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The effect of the euro on aeronautic trade: A French regional analysis

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ABSTRACT

After describing the spatial distribution of the aeronautic industry in France, this study analyzes the determinants of French regional bilateral exports and imports, according to a trade gravity model, for the period 2003–2010. The appreciation of the euro has a negative impact on exports and a positive effect on imports, confirming the fears of European politicians and managers in the aeronautic sector. The gravity equation, extended to integrate factor complementarities among partners, also shows that labor productivity levels in France and its partner countries are significant determinants of trade, supporting O-ring theory applied from Kremer (1993) to explicate trade in the aeronautical sector. The spatial organization of this sector is also analyzed via the impact of foreign military spending on French trade. Finally, by distinguishing French imports and arrivals of products manufactured in Europe and in France, supplementary estimations reveal that outward foreign direct investment FDI affects the imports and arrivals of European products negatively but has positive influences on the imports and arrivals of French products.

1. Introduction

Historically, France has been a major player in the aerospace industry. At the end of World War I, France led aircraft production; only in 1930 did the United States start to acquire a dominant position, which it strengthened after World War II. In the 1960s, France allied with the United Kingdom to complete the Concorde project; in 1970, it coordinated with Germany on the Aerospatiale, to be joined by CASA Spanish in 1971 and British Aerospace in 1979. As a result of this process of mergers and acquisitions, the European Aeronautic Defense and Space (EADS) company was founded in 2000, to become the Airbus group on January 1, 2014. As Table 1 shows, France ranks second in the world as an exporter of aircraft and spacecraft, and Airbus is the second most important firm in the defense and aerospace sector.

The aerospace industry (aeronautics and space) has a critical importance in France. Indeed, this sector accounts for nearly 4% of total industrial employment and fosters various indirect jobs in related sectors. It is also one of the few industrial sectors to have at least maintained employment levels throughout the 2000s. Moreover, since the end of the 1990s, France has suffered a deterioration of its trade balance; the trade deficit of 231 million euros in 2003 increased to 24 billion euros in 2005 and 70 billion euros by 2011. Few sectors have resisted this troubling trend, such as luxury, pharmaceuticals, and aerospace. As Fig. 1 shows, despite a wealth of economic crises over the past four decades, the trade balance in the aerospace industry has remained positive, with a growing surplus.

Furthermore, amounting to 2546 million euros in 2009, R&D expenditures by French aerospace firms represent 10% of the internal R&D expenditures of French enterprises—the third most substantial, after automobile and pharmaceutical sectors. For aerospace companies during the 2000s, these expenses accounted for around 18% of their total turnover. Furthermore, self-financed R&D represents 54% of global R&D (the remaining 46% comes mainly from public funding; ECORYS, 2009).

Lastly, France seeks to integrate its regional aerospace sector in regional policies (see Schönfeld and Jouaillec, 2008, p. 1). As of July 2005, 67 clusters, covering most industrial sectors, were approved by the French government. The aeronautic and space industry was represented primarily in three clusters, located according to the industry's historical regionalization: ASTech Paris in Ile-de-France, Aerospace Valley spanning the Aquitaine and Midi-Pyrénées regions, and Pégase in Provence-Alpes-Côte-d'Azur.

Considering that the aerospace sector thus constitutes one of the main pillars of French industry, it is easy to understand why French authorities became worried when the euro appreciated strongly against the U.S. dollar. Competition also is increasing in the aeronautic industry. Take the 100-plus seat jetliner category as an example. Products such as Boeing's 737 or Airbus' A320 confront increasing horizontal and vertical competition, all around the world,[1] which is not limited to Airbus and

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[1] In addition to traditional competitors, such as Brazil's Embraer and its E-Jets (E190 and E195), likely market entrants include Japan's Mitsubishi (MRJ-90), with a maiden flight scheduled for 2014; the Commercial Aircraft Corporation of China, whose C919 plane, seating 168–190, is scheduled for 2016; and the Russian company Irkut, with its MS-21 designed for 150 passengers. We also include on this list the Canadian firm Bombardier, which plans to deliver its CSseries, with 110 and 130 seats, in 2014.

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Table 1
Firms and exporters in the aerospace sector.

Rank	Aircraft and spacecraft exporters (US$ billion and world share)	Top defense and aerospace companies[a] (revenue in the first half of 2013)
1	USA: $104.3 bn (30%)	Boeing: $40.7 bn[b]
2	France: $54.5 bn (19.3%)	EADS, Europe: $34.25 bn
3	Germany: $43.4 bn (15.4%)	United Techno. Corp.: $30.40 bn
4	UK: $16.7 bn (5.9%)	Lockheed Martin: $22.47 bn
5	Canada: $10.3 bn (3.6%)	General Dynamics Corp.: $15.31 bn
6	Singapore: $6.0 bn (2.1%)	Northrop Grumman: $12.39 bn
7	Italy: $5.7 bn (2.0%)	BAE System, UK: $12.09 bn
8	Brazil: $5.2 bn (1.9%)	Raytheon: $11.99 bn
9	Spain: $4.5 bn (1.6%)	Finmeccanica, Italy: $10.43 bn
10	Japan: $3.9 bn (1.4%)	GE Aviation: $10.37 bn

Source: ECORYS (2009) and http://www.army-technology.com/features/feature-highest-earning-defence-and-aerospace-companies/, November 2013.
[a] Companies are based in the United States, unless otherwise indicated.
[b] The company expects to generate full-year revenues of $83–$86 bn in 2013.

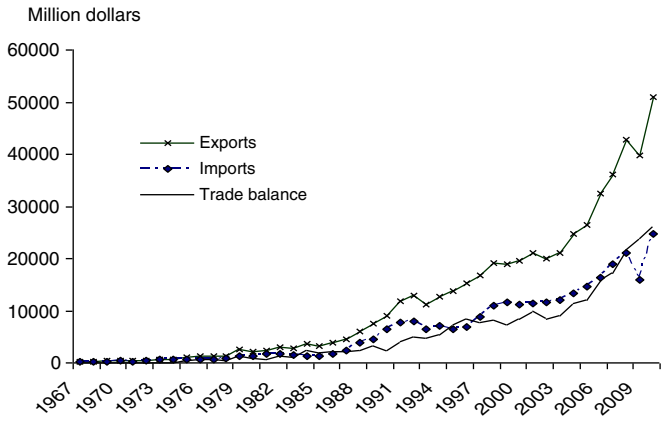

Fig. 1. Aeronautic and space trade in France.
Source: Chelem (calculations of authors).

Boeing but involves the entire aeronautic industry. European politicians thus complain loudly about the barriers to export and international competition, such as when former French President Nicolas Sarkozy worried, in June 2008, "Every time that the euro appreciates by ten cents, Airbus lose one billion euros! We cannot be competitive against Boeing who sells in dollars, if the euro is 30% over-valued.[2]"

Airbus already has responded to this challenge, by relocating part of its production and R&D. In 2008 the company began to assemble its A320 in Tianjin, China. Starting in summer 2013, Airbus initiated the construction of assembly lines for the A319, A320, and A321 in the town of Mobile, Alabama (USA); aircraft assembly is slated to start in 2015. With this study, we aim to determine whether these observations are merely anecdotal or if the euro effectively has influenced the French aeronautical industry.

We propose to analyze the evolution of the aircraft industry in France, using a trade-based approach at the French regional level. Thus, we attempt to determine precisely how producers have been affected by worldwide competition and the appreciation of the euro. Moreover, this article deals with the coordination and organization of trade in the aeronautic sector in accordance with O-ring theory. In the aerospace sector, where a simple O-ring was the cause of the tragic crash of the space shuttle Challenger, Kremer (1993) asserts that the value of a product depends on the value of its cheapest components. By extending a standard gravity equation, we show that labor productivities in France and its partner countries are significant determinants of trade, in support of the view that complementarities matter. In addition, using military spending as a measure of local and specific knowledge in each country, we interpret their positive impacts on export as an indication that trade may be driven by the unbundling of the production process (Baldwin, 2006), with complementarities across locations. Because French exports increase with military spending, network effects appear to overtake any home bias (i.e., discriminatory public procurement), which in turn implies that production processes take place in interconnected locations. The introduction of FDI in the aeronautic sector in partners' countries confirms this intuition. Finally, we introduce a contractual friction variable that indicates that good institutions are a key determinant of trade in Europe but not with partners in the rest of the world. This result affirms a description offered by Grossman and Rossi-Hansberg (2012) about the fragmentation of the Boeing 787, for which the division of the supply chain mainly involved northern countries with minor technology differences but strong local advantages (driven by economies of scale).

In the next section, we outline several stylized facts about the aeronautic and space trade industries, including their main regions and clusters. To our knowledge, Section 2 is the first description in the literature of trade at the regional level in the aeronautic sector in France. After describing aeronautic trade by French region, we show how it fits into a wider European network. This section describes in particular how exports in destination to the U.S. have decreased while in contrast exports to Germany have increased. These two elements potentially indicate the effect of the Euro appreciation and reorientation of the aeronautical sector inside the European Union. Lastly to illustrate this European network, this section presents the A380 production which is a symbolic element of the European factory. This huge project, at a time of a strong euro, may have strengthened the internal hub and spoke in Europe. The price competitiveness of the aeronautic sector is our focus in Section 3. A gravity equation is presented in Section 4, and we dedicate the next sections to estimate our proposed regional export (Section 5) and regional import (Section 6) equations. We conclude in Section 7.

2. Trade and general description of France's aeronautic sector

We describe briefly the evolution of exports and imports in the aeronautic sector during the 2000s, distinguishing total trade throughout France from trade by French region.

The first cluster leads the fields of executive aviation, space travel, and engines/equipment by bringing together more then 100,000 people, who perform the majority of sector-specific R&D in France. Groups and organizations involved in this cluster include Dassault Aviation, Safran, Astrium, the CNES, and the European Space Agency, though the Safran group performs perhaps the most notable industrial activities. Aerospace Valley, a bi-regional aerospace cluster, leads the European aerospace, space travel, and embedded system sector, with a turnover of 10 billion euros. It comprises more than 200 companies, including international groups such as EADS, Freescale Semiconductors, Goodrich, Honeywell, and Siemens. In addition to a strong focus on Airbus-related activities, Aquitaine is home to industrial activities by Dassault Aviation and solid propulsion tests for the aerospace industry (mainly by EADS Space Transportation, Snecma Propulsion Solide, and SNPE). Finally, Provence-Alpes-Côte d'Azur hosts Eurocopter and Thales Alenia Space. These three clusters account for 78% of employment in the aerospace sector (Fig. 2).

2.1. Trade

French trade in the aeronautic industry has been characterized by fast import growth from the UE15 during 2003–2006, and then relative stagnation. In contrast, imports from the rest of the world (RoW) increased strongly over the same period (Fig. 3), indicating a possible impact of euro appreciation.

[2] http://www.elysee.fr/president/root/bank/print/5637.htm.