



# Financial constraints and international trade with endogenous mode of competition



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## ABSTRACT

The paper examines how financial constraints affect firms' decisions to export when the mode of intra-sectoral competition is endogenous. We propose an extension of Neary and Tharakan's (2012) model, in which firms resort to external funders to finance investments in production capacities. Sectors differ in financial constraint and the cost of capital increases with the level of financial constraint. We first show that a weaker financial constraint allows firms to adopt a Cournot (rather than a Bertrand) pricing scheme and generate a high duopoly profit. Consequently, less financially constrained sectors are more likely to export. We also exhibit a new transmission channel of financial crisis. By increasing the financial cost of exporting and making it more difficult to engage in a Cournot behavior, a financial shock reduces both the intensive and extensive margins of trade.

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## 1. Introduction

A recent and large literature, empirical and theoretical, has documented the implications of the 2007–2008 global financial crisis. Some of this literature has focused on the impact on firms' investment, while the rest has investigated the effect on international trade. In this paper, we offer a theoretical explanation of how financial constraints simultaneously affect trade and investment, and show that interactions between both variables give birth to an additional channel of transmission for the financial crisis to impact the real economy. We build a general equilibrium model with oligopolistic firms facing a sequential decision with three stages (trade-investment-price) and sectors differentiated by financial conditions. This model, where the mode of competition is endogenous, points out a new channel of transmission of a financial shock to both trade and investment: sector-level financial constraints reduce firms' ability to engage in capitalistic and profitable Cournot competition. This new channel, combined with the previously documented effect of an upfront trade cost, explains

why the impact of the financial crisis on trade and investment has been so large.

The global financial crisis implied, on the one hand, a severe drop in firms' investment. For example, during the first quarter of 2009, the growth rate of investment reached approximately –6.5 percent in the United States and Europe.<sup>1</sup> Investment expenditures were significantly affected by the decline in bank lending, particularly after the bankruptcy of Lehman Brothers. However, the shock also affected financial markets. Due to a crisis of confidence, investors fled stock markets for less risky markets (notably, sovereign bond markets); firms' investment also suffered from a global collapse in credit supply. A large body of literature has explored this credit rationing phenomenon, showing that the decline in investment was stronger for financially dependent firms (Krosner et al., 2007; Duchin et al., 2010; Almeida et al., 2012; Campello et al., 2010, 2011, 2012).

On the other hand, the financial crisis is considered one of the major causes of the great trade collapse observed in 2009 (Auboin, 2009, 2011). According to the World Trade Organization (WTO), the volume of world trade fell by 12 percent in 2009. More

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<sup>1</sup> Source: OECD.

notably, the slump in world trade appeared to be much stronger than the contraction in Gross Domestic Product (GDP), which amounted to  $-2.6$  percent in 2009.<sup>2</sup> The recent drop in export volumes was also more severe than the fall in world trade observed during the Great Depression of the 1930s. In line with Melitz's model (2003), some researchers investigated how financial conditions affect international trade. Using a monopolistic competition framework, they introduced the notion of financial constraint with firm-level heterogeneous productivity. Through this approach, exporters face upfront costs, related to things such as advertising, gathering information on foreign customers, administrative procedures, translation, and organizing foreign distribution networks. Since these specific costs must be externally financed, intensive and extensive margins crucially depend on the strength of firms' financial constraints. In Chaney (2005), productivity not only affects firms' competitiveness on foreign markets but also determines the amount of profit earned from domestic activities and firms' ability to cover upfront export costs. Hence, firms with a very low productivity level do not export because they are not competitive enough to sell abroad. Conversely, high-productivity firms export because they are competitive and generate large profits from their domestic activities. Finally, firms with an intermediate level of productivity are financially constrained; despite their potential viability on foreign markets, they do not generate enough profit to cover upfront costs and trade. Similarly to Chaney (2005), Manova (2013) assumes that high productivity implies large profits and allows firms to offer high returns to external funders, enabling them to more easily borrow and finance upfront export costs. Hence, there exists a productivity threshold such that low-productivity firms (which cannot obtain external funds to cover fixed costs) are excluded from international trade, whereas high-productivity firms (which face no financial constraint) can export. These theoretical findings have been widely confirmed by the empirical literature (Bellone et al., 2010; Berman and Héricourt, 2010; Bricongne et al., 2010; Engel et al., 2013; Askenazy et al., 2015; Muùls, 2015).

In both bodies of literature presented above, the implications of a financial shock on investment and exports are examined independently. In fact, interaction between firms' investment and export behavior can give birth to an additional channel of transmission of the financial crisis to the real economy: firms' investment crucially determines the level of their production capacities. For this reason, a drop in investment expenses does not only represent a reduction in final demand; it also has large implications on firms' supply. This supply effect is particularly interesting in an oligopolistic set-up, where firms make their decision in two stages, first choosing investment capacity and then determining prices. In such a framework, as shown by Kreps and Scheinkman (1983), Maggi (1996) and Neary and Tharakan (2012), the level of production capacities influences the degree of competitive behavior as well as prices and profit. For example, Neary and Tharakan (2012) design a capacity-price competition model in a general equilibrium in which sectors are heterogeneous in terms of skilled/unskilled-labor intensity. Focusing on the duopoly case, the authors show that in each sector, the mode of competition is endogenously determined. Since their marginal cost to produce above capacity is lower than the marginal cost to invest and produce at capacity, very unskilled-labor intensive sectors do not install a production capacity. Firms in these sectors set their price as in a Bertrand equilibrium. In contrast, very skilled-labor intensive sectors install a production capacity, which implicitly commits firms in these sectors in the second stage to set a price such that the demand addressed to them will equal the level of production capacity. For these sectors, production capacity acts

as a commitment device, with everything happens as if they behaved in a one-stage Cournot game. The price they set corresponds to the Cournot-game price and their profit is higher than in a Bertrand equilibrium.

This literature thus concludes that the mode of competition (Bertrand or Cournot) crucially determines prices and firms' profit in international trade. Consequently, through their effects on production capacity, the mode of intra-sectoral competition and firms' duopoly profit, investment expenses should finally affect export behavior. This effect may explain why capital-intensive firms export more than others (Bellone et al., 2006; Bernard et al., 2007). Furthermore, this idea can be transposed in a framework where, in line with Rajan and Zingales (1998), sectors differ in their financial constraint rather than in skilled/unskilled-labor intensity. In this case, most financially dependent sectors are particularly affected by a financial crisis, which increases their cost of capital and reduces their level of investment and production capacity.

Taken together, these arguments suggest that a financial shock does not only affect international trade through the need to financing fixed exporting costs, as described in the existing literature. It should also decrease exports by reducing financially dependent firms' investment in production capacity and their ability to engage in a more profitable mode of international competition.

The goal of our paper is to account for this new transmission channel of financial shocks. To do so, we introduce financial constraints in the theoretical set-up proposed by Neary and Tharakan (2012) to investigate the extent to which financial factors affect firms' competitive behavior, capacity production decisions and, ultimately, export behavior. Based on the notion that sectors differ in their financial constraint, one important contribution of our paper is to show that less financially constrained sectors are more likely to export. On the one hand, a high level of financial constraint allows firms to finance fixed export costs at a lower interest rate. On the other hand, a weaker financial constraint reduces the cost of investing in capacities, allowing firms to adopt a Cournot (rather than a Bertrand) pricing scheme and generate a high duopoly profit. Another innovation of the paper is the exhibiting of a new transmission channel of financial crisis, which passes through firms' investment in production capacities and affects both the extensive and intensive margins of trade. A rise in the cost of capital increases the cost of investment in production capacities, thus reducing firms' ability to engage in Cournot pricing schemes. Combined with the (more standard) argument that a financial shock increases the financial cost of exports, this finally reduces firms' probability to export. Moreover, by reducing firms' levels capacity, the transmission channel described in our model also decreases firms' production and exports.

The paper is organized as follows: the second section presents the basic assumptions of the model; the third section considers the case of autarky; the fourth section introduces the case of free trade; in the fifth section, we discuss our results; and in the sixth section we present our conclusions.

## 2. Assumptions

### 2.1. The supply side

#### 2.1.1. Financial constraint across sectors

We consider two identical economies, domestic and foreign, with a continuum of sectors indexed by  $z \in [0; 1]$  in each country. There is one domestic firm and one foreign firm in each sector; these firms supply different products. The first crucial assumption of our model refers to financial constraint across sectors:

<sup>2</sup> Source: WTO.

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