t^{\bar{H}} = L\tau^2\frac{k-n}{k-n+1} \qquad \forall\ i \in \{A,B\} \tag{15}$$

4.2.2 Tax equilibrium under bailing-out decision

We now turn to the tax outcome that occurs if governments decide to bail out firms in financial trouble at the previous stage of the game ($\theta = S$). The first-order condition of each government at stage 2 is given by:

$$\frac{d\boldsymbol{F}_i^{S}}{dt_i^{S}} = \underbrace{\delta_i^{S}\left(k-n\right)\left(1-\varepsilon_i^{S}\right)}_{+/-} + \varphi\underbrace{\frac{n}{2}\frac{d\ell}{dt_i^{S}}E}_{0} = 0$$

The first term of the first-order condition is qualitatively and quantitatively similar to the one arising when $\theta = H$, because location equilibria are identical. The second term describes a new relationship between tax policy and the total non-monetary benefits arising from the government's bailout. As shown below, this incentive exists if and only if trade costs are higher than the threshold τ^S (trade regime 1). In this case, the output and volume of jobs of a rescued firm depends on its domestic sales only ($x_{ii}^{h,S}$). By raising the business tax, the government induces a capital outflow that relaxes competition on the domestic market and allows the number of jobs per bailed-out firm to grow. In sum, the tax policy can be used as strategic instrument to sustain the number of manufacturing jobs in the economy. However, this relationship disappears when $\tau < \tau^S$, which corresponds

to trade regime 2 under scrutiny here, because the sum of domestic sales and foreign ones $(x_{ii}^{h,S} + x_{ij}^{h,S})$ does not depend on the spatial distribution of foreign firms.

Solving the first order condition for each government and crossing the reaction functions, we obtain:

$$t_i^S = L\tau^2 \frac{k-n}{k+1} \qquad \forall\ i \in \{A, B\} \text{ and } \tau < \tau^S \tag{16}$$

4.2.3 Tax comparison

Let us now comment on the properties of the tax outcome. First, observe that equilibrium taxes are always increasing and convex in the level of trade costs : $dt^\theta/d\tau > 0$ for all $\tau > 0$ and $d^2t^\theta/d\tau^2 > 0$ for all θ. Low trade costs weaken the pro-competitive effect and make footloose firms more responsive to corporate tax differences. This encourages governments to engage in a race to the bottom in taxation. This is a standard result in the tax competition literature assuming imperfectly integrated and imperfectly competitive economies (see, among others, Ottaviano and Van Ypersele 2005, Haufler and Wooton, 2010, Gaigné and Wooton, 2011).

More importantly, the level of taxation at the equilibrium is also shaped by the effort made by politically-connected managers in stage 0 and the bailing out decision in stage 1. From (14), (15) and (16), we can rank the tax equilibria in the following way under trade regime 2:

$$t^{\bar{H}} > t^H > t^S > 0 \qquad \forall\ \tau < \tau^S \tag{17}$$

Two mechanisms contribute to explain this ranking.

Recall that a given marginal increase in business taxation in a country leads to a lower capital outflow when $\theta = \bar{H}$ than when $\theta = H$ because competition is weakened by the exit of high-cost firms in the former case. Consequently, governments are more able to raise taxation and then to collect higher tax revenues. This effect contributes to explain why $t^{\bar{H}} > t^H$.

The sign of the difference between t^H and t^S is *a priori* not obvious. On the one hand, governments have an additional incentive to cut taxes when $\theta = H$ in order to raise the net return to capital invested in domestic firms (see eq. 12). On the other hand, domestic firms being an immobile tax base when $\theta = H$, governments are more incited to raise taxes. The fact that $t^H > t^S$ suggests that the latter effect dominates. Given the symmetry of the model, this result implies that for all $\tau < \tau^S$, governments collect more tax revenues under a laissez-faire policy than when they decide to bail out inefficient firms. Thus, rescuing ailing firms is costly in terms of public resources and, as pointed by

Qian and Roland (1998), capital mobility should discipline governments. We show in the next section that this result does not always hold for higher levels of trade cost.

We are now equipped to analyze the bail-out decision of governments (stage 1). This decision being perfectly anticipated by politically-connected managers, we can determine their optimal effort (stage 0) and select the subgame Nash perfect equilibrium accordingly.

5 Bailout decision and trade costs

We first present the government's trade-off between the bailout and the laissez-faire policies (subsection 5.1). This section being dedicated to the effect of trade integration, we go beyond the benchmark case we considered so far (that is, trade regime 2) and describe how a *shift from trade regime 1 to trade regime 2* impacts the equilibrium policy decision. Said differently, we analyze whether or not governments are more prone to adopt a bailout policy when trade integration is so deep that high-cost firms become exporters. The last subsection (subsection 5.2) completes the analysis by discussing the impact of a *gradual decline in trade costs within each trade regime.*

5.1 The government's problem

The choice between a laissez-faire policy and a bailout makes sense if and only if politically-connected managers exert a low effort. In such circumstances, the government selects the policy option maximizing the overall gain of residents including non-monetary benefits accruing to managers, by anticipating all the effects of its choice on the rest of the game (stages 2, 3 and 4). If this overall gain of residents $\digamma_i^\theta$ is higher when $\theta = S$ than when $\theta = \bar{H}$, a bailout is preferred to the laissez-faire policy and politically-connected managers exert a low effort in order to enjoy a higher level of benefits (as $E.\ell > E$). Therefore, the decision path S is the subgame perfect equilibrium of the game. Otherwise, the government adopts a laissez-faire policy and politically-connected managers exert a high effort. In that case, the decision path H is the subgame perfect equilibrium.

Solving the government's problem therefore requires to evaluate the difference in the overall gain of residents between a bailout policy and a laissez-faire policy. If $\tilde{\digamma}_i^S$ denotes the overall gain of residents that results from a bailout policy when $\tau \in (\tau^S, \tau^H)$, this difference amounts to:

$$\begin{array}{l} \tilde{\digamma}_i^S - \digamma_i^{\bar{H}} = \frac{1}{2}(k-n)\left(\tilde{t}_i^S - t_i^{\bar{H}}\right) + \varphi\frac{n}{2}\tilde{\ell}E \text{ under trade regime 1} \\ \digamma_i^S - \digamma_i^{\bar{H}} = \frac{1}{2}(k-n)\left(t_i^S - t_i^{\bar{H}}\right) + \varphi\frac{n}{2}\ell E \text{ under trade regime 2} \end{array} \quad (18)$$

with $\tilde{t}_i^S$ the equilibrium corporate tax and $\tilde{\ell}$ the equilibrium labor demand of a high-cost firm that occur under a bailout policy for all $\tau \in (\tau^S, \tau^H)$ (see next subsection).

Note that the expression of $F_i^{\bar{H}}$ is similar – up to the level of trade cost – across the two trade regimes as high cost firms exit the market in the two cases. Therefore, the trade regime influences the difference in the overall gain of residents only through its value under a bailout decision ($\tilde{F}_i^S \neq F_i^S$). Moreover, whatever the trade regime, the difference in the overall gain of residents is decomposed in two terms.

The first term is the difference in tax revenues resulting from the two policy options. It stands for the relative cost of a bailout policy compared to a laissez-faire policy. In subsection 4.2.3, we showed that $t_i^S < t_i^{\bar{H}}$ under trade regime 2. We extend the analysis to regime 1 in next subsection and show that the sign of $\tilde{t}_i^S - t_i^{\bar{H}}$ can be either positive or negative.

The second term captures the total political benefits. These benefits grow with φE and with the amount of jobs that would be saved thanks to the bailout ($n/2\tilde{\ell}$). This term is positive whatever the trade regime and captures the too big to fail motive. Indeed, governments are more likely to rescue domestic manufacturing firms when the number of jobs involved is large because the electoral feedback is certainly more important and/or the social cost of a bankruptcy is too large.

Importantly, trade integration influences the government's trade-off (18) in two respects. First, a discrete shift from trade regime 1 to trade regime 2 might change the policy option (bailout vs. laissez-faire) because domestic firms become exporters. We explore this point in the next two subsections. Secondly, a gradual decline in trade costs within each trade regime affects the magnitude of the relative cost of each policy decision as well as the amount of total external benefits resulting from a bailout. This impact of gradual trade liberalization within each trade regime is analyzed in section 5.2.

5.1.1 Bailout decision under trade regime 1

Let us assume that trade costs lie within the range (τ^S, τ^H), so that low-cost firms participate to bilateral trade whereas high-cost firms serve their domestic market only. In order to determine whether $\theta = S$ or $\theta = \bar{H}$ will be the equilibrium decision path, we first need to quickly present the outcome at stages 4, 3 and 2 of the game (hereafter $\tilde{p}_i^S$, $\tilde{\delta}^S$, $\tilde{t}^S$) in the presence of a bailout. In the short-run, equilibrium prices are given by:

$$\tilde{p}_i^S = \frac{a + m\frac{n}{2} + \tau\tilde{\delta}_j^S(k-n)}{k+1-\frac{n}{2}} \text{ for all } \tau \in (\tau^S, \tau^H) \tag{19}$$

In the long-run, the share of mobile firms set up in country A for given tax policies is:

$$\tilde{\delta}_A^S = \frac{1}{2} - \frac{1}{2}(t_A - t_B)\frac{k - \frac{n}{2} + 1}{L\tau^2(k-n)} \text{ for all } \tau \in (\tau^S, \tau^H) \tag{20}$$

Solving the tax competition game at stage 1, we obtain the following tax equilibrium level:

$$\tilde{t}_i^S = 2L\tau^2\frac{k-n}{2k-n+2} + \varphi Lmn\tau\frac{1}{2}\frac{E}{2k-n+2} \;\forall\; i \in \{A, B\} \text{ for all } \tau \in (\tau^S, \tau^H)$$

It is worth stressing that $\tilde{t}_i^S > t_i^S$. There are two reasons for that. Firstly, bailed-out firms being not competitive enough to export when $\tau \in (\tau^S, \tau^H)$, competition is relaxed for foreign firms which are less responsive to a given rise of taxation ($\left|d\delta_i^S/dt_i^S\right| > \left|d\tilde{\delta}_i^S/dt_i^S\right|$). Secondly, the business tax in each country now depends positively on E. To understand this result, recall that the total non-monetary benefits accruing to politically-connected managers are proportional to the total output and jobs of the firms they manage. When trade regime 1 prevails, total employment in each rescued firm boils down to $(1 + m\tilde{x}_{ii}^{h,S})$. The domestic output level $\tilde{x}_{ii}^{h,S}$ is obviously increasing in the domestic price level and the latter goes down with the share of foreign firms located in the country (see eq. 19). Therefore, the government uses the tax policy strategically to protect its domestic market, expand production from domestic firms and increase total non-monetary benefits.

As a consequence, business taxes under trade regime 1 may become higher in the presence of a bailout than under a laissez-faire policy. As the following expression shows, this is more likely to happen when E and/or φ reach high values:

$$\tilde{t}^S \gtrless t^{\bar{H}} \text{ when } E \gtrless 2\tau(k-n)/\varphi a_{\min} \equiv \tilde{E} \text{ for all } \tau \in (\tau^S, \tau^H) \tag{21}$$

Recalling that $t^{\bar{H}} > t^S$ when $\tau \in (0, \tau^S)$, the following proposition summarizes our results.

Proposition 1 *Consider the tax competition subgame. A laissez-faire policy always leads to a higher corporate tax than a bailout policy when bailed-out firms are competitive enough to export (trade regime 2). The same result holds under trade regime 1 except when the non-monetary benefit per job saved is high enough ($E > \tilde{E}$).*

We can now address the government's behavior at stage 1. Given inequality (21), the first component of $\tilde{\digamma}_i^S - \digamma_i^{\bar{H}}$ (see eq. 18) can be viewed as the opportunity cost of the bailout when $E < \tilde{E}$, and the opportunity cost of the laissez-faire policy when $E > \tilde{E}$. As the second term is always positive, there is no trade trade-off for governments when $E > \tilde{E}$: they always choose the bailout policy. This decision being perfectly anticipated

by politically-connected managers, they choose a low effort. However, when $E < \tilde{E}$, governments are faced with a trade-off between the loss in tax revenues and the political benefits resulting from a bailout. Specifically:

$$\tilde{F}_i^S \gtrless F_i^{\bar{H}} \text{ if and only if } E \gtrless \hat{E}$$

with

$$\hat{E} = \frac{L\tau^2}{\varphi(k-n+1)} \frac{(k-n)^2}{2k-n+2+Lm((a-a_{\min})+\tau(k-n))} \in [0; \tilde{E}]$$

The above inequality stipulates that political benefits from a bailout more than compensate for the loss in tax revenues for all $E \in [\hat{E}, \tilde{E}]$. In this case, politically-connected managers anticipate a bailout in stage 1 and adopt a low effort. In contrast, governments will adopt a laissez-faire policy and politically-connected managers will choose a high effort when $E < \hat{E}$. To understand this result, one has to analyze the impact of E on the relative cost and the political benefits of a rescue plan. In addition to its direct and negative effect on the political benefits arising from the bailout, a decline in E increases its relative cost as the tax gap (21) is proportional to E.[22] Both effects go in the same direction and the bailout equilibrium is less likely to occur when the benefit per job saved is low. Last, as $\hat{E}$ decreases with m, a high labor intensity in the manufacturing sector favors a bailout decision.

5.1.2 Bailout decision under trade regime 2

Assume now that trade costs fall below the threshold τ^S so that high-cost firms start exporting as well. By replacing $t_i^{\bar{H}}$, t_i^S, $x_{ii}^{h,S}$ and $x_{ij}^{h,S}$ by their equilibrium values into (18), we get:

$$F_i^S \gtrless F_i^{\bar{H}} \text{ when } E \gtrless \frac{2L\tau^2}{\varphi(k-n+1)} \frac{(k-n)^2}{2(k+1)+Lm(2(a-a_{\min})-\tau)} = \bar{E} \qquad (22)$$

Above a threshold $\bar{E}$, governments decide to bail-out domestic firms and politically-connected managers choose a low effort. Otherwise, the decision path H describes the subgame perfect equilibrium. The intuition for this result is the following. A rise in the level of E increases total political benefits, whereas it does not have any impact on the

[22] Given the symmetry of the model, equilibrium taxes are equalized across countries and the location equilibrium boils down to $\delta^S = 1/2$. As a consequence, the individual output of a high-cost firm $\tilde{x}_{ii}^{h,S}$ is not influenced by the amount of external benefit per job saved. The latter only influences political benefits at the country level, as they are proportionnal to the number of firms run by politically-connected managers.

relative cost of a bailout as neither $t^{\bar{H}}$ nor t^S depend on E. Thus, governments are more prone to bail out firms when E rises because it increases total political benefits from the bailout without any impact on its relative cost.

Using the expressions of $\bar{E}$ and $\hat{E}$, it is now possible to analyze to what extent the equilibrium outcome depends on the level of trade costs. We easily check that $\hat{E} < \bar{E}$. (see Appendix 2). Therefore, the policy choice of governments depends on non-monetary benefits of managers: i) if $E < \hat{E}$, governments choose the laissez-faire policy and politically-connected managers exert a high effort whatever the trade regime; ii) if $E \in (\hat{E}, \bar{E})$, governments bail out and politically-connected managers exert a low effort under trade regime 1, while the opposite result applies under trade regime 2; and iii) if $E > \bar{E}$, governments bail out high-cost firms and politically connected managers exert a low effort whatever the trade regime.

Thus, there exists a range of E values ($E \in (\hat{E}, \bar{E})$) making the government decision dependent on the trade regime. The intuition for this result comes from the difference in the relative cost of a bailout as we move from one trade regime to the other. Indeed, $t^{\bar{H}}$ remains unchanged across trade regimes whereas $\tilde{t}^S > t^S$ as the tax policy ceases to be a strategic instrument to preserve manufacturing jobs when $\tau < \tau^s$. Therefore, the relative cost of a bailout is lower when high-cost firms only serve the domestic market (trade regime 1). That is the reason why the laissez-faire policy may become the optimal policy following a bilateral trade agreement that allows high-cost firms to start exporting.

5.2 The effects of a gradual trade liberalization

We now analyze, within each trade regime, the influence of a gradual and small decline in trade costs on governments' decision.

5.2.1 Trade regime 1

We first investigate the effect of a gradual trade liberalization over the interval (τ^S, τ^H). Recall that when $E > \tilde{E}$, $\tilde{F}_i^S > F_i^{\bar{H}}$ holds for all $\tau \in (\tau^S, \tau^{\bar{H}})$. In what follows, we restrict our analysis to the most interesting case where $E < \tilde{E}$, in which a bailout may or may not be optimal (see proposition 1) because it engenders tax revenue losses ($\tilde{t}^S < t^{\bar{H}}$). Under these circumstances, a gradual fall of trade costs gives rise to two opposite forces.

On the one hand, it is straightforward to check that $d(t^{\bar{H}} - \tilde{t}^S)/d\tau > 0$ (see eq. (21)). Thus, the decline of trade costs over the interval $(\tau^S, \tau^{\bar{H}})$ leads to a reduced tax wedge between $t^{\bar{H}}$ and $\tilde{t}^S$, which decreases the relative cost of a bailout in terms of tax

revenues foregone. On the other hand, a fall in trade costs under trade regime 1 shrinks the output and employment of high-cost firms, which face fiercer competition on their domestic market (see eq. 23):

$$\frac{n}{2}\tilde{\ell} = 2 + L\frac{2\left(a - a_{\min}\right) + \tau\left(k - n\right)}{2k - n + 2} \;\forall\; \tau \in \left(\tau^S, \tau^{\bar{H}}\right) \tag{23}$$

As political benefits are proportional to $n\tilde{\ell}/2$, they also shrink when trade costs fall.

In order to figure out which one of these effects predominate, we differentiate $\hat{E}$ with respect to τ and obtain:

$$\frac{d\hat{E}}{d\tau} = L\tau\left(k - n\right)^2 \frac{2\left(2k - n + 2\right) + Lm\left(2\left(a - a_{\min}\right) + \tau\left(k - n\right)\right)}{\varphi\left(k - n + 1\right)\left[2k - n + 2 + Lm\left(a - a_{\min} + \tau\left(k - n\right)\right)\right]^2}$$

which is positive and convex in τ. Trade liberalization erodes the political benefits of a bailout by shrinking the number of jobs to save, but the magnitude of this effect is not large enough to compensate for the decrease in the relative cost of this policy. Therefore, a decline of trade costs over the range (τ^S, τ^H) encourages governments to bail out high-cost firms.

5.2.2 Trade regime 2

When trade regime 2 prevails, the tax differential between a laissez-faire and a bailout policy is given by:

$$t^{\bar{H}} - t^S = Ln\tau^2 \frac{k - n}{\left(k + 1\right)\left(k - n + 1\right)} \qquad \forall\; \tau \in \left(0, \tau^S\right) \tag{24}$$

which is increasing in τ. Thus, a *gradual* decline in trade costs reduces the relative cost of a bailout as it does for trade regime 1.

To evaluate the impact of a gradual decline in τ on the political benefits, we derive the total labor force employed in the manufacturing sector of domestic firms at the subgame perfect equilibrium:

$$\frac{n}{2}\ell = 2 + L\frac{2\left(a - a_{\min}\right) - \tau}{k + 1} \;\forall\; \tau \in \left(0, \tau^S\right) \tag{25}$$

Clearly, gradual trade liberalization now exerts a positive influence on the total labor force by expanding output of high-cost firms. The intuition is the following. Bilateral trade being facilitated, quantities sold by each firm decline on the domestic market while they increase on the export market. The latter effect dominates, so that total output is increasing as trade costs fall within the range $(0, \tau^S)$. Recall that the relationship goes in

the opposite direction under trade regime 1. Therefore, the impact of trade liberalization on the total political benefits arising from a bailout tightly depends on whether high-cost firms export or not.

To summarize, the decline of trade costs has an unambiguous effect on the incentive for governments to bail out over the range $(0; \tau^S)$: it decreases in the relative cost of the bailout policy and increases in its total political benefits. Therefore, it encourages governments to bail out high-cost firms and $d\bar{E}/d\tau > 0$. As we also checked that $d\hat{E}/d\tau > 0$, our results can be summarized by the following proposition.

Proposition 2 *Gradual trade liberalization within each trade regime always encourages governments to adopt a bailout policy.*

To provide a complete picture of the relationship between the level of trade costs and the incentives to bail out, Figure 2 simulates $\bar{E}$ (trade regime 2) and $\hat{E}$ (trade regime 1) with respect to τ for three different values of φ (which captures the degree to which governments care about manufacturing jobs and the non-monetary benefits of politically-connected managers).[23] Unsurprisingly, the higher φ, the lower the threshold values $\bar{E}$ and $\hat{E}$ above which governments decide to bail-out domestic firms. More importantly, we can visualize in Figure 2 the discontinuity in the incentive to bail-out that arises when the economy shifts from trade regime 1 to trade regime 2. Starting from high levels of trade costs such that trade regime 1 prevails, $\hat{E}$ decreases when trade costs fall. At τ^S, represented by the vertical dash line, the threshold E shifts upward because the relative cost of a bailout becomes larger. Below τ^S, $\bar{E}$ decreases again with trade liberalization.

[23] The numerical specification assumes: $k = 20$, $a = 25$, $L = 100$, $m = 1$. Additional simulations were done with high and low values of a, L, and $(k - n)$. Results regarding the impact of trade integration on the decision to bailout remain valid.

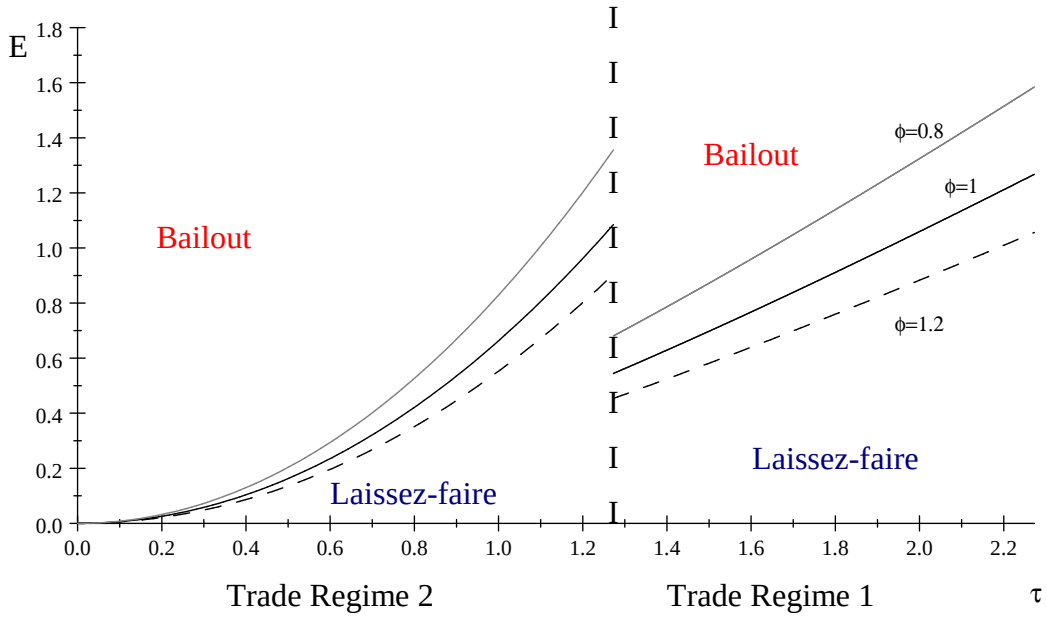

Figure 2: Bailout and Trade Regimes

6 Extensions

The basic framework presented in this paper allows for various extensions which constitute robustness checks of our main results.

So far, we have assumed that governments maximize a weighted sum of total net income of residents and total non-monetary benefits received by politically-connected managers. We could wonder how the previous results are influenced when the governments maximize the weighted sum of national welfare and total non-monetary benefits received by politically-connected managers. To address that question, we solve the model when governments maximize $\mathbf{W}_i^\theta + \varphi \mathbf{E}_i^\theta$, with $\mathbf{W}_i^\theta = \mathbf{S}_i^\theta + \mathbf{R}_i^\theta$ and $\mathbf{S}_i^\theta = \frac{L}{4}\left(a - p_i^\theta\right)^2$ stands for the consumers' surplus in country i. Solving the tax competition game, governments now have an additional incentive to cut capital taxes because prices will fall if more foreign firms are attracted. As a result, taxes are set at a lower level than in our benchmark case. Introducing the consumers' surplus also influences the decision to bailout in the following manner. Prices reach a lower level when governments rescue firms than when they let them die, whatever the trade regime ($p_i^{\bar{H}} > p_i^{\tilde{S}}$ and $p_i^{\bar{H}} > p_i^{S}$). Therefore, they have an additionnal incentive to rescue firms in order to raise the consumers' surplus. Still, the decision to bail-out follows the same rationale, that is, governments decide to rescue firms when E is higher than a threshold value $\hat{E}^{surplus}$ (under trade regime 1) and $\bar{E}^{surplus}$

(under trade regime 2) shaped by the level of trade integration[24]. Simulations reveal that, as in our benchmark case, $\hat{E}^{surplus} < \bar{E}^{surplus}$ trade integration exerts a negative impact of both threshold values within each trade regime. The main implication of introducing the surplus lies in the decrease in both threshold values, so that the bailout decision is even more likely to occur.

We also solved the model by considering that the net return to capital invested in high cost firms keeps being positive after the bailout. In such a case, the tax exemption offered by the government not only allows these firms to survive as it has been assumed so far. It will also raise the net return to capital accruing to domestic capital owners. Under the bailout scenario, governments will therefore set up capital taxes at a higher level than in our benchmark case, whatever the trade regime. By doing so, they induce a capital outflow from foreign firms so that competitition is less fierce and domestic capital owners enjoy a higher net return to capital. This behavior will influence the bailout decision through the tax differential $t_i^S - t_i^{\bar{H}}$ in the following manner. When trade costs are very high ($\tau \in \left(\tau^*, \tau^H\right)$, with $\tau^* \in \left(\tau^S, \tau^H\right)$), $\tilde{t}_i^S \gtrless t_i^{\bar{H}}$ when $E \gtrless \tilde{E}^*$.[25] Thus, as in our benchmark case, governments choose to bail-out firms when $E > \tilde{E}^*$ whereas they are faced with a trade-off between the cost and benefits of a bailout when $E < \tilde{E}^*$. Specifically, they will adopt a bailout decision (resp. a laissez-faire policy) if and only if $E > \hat{E}^*$ (resp. $E < \hat{E}^*$). If trade costs fall within the range $\tau \in \left(\tau^S, \tau^*\right)$, we always verify that $\tilde{t}_i^S > t_i^{\bar{H}}$ so that governments adopt a bailout policy.[26] Finally, for trade values lower than τ^S, we verify that $t_i^S < t_i^{\bar{H}}$ as in our benchmark case. We can thereby show that governments adopt a bailout policy for all $E > \bar{E}^*$ whereas they prefer a laissez-faire policy when $E < \bar{E}^*$.[27]

Furthermore, one might object that the discontinuity in firms' marginal cost is critical for the robustness of our results. We considered that when politically-connected managers exert the level of effort e, the marginal cost is $e^{-1} \in \mathbb{R}^+$ and firms are eligible for a bailout[28]. These politically-connected firms export part of the production if and only if trade costs are lower than $2\left(ae-1\right)/e\left(k+2\right)$. This trade condition becomes more and more restrictive as the level of effort decreases. Therefore, trade regimes now depend not

[24] As in the benchmark case, threshold values are polynomial functions of degree 2 with respect to τ.

[25] $\tilde{E}^* = 2\left[\tau\left(k+1\right)\left(k-n\right) - 2\left(k-n+1\right)\left(a-a_{\min}\right)\right] / \left[\varphi a_{\min}\left(2k-n+2\right)\right]$

[26] Indeed, τ^* is the threshold value of trade costs below (resp. above) which $\tilde{E}^*$ becomes negative (resp. positive).

[27] Expressions of $\hat{E}^*$ and $\bar{E}^*$ are available upon request to the authors.

[28] By contrast, market-oriented managers always exert the maximal effort level so that the marginal cost is equal to 0, as in our benchmark case.

only on the level of trade costs but also – indirectly – on the level of effort[29]. Even though this modeling assumption influences equilibrium prices and quantities in the short-run, our results regarding tax competition (Proposition 1) and the bailout decision (Proposition 2) in the long-run remain valid[30]. Moreover, the threshold levels of political rent above which governments choose to bail out (under each trade regime) become endogenous with respect to the level of effort. When the effort exerted by politically connected managers increases, these threshold values decline so that government are more prone to rescue firms. The intuition for this result is that a higher effort level will improve firm's margin and therefore increase their size. Thus, following a 'too big to fail' argument, government will more easily rescue firms eligible for a bailout when the effort increases even though their profitability is improved.

7 Conclusion

One might expect at first sight that governments are less prone to bail out inefficient firms in well integrated economies, for ideological or institutional reasons. However, we saw a resurgence of corporate bailouts in these countries. Our contribution provides a new explanation why such corporate bailouts occur in developped countries, by analyzing how the fall in trade costs might incite governments to rescue firms rather than let them go bankrupt.

Using a 2-country model of generalized oligopoly with heterogenous firms and trade costs, we show that the government's attitude toward politically-connected firms depends on a trade-off between the relative cost of a bailout in terms of tax revenue losses and its potential political benefits. We assume that these political benefits are proportional to the total labor force in politically-connected firms, so that trade liberalization influences the relative cost of a bailout through tax competition and its potential political benefits

[29] Because of the symmetry of the model, managers of politically connected firms will choose the same level of effort. As in our benchmark framework, a marginal decline in trade cost at the neighbourhood of $2(ae-1)/e(k+2)$ provokes a switch between trade regime 1(only $k-n$ exporting firms) and trade regime 2 (k exporting firms). Said differently, the discontinuity in the relationship between government's bailout decision and the trade cost level (Figure 2) is not due to the fact that we considered two level of marginal cost in our basic framework. This finding results from the fact that the effort (and therefore the marginal cost) is endogenous for politically-connected firms whereas it is exogenous for market-oriented firms.

[30] The robustness of our results is due to the fact that the location equilibrium of market-oriented firms is not influenced.

through the size of surviving firms. As a result, a marginal decline in trade costs that does not change the export status of high cost firms always makes governments more prone to adopt a bailout decision.

However, when the fall in trade costs is large enough to allow high-cost firms to become exporters, governments might move away from a bailout policy to a laissez-faire policy. Thus, whether trade liberalization is bound to reduce or increase corporate bailouts turns out to be an empirical question. To the best of our knowledge, there is no contribution dealing with that question because data are dispersed and difficult to gather in an exhaustive way. More research should be done to identify through which channels economic integration might impact the proportion of rescued firms over the number of firms in financial distress, and whether this relationship differs depending on the export status of firms in difficulties. We leave this investigation for future research.

Appendix

■ Appendix 1: wage and employment levels

We make two specific assumptions regarding the labor market in order to determine wage and employment levels.

Firstly, we consider that the T sector is always active in both countries so that labor mobility across sectors equalizes wages to unity in each country. Thus, we ensure that a single country cannot supply the world demand for the numéraire good, that is :[31]

$$Lz_i^\theta > \frac{L}{2} \tag{A1}$$

with the individual consumption of numéraire

$$\begin{aligned} z_i^\theta &= \bar{z} + 1 + \frac{2}{L}T_i^\theta - p_i^\theta\left(a - p_i^\theta\right) \text{ if } \theta \in \left\{\bar{H}, S\right\} \\ z_i^\theta &= \bar{z} + 1 + \frac{2}{L}T_i^\theta + \frac{n}{L}\rho_i^{l,\theta} - p_i^\theta\left(a - p_i^\theta\right) \text{ if } \theta = H \end{aligned} \tag{26}$$

Secondly, we consider that in each country, that there is no labor shortage so that firms are always able to produce. In other words, we assume that the national labor supply is never lower than national labor demand. At the location equilibrium, this condition

[31] Note that this condition also garantees that the individual consumption in numéraire is positive.

implies:

$$\frac{L}{2} \geqslant \begin{cases} 2 + \dfrac{(k-n)}{2} + \dfrac{L}{2} z_i^H \text{ when } \theta = H \\ 2 + \dfrac{(k-n)}{2} + \dfrac{n}{2}\left(1 + m x_{ii}^{h,S} + m x_{ij}^{h,S}\right) + \dfrac{L}{2} z_i^S \text{ when } \theta = S \\ \dfrac{(k-n)}{2} + \dfrac{L}{2} z_i^{\bar{H}} \text{ when } \theta = \bar{H} \end{cases} \tag{A2}$$

where the expressions on the right hand side stand for total labor demand (for both management and production jobs) under each market structure.

Replacing z_i^θ by their equilibrium values in each of the two inequalities, the conditions (A1) and (A2) implies that we consider the following intermediate level of individual endowment in numéraire:

$$\bar{z} \in \left[z_{\min}^\theta, z_{\max}^\theta\right]$$

where $z_{\min}^\theta$ and $z_{\max}^\theta$ are easily is deducted from, respectively, (A1) and (A2). While $z_{\min}^\theta$ are either independant or a decreasing function of L, $z_{\max}^\theta$ values are increasing with L.

Finally, we must ensure that $z_{\min}^\theta < z_{\max}^\theta$ for all $\theta \in \{S, H, \bar{H}\}$. Tedious calculations leads to the conclusion that $z_{\max}^\theta$ is higher than $z_{\min}^\theta$ for all θ under the necessary condition that

$$L > \frac{2\,(k+4)\,(k+1)}{2m^2 n\,(k-n+1) - mn\,(2a-\tau) + (k+1)}$$

We assume this condition holds. Therefore, there is always a range of endowment in numéraire such that wages are equal to unity (A1) and there is no labor shortage in each country (A2).

The intuition for this range of individual endowment in numéraire is the following. The individual endowment in numéraire $\bar{z}$ has to be high enough so that the world demand in numéraire cannot be served by only one country and therefore, all wages are equalized to unity thanks to labor mobility across sectors. Nevertheless, $\bar{z}$ – and thereby the size the T sector – should not be too high so that, given the inelastic labor supply, there is no labor shortage for firms of each sector. While these assumptions seem to be constraining at a first sight, they prove the existence of parameter values (in terms of numéraire endowment) such that wages are equalized to one across all jobs and there is no labor shortage.[32]

■ Appendix 2: Comparison of threshold values $\hat{E}$ and $\bar{E}$

Let us rewrite threshold values $\hat{E}$ and $\bar{E}$ as follows:

[32] Note also that the assumptions we make are less restrictive than if we consider that the labor market clears in each country. Clearly, some involuntarily unemployment occurs in our economy when there is excessive labor supply.

$\hat{E} = L\tau^2 \frac{(k-n)^2}{\varphi(k-n+1)\hat{\Psi}}$ with $\hat{\Psi} = 2(k+1) - n + Lm(a - a_{\min} + \tau(k-n)) > 0$, and $\bar{E} = 2L\tau^2 \frac{(k-n)^2}{\varphi(k-n+1)\bar{\Psi}}$ with $\bar{\Psi} = 2(k+1) + Lm(2(a - a_{\min}) - \tau) > 0$.

Then, $\hat{E} - \bar{E} = L\tau^2 (k-n)^2 \frac{\bar{\Psi} - 2\hat{\Psi}}{\hat{\Psi}\bar{\Psi}\varphi(k-n+1)}$ with $\bar{\Psi} - 2\hat{\Psi} = -mL\tau(2k - 2n + 1) - 2(k - n + 1) < 0$

Therefore, $\hat{E} < \bar{E}$.

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