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This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

Published Version:
Rossini Gianpaolo (2019). State Owned Enterprises (SOEs) and Non Transparent Trade Policies. ITALIAN ECONOMIC JOURNAL, 5(3), 433-453 [10.1007/s40797-019-00091-2].

Availability:
This version is available at: https://hdl.handle.net/11585/723231 since: 2020-02-08

Published:

DOI: http://doi.org/10.1007/s40797-019-00091-2

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(Article begins on next page)

13 July 2024

This is the final peer-reviewed accepted manuscript of:

Rossini, G. (2019). State Owned Enterprises (SOEs) and Non Transparent Trade Policies. *Italian Economic Journal*, *5*(3), 433-453.

The final published version is available online at:

https://doi.org/10.1007/s40797-019-00091-2

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State Owned Enterprises (SOEs) and Non Transparent Trade Policies

Gianpaolo Rossini[1]

Abstract
A hot issue in trade negotiations concerns SOEs and state subsidies. Disputes between the US and the EU and the discussion on the recognition of the status of market economy to China are often the epitome of that. In China almost 1/3 of firms are SOEs and loom in almost all industries with relevant or even dominant market shares. SOEs maximize domestic social welfare. When they export or compete with foreign producers at home their objective functions produce equilibria similar to those obtained via specific trade policies such as tariffs. We investigate oligopoly trade with SOEs and find that both dumping and foreclosure of the domestic market may occur explaining home prices significantly higher or lower than export prices. In this sense SOEs could become the vehicle governments may use for disguised trade policies.

Keywords Market asymmetry · Dumping · Market foreclosure · State owned enterprises

JEL Classification F12 · F13 · L32

1 Introduction

After decades of gradual tariff reduction trade barriers have become marginal. However, "the perception that trade policy is no longer relevant arises to a large extent from the inability to precisely measure most non-tariff barriers that have replaced

I thank Lehan Jin who mined data on Chinese products, Luca Lambertini and Carlo Reggiani for helpful comments and suggestions. Moreover, I gratefully acknowledge the financial support of the University of Bologna within the 2016 and 2017 RFO schemes and the Fondazione Cassa dei Risparmi di Forlì for the support to the project ORGANIMPRE. Finally I thank Andrea Mantovani and the audiences of the Thessaloniki ASSET annual conference (9–12 November 2016) and Algiers ASSET annual conference (17–19 October, 2017) where companion papers were presented.

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traditional tariffs and subsidies as the primary tools of trade policy" (Goldberg and Pavcnik 2016). Quite often non tariff impediments are based on non transparent instru-ments used by governments to pursue commercial, industrial and welfare objectives. A closely related theme is the presence of state owned enterprises (SOE) in industries open to trade. As we shall see, like trade barriers, SOEs affect international market equilibria making them similar to the outcomes of specific commercial policies. Inci-dentally, the discussion on the recognition to China of the status of market economy and trade negotiations with the Us touch also these issues (Puccio 2015; Urdinez and Masiero 2015; The Economist 2018).[1]

How important are SOEs? Confining to China, SOEs are large, account for about 1/3 of total production and for almost 40% of stock market capitalization (Chang and Jin 2016).[2] Are SOEs' operating modes consistent with free trade? Since "the general public is the ultimate owner of SOEs" (OECD 2018, p.15).[3] domestic social welfare maximization is the mission of a SOE. Possible alternative and/or complementary goals are, among others, export promotion, innovation, reduction of regional gaps.[4] Do these objectives conflict with free trade? Do SOEs provide a protective shelter for home markets when maximizing domestic social welfare? As a matter of fact quite a few complaints against SOEs point to presumed dumping, i.e., selling goods in foreign markets at prices too low either with respect to domestic prices or to costs or to foreign competitors.[5] Government subsidies and easier access to finance are more relevant since they seem to lead to "excessively aggressive" strategies of SOEs.[6] A final hot concern is market access. A great deal of disputes between China, the Us and the Eu are linked to these matters.

What do SOEs maximize when they operate in foreign markets? Realism and obser-vation suggest that, while SOEs at home maximize domestic social welfare, abroad they bet on their operative profit from export. That is close to Corneo and Jeanne

[1] SOEs operate also in France, Germany and other countries. In Germany regional public entities (Länder) have control stakes in giant automaker Volkwagen and other firms. In France this is the case for Renault-Nissan and AirFrance. GM in the Usa has benefited from public capital injections. The dominant presence of SOEs is quite relevant all over the globe, not just in Communist or formerly Communist countries. In the majority of cases SOEs are large enterprises (OECD 2018).

[2] In China there are firms which are owned by the state in indirect way. For instance the state university of Tsinghua owns a semiconductor producer. In 1995 the Chinese government adopted the policy of keeping the direct control only of large firms abandoning small firms (Chang and Jin 2016).

[3] For a fresh survey of SOEs governance, objectives and theoretical investigations see OECD (2018).

[4] For a textbook survey of SOEs objectives see Atkinson and Stiglitz (2015), chapter 15. Literature examples of adoption of social welfare as the goal of a SOE are De Fraja and Delbono (1990), Delbono and Rossini (1992), Corneo and Jeanne (1994). Further discussion of SOEs targets is in Sapienza (2002) and White (2002) among others. A fresh view of changing Chinese SOEs governance is in Harrison et al. (2019).

[5] Theoretically, only the second case may be defined as dumping, while the former is mere international price discrimination and the third is a legitimate cost advantage (Malueg and Schwartz 1994). Nonetheless, several competition authorities and trade regulators do not reckon international price discrimination as a sound (and legitimate) firm strategy. Consequently they tend to sentence it when it goes beyond a reasonable price difference across countries. See for instance: Zanardi (2006) for dumping definition.

[6] In Li and Whalley (2010) antidumping measures towards Chinese firms are examined. A more detailed investigation studies reactions to antidumping measures in a separate way for SOEs and private firms in China (Dong and Whalley 2010). See also The Economist (2018).

(1994) who consider the effects of privatization on welfare and exports of a country with private firms and SOEs.[7]

To answer some of the questions raised we shall investigate international mixed oligopolies with SOEs and private firms in several scenarios. We shall find that SOEs strategies give rise to both foreclosure of the domestic market[8] to foreign rivals and *involuntary* dumping according to specific circumstances. Dumping occurs in a vein similar to Brander and Krugman (1983) while foreclosure has not yet been deeply examined in the literature. We shall see that isolation (partial or complete) is the aftermath of the SOE objective and of the underlying pricing policy. The interesting thing is that foreclosure is an example of a trade equilibrium that may be reached, in the absence of SOEs, by a proper trade policy. In this sense, a SOE may become the vehicle of a disguised trade policy a government sets without any tariff or any other transparent barrier to insulate the home market. Also dumping may be an instance of a SOE strategy that mimics a trade policy of a government supporting foreign market penetration.

Although strong conclusions should not be based on oversimplified models as those presented, the results of the paper can be productively linked to the current discussion on the recognition to China of the status of market economy and to collateral international disputes involving SOEs. To make the investigation more real, in Appendix A we provide some anecdotal evidence based on a few instances of goods produced in China and sold in global markets. Retail prices at which those goods are sold in China and in the Euro area are compared. In the majority of cases the export price is significantly higher than the domestic one making for (at least) partial foreclosure. Only in one case there is the presumption of dumping, i.e., the domestic is far higher than the export price. In other instances the difference is not significantly relevant. Domestic market foreclosure reduces (in the extreme case, eliminates) import penetration and cuts foreign profits mimicking a trade policy that aims to limit imports in a specific industry. Yet, unlike a corresponding import duty, the final price does not increase. Related to the hot issue of market access, foreclosure points to the (voluntary or involuntary) role that SOEs may have for government international targets. Nonetheless, foreclosure in only one out of different possible equilibrium strategies.

The ensuing theoretical analysis is based on oligopoly models since SOEs loom quite large in domestic and foreign markets and show some leeway in setting quantities or prices. Consistently, we shall go through technological scenarios with both constant and increasing returns to scale. On the demand side we shall consider both homogeneus and differentiated goods.

The paper is organized as follows. In Sect. 2 we go through a simple duopoly framework à la Brander and Krugman (1983). In Sect. 3 we deal with increasing returns to scale and SOEs. In Sect. 4 we introduce price competition and differentiation. In Sect. 5 we provide an example of trade policy and in Sect. 6 we read the epilogue.

[7] The analysis focuses on macro net export balances neglecting the implications for trade and international competition of strategically exporting SOEs.

[8] A similar point is made in Autor et al. (2016) and Friedman (2018).

2 An Elementary Duopoly Framework

SOEs are mostly large firms (see footnote no. 1). Realism and recent contributions, such as Head and Spencer (2017), suggest for a theoretical investigation the adoption of an oligopoly framework. Consistently with that and for the sake of simplicity we consider an international duopoly. Two enterprises are located respectively in country H (Home) and F (Foreign) separated by transport costs, described by the iceberg parameter $t \in (0, 1[$ whereby only a share t of the value of the goods reaches the foreign market.[9] Both firms manufacture a homogeneous good, comply with the Cournot tenet and face linear inverse demand functions, one in each market:

$$\begin{aligned} p_H &= a_H - q_H - t\, q_{FX} \\ p_F &= a_F - q_F - t\, q_{HX} \end{aligned} \tag{1}$$

where p_H and p_F are the market prices of the good respectively in market H and F, a_H and a_F are the market sizes, q_H, q_F are the domestic sales of the two firms while q_{HX}, q_{FX} are their exported outputs. We assume that consumers are not able to carry out commercial arbitrage buying a good in the country where the price is lower since the individual transport costs are prohibitive. One company is a SOE based in H while the rival is a private profit seeking firm in F. The total profit of the SOE (S is for SOE) is made by the profit coming from domestic sales (π_H) plus the profit from exports (π_{HX})

$$\pi_{HS} = \pi_H + \pi_{HX}$$

where

$$\pi_H = p_H q_H \qquad \text{and} \qquad \pi_{HX} = t\, p_F q_{HX}$$

since we assume, for the sake of simplicity, that the production cost is null.

The consumer surplus in country H is

$$cs_H = \frac{(a_H - p_H)(q_H + t\, q_{FX})}{2}.$$

The profit of the foreign rival is:

$$\pi_F = p_F q_F + t\, p_H q_{FX}.$$

Here we come to the objective function of the SOE. The textbook recommendation is for a SOE maximizing domestic social welfare that does not include the profit of the foreign firm selling in H. For the export market no manual guideline exists. Casual observation suggests that the SOE exports to the market of the rival maximizing profit. Unlike the SOE located in H, the foreign enterprise, based in country F, maximizes

[9] For a detailed definition and an application see Rossini (2007).

profit in both F and H markets by setting optimal Cournot quantities. Domestic social welfare maximized by the SOE is:

$$sw_H = cs_H + \pi_H.$$

Since the SOE is a home consumers' asset we may additionally consider an *augmented* version of the social welfare function in country H that includes the profit obtained by the SOE abroad. We shall use this *augmented* function in the proof of the next Lemma and in subsequent cases. From this simple framework we derive the following:

Lemma 1 *An international mixed duopoly is made by two firms each exporting to the rival market. The SOE maximizes domestic social welfare and profit abroad while the foreign rival is a pure Cournot profit seeker. In equilibrium, the market where the SOE belongs is foreclosed to the foreign profit seeker rival that is not able to export.*

Proof Let's assume symmetric markets, i.e., $a_H = a_F = a$. Simultaneously solving for the following first order conditions (FOCs):

$$\left\{\begin{array}{l} \frac{\partial \pi_F}{\partial q_F} = 0 = a - 2q_F - q_{HX}t \\ \frac{\partial \pi_F}{\partial q_{FX}} = 0 = t(a - q_H - 2q_{FX}t) \\ \frac{\partial sw_H}{\partial q_H} = 0 = a - q_H \\ \frac{\partial \pi_{HX}}{\partial q_{HX}} = 0 = t(a - q_F - 2q_{HX}t) \end{array}\right\}$$

we get the equilibrium quantities:

$$q_F^* = \frac{a}{3}; \quad q_{FX}^* = 0; \quad q_H^* = a; \quad q_{HX}^* = \frac{a}{3t}.$$

Second order conditions (SOCs) are met due to the stability requirement over the sign of the principal minor of the determinant of the Hessian matrix which is satisfied. Equilibrium social welfare and consumer surplus are:

$$\pi_F^* = \pi_{HX}^* = \pi_H^* = \frac{a^2}{9}$$
$$cs_H^* = \frac{a^2}{2} \geq cs_F^* = \frac{2a^2}{9}$$
$$sw_H^* = \frac{a^2}{2} \geq sw_F^* = \frac{a^2}{3}.$$

Including in sw_H^* the profit of the H firm in country F (π_{HX}^*) we get the *augmented* version of domestic social welfare defined as $sw_{HN}^* = \frac{11a^2}{18} \geq sw_H^* \geq sw_F^*$.

It can be easily seen that the two firms obtain the same total profit, i.e., $\frac{a^2}{9}$. The SOE operates in both countries while the private firm is confined to the domestic market. Country H, where the SOE belongs, enjoys a higher consumer surplus (in

country H the market price is zero and equal to the marginal cost of the domestic firm) and the same national producer surplus of the other country, since the SOE maximizes profit abroad (we consider the augmented welfare definition, mentioned at the end of the proof of Lemma 1, containing the foreign profits of the domestic firm). Therefore, H enjoys a higher social welfare. The most notable feature is that in country H the market is foreclosed to the foreign producer without any prohibitive tariff or discriminatory measure in favour of the domestic producer. A country with a SOE does not need any trade policy to keep the door of the domestic market shut to foreign competitors. Although the framework where this result obtains is highly stylized and naive, nonetheless, it highlights SOE strategies that may reach the same objective of a transparent trade policy, such as a tariff, aimed at the (total or partial) insulation of the domestic market.

Extending the investigation we may compare the above case with the control solution represented by a standard symmetric Cournot international duopoly with two profit seeking firms. In that case we may state:

Proposition 1 *If we compare a mixed international duopoly, made by a SOE and a profit seeking firm, with the symmetric case of two profit seeking firms, we find that the country with the SOE enjoys a larger social welfare than in the symmetric case, while the other country whose firm is foreclosed has a lower welfare. At the global tier social welfare and consumer surplus are higher with the presence of just one SOE (which maximizes profits abroad).*

Proof In the naive Cournot symmetric case we have:

$$q_F^* = q_H^* = \frac{a}{3}; \quad q_{HX}^* = q_{FX}^* = \frac{a}{3t},$$
$$p_H^* = p_F^* = \frac{a}{3}.$$

With the SOE in H and the profit seeking firm in F the equilibrium market price in H is zero ($p_H^* = 0$) while in F it replicates the symmetric Cournot international duopoly ($p_F^* = \frac{a}{3}$). In the symmetric private duopoly total profits, consumer surplus and welfare are:

$$\pi_F^* = \pi_H^* = \frac{2a^2}{9}$$
$$cs_H^* = cs_F^* = \frac{2a^2}{9}$$
$$sw_H^* = sw_F^* = \frac{4a^2}{9}.$$

Let's compare them with the corresponding equilibrium welfare and consumer surplus in the proof of Lemma 1. Simple inspection suggests that social welfare is larger in the symmetric Cournot for country F but lower for country H with respect to the mixed case with a SOE in country H. At the global tier we have:

$$\left(cs_H^* + cs_F^*\right)_{SymmCournot} - \left(cs_H^* + cs_F^*\right)_{Mixed} = -\frac{5a^2}{18}.$$

Moreover

$$\left(sw_H^* + sw_F^*\right)_{SymmCournot} - \left(sw_H^* + sw_F^*\right)_{Mixed} = -\frac{5a^2}{18}.$$

If we use the augmented version of social welfare in H we have

$$\left(sw_H^* + sw_F^*\right)_{SymmCournot} - \left(sw_{HN}^* + sw_F^*\right)_{Mixed} = \frac{8a^2}{9} - \frac{17a^2}{18} = -\frac{1a^2}{18}$$

which shows that social welfare differences between the two market structures decrease.

Foreclosure is a fairly general outcome occurring also with product differentiation in the Cournot model (the proof of this sentence is presented in Appendix B). As we have seen, in the mixed case prices differ across borders. The market of country with the SOE is shielded from foreign competitors and a lower market price. No dumping occurs, yet the country with the SOE cannot be accessed and domestic welfare grows while foreign profits are cut. In terms of political economy this setting may be quite stable and sustainable with political consensus in the country of the SOE. As a matter of fact limited market access, a setting akin to partial foreclosure, may poison some Chinese industries (see Autor et al. 2016; Friedman 2018).

A simple corollary may be derived considering the effects of changes in country size. In the traditional Cournot framework there is a positive effect of increasing market size of a country on the social welfare of the foreign partner. However, when in one country the autarky (pre-trade) market is covered by a SOE this effect disappears making the reciprocal benefits of trade opening quite asymmetric. This can be detailed in the following:

Corollary 1 *As the size of country H increases the social welfare of F does not change since the firm of country F is foreclosed, while in the traditional Brander and Krugman (1983) Cournot model of trade the profits of firm F grow (and hence sw_F) when the partner country gets larger.*

Proof Extending the two previous proofs and assuming that the demand in H is

$$p_H = a_H - q_H - tq_{FX}$$
$$p_F = a_F - q_F - tq_{HX}$$

we can see that

$$sw_F^* = \frac{{a_F}^2}{3} \text{ and } \frac{\partial sw_F^*}{\partial a_H} = 0.$$

The above results show that opening trade between a country with a SOE and one with a profit seeking firm generate asymmetric trade benefits which may call for a commercial policy as a reaction to state ownership seen as a disguised trade policy to limit import competition. Here again the "hidden barrier" to trade comes from foreclosure caused by the pricing strategy adopted by the SOE that makes the domestic market hardly contestable by foreign firms. Even though foreclosure is not the aftermath of any intentional trade policy yet the sheer effect of SOE strategies, possible counteracting measures can be devised by a rival foreign country, as we shall see with an example in Sect. 5.

3 Increasing Returns to Scale (irs) and SOEs

The analysis can be extended to the intriguing case of SOEs with *irs* . The scenario is similar to the section above with two firms located respectively in country F and H, now producing with concave costs due to a fixed commitment. Competition authorities afraid of natural or quasi natural monopoly may try to regulate pricing. In that case the mode of behavior tends to coincide with that of a SOE.[10] Anyway, for both private profit seeking and SOEs with *irs* the question is: what pricing policy? Contestable markets theory (Baumol et al. 1982) suggests a solution close to the planner objective, i.e., average cost pricing. Whenever fixed costs are sunk and exporting is a feasible opportunity zero profit condition may be the best response, at least in the domestic market where regulation is perhaps enforced. In such circumstance the behaviours of the SOE and the regulated profit seeking coincide.[11] On the contrary, in the foreign market profit maximizing is the best strategy if there is no regulation. Then, a SOE charges fixed costs on the domestic market and maximizes operative earnings abroad. This is just one out of several viable choices of SOEs facing *irs* and trading. It departs somewhat from canonical models of Helpman (1984) and Krugman (1980) where strategies do not change according to the market where firms sell.

We examine the equilibria resulting from the above assumptions in the following:

Proposition 2 (symmetric SOEs duopoly) *In an international duopoly with two SOEs and irs each firm charges fixed costs on the domestic sales making zero profits at home while maximizing profit in the foreign market. Prices are larger than average total costs and allow non negative profits from exports. With different sizes the price is higher in the large market leading to "involuntary dumping" by the firm exporting to the small country.*

Proof Let us consider separately domestic and export profits for both SOEs:

$$\begin{aligned} \pi_H &= p_H q_H - f \quad \text{domestic} \\ \pi_{HX} &= t\, p_F q_{HX} \quad \text{foreign} \\ \pi_F &= p_F q_F - f \quad \text{domestic} \\ \pi_{FX} &= t\, p_H q_{FX} \quad \text{foreign} \end{aligned} \tag{2}$$

[10] See for instance Bauer (2005) and Decker (2014).

[11] See again Bauer (2005) and Decker (2014).

where f stands for the fixed cost. The SOEs simultaneously set the quantities in their respective domestic markets by charging the fixed cost on the domestic balance sheet and setting profits equal to zero. Then, they set marginal profits to zero abroad. The resulting equilibrium quantities are:[12]

$$q_H^* = \frac{1}{2}\left(a_H + \sqrt{a_H^2 - 8f}\right); q_{HX}^* = \frac{a_F - \sqrt{a_F^2 - 8f}}{4t}; \tag{3}$$

$$q_F^* = \frac{1}{2}\left(a_F + \sqrt{a_F^2 - 8f}\right); q_{FX}^* = \frac{a_H - \sqrt{a_H^2 - 8f}}{4t}. \tag{4}$$

Prices are:

$$p_H^* = \frac{1}{4}\left(a_H - \sqrt{a_H^2 - 8f}\right); \; p_F^* = \frac{1}{4}\left(a_F - \sqrt{a_F^2 - 8f}\right).$$

It can be easily seen that

$$p_H^* \geq p_F^* \quad if \quad a_H \geq a_F.$$

Then, in case of asymmetric countries the firm of the large country carries out *involuntary dumping*. Profits are zero in the domestic markets, i.e., $\pi_H^* = \pi_F^* = 0$, while abroad they are:

$$\pi_{HX}^* = \frac{1}{16}\left(a_F - \sqrt{a_F^2 - 8f}\right)$$

and

$$\pi_{FX}^* = \frac{1}{16}\left(a_H - \sqrt{a_H^2 - 8f}\right),$$

the profit of the SOE residing in the large market is lower since it exports less than the rival. □

The outcome is interesting on several grounds. First, the large country with SOE displays prices above marginal (and average) costs which are higher than in the small country. The effects of *involuntary dumping* are double sided. On one hand it helps the firm of the large country to penetrate the small market. On the other hand the enterprise based in the small country profits from trade more than the rival of the large country since it sells in a market where the price is higher than at home. This

[12] Feasibility requires

$$a_{H,F} \geq 2\sqrt{2f}$$

that implies that the solution obtains if fixed costs are not too large vis à vis market size.

replicates a recurrent trade result maintaining that small countries benefit more than large ones from trade. In this case an antidumping policy may not be rational for the small country since dumping is coupled to the opportunity to access a large and high price market.

3.1 A Mixed International Duopoly with irs

We move to the mixed duopoly with one SOE in H and one profit seeking in F. The SOE sets profits in the domestic market to zero charging the fixed cost on domestic sales while maximizing profits abroad. The private rival targets profits in both the domestic and the foreign market imputing the fixed cost to domestic sales.The Cournot Nash equilibrium looks as follows:

Proposition 3 *In an international mixed duopoly with one private and one SOE, the market price is higher in the country of the SOE. Involuntary dumping by the SOE results. However, if the country of the private firm is sufficiently large dumping may be reversed.*

Proof The private firm maximizes profits in both markets. The SOE targets social welfare charging fixed cost on the domestic sales and maximizes profits abroad. The resulting equilibrium quantities are:[13]

$$q_H^* = \frac{1}{2}\left(a_H - \sqrt{a_H^2 - 8f}\right); \quad q_{HX}^* = \frac{a_F}{3t};$$
$$q_F^* = \frac{a_F}{3}; \quad q_{FX}^* = \frac{a_H + \sqrt{a_H^2 - 8f}}{4t}.$$

As for prices we have:

$$p_F^* = \frac{a_F}{3}; \quad p_H^* = \frac{a_H + \sqrt{a_H^2 - 8f}}{4}.$$

If $a_H = a_F$ we have $p_F^* \leq p_H^*$, while if $a_H \leq a_F$ then $p_F^* \geq p_H^*$.

In mixed international duopolies with *irs,* if countries have the same size, the SOE adopts involuntary dumping selling in the foreign country at a price lower than at home. This result may be reversed whenever the market of the private firm is large.

[13] Here feasibility requires a more stringent condition than in the previous symmetric case, i.e.,

$$a_{H,F} \geq 3f.$$

4 Product Differentiation

4.1 Price Competition Among SOEs

The last extension we examine touches product differentiation[14] and price competition. As before two firms respectively based in country F and H produce and export a differentiated good strategically setting prices. We introduce the parameter $s \in [0, 1]$ with maximum and minimum differentiation respectively at the lower and at the upper bound. The inverse demand functions are:

$$\begin{aligned} p_H &= a_H - q_H - s\, t\, q_{FX} \\ p_F &= a_F - q_F - s\, t\, q_{HX} \\ p_{HX} &= a_F - s\, q_F - t\, q_{HX} \\ p_{FX} &= a_H - s\, q_H - t\, q_{FX} \end{aligned}$$

while direct demand functions are:

$$\begin{aligned} q_H &= \frac{p_H + a_H(s-1) - s\, p_{FX}}{s^2 - 1} \\ q_F &= \frac{p_F + a_F(s-1) - s\, p_{HX}}{s^2 - 1} \\ q_{FX} &= \frac{-s\, p_H + a_H(s-1) + p_{FX}}{t(s^2 - 1)} \\ q_{HX} &= \frac{p_{HX} + a_F(s-1) - s\, p_F}{t(s^2 - 1)}. \end{aligned}$$

Profit functions are:

$$\begin{aligned} \pi_H &= p_H q_H - f = 0 \\ \pi_F &= p_F q_F - f = 0 \\ \pi_{HX} &= t\, p_{HX} q_{HX} \geq 0 \\ \pi_{FX} &= t\, p_{FX} q_{FX} \geq 0. \end{aligned} \tag{5}$$

[14] The demand specification we use is derived from Singh and Vives (1984) type quadratic and quasi concave utility functions, further generalized in Ottaviano et al. (2002) and subsequent literature on trade with heterogeneous firms. Our demand functions are a simplified version chosen out of the large set of specifications that can be obtained from the Singh and Vives (1984) basic scheme. Singh and Vives (1984) and subsequent extensions are not the only avenue that could be taken to model differentiation in trade models. Non linear demand curves or discrete demand curves (Hotelling 1929) may be adopted instead. In the latter specifications realism is quite high since each consumer buys only one good from a single supplier instead of buying from all firms. This is the main reason why the affluency of a market tends to coincide with its size in non discrete demand models. However, with Hotelling type models we are not able to reach analytically interpretable results and we are confined to parametric numerical simulations whose degree of generality is quite low. The demand functions we use are quite suitable for partial equilibrium trade analysis since they do not display any income effect (Singh and Vives 1984, p. 547). They can be easily used after simple transformation for both Cournot and Bertrand behaviours due to their duality properties (Singh and Vives 1984, p. 547).

As before the fixed cost is subtracted from domestic profit. On the foreign market SOEs set price maximizing profits. Equilibrium prices come from the ensuing FOCs subject to constraints (5)

$$\begin{cases} \frac{\partial \pi_{FX}}{\partial p_{FX}} \\ \frac{\partial \pi_{HX}}{\partial p_{HX}} \\ \pi_H \\ \pi_F \end{cases} = 0$$

and are:

$$p^*_{HX} = -\frac{a_F(s-1)((2+s)s-4) + s\sqrt{{a_F}^2(s+s^2-2) - 8f(2-3s^2+s^4)}}{4(s^2-2)}$$

$$p^*_{FX} = -\frac{a_H(s-1)((2+s)s-4) + s\sqrt{a_H^2(s+s^2-2) - 8f(2-3s^2+s^4)}}{4(s^2-2)}$$

$$p^*_H = \frac{a_H(s+s^2-2) - \sqrt{(s-1)(a_H^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))}}{2(s^2-2)}$$

$$p^*_F = \frac{a_F(s+s^2-2) - \sqrt{(s-1)({a_F}^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))}}{2(s^2-2)}.$$

From the above results we can state the following:

Proposition 4 *Differentiated SOEs with irs adopt a Bertrand mode of behavior abroad and break even on the domestic market where they charge the fixed cost. Each firm sells at a lower price a larger quantity on the foreign market giving rise to reciprocal involuntary dumping. If countries have different size the firm of the large country adopts a more aggressive dumping (lower price) than its rival but sells less. The rival sells more in the large (foreign) country obtaining higher profits.*

Proof Just calculate the difference between the two prices set by the two firms in foreign markets:

$$\begin{aligned} p_F - p_{FX} = \frac{1}{4(s^2-2)}(&a_H(s-1)(s(s-2)-4) + 2a_F(s^2+s-2) \\ &+ s\sqrt{(s-1)(a_H^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))} \\ &- 2\sqrt{(s-1)({a_F}^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))} \end{aligned}$$

which is always non negative. Ancillary numerical simulations are presented in Appendix C.

The above proposition generalizes previous results to a Bertrand cum-differentiation scenario. Dumping may be exacerbated by size asymmetries among countries.

4.2 Bertrand Competition and Foreclosure

Is there still a case for foreclosure with Bertrand competition and SOEs? The setting we investigate shows a SOE based in country H competing with a profit seeking rival of country F.

Proposition 5 *With Bertrand strategies, irs and differentiation, a SOE competing with a foreign profit seeking firm sells at home at a price lower than abroad, while the rival maximizing profits, adopts a dumping strategy*

Proof Unlike the previous case the profit functions are:

$$\begin{aligned}\pi_H &= p_H q_H - f = 0\\ \pi_F &= p_F q_F - f \geq 0\\ \pi_{HX} &= t\ p_{HX} q_{HX} \geq 0\\ \pi_{FX} &= t\ p_{FX} q_{FX} \geq 0.\end{aligned} \tag{6}$$

Again the fixed cost is charged on the domestic profit. The SOE in the domestic market breaks even while the rival maximizes profit. Abroad they behave the same way. Then, the solution comes from the following system made by three first order conditions (FOCs) and a zero profit condition:

$$\begin{cases} \frac{\partial \pi_{FX}}{\partial p_{FX}} \\ \frac{\partial \pi_{HX}}{\partial p_{HX}} \\ \pi_H \\ \frac{\partial \pi_F}{\partial p_F} \end{cases} = 0$$

Direct demand functions replicate the previous case. The domestic firm has a break even goal corresponding to the maximum consumer surplus. Equilibrium prices are

$$\begin{aligned} p^*_{FX} &= \frac{-a_H(s-1)(-4+(s-2)s)}{4(s^2-2)} + \\ &\quad + \frac{s\sqrt{(s-1)(a_H^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))}}{4(s^2-2)} \\ p^*_F &= p^*_{HX} = a_F\left(1+\frac{1}{s-2}\right) \\ p^*_H &= \frac{a_H(s+s^2-2) + \sqrt{(s-1)(a_H^2(s-1)(2+s)^2 - 8f(1+s)(s^2-2))}}{2(s^2-2)}. \end{aligned}$$

while quantities are:

$$\begin{aligned} q^*_F &= \frac{a_F}{2+s-s^2} \\ q^*_{HX} &= \frac{a_F}{(2+s-s^2)t} \end{aligned}$$

$$q_H^* = \frac{a_H(s+s^2-2)}{(s^2-1)4} - \\ -\frac{\sqrt{(s-1)(a_H^2(s-1)(2+s)^2-8f(1+s)(s^2-2))}}{(s^2-1)4}$$

$$q_{FX}^* = \frac{a_H(s-1)(-4+s(s-2))}{(2-3s^2+s^4)4t} - \\ -\frac{s\sqrt{(s-1)(a_H^2(s-1)(2+s)^2-8f(1+s)(s^2-2))}}{(2-3s^2+s^4)4t}$$

and profits are:

$$\pi_H^* = 0$$

$$\pi_{HX}^* = -\frac{a_F^2(s-1)}{(s-2)^2(1+s)}$$

$$\pi_F^* = -\frac{a_F^2(s-1)+f(s-2)^2(1+s)}{(s-2)^2(1+s)}$$

$$\pi_{FX}^* = -\frac{[a_H(s-1)(-4+s(s-2))}{(s^2-2)^2(s^2-1)16} - \\ -\frac{s\sqrt{(s-1)(a_H^2(s-1)(2+s)^2-8f(1+s)(s^2-2))}]^2}{(s^2-2)^2(s^2-1)16}.$$

Countries have equal size ($a_H = a_F$). Then:

$$p_H^* \leq p_{FX}^* \leq p_{HX}^* = p_F^*.$$

The SOE sells at home at a price lower than the export price, yet foreclosure does not obtain since the foreign rival is shielded by differentiation. In this case we may observe low prices at home and the presence of a foreign competitor selling at a price lower than the price set at home. In other words the foreign profit seeking firm carries out dumping. As differentiation decreases the lower price set by the SOE at home may limit the penetration of the foreign rival, leading to a kind of "partial" foreclosure.

5 An Example of a Counteracting Trade Policy

The new[15] theories of trade policy make for a variety of prescriptions according to market structure, strategies, Cournot vs. Bertrand, private vs. SOE. In the above sections a bunch of equilibria have been reviewed. In a mixed duopoly with constant

[15] We refer to the theories which have been produced since the 1980s. See for this taxonomy Head and Spencer (2017).

returns to scale the market of the SOE is foreclosed to the foreign firm while with *irs* foreclosure does not appear. In this last case the market price is higher in the country of the SOE generating *involuntary dumping* which may be reversed if the country of the SOE is small. With Bertrand competition and *irs* the private firm carries out dumping.

These different outcomes exclude the possibility of featuring a unique dumping or foreclosure case to be counteracted by a catchall trade policy. Last but not the least it is hard to trace a market outcome to its strategic determinants since market evidence does not reveal immediately which strategies are involved. Then, what kind of trade policy may be envisaged? Given the variety of scenarios only a piecemeal approach appears reasonable.

Confining to foreclosure, the foreign country may wish to support its firm to export to the market of the foreclosing SOE. What kind of objective should inspire that sort of export promotion policy? Exporting is a healthy industrial strategy stimulating innovation and competitiveness of domestic firms with substantial spillovers to the entire national economy. Moreover, a government may wish to adopt policies so as to secure reciprocity in terms of trade opportunities, a pillar of WTO rules (Bagwell and Staiger 2002). This principle appears violated by foreclosure even in the absence of any explicit policy.

Then, it may be useful to provide an instance of a possible policy aimed at reciprocity standards when there is foreclosure induced by a SOE. Perhaps, the simplest measure that could be set in place is a subsidy whose features are described in the following:

Proposition 6 *A per unit of output production subsidy is chosen by the country of the profit maximizing firm competing with a foreign SOE. The goal is to let the profit seeking firm export the same quantity of the rival SOE. The subsidy increases with the size of the market and decreases as the SOE costs increase.*

Proof In Appendix D

We may design subsidies or other trade policy tools bound to pursue alternative public goals, for instance, to react to dumping. We leave an extensive analysis of this point for future research.

6 Epilogue

We have investigated trade equilibria in mixed oligopoly markets with SOEs and profit seeking firms selling either homogeneous or differentiated goods with linear and nonlinear costs. We have come across cases of (total or partial) foreclosure and (involuntary) dumping.

Foreclosure obtains in the country where the SOE belongs and provides a kind of insulation of the domestic market like an intentional protection policy, based, for instance, on a tariff. In this sense a government can take advantage of a national SOE and use it to reach, in a *disguised* manner, what would otherwise require a transparent measurable trade policy tool. Even though foreclosure emerges in a simple theoretical platform based on a Cournot interaction mode, it may be observed in quite a few industries and countries where market access is restricted even in the absence of

apparent trade policies and/or administrative limitations (Autor et al. 2016; Friedman 2018).

Turning to dumping the results of the theoretical inquiry are somewhat mixed. Nonetheless, in several circumstances we find that SOEs adopt dumping strategies in foreign markets. In the case of foreclosure SOEs may be a substitute for insulating trade policies. In the case of dumping the aim could be export promotion and penetration of foreign markets. In this multifaceted scenario and in the circumstances defined in the models presented, SOEs may become the vehicle of voluntary (or involuntary) disguised trade policies.

7 Appendix A

See Table 1.

Table 1 Full Prices of Chinese manufactured goods in the Euro area and China (January 2019)

Good	1. TV/Laser	2. Hisense TV	3. Lenovo	4. Huawei
Price China	1299 €	987	949	648
Price EU	1899 €	599	999	716
PCH-PEU	− 600 €	+ 388	−50	− 68
Equilibrium	Foreclosure	Dumping	N.sign. ≠ 0	N.sign. ≠ 0
Good	5. XIAOMI	6. Honor 10	7. Haier frig	8. Deroce bike
Price China	€ 428	253	337	10
Price EU	€ 550	380	768	19
PCH-PEU	€ − 122	−127	−431	−9
Equilibrium	Foreclosure	Foreclosure	Foreclosure	Foreclosure

Prices have been retrieved on Italian sites referred below. We see 5 cases of partial foreclosure, represented by a significantly large negative difference between the China and the EU price, 1 case of presumed dumping, revealed by a large difference of the opposite sign and 2 cases where the price differences are not significantly different from zero (n.sign. ≠ 0) signaling neither dumping nor foreclosure.

Goods' prices references

Good 1:
TV/Laser projector ■ MI Laser Projector.
Prices retrieved 29/12/2018.
CNY 9999
https://www.mi.com/laser-projection/
Eur 1899 https://www.mi.com/it/mi-laser-projector-150/—Italy.
Good 2:
TV/Laser Projector Hisense TV Uled H55U7A.
Prices retrieved 07/01/2019.

CNY 7599
https://www.hisense.com/items/2214
Eur 599 https://www.hisenseitalia.it/televisori/h55u7a/—Italy.
Good 3:
Lenovo mod THINKPAD X280.
Prices retrieved 07/01/2019.
CNY 7299
https://mitem.lenovo.com.cn/android/product/100726.html
EUR 999
https://www.lenovo.com/it/it/laptops/thinkpad/x-series/ThinkPad-X280/p/22TP2TX2800—Italy.
Good 4:
Smartphone: 28/12/2018 Huawei P20 Pro 15,5 cm 6 GB 128 GB.
Prices retrieved: 28/12/2018.
CNY 4988 (Tian Mao)
https://huaweistore.tmall.com/p/huaweiP.htm?spm=a1z10.1-b-s.w5001-14758655655.8.23963421PjSsoM\&scene=taobao_shop
EUR 716 https://www.unieuro.it/online/Smartphone/P20-Pro-pidHUAP20PROB—Italy.
Good 5:
XIAOMi smartphone MIX3 (6GB+128GB).
Prices retrieved 07/01/2019.
CNY 3299
https://item.mi.com/product/10000123.html
EUR 549,90 https://buy.mi.com/it/buy/product/mix3—Italy.
Good 6:
Smartphone Honor 10 ■4GB 128 GB).
Prices retrieved 07/01/2019.
CNY 1948
https://item.jd.com/31016732646.html
EUR 379,90
www.hihonor.com/it/product/37462438.html#363271178—Italy.
Good 7:
Haier Cantina Wine mod. WS052.
Prices retrieved 08/01/2019.
CNY 2599
http://www.haier.com/ice_bar/t20160616_310465.shtml
EUR 768,16 + EUR 12 shipment
https://www.amazon.it/Haier-WS53GDA-installazione-Cantinetta-compressore/dp/B07FQZS7L5/ref=sr_1_3?ie=UTF8\&qid=1546984947\&sr=8-3\&keywords=haier+cantina+vino—Italy.
Good 8:
Deroce Luce professional bike.
Prices retrieved 08/01/2019.
CNY 79

https://item.m.jd.com/product/4392935.html?price=79.00&fs=1&sid=&sf=newM\&pos=8\&csid=fb60b791f040599b7149a1062fb6fea9_1546959024201_1_1546959024201\&ss_symbol=8\&ss_mtest=app-search-none\&key=

EUR 19,18

https://m.it.dhgate.com/product/deroace-bicycle-light-waterproof-usb-rechargeable/404536256.html—Italy.

8 Appendix B

We prove in this appendix the remark concerning the foreclosure with a differentiated Cournot framework. Demand functions, based on Singh and Vives (1984) framework, are[16]:

$$p_H = a - q_H - stq_{FX}$$
$$p_F = a - q_F - stq_{HX}$$

while profits are

$$\pi_H = p_H q_H + tp_F q_{HX}$$
$$\pi_F = p_F q_F + tp_H q_{FX}.$$

The consumer surplus in H is

$$CS_H = (a - p_H)(q_H + tq_{FX})/2.$$

Equilibrium quantities come from the solution of the system

$$\begin{cases} \frac{\partial \pi_F}{\partial q_F} \\ \frac{\partial \pi_F}{\partial q_{FX}} \\ \frac{\partial (\pi_H + CS_H)}{\partial q_H} \\ \frac{\partial \pi_{HX}}{\partial q_{HX}} \end{cases} = 0$$

and are:

$$q^*_{HX} = \frac{a}{3s\,t}; q^*_F = \frac{a}{3}; q^*_H = a; q^*_{FX} = 0; p^*_H = 0; p^*_F = \frac{a}{3}; \pi^*_{HX} = \frac{a^2}{9s}; \pi^*_F = \frac{a^2}{9}.$$

9 Appendix C

We present in Table 2 the calibration of parameters and in Table 3 the simulations of Proposition 4.

[16] We confine, for the sake of simplicity, to a simple case of two countries of equal size ($a_H = a_F = a$).

Table 2 Calibration

Parameters	1st sim	2nd sim	3rd sim	4th sim	5th sim
a_H	10	20	20	20	
a_F	10	=			
f	2	=			
s	0.8	=		0.5	
t	0.7	=	0.5	0.7	

Table 3 Equilibrium values of endogeneous variables

	1st sim	2nd sim	3rd sim	4th sim
p_{HX}	2.54	2.54		4.22
p_{FX}	2.54	5.24		8.54
p_H	3.84	8.10		14.16
p_F	3.84	3.84		6.89
q_{HX}	10.07	10.07	14.09	8.04
q_{FX}	10.07	20.80	29.12	16.27
q_F	0.52	0.52		0.29
q_H	0.52	0.25		0.14
π_{FX}	17.86	76.33		97.27
π_{HX}	17.86	17.88		23.78
π_F	0	0	0	0
π_H	0	0	0	0

1st Sim: (symmetry) zero profit at home and fixed cost charged at home, Bertrand competition abroad. There is reciprocal dumping and sales are higher in the export market than at home.

2nd Sim: (asymmetry) H market is larger ($a_H = 20$) than F ($a_F = 10$). Same strategies as above.

10 Appendix D

Proof of Proposition 6 We use a more general framework with respect to the model of previous sections introducing heterogeneous costs across firms. Therefore, while the demand functions remain the same, the profit functions now look as follows:

$$\pi_F = (p_F - c_F)q_F + t(p_H - c_F)q_{FX}$$
$$\pi_H = (p_H - c_H)q_H + t(p_F - c_H)q_{HX}$$

where c_F and c_H are the average costs of production of the two firms F and H. If firm F is a SOE while firm H is a profit seeker the equilibrium Cournot quantities are (assuming symmetric markets, i.e., $a_H = a_F = a$):

$$q_H = \frac{1}{3}(a + c_F - 2c_H)$$
$$q_{HX} = \frac{c_F - c_H}{2t}$$
$$q_{FX} = \frac{a - 2c_F + c_H}{3t}$$
$$q_F = a - c_F.$$

If $c_H \geq c_F$ exports of country H to F are negative. To make them non negative firm H receives a per unit subsidy τ as follows:

$$\tau \geq \left| \frac{c_F - c_H}{2t} \right|,$$

that depends directly on the gap between the costs of the two rivals and decreases as transport costs decrease ($t \to 1$). If country H objective is to let the firm export the same amount of F the subsidy may be found by equating q_{FX} and q_{HX} and solving in terms of c_H:

$$q_{FX} = q_{HX} \text{ if } c_H^s = \frac{1}{5}(7c_F - 2a) \leq c_F,$$

where c_H^s is the cost of H that equalizes exports of F and H. If $c_H = c_F$, the subsidy is:

$$\tau_{EX} = c_F - c_H^s = c_F - \frac{1}{5}(7c_F - 2a) = \frac{2}{5}(a - c_F).$$

As it can be seen, the subsidy should be calibrated to the size of the market (increases with the size) and to the cost of the rival (if it becomes more efficient the subsidy must increase).

References

Atkinson AB, Stiglitz J (2015) Lectures on public economics. Princeton University Press, Princeton Autor DH, Dorn D, Hanson GH (2016) The China shock: learning from labor market adjustment to large changes in trade. NBER Working paper 21906

Bagwell K, Staiger RW (2002) The economics of the world trading system. MIT Press, Cambridge Bauer JM (2005) Regulation and state ownership: conflicts and complementarities in EU. Ann Publ Coop Econ 76:151–177

Baumol W, Panzar J, Willig R (1982) Contestable markets and the theory of industry structure. Harcourt Brace Jovanovich, New York

Brander J, Krugman P (1983) A reciprocal dumping model of international trade. J Int Econ 15:313–321

Chang SJ, Jin CJ (2016) The performance of state owned enterprises in China: an empirical analysis of ownership control through SASACs. Centre for Governance, Institutions & Organizations, Business School National University of Singapore

Corneo G, Jeanne O (1994) Oligopole mixte dans un march é commun. Annales d'économie et de statistique 33:73–90

Decker C (2014) Modern economic regulation: an introduction to theory and practice. Cambridge University Press, Cambridge
De Fraja G, Delbono F (1990) Game theoretic models of mixed oligopoly. J Econ Surv 4:1–17
Delbono F, Rossini G (1992) Competition policy vs. horizontal merger with public, entrepreneurial and cooperative firms. J Comp Econ 16:216–40
Dong Y, Whalley J (2010) Model structure and the combined welfare and trade effects of China's trade related policies. Glob Econ J 10:1–19
The Economist (2018) Are China's state giants reformable? March 3, p 59
Friedman TL (2018) Some things are true even if trump believes them. The New York Times, 13 March. Op-Ed Columnist
Goldberg PK, Pavcnik N (2016) The effects of trade policy. NBER Working paper 21957
Harrison A, Meyer M, Wang P, Zhao L, Zhao M (2019) Can a Tiger Change its Stripes? Reform of Chinese State-Owned Enterprises in the Penumbra of the State. NBER Working paper 25475
Head K, Spencer BJ (2017) Oligopoly in international trade: rise, fall and resurgence. Can J Econ 50:1414–1444
Helpman E (1984) Increasing returns, imperfect markets, and trade theory. In: Jones R, Kenen P (eds) Handbook of international economics, vol 1. North Holland, Amsterdam
Hotelling H (1929) Stability in competition. Econ J 39:41–57
Krugman PA (1980) Scale economies, product differentiation, and the pattern of trade. Am Econ Rev 70:950–959
Li C, Whalley J (2010) Chinese firm and industry reactions to antidumping initiations and measures. NBER Working Paper, pp 16446
Malueg DA, Schwartz M (1994) Parallel imports, demand dispersion, and international price discrimination. J Int Econ 37:167–95
OECD (2018) Ownership and governance of state-owned enterprises: a compendium of national practices. Paris
Ottaviano G, Tabuchi T, Thisse JF (2002) Agglomeration and trade rivisited. Int Econ Rev 43:409–436
Puccio Laura (2015) Granting Market Economy Status to China An analysis of WTO law and of selected WTO members' policy. European Parliamentary Research Service Members' Research Service November PE 571:325
Rossini G (2007) Pitfalls in private and social incentives of vertical crossborder outsourcing. Rev Int Econ 15:932–947
Sapienza P (2002) What do state-owned firms maximize?. Evidence from the Italian Banks. CEPR Discussion Paper 3168
Singh N, Vives X (1984) Price and quantity competition in a differentiated duopoly. RAND J Econ 15:546–54
Urdinez F, Masiero G (2015) China and the WTO: will the market economy status make any difference after 2016? Chin Econ 48:155–72
White MD (2002) Political manipulation of a public firm's objective function. J Econ Behav Organ 49:487–499
Zanardi M (2006) Antidumping: a problem in international trade. Eur J Political Econ 22:591–617