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## UNDERSTANDING PRODUCTIVITY LEVELS, GROWTH AND DISPERSION IN THE TEXTILES SECTOR IN ARGEN- TINA: AN O-RING STORY OF LOW-PRODUCTIVITY TRAP\*

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### ABSTRACT

We use case study techniques to analyze the determinants of the marked productivity decline experienced by the textiles sector in Argentina since 1996. We find that, given the observed complementarity in the qualities chosen by different firms in this sector, low productivity results from a failure to coordinate in the investment in quality upgrading technologies by all firms. The sector was pushed to a poor productivity equilibrium by adverse financial shocks that combined with capital wedges to prompt some firms to invest in lower quality or to exit the market, propagating to the other firms through the quality complementarity.

### RESUMEN

Este trabajo analiza los determinantes del colapso en productividad del sector textil en Argentina desde 1996, empleando técnicas de estudio de caso. Dada la complementariedad encontrada en la elección de calidad por distintas empresas, la baja productividad resulta de una falla de coordinación para invertir en tecnologías que mejoren la calidad. El sector fue empujado hacia un equilibrio de baja productividad por una combinación de shocks financieros adversos junto con imperfecciones crediticias que llevaron a algunas empresas a invertir en calidad inferior o a dejar el mercado, propagándose a las demás empresas a través de la complementariedad en calidades.

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## **I. Introduction**

The object of this paper is to shed light on the wedges that may affect resource allocation and the productivity levels in the textile sector in Argentina.

Special interest is placed on analyzing whether there exist government and market failures that hinder reallocation of resources towards the most efficient firms, and that impede equating revenue productivity across firms. We are also concerned about how these failures affect the distribution of productivity itself.

More specifically, we care about the differential impact of financial constraints; taxation; non-compliance with taxes and labor regulations; macroeconomic volatility; and trade restrictions. We are also concerned about the roles played by coordination failures that may hinder the provision of public goods that are required for the acquisition of bigger scales and better technologies. We additionally care about possible coordination failures to develop different stages of the value chain that may also hamper the distribution of productivities and resource allocation.

The textile value chain includes the following stages. First comes the processing of cotton fibre. The spinning stage, which generates the yarn, follows next. Then ensues the weaving and knitting stages, which generate the cloth. The fabrics then have to undergo different treatments, like bleaching and dyeing, to obtain the final product. Finally comes the apparel stage, which includes the production of clothing, linen, towels, upholstery, draperies, etc.

In this study we are concerned specifically about the weaving and knitting stages, which are stages with apparent potential for competitiveness and which have been subject to distinct shocks that appear to have distorted resource allocation and the distribution of productivity. The analysis includes the production of both woven and knitted fabrics. We include in our analysis the spinning stage, as many producers of fabrics are vertically integrated backwards.

The textile and spinning sector in Argentina experienced an important

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restructuring between 1991 and 1997, which led to substantial productivity growth (above the economy wide productivity growth), although sectoral production did not grow during that period. The combination of the large devaluation in Brazil in 1999, the large domestic recession between 1999 and 2002 and the growing financial constraints associated to capital outflows during that period shocked negatively this sector, both in terms of productivity and production.

During this period and even during the recovery since 2003 several policy and economic shocks have distorted resource allocation and choices of scale and technologies. As a result labour productivity in the sector fell 45% between 1997 and 2002, and recovered only partially since then (the 2007 productivity was still 25% below 1997), while labour productivity and TFP for the economy as a whole respectively fell 30 and 18% between 1997 and 2002 and by 2007 had surpassed the initial levels.

The bulk of the productivity decline was borne by the decline in sectoral output, which fell 65% between 1997 and 2002 and, while partially recovering since then, in 2007 was still 38% below the 2007 level. Hence, the sector appears to have been subject to major shocks that both led to lower output and also to operate with less productive technologies and/or production techniques. Alternatively, it could also be the case that new wedges were introduced preventing the expansion of potentially productive firms and establishments. These are the hypotheses that we explore in our research. The main suspects are financial distortions, coordination failures within the sector and trade policy failures. One important feature appears to be the coexistence of firms that seek to base their competitiveness on product differentiation and quality, and firms that want to be cost-competitive, which is not possible due to global competition from cheaper foreign competitors.

We conduct this research both by analyzing the available data on the pattern of allocation of resources and sales within this sector and on the distribution of labor productivity in this sector and, more importantly,

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by undertaking a case study analysis based on interviews to relevant actors. We have interviewed most of the largest textile producers, both national and foreign owned, and of smaller firms with varying productivity levels. We conduct structured interviews in the manner of Javorcik, Keller and Tybout (2006).

The results obtained regarding the nature of the capital wedges and coordination failures that hinder productivity in the sector can be adequately interpreted using the O-Ring model of economic development proposed by Kremer (1993).

Section 2 provides a macroeconomic and policy background and the stylized facts for the sector. Section 3 presents the industrial organization of the textiles sector in Argentina, and the patterns of allocation and the distribution of productivity. Section 4 analyzes the different government and market failures that affect resource allocation and productivity in this sector in Argentina. Section 5 sketches an O-Ring model of productivity decline for the textiles sector. Section 6 concludes. Appendix 1 describes the design and implementation of the methodology and questionnaire employed in the case study analysis.

## **II. Macroeconomic and policy background and stylized facts for the sector**

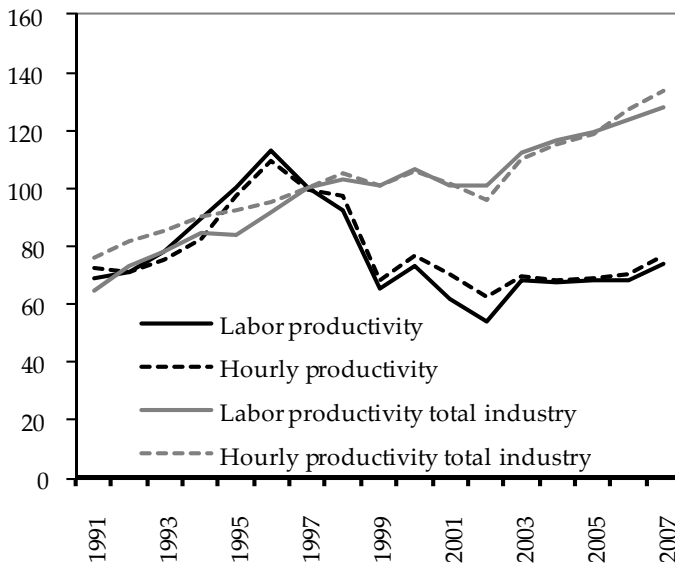
In this section we provide a sketchy macroeconomic and policy background. During the 1990s there was macroeconomic stabilization and openness to trade and capital flows, together with a favourable environment for FDI. In comparison to the previous decade, during this period a more predictable policy and regulatory environment prevailed over discretion. This was a period of fast growth and price stability until 1998. This period witnessed trade liberalization, which started in the late 1980s and deepened with Mercosur. There was some incipient real exchange rate appreciation, which was exacerbated after 1998.

Based on CEPAL (2004), we learn that during 1993-1998 trade liberalization and real exchange rate appreciation caused the textil sector

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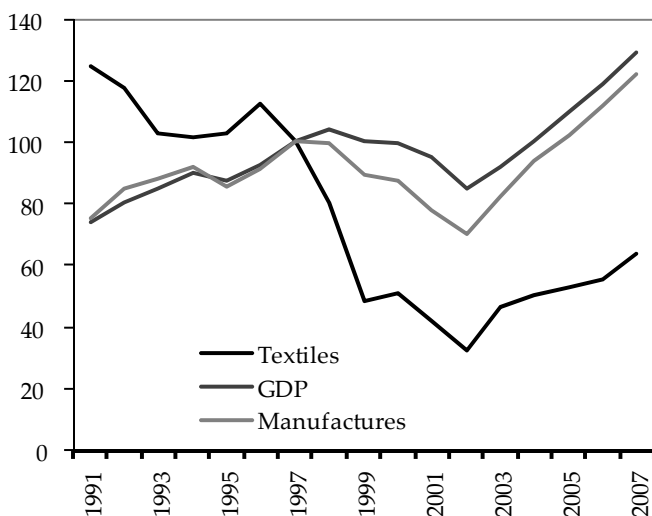
to experience a decline in production and a bigger decline in employment and hours, which raised labour productivity (see Figures 1a and 1b). Real wages and other labor costs also fell significantly. This labor saving was the main mechanism used to raise competitiveness vis-à-vis foreign competitors, rather than bigger investment and incorporation of technology. This period also showed increasing informality and firm exits. The existence of important fixed costs, especially in the yarn and woven fabrics sectors, made productivity contingent on production levels.

**Figure 1a: Textiles productivity 1997=100**



*Source: IERAL-Fundación Mediterránea, based on Industrial Survey*

On the other hand, during this period the price stabilization facilitated access to bigger banking and, especially, commercial financing by suppliers. The first years of the 1990s actually witnessed stable production levels until 1996; the actual decline started after 1997.

**Figure 1b: Textiles production 1997=100**

Source: IERAL-Fundación Mediterránea, based on Industrial Survey

Firms tried to move towards less tradable products and to more differentiated products with bigger profit margins. The sub-sectors of woven fabrics and clothing suffered the bigger exit of firms and the biggest drop in installed capacity, while the subsectors that produced yarns and knitted fabric were much less shocked. The clothing sub-sector increasingly moved into informality.

Different firms performed differently depending on whether they benefited or not from national or provincial promotion regimes, and depending on their net worth and financial status. This heterogeneity appeared to create coordination problems along the value chain, which hurt the performance of the more efficient firms and of the sector as a whole.

Things changed for the worse when Brazil and other developing countries devalued after 1998, while Argentina kept its exchange rate fixed. Additionally, capitals started flowing out of emerging markets. Argentina started to experience a combination of fiscal unsustainability, loss of competitiveness and monetary contraction that eventually led to

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the collapse of the convertibility regime in 2001-2002. Aggregate GDP fell 20% between 1998 and 2002 (11% in 2002), and per capita GDP declined by 27%. The combination of real exchange appreciation, declining domestic demand and financial tightening was particularly damaging for the sector during this period.

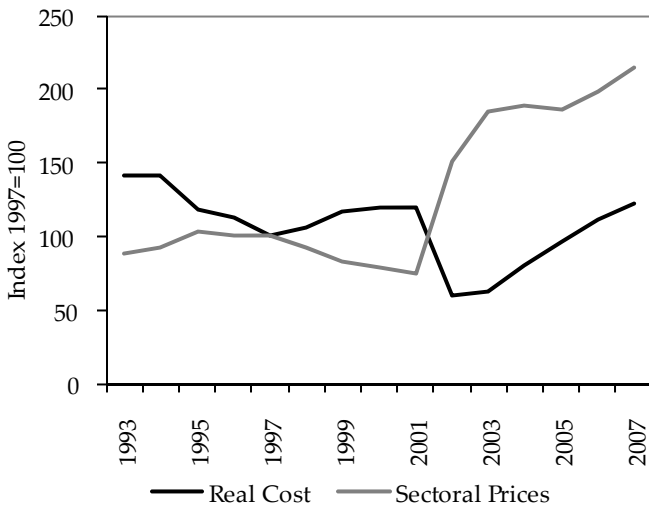
In 2002 a huge devaluation (250% vis-à-vis the US dollar) occurred in order to facilitate the required current account reversal (8% GDP), restore competitiveness and public and private savings, and to melt down public spending and private debts. There ensued a period of high real exchange rate (at least until 2007) and of increasingly discretionary policies and government intervention in the goods and factors' markets, which includes bigger and more discretionary taxes, stiffer labor regulations, and more discretionary protection from foreign competition, including within Mercosur. At the same time this period witnessed the full entry of China in world trade, and a leading role of Asia in the world trade of textiles. Argentine firms claim that a good share of the Asian competitiveness is based on export and production subsidies that generate an unfair competition.

Despite all these rising distortions the economy grew very fast until 2007 (around 8% per year on average between 2003 and 2007), helped by the initially large output gap, the boost to savings and investment promoted by the devaluation and public debt restructuring of 2005 and the rise in the terms-of-trade, world growth, and very expansionary fiscal and monetary policies. Since 2006 the economy began to operate above potential GDP, and inflationary pressures started to mount. Since mid-2008 the economy had started to adjust to the natural level of production through a monetary contraction and real exchange rate appreciation. The international financial crisis that exacerbated in September 2008, fiscal sustainability concerns and some bigger discretionary government interventions that have deteriorated severely the business climate have fostered capital outflows, reduced domestic and external demand and consumers' confidence, sharply decelerating the economy.

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The 2003-2007 period displayed a combination of lower labor costs, lower costs of public utilities (due to price regulations by the government), and fast growing domestic demand, with sectoral domestic prices doubling in real terms because of the devaluation (see Figure 2). Firms in the textile sector also benefited from the debt melt down caused by the peso-ification of liabilities, although they still faced constraints to access banking credit. On the other hand, commercial credit from suppliers was restored, and at the same time financing of consumption with credit cards reappeared. The surviving firms had bigger cash flows, bigger profits and restored liquidity.

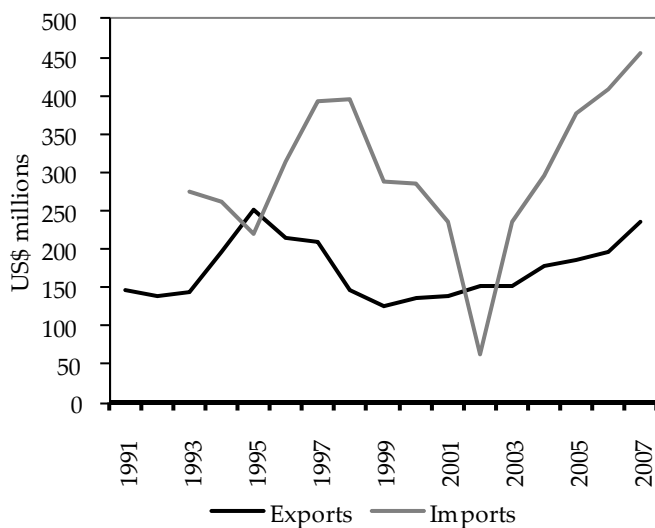
**Figure 2: Textiles, sectoral costs and prices**



Source: IERAL - Fundación Mediterránea based on Industrial Survey

However, firms in this sector reacted by initially exploiting idle installed capacity rather than investing. As a result, exports grew little and domestic production was not enough to meet the fast growing domestic demand, resulting in rapidly growing imports despite the exchange rate advantage (see Figures 3a and 3b).



**Figure 3a: Textiles Trade**

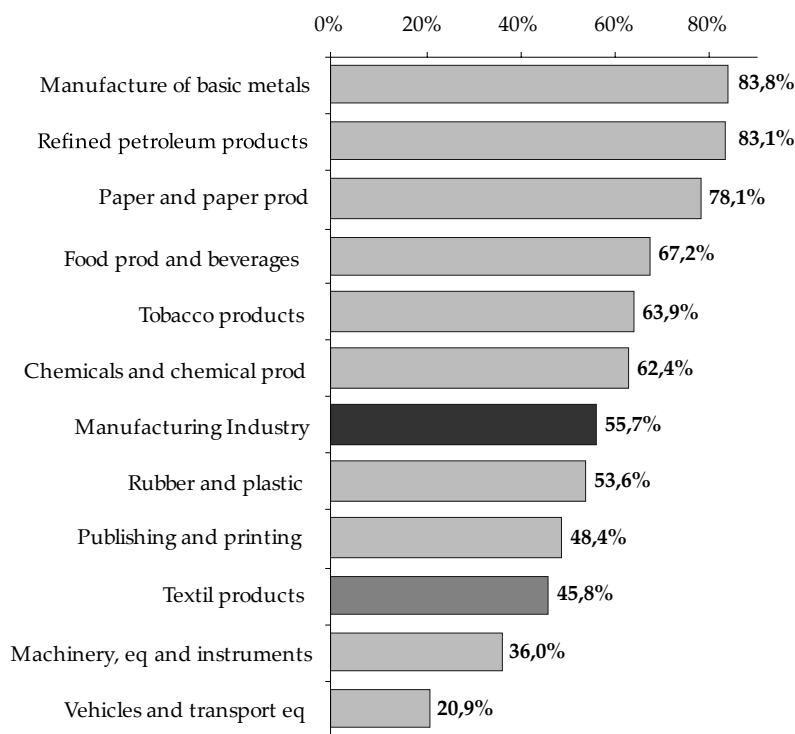
Source: IERAL-Fundación Mediterránea, based on INDEC

**Figure 3b: Textiles Trade**

Source: IERAL-Fundación Mediterránea, based on INDEC

The levels of capacity utilization in the textile sector in Argentina in 2002 were one of the lowest among manufacturing industries (see Figure 4).

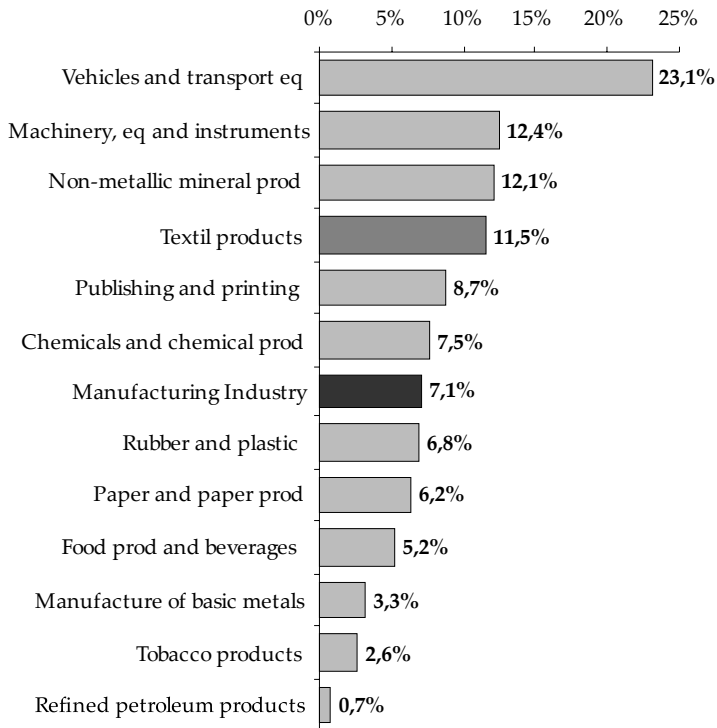
**Figure 4: Utilization of the installed capacity in 2002**



*Source: IERAL - Fundación Mediterránea based on INDEC*

During 2002-2008, the textile sector showed one of the biggest rates in the growth of installed capacity among manufacturing industries (proxied by comparing the growth in production vis-à-vis the change in the use of installed capacity) (see Figure 5).

By 2008, this sector had one of the highest levels of capacity utilization among manufacturing industries (see Figure 6 in page 60).

**Figure 5: Growth of the installed capacity**

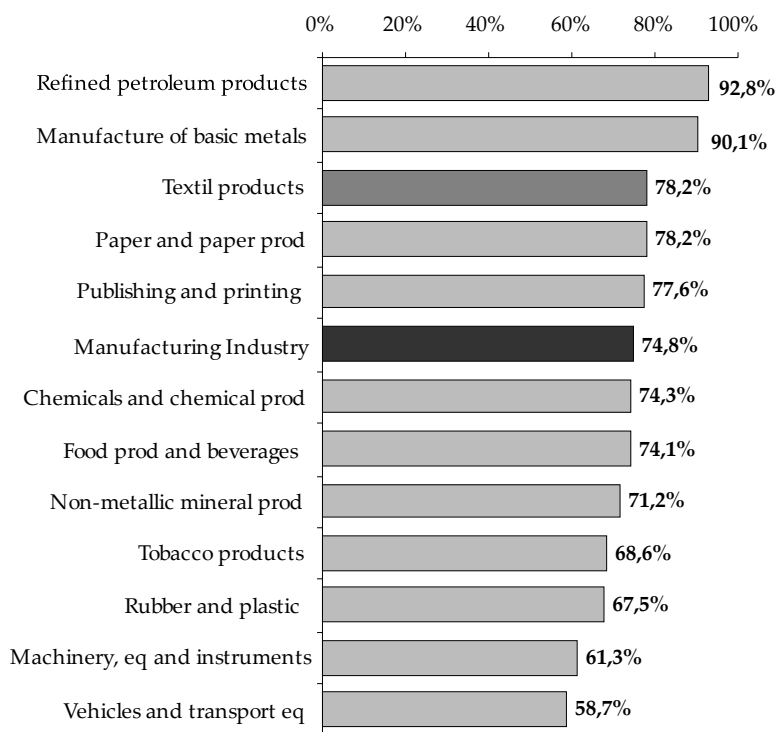
Source: IERAL - Fundación Mediterránea based on INDEC

This suggests that there was some investment in the sector. However, the fact that sectoral exports grew little and that imports grew very fast, with an increasingly negative sectoral trade balance, indicates that the growth in production capacity fell behind the growth in demand. Additionally, our interviews reveal that there has been very little investment in technological upgrading since 2002, and that many investments targeted less productive equipment with low scale economies.

Financial constraints have exacerbated since 2002. In 2002 banking credit to the non-financial private sector amounted to 23% GDP while it currently represents only 12% GDP (and half of it finances consumption,

while in 2001 only 20% of these credits financed consumption). Sánchez and Butler (2008), estimate that financial constraints have become tighter since 2002 (especially for SMEs). The abnormally large cash flows of firms permitted the self-financing of investment. This possibility has been curtailed since mid-2008.

**Figure 6: Utilization of the installed capacity in 20**



Source: IERAL - Fundación Mediterránea based on INDEC

### III. Industrial organization of the textiles sector, resource allocation and distribution of productivity

Here we provide a description of the industrial organization of the sub-sectors that produce yarns and woven and knitted fabrics, along with a description of the distribution of productivities.

The textile value chain includes clearly differentiated stages. First comes the production of cotton fiber, which undergoes several processes. Firstly, cotton is ginned, usually in the field, separating cotton fibers from seedpods. Then the manufacturing stages begin:

- Spinning which makes yarn.
- Weaving which makes cloth (knitted and woven fabrics).
- The fabric then undergoes different treatments to obtain final product, like bleaching and dyeing. The final use of the cloth will determine the treatments required.
- The final stage includes production of clothing and other apparel.

In Argentina, cotton production and ginning are undertaken by many different actors. We here focus on spinning, weaving and knitting.

### III.1. Spinning

The spinning process has big scale economies due to the large fixed costs associated to the minimum scale and installed capacity required. This stage of the textile value chain is the most capital intensive. In Argentina, there are seven mills. Many of the biggest firms in the weaving sector are fully integrated and have their own yarn production.

The spinning sector is quite concentrated, due to the large scale economies, the financial constraints to investment and the underdeveloped domestic and export markets. The largest producer is the domestic-owned TNPlatex firm, which controls 60% of the domestic market. Other large spinners include Tipoití, Algodonera Avellaneda and Villa Ocampo Hilados. These firms are not vertically integrated with the production of fabrics. Fifteen percent of the domestic market of yarns is supplied by imports.<sup>1</sup>

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1. There are three types of yarns, which differ in their processing, required machinery, final quality and usage: open ended, "cardado," and combed yarns. The yarns are used in final products that range from socks to mopping cloths. The one which offers the biggest productivity (5.3 tons per worker per month in a modern large scale plant) but lowest quality is the open ended. The traditional yarns offer intermediate quality (cardado) and high quality (combed) and many usages, and lower productivity than the open-ended (between 1 and 1.7 tons per worker, depending on the combinations of cardado and combed produced in each plant, the technology used, and the workers' skills).

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The large manufacturers produce yarns of different qualities, using mostly cotton but also synthetic fibers. The largest firm can produce 4,600 tons per month, has plants in 7 provinces, and 2,300 employees. The location of its plants is based on proximity to cotton supply and also on promotion regimes. It sells yarns with relatively little processing (like dyeing). Hence its clients are relatively large firms that have a minimum size to justify having their own dyeing installations. Its clients also include some vertically integrated producers of fabrics, which buy from it some yarns that they themselves do not produce. Sixty percent of its clients are knitters and 40% are weavers.

### **III.2. Woven fabrics**

The production of woven fabrics demands more resistant yarns than the knitted fabrics. The production of this fabric demands more mechanical processing and a bigger investment in equipment, which creates bigger scale economies. The optimal production scale is significantly bigger than in knitted fabrics. The woven fabrics sub-sector is considered to be the potentially most competitive sub-sector within the sectoral value chain. It is less capital-intensive than spinning, and has lower barriers to entry.<sup>2</sup>

In this sector there co-exist firms of different sizes, technological productivities and capabilities, both of domestic and foreign (Brazilian) ownership. There are about 300 firms in this sub-sector. This sub-sector is populated by large firms that satisfy the demands for higher quality products and by a large number of smaller firms that produce cheaper lower quality fabrics that are bought by manufacturers of cheaper apparel. The smaller firms serve 50% of the domestic market. Many large firms are vertically integrated with the spinning stage and have scale economies.

There is a sizable productivity gap between both groups of firms.

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*2. Denim is the woven fabric that requires the biggest scale. It demands the use of machines for dyeing the yarn that are amortized only when processing a large volume of fabrics (20km of yarn or 20,000 m<sup>2</sup> of fabrics). Eighty five percent of these fabrics are used to produce jeans.*

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This co-existence is made possible by the fact that the groups target two different market niches.

The largest firms include Alpargatas-Argentina, Grafa-Santista, Santana and Algoselan. We do not have data on productivity for these individual firms, but according to the opinions of our interviewees the Brazilian owned Santana shows the highest productivity, because it has incorporated the machinery with the latest technology. Grafa-Santista (also Brazilian) is perceived to have the second highest productivity, followed by Alpargatas and Algoselan. Alpargatas is devoted both to textiles and to the manufacture of sports shoes (Topper brand); it is vertically integrated from cotton processing to spinning, weaving and dyeing.<sup>3</sup>

Santana is a Brazilian owned firm that had been exporting to Argentina from Brazil during the past 12 years. Approximately 3 years ago they got installed in the industrial park of Puerto Tirol in the Province of Chaco, to take advantage of an industrial promotion regime that provides provincial tax exemptions (on gross revenue taxes and other distortionary taxes). Their plant has cutting edge technology. In order to ensure high quality, 98% of their production is first quality; they are completely integrated from cotton to fabrics. It specializes in the production of denim.

Algoselan-Flandria is Argentine owned. It specializes mostly in denim. However, it also produces other woven fabrics such as gabardines, canvas, rubber treated fabrics for shoes, and others. In the production of these fabrics it specializes in the segments of upholstery and tennis shoes. It buys some of its fabrics from other small and large manufacturers, and finishes processing them itself.

Then come a group of Argentine-owned intermediate scale firms, like Torca and Karatex (which are located in the Province of La Rioja), and other smaller scale firms, like Estampados Rotativos (which is located

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3. *Alpargatas is in the process of being absorbed by Santista. The main interest of Santista lies in acquiring the Topper shoe brand. Santista is already one of the leaders in the woven fabric market in Argentina through Grafa, and it is hence expected that they will sell the textile operations and capacities of Alpargatas.*

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in Parque Industrial villa Flandria in Luján, in the Province of Buenos Aires and started as a dyeing firm), and Printel, which mostly processes and finishes fabrics made by smaller firms through contract manufacturing.

Finally come the smallest fabric weavers, which are located in Luján and which are spinoffs of Algodonera Flandria S.A., which closed in 1996. These small firms usually produce through contract manufacturing for distributors such as Printel or Estampados Rotativos, who do the dyeing and finish the fabrics. This outsourcing occurs because the finishing process, especially dyeing, demands a scale that is beyond the (financial and market) possibilities of the small firms.<sup>4</sup> There also are small firms devoted to producing fabrics for upholstery and drapery, which are located mostly in Quilmes (Greater Buenos Aires area). Production and finishing of these fabrics demands a lower scale than the other fabrics, facilitating its production by SME; the main type of fabric (jacquard) allows the yarn being dyed before converting it into fabric, which saves on machinery and scale (the other fabrics have to be dyed after being manufactured).

Algodonera Flandria S.A. was a leading textile firm located in Luján that had been operating since the 1920s and which in the 1960s employed more than 2,500 staff. It went bankrupt in 1996, and its production facilities and machines were acquired by Algoselan in 2001. Algoselan uses part of these facilities and has devoted and reconverted the rest to create an industrial park (Industrial Park Villa Flandria). This industrial park accommodates the above mentioned contract manufacturing small weavers, which rent the facilities from Algoselan.

To give an example of the kind of specialization patterns which may emerge in the sector we can highlight the story of Estampados Rotativos. This is a sixty-one year old firm that is a weaver and which also provides finishing services for fabrics manufactured by others. The finish-

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4. A dyeing machine for woven fabrics, like RAMA, costs about U\$S 2 millions (most of the independent dyers shut down in the 1990s).

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ing services are allocated 60% to own fabrics and 40% to others' fabrics. Seventy percent of the own fabrics are produced by the firm itself and the rest is acquired through contract manufacturing from small firms.

The firm initially specialized in dyeing and fabric finishing for contract manufacturers, employing only 10-15 workers. In a second stage they started to sell their own products, obtained from contract manufacturers in exchange for dyeing and finishing services. During this stage they started to grow. Then they moved on to buying unfinished fabrics and finishing and commercializing them. Finally they installed weaving facilities. In 2005 they decided to expand, to which end they installed a weaver in the Flandria Industrial Park, renting space that was already apt for textile production. They currently employ 199 workers. They do not produce yarns, but rather buy them from firms like Colortex and Tecotex.

### III.3. Knitted fabrics

The production of knitted fabrics has smaller scale economies than the production of woven fabrics, and requires less installed capacity, which lowers the barriers to entry. Hence there are a larger number of firms than in the weaving sector.

Knitted fabrics use yarns that are softer and more fragile. Production of knitted fabrics is quite rapid and requires low scale: 2 machines generate 25 kg of knits per hour. Production of knitted fabrics requires good quality in cotton, cotton processing, and yarn making and processing. There is some specialization by market niches (women's underwear, for instance) and also some more standard products.<sup>5</sup>

This sector is more atomized. It is populated mostly by 500-600 small and medium size firms, many of which produce high quality products. There are 8 large or medium-large firms, and only two of them are vertically integrated to the spinning stage, using very modern technologies.

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5. *There are important developments in the production of knitted fabrics for sports clothing, especially in the high performance segment, although in Argentina only the final processes are undertaken; the yarn with cutting edge technology incorporated is imported and the only the knitting is done here, so as to adapt the fabric to the latest fashion.*

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This sector presents bigger informality rates than woven fabrics. It is also more competitive and homogeneous than woven fabrics, and there is bigger entry and exit and job turnover. The spinners that are the most important suppliers to manufacturers of knitted fabrics are Tipoití and TNPlatex.

The sector enjoys some natural barriers to foreign competition due to the frail nature of the knits, which can be damaged during their transportation.

Producing knitted fabrics requires good quality in the different stages. The domestic SME compensate the lack of scale with much shorter response cycles and the ability to provide smaller lots than in the case where the fabrics have to be imported. This capability for quick and flexible response is a key for being competitive in the sector that is subject to rapid changes in fashion. This competitiveness is lost when there are failures in the supply of cotton and good synthetic fibers and in the access to dyeing services.

#### **III.4. Apparel**

The apparel sector has high rates of informality (74% of sectoral employment is unregistered). The sector is characterized by the presence of a large number of small informal firms and a large degree of intermediation between production and retail. Intermediation is undertaken by “production organizers.” The sector is highly labor intensive, and very vulnerable to foreign competition (when it seeks to compete via lower costs). In some cases, firms that produce branded products also undertake some more capital intensive activity like cloth cutting.

Since the opening of the economy in the late 80s-early 90s the strategy of some firms was to specialize in brands (the most profitable line of business), while others (the majority) to compete via lower costs by appealing to informality.

Most firms that sell branded products undertake the design and distribution activities themselves, but the production is outsourced. The

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production organizer is in charge of intermediating in this outsourcing process, which is not subject to standardized processes and which is subject to large variability in the final quality of a same product. Often-times the contract manufacturers outsource themselves the contracted production, creating a chain of outsourcing which further lowers quality control and the possibility to exploit any scale economies. Price competitiveness is achieved via informality. Most producers of apparel operate at a very low scale, with poor technologies.

There are a few exceptions of formal and highly productive firms, like Mauro Sergio (Textilana), which has a very modern and high tech integrated production process. This firm is much more productive than the firms that outsource production.

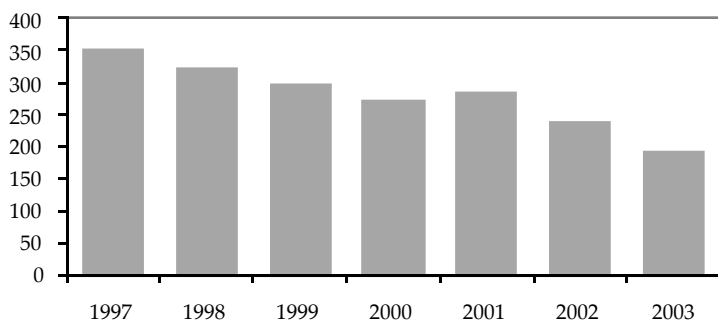
### **III.5. Size and productivity distribution**

The Annual Industrial Survey (AIS) conducted by INDEC provides hard data on sectoral productivities. Information is available at the firm level, albeit only in per worker terms and no weights for each firm are provided. The only 'size' measure in the database is a categorical variable that takes value 1 for small firms (between 10 to 80 employees), 2 for medium sized firms (81 to 200 employees) and 3 for big firms (more than 200 employees). Textile products are included in sector 17 of industry classification (apparel belongs to code 18). There are 194 observations in 2003, down from 352 in 1997.

The Survey's level of aggregation bundles together the spinning and fabrics sector. Hence the changes in the observed distribution of productivity and sizes may reflect both reallocation within each of these sub-sectors or across these sub-sectors (which vary significantly in terms of sizes and technologies).

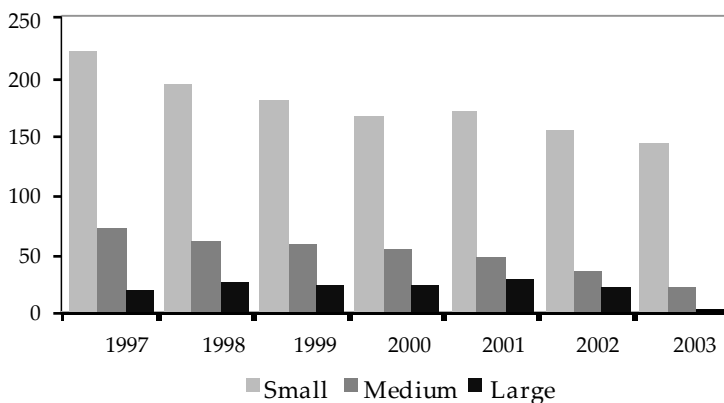
Between 1997 and 2003 there was a marked decline in the number of firms in the textile sector taken as a whole (see Figure 7). As discussed above, the sub-sector of woven fabrics was the one that suffered the bigger exit of firms.

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**Figure 7: Textile products, number of firms**

Source: IERAL - Fundación Mediterránea based on INDEC, EIA.

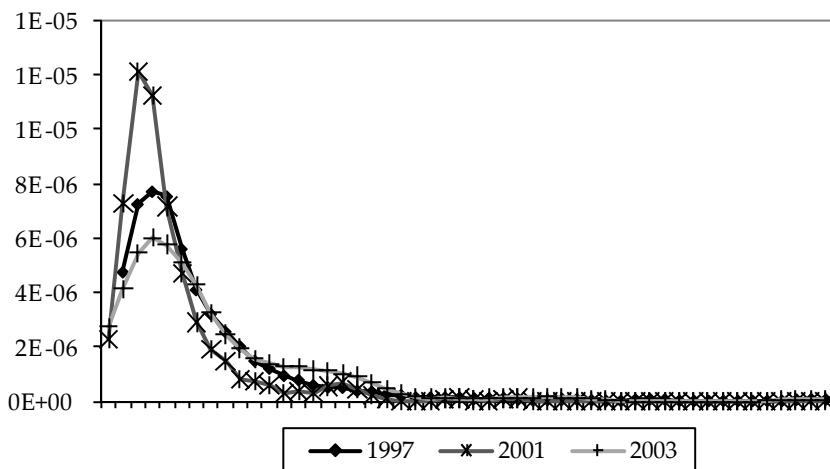
The textile sector has a high proportion (70%) of small companies. Between 1998 and 2001, medium sized firms have reduced their participation markedly, from 23% to 16% (see Figure 8). The reduction in the participation of medium sized firms is consistent with the concentration of exits in the weaving sub-sector.

**Figure 8: Textile products, number of firms by size**

Source: IERAL - Fundación Mediterránea based on INDEC, EIA.

During 1998-2002 a reduction of labor productivity was observed for the sector as a whole. Mean productivity (measured as real value-added per worker) fell from an average of AR\$85,600 to AR\$62,900. During the same period the dispersion of productivity across firms increased. The coefficient of variation for labor productivity rose to 2.08 in 2002, up from 1.23 in 1997. Estimated productivity densities for those years show initially an increase in the participation of low productivity firms between 1997 and 2001, and then a recovery of the share of medium productivity firms in 2003 (see Figure 9). Between 1997 and 2003 there was a flattening of the distribution, with an expansion of the share of medium productivity firms. Hence the dispersion in productivity has increased over time, together with a lower average sectoral productivity. A misallocation towards low productivity firms cannot be blamed for the decline in productivity, but rather a lower investment in quality across the board.

**Figure 9: Estimated density kernels of labor productivity**



Source: IERAL - Fundación Mediterránea based on INDEC, EIA.

Productivity dispersion is much bigger for small firms, which show the biggest coefficient of variation (2.27) (see Table 1). Although average productivity reaches \$96,068, 50% of small firms have a productivity level below \$54,587. Conversely, 50% of medium sized firm's productivities are above \$60,759. The observed gain in the participation of small firms has hence contributed to the increase in the dispersion of labor productivities.

**Table 1: Labor productivity and dispersion across firm sizes**

<b>Size</b>	<b>Mean</b>	<b>Median</b>	<b>Coefficient of variation</b>
Small	96067,9	54 586,8	2,27
Medium	80992,9	60758,8	0,89
Large	49161,7	45542,1	0,23

*Source: IERAL - Fundación Mediterránea based on INDEC, EIA*

The stylized facts on productivity and size distribution are thus that:

- The total number of firms declined;
- The number of exits was bigger for medium sized firms;
- Labor productivity fell 26% for the sector as a whole;
- The dispersion of productivities increased, with a decline in the share of low productivity firms.

### **III.5.a. Firms' technological choices**

Here we provide an illustration of the differences in productivities across firms that compete in a same market segment of the woven fabrics sector, and of their abilities to capture more or less market share.

We consider the intermediate scale firms (Torca, Karatex, Estampados Rotativos, and Printel). Estampados Rotativos takes advantage of the large installed capacity and expertise and capabilities spun by the Algodonera Flandria. Karatex and Torca are bigger firms, which should be

able to exploit potentially bigger scale economies. However, both firms display less flexibility to accommodate changes in demand. This lower flexibility is associated to their bigger sizes (they need to produce bigger volumes of same types of fabrics, which are not always demanded). The smaller scale of Estampados Rotativos allows it to produce competitively smaller lots, and to adapt more swiftly to changes in demand or to small demands of different lots. Its smaller scale also allows it to offer faster delivery and better quality in design and colors.<sup>6</sup>

Estampados Rotativos adjusts the quality of the fabrics to the demands of customers and to market trends. In order to achieve a more uniform quality from contract manufacturers they give them quality norms and provide them with the yarns to be used. The contract manufacturer charges only the weaving service. This firm complains that the yarn that they have access to has a bad price/quality ratio. This firm avers that it has medium-high productivity (6-7 in a scale from 1 to 10), whereas the contract manufacturers that it works with have productivities that range from 4-5 to 7-8, depending on the type of fabric and the technology that they employ. Contract manufacturers have been investing in better technologies buying used mechanic looms of good quality. For these reasons they are not in the same league as the largest fabric manufacturers, for which 94-98% of their production is of top quality.

#### **IV. Barriers to productivity gains**

Next we move on to discuss the evidence arising from the interviews regarding distortions arising from government and market failures, resource allocation and the distribution of productivity.

We anticipate the conclusions, which are that low productivity is caused not so much by inefficient firms stealing market share from more productive firms because of distortions, but rather that the distortions

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*6. Additionally, Karatex and Torca are both located in the Province of La Rioja, where textile workers have poorer skills than those available in Luján, which have accumulated sizable skills and capabilities in the long-standing contract manufacturing textile sector developed in that area.*

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prevent potentially more productive firms from gaining scale, incorporating technology, and ensuring the required product quality. The most important distortions are financial market imperfections (which discriminate against domestic firms, especially the smallest ones, relative to the Brazilian firms), and coordination failures in the form of missing links in the sectoral value chain, which hurt quality and scale. Some trade policy failures also appear to matter.

The market is segmented for firms with different qualities and productivities, which serve different quality niches in the downstream. What this heterogeneity in qualities and productivities does is to prevent the emergence of large and sophisticated enough customers and suppliers that may justify investing in bigger scale, and better technologies and qualities. But the solution does not appear to be to displace the less efficient but to increase productivity across-the-board.

Hence it appears that distortions hurt more via the distribution of productivity than through resource allocation.

The sector as a whole seems to face an output tax arising from the coordination failures and a capital tax arising from unequal access to financing vis-à-vis foreign-owned firms.

#### **IV.1. Scale**

There are potentially large scale economies in the spinning and woven fabric sectors which fail to be materialized due to coordination failures along the value chain and to the predominant technology choices made by firms in this sector.

The choice of scale in Argentina in the fabric sector is associated to the choice of technology and to the scales, productivities and qualities of firms in the upstream and the downstream. In Argentina the spinners are the largest firms, the weavers and knitters have smaller scale, and the firms in the apparel and commercialization stages have the lowest scales. These scales are conditioned by technology choices made in each stage. The way the size distribution of firms is established across sub-

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sectors in Argentina, the upstream firms must “push” the downstream companies in order to ensure that the former operate at full capacity. Some firms in the fabrics sub-sector would like to operate at a bigger scale (and with better technologies), but are hurt by financing constraints and coordination failures.

This market structure is opposite the one observed in the United States, where the retailers (JCPenny, Macy’s, etc.) have bigger scales than the firms that manufacture wearing apparel (such as Levi’s), which in turn have bigger scales than weavers and spinners (like Corn Mills). The market structure in the US works well, because this is a very seasonal market, and highly sensitive to rapid changes in demand.

Hence it is better to have a larger downstream that pulls the upstream stages and that reacts rapidly to changes in demand. Instead in Argentina, the upstream must produce ahead of demand, and try to “impose” the fabrics to be used, which is not how the market works. This insufficient scale in the downstream prevents weavers and spinners from operating at bigger scale and productivity.

## **IV.2. Technology**

There have been important technological changes in the world that allow reducing the requirements of infrastructure (plant area), which is a very expensive input. These changes have doubled the production per m<sup>2</sup> in a very short period of time. However, in Argentina the process of investing in the adoption of these latest technologies is stuck, especially in the area of woven fabrics (there has been a bit more investment in technological upgrading in the area of knitted fabrics). Interviewees claim that this is due to the coordination failures observed in the sector and to financial constraints. More generally, in order to move steadily towards bigger quality and product differentiation it is required to incorporate specific equipments with embodied technologies both for processing and finishing the fabrics; it is not enough to adopt good manufacturing practices that strengthen design and quality.

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Within the woven fabrics sub-sector, only Santana made a top-of-the-line investment in new technology, which is vertically integrated since cotton processing all the way up to production of finished fabrics. This firm invested in high technology machines, which are the most advanced in the world today. This way they have managed to become the cheapest producers of fabrics in the American continent. This technology is highly capital-intensive. It allows producing 1 million m<sup>2</sup> per month with 300 employees, whereas its closest competitors in Argentina need more than 1,000 workers to achieve the same monthly production. Ninety eight percent of this firm's output is of top quality.

According to CEPAL (2004), the recovery of production in this sector in 2003 was based on the re-opening or bigger utilization of installed capacities that were already amortized and far from the world technology frontier. While there was investment since then, the lack of productivity growth was directed towards less productive and low-scale technologies.

### **IV.3. Access to finance**

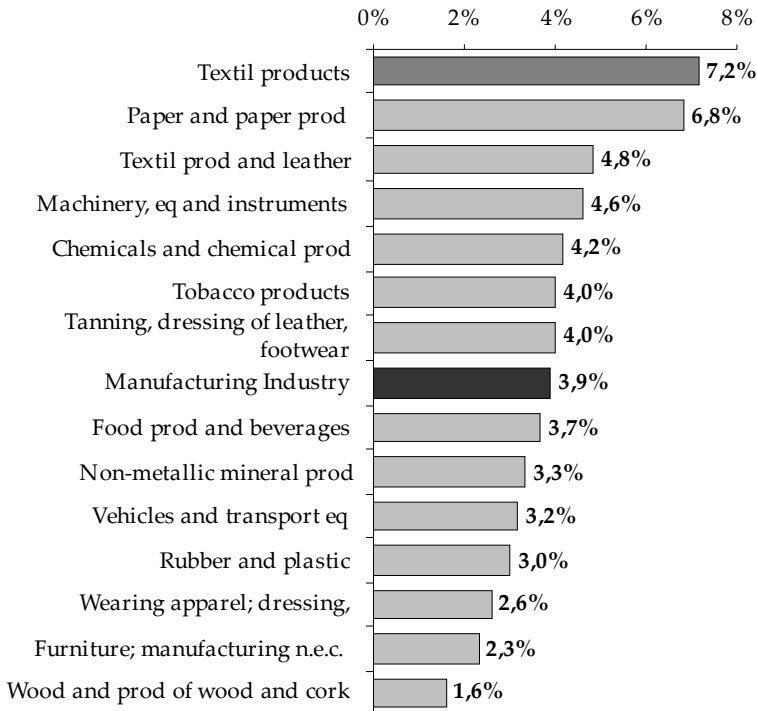
The textile sector (fabrics) is capital intensive, and is becoming more capital intensive over time. The latest generation looms are becoming increasingly wider, in a way that significantly boosts productivity but also significantly increases the amount to invest.

Indeed, the textile sector (yarns and woven and knitted fabrics) in Argentina shows the biggest financial dependence among all the manufacturing sectors (see Figure 10). Financial dependence is proxied in this work by the stock of banking credit allocated to firms in the sector relative to the gross value of sectoral output. Rajan and Zingales (1998) also find the textile (woven and knitted fabrics sector) to be one of the most dependent on external finance in the United States.

This means that in the presence of financial constraints (as estimated by Sánchez and Butler, 2008), the cash flows of firms in this sector may not be enough to undertake the desired investments.

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**Figure 10: Financial dependence in manufacturing**  
**Sectoral banking credit stock in % of gross value production (2007)**



Source: IERAL - Fundación Mediterránea based on CEP and BCRA

According to our interviews, all the stages of the textile value chain in Argentina present important capital shallowing. The interviewed firms that are Argentine owned point out to financial constraints as the main culprit for insufficient investment in the stages of spinning, weaving, knitting and dyeing (together with coordination failures). They consider that their Brazilian competitors have access to much better financing from the BNDES (National Development Bank), which enables them to invest in the optimal scales, and also to do large and productive Greenfield investments with cutting edge technology (like the one made by Santana) and to acquire Argentine firms.

The lack of access to financing explains the increasing participation of foreign capital in the ownership structure of domestic textile firms. When there is scarcity of financing both of investment and working capital, firms end up being sold. The fact that financial constraints currently appear to be binding also suggests that firms' own cash flows for self-financing have dwindled significantly.

This constraint appears to be generating a widening gap between foreign-owned firms that have access to financing investment and the acquisition of technology, and domestic owned firms, which have less adequate scales and technologies. Our interviewees avow that if more adequate financing were available, there would be significant investment in all stages, which suggests that this capital tax is hurting the distribution of productivities in the sector.

The problem is magnified by the fact that upstream producers have to obtain financing not only for themselves, but also for their downstream customers (which they finance with commercial credit). Currently not even the largest firms have adequate access to financing, which has forced them to cut down on financing customers. While in times of macroeconomic stability in the early 1990s the commercial loans maturities reached up to 150 days, whereas currently suppliers like TNPlatex have reduced the commercial financing maturity to 30 days.

#### **IV.4. Informality**

Our interviews reveal that labour and tax informality (low compliance with output taxes and with labor taxes and regulations) in the spinning sub-sector is not an issue because all the firms in the sector are necessarily large (because of the minimum required scale), visible and subject to tax auditing. If any of their customers is informal, it has to pass its tax costs (like the value-added tax) to its downstream clients.

Labour informality rates in the spinning and fabrics sectors taken together decrease significantly with firm size (see Table 2 below). There is a huge discrete decline in labour informality when moving from firms with

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less than 6 employees to firms between 6 and 40 workers, and an even bigger decline when moving to firms with more than 40 employees.

Firms in the spinning sector all have more than 40 employees. The large and intermediate scale manufacturers of woven clothes also fall in this size category. Small weavers, contract manufacturers and most fabric knitters fall in the below 40 category. Hence informality increases as we move downstream, which is coincidental with the distribution of scales across sub-sectors. The average for the sector as a whole in the second half of 2006 (latest available reliable datum) was around 30%, significantly less than the downstream apparel sub-sector (above 70% informality rates), and the economy wide informality rate (around 45%). Small producers in the fabrics sub-sector tend to be informal, and they represent 50% of sales in the woven fabrics sector (and a larger share in the knitted fabrics sector).

**Table 2: Labor informality in the spinning and fabrics sectors**

Textiles (1700) Firm size (number of workers)	Quarter and year						
	II -03	I -04	II -04	I -05	II -05	I -06	II -06
Less than 6	95,91%	72,64%	93,63%	81,14%	52,68%	70,70%	66,67%
Betwe en 6 and 40	66,42%	26,69%	35,34%	53,66%	35,00%	46,99%	31,18%
More than 40	12,79%	13,86%	20,74%	8,67%	16,17%	17,39%	9,20%
Unreported size	69,53%	36,12%	32,31%	62,74%	39,73%	29,90%	57,19%
Sector average	52,00%	30,09%	36,72%	45,40%	30,51%	37,71%	29,92%

*Source: IERAL - Fundación Mediterránea based on Permanent Household Survey*

Non-wage labour costs increase labour costs 45% over wages. Evading payroll (and other) taxes in the fabrics sub-sector may allow the survival of less efficient producers. However, these informal firms are not considered to steal market share from the more efficient firms. Indeed, the more productive firms aver that markets are somewhat segmented,

with informal firms trying to compete via prices rather than via quality, which is very difficult given the lack of international competitiveness in this sub-sector. Larger and formal firms seek to base their competitiveness on quality and scale economies, and target different market segments that are less threatened by international competition. Nevertheless, informality, especially in the apparel sub-sector conspires against the emergence of large producers and retailers in this stage, which in turn hurts upstream firms, which are discouraged to invest in scale and technology.

#### **IV.5. Coordination failures**

Our interviewees coincide in pointing out the lack of coordination among the different stages in the sectoral value chain as the main hindrance that hurts the productivity distribution and that acts as an output tax which prevents the expansion of more efficient firms. They state that all the stages must act in a coordinated fashion for the sector as a whole and for individual firms to be competitive. For instance, there remain important bottlenecks in the provision of high quality services for the finishing of the product (like washing and dyeing; many dyers closed in the 1990s), which hinder the investment in technological upgrading by weavers, which in turn lowers the demand for these services. The lack of these services conspires against the product differentiation that would justify investing in superior technologies.

The fabric manufacturers that we interviewed state that it is necessary to have access to good quality cotton and yarns. Some of them consider that the largest spinners do not offer adequate quality yarns, which hinders productivity and quality in all the downstream stages, all the way down to retail.

These fabric manufacturers consider that the distribution of scales along the value chain hurts this coordination. Due to this distribution there is not an adequate upstream transmission of the characteristics (quality, types, designs, etc.) of the yarns and fabrics that final consumers demand. As a result if upstream spinners decided to sell higher quality yarns they

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would have to use their arms-length relations (or to vertically integrate) with cotton producers and weavers and knitters to generate more uniform high quality, and also to promote a bigger orientation of the apparel sector towards product differentiation. However, they do not have sufficient incentives to do so and as a result they are seen to offer average or low quality yarns. This hinders the sectoral competitiveness, and prevents weavers and knitters from achieving bigger quality and productivity.

Some big spinners, both directly and through business associations, are seen to focus their efforts on lobbying for protection for themselves and their customers instead of focusing more on training, investment, export promotion and brand development. There are other vertically integrated spinner/weavers that are more integrated through arms-length relations with their customers and which promote bigger quality uniformity. However, their strategy is to compete via lower costs, which is considered not to be feasible in Argentina.

There are only a few cases of producers of differentiated wearing apparel that have arms-length relations with SME suppliers that, while being expensive, offer good quality and services, and the possibility of doing joint developments in the area of colours and designs. There are some relatively limited initiatives to form industrial districts where some producers of differentiated apparel provide training and financial support to textile SME that supply them. But this is the exception rather than the rule.

Alpargatas in the past used to sponsor designer competition every year. Winners received not only the award, but also training and the financing of visits and contacts with designers and manufacturers abroad. This competition was discontinued. Many of the top designers in Argentina had been winners of this competition. This type of adequate coordination also existed when Alpargatas had an arms-length relation with Levi's by which it supplied it with denim. Due to Levi's demands, Alpargatas had to raise its quality standards.

For the interviewed fabric producers the optimal thing would be to

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imitate the “Italian model.” In Italy there exist many creative SME in the apparel sector and one large retailer that transmits market demands, exploits scale economies in retailing, and provides financing for suppliers. This generates an adequate backward transmission of demands for uniform quality that permits weavers and knitters to produce at bigger scales and invest in technology, and to transmit the demand for higher quality yarns.

This coordination failure, especially the insufficiently developed network of arms-length relationships, makes smaller firms very vulnerable to macroeconomic shocks, especially to credit crunches. Tax and labor informality in the downstream apparel sub-sector appears to be very relevant for the occurrence of the coordination failure, hindering the emergence of large relevant firms that “pull” the upstream. The lack of large apparel firms can be attributed to unfair competition from informal firms and to the incentives to remain small and “invisible” to the tax authority.<sup>7</sup>

#### **IV.6. Trade policy and international competition**

Fabric makers complain that unfair international competition is a big threat that hurts the ability to solve the coordination failures and that discriminates against the ability of domestic-owned firms to acquire bigger productivity.

There is intense international competition at all the stages of the textile value chain. The imports of yarns and fabrics represented 11% of domestic absorption in 1997, 21% in 2001, 8% in 2002 and 24% in 2007. On the other hand, sectoral exports represented 6% of the gross value of production in 1997, 13% in 2001, 18% in 2002, and 15% in 2007. Imports almost doubled exports in 2007.

Imports of yarns in 2008 represented almost 15% of domestic absorption. It is claimed that this subsector is highly hurt by these imports, especially those from India and from Brazil, which appear to receive

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*7. This large prevalence of informality is consistent with multiple equilibria in tax compliance. If most firms comply, the probability of catching evaders is larger, discouraging informality. The opposite happens when most firms fail to comply.*

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important indirect subsidies through sectoral support policies and subsidized credits. Exports of yarns represent 5-10% of sectoral production and are close to reaching a historical minimum supposedly because of the real exchange rate appreciation accrued until 2008 (which is being reverted now). They claim that it currently is not possible to export to Brazil and Europe because of the loss of cost competitiveness, and that it is becoming too difficult to export to Chile for the same reason.

Manufacturers of fabrics are equally hurt by imports, especially those coming from Asia. It is claimed that the Asian exporters benefit from significant subsidies to the use of labour and energy, which makes domestic firms unable to compete cost-wise (hence the need to focus on quality/differentiation). Argentine firms can compete with imports coming from Brazil, which have an average value of U\$S 2 per kg. But they cannot compete with imports originating in China, which have an average value of U\$S 0.99, and which are considered to be unfair competition. The same complaints apply to apparel originating in China and to the apparel made in Paraguay using Chinese fabrics.

Local producers consider that the Argentine government is too slow to apply adequate trade restrictions that countervail the Chinese subsidies, although they recognize that some reference price and antidumping policies have been implemented.

Manufacturers of commoditized fabrics are also hurt by the fast growth of imports of apparel.

Fabric manufacturers consider that with "reasonable" exchange rates they can compete, but that even at the current real exchange rate they can compete provided they focus on design and differentiation, where they are hurt by coordination failures.

International asymmetries in access to financing are seen to be very important, because the sectoral value chain is facing severe financial constraints. This asymmetry hinders the competitiveness vis-à-vis Brazilian manufacturers, which have access to cheap financing and which also have higher productivities (because of domestic market size, access

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to financing, and better coordination within its textile value chain).

Some fabric makers consider that it is not enough to focus on policies that protect against unfair competition. They aver that without overcoming the coordination failure observed and easing financial constraints, the sector will not be competitive. They think that there is also need to implement export promotion policies and policies that help cultivate export markets. It is considered that Argentina has an unexploited competitive advantage in design and branding.

Trade policy appears to act as an output tax on domestic-owned firms. Brazilian-owned firms in Argentina are less hurt by this policy, as they are part of integrated networks of Brazilian-based regional companies and exploit it to somehow get preferential access to the Brazilian market. But perhaps the biggest wedge is the combination of international competition with access to subsidized inputs (especially capital) with local financial constraints that prevent Argentine-owned firms to invest in the optimal scales and technologies (Brazilian-owned firms get access to subsidized credit from Brazil).

The combination of apparently inadequate trade policies, together with coordination failures along the value chain and financial constraints prevent potentially more efficient local firms in the fabrics sector from investing in better technologies, operating at larger scales and improving productivity and quality.

#### **IV.7. The supply of cotton**

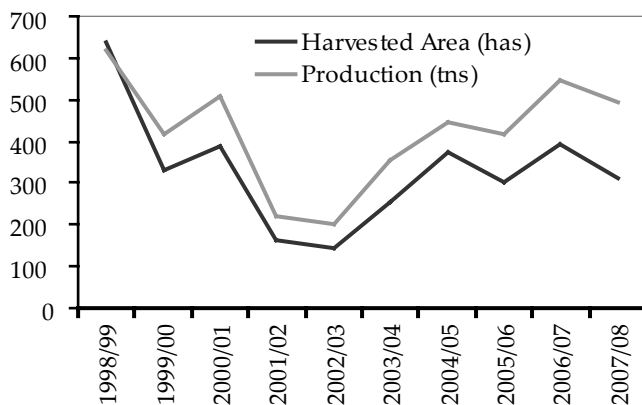
The coordination problems that distort the sector are exacerbated by an inadequate supply of cotton. The textile industry naturally locates in countries that produce cotton.

Argentina has a natural comparative advantage in the production of cotton, and used to have an adequate supply of this product. However, the combinations of bad policies, together with a series of poor harvests, have led to a significant reduction in the planted area and in production (see Figures 11a and 11b). The expansion of the soy planting frontier by

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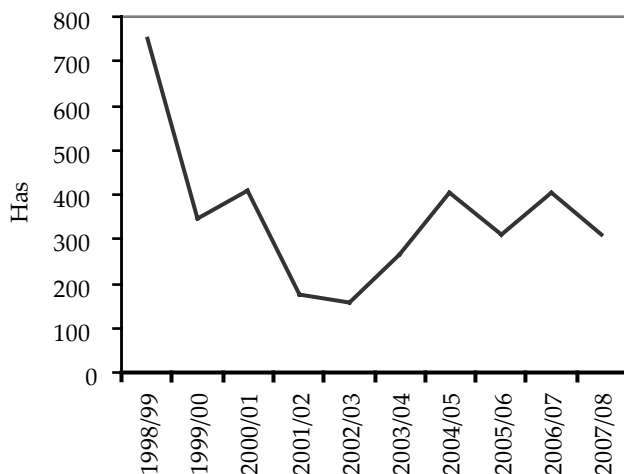
virtue of the adoption of direct seeding techniques and the adoption of transgenic seeds that are resistant to glyphosate significantly contributed to this decline in the planting and producing of cotton.

**Figure 11a: Cotton Production**



Source: IERAL - Fundación Mediterránea based on Agricultural Ministry

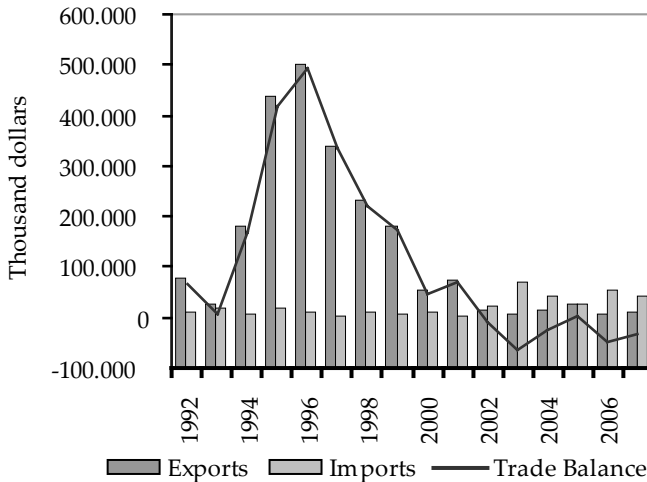
**Figure 11b: Cotton, Seeded Surface**



Source: IERAL - Fundación Mediterránea based on Agricultural Ministry

Argentina even used to be a net exporter of cotton, but since 2002 it became a net importer (see Figure 12). An adequate supply of cotton is not guaranteed now that Argentina has to rely on imports. Additionally domestic cotton prices have become more volatile.

**Figure 12: Cotton Argentine Trade**



Source: IERAL - Fundación Mediterránea based on WITS

#### IV.8. Macroeconomic fluctuations

Demand for textile products is highly sensitive to macroeconomic cycles, and especially the demand for “commoditized” textiles, which compete on a price basis. When there is high volatility, there is a large degree of substitution among suppliers, and “spot” sales may drop drastically from one day to the next (spot sales are those that do not involve specific product developments for certain clients).

The fabric making sector is capital-intensive and requires both adequate production capacity and financing of working capital. Hence negative macroeconomic shocks affect mostly SME through lack of financing and inability to invest. Only firms that are adequately capital-

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ized and/or have developed differentiated products survive economic downturns.

Therefore macroeconomic risk hurts especially the smallest firms. Downturns force them to exit the market, and their high financial vulnerability hurts their access to credit leaving them unable to finance the required investment in equipment and scale, which creates a vicious circle of insufficient investment and low access to credit.

Since the textile value chain needs all the production stages to work in a coordinated fashion, the high vulnerability to macroeconomic shocks of the sub-sectors that are more populated by SME (which include also suppliers of specialized inputs such as buttons, zippers, anilines, etc., and fabric contract manufacturers and most apparel producers and retailers) transmits volatility to all the sectors and firms in the value chain. It is claimed that industry of suppliers of specialized inputs has poor quality and quality control and assurance processes, making mistakes that are very costly to customers.

Exchange rate fluctuations are particularly relevant, especially for those that produce more commoditized fabrics.

Hence macroeconomic volatility feeds into the output wedge (coordination failures) and the capital wedge.

#### **IV.9. Factors of competitiveness**

We inquired in our interviews on the factors of competitiveness, which define which types of firms may thrive and overcome the constraints that hurt their access to bigger quality/productivity.

The two most important drivers of competitiveness in the fabrics segment are the price/quality ratios and the ability to deliver the products in short time and to adjust quickly to changes in the types of products being demanded caused by fashion cycles.

It is impossible for firms in a country like Argentina to compete with Asian producers via lower costs. Besides, as mentioned above, for commoditized fabrics there is large elasticity of substitution: due to exchange

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rate fluctuations and/or foreign subsidies Brazilian importers frequently stop buying Argentine fabrics all of a sudden (these are spot sales of commoditized fabrics). For these types of products there are no arms-length relations.

The biggest comparative advantages that Argentina has are in the areas of design and branding that enable product differentiation (in the apparel sub-sector). Hence one important factor of competitiveness for fabric makers is the development of arms-length relations with apparel producers aiming at generating differentiated products. Production alliances based on design and branding, which allow to charge higher prices for the apparel produced, compensate the undeveloped scale economies. Higher price sales of apparel pull the backward stages of the value chain. The development of telecommunications has created “universal” consumers of apparel. If an apparel firm hits it right with its product differentiation, there is large scalability without need of having lower costs.

In order to be competitive it is also important to have steady access to good quality cotton, and to spinners that are reliable providers of good quality yarns. If yarns are of low quality, then fabrics can at most offer intermediate quality.

Smaller fabric makers seek to base their competitiveness on the development of differentiated products (that compensate for scale economies) and/or, often times, via labor informality and tax evasion. The weavers and spinners located in the Luján area (Flandria Industrial Park) are in trouble because they are trying to base their competitiveness on lower costs, which makes them highly vulnerable to macroeconomic fluctuations (exchange rate and financing).

We next illustrate how difficult it is trying to compete via low cost/prices. For instance, in the case of woven fabrics that have patterns including up to four colors (the case of sheets), individual Asian producers have production volumes of 1 million m<sup>2</sup>, which dwarf the local capabilities (2,000 m<sup>2</sup>) that do not allow exploiting scale economies. If

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an Argentine, Brazilian or Chilean customer (the markets for Argentine fabrics) needs 100 or 200 thousand m<sup>2</sup>, it buys them directly in Pakistan. The Argentine suppliers of commoditized fabrics cover the market niche of customers buying less than 5,000 m<sup>2</sup>, which buy products with a slight differentiation (more colors) at a bigger price.

The demand patterns for woven and knitted fabrics are tied to rapid changes in fashion trends, making the ability to respond quickly to these changes a factor of competitiveness. A prevailing view in our interviews is that Argentine SME should try to compensate their lack of scale with much shorter “response cycles” (ability to deliver products fast in response to changes in demand/fashion) and with shorter series of production (smaller lots). It is possible for Argentine SME to compete based on short response cycles and design, without need to squeeze costs. However, bigger imports put bigger pressure on shorter response cycles and better design.

The textile market shows great volatility in the patterns of demand. Smaller firms may have more flexible production structures that allow a better adaptation to changes in demand (as in the above mentioned case of Estampados Rotativos vis-à-vis- Karatex and Torca).

Within the spinning sub-sector the competitiveness depends on the scale of production, the incorporation of state-of-the-art technology and the availability of good quality inputs at internationally competitive prices. Since they operate mature technologies of production, the achievement of scale and technology is constrained only by access to financing, and also by the size of the market.

## **V. An O-Ring Theory of Productivity Decline for the Textiles Sector**

The case of the textiles sector in Argentina is adequately captured by the O-Ring model of economic development developed by Kremer (1993). In Kremer’s model, production can be divided in either parallel or sequential tasks. Workers in each task can display different levels of quality, which is defined as “the expected percentage of maximum value

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the product retains if the worker performs the task.” In this model the expected value of the marginal productivity of hiring bigger quality for a given task is bigger when the workers in the other tasks have bigger quality as well. The model is set in such a way that quality is equalized across tasks within a given firm in the case of parallel tasks, or that bigger quality is allocated to the later production stages in the case of sequential production. In this model capital and worker quality are complements. In the case where the supply of quality is not exogenously given but rather results from a deliberate investment in quality acquisition by workers, there can emerge multiple equilibria in the availability and utilization of quality.

In the case of textiles we can think of a version of Kremer’s model where there is sequential production, and where firms in each stage must choose which technology (quality) and how much (and what type of) capital to invest in. Each firm’s choice of technology (quality) would depend on the expected quality of the intermediate goods delivered by suppliers (which affect the expected marginal productivity of your own quality), and on the willingness to pay for quality by their customers (which in turn depends on their own qualities). These choices also depend on the cost of technology acquisition, which is largely embodied in capital. These technologies can be imported, at a given international price.

Each firm’s choice of the amount of capital to employ depends both on its choice of quality and on the interest rate, which is exogenously given to the sector. Lower quality will bring down capital investment and viceversa. Given the Argentine capital market imperfections, the interest rate faced by each firm may vary depending on its collateral, net worth and credit history. The choice of leveraging over self-financing may create different degrees of vulnerability to financial shocks. Additional capital wedges may emerge from differences in the access to financing from headquarters (in the case of foreign-owned firms) and in the degree of tax and labor formality (more informal firms face more costly credit and/or have less access to institutional financing).

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The sector is then characterized both by technological differences along the value chain, ranging from the more capital intensive spinning to the more labor intensive apparel, and by the quality choices made in each stage, which are correlated to the quality choices made both in your own stage and in the other stages.

There can be individual chains (arms-length relationships) where bigger quality firms get together. However, if there is imperfect matching along the value chain (or capacity constraints that force you to use different suppliers with uneven quality), a sizable dispersion of quality together with low average productivity would lower the probability of finding a good quality supplier and/or customer, hence bringing down the incentive to invest in quality. What is more, if competing firms within your own stage have low quality, bringing down the average quality in the stage, then in equilibrium there will be little demand for quality from your downstream customers (who find it more uncertain to match with good quality suppliers) and lower investment in quality from your suppliers (who find it more uncertain to match with demanders of good quality), further bringing down the incentive to invest in quality.

In this setup, expected quality (and productivity) will be bigger the lower is the cost of capital, the lower are the output taxes (this is not considered in Kremer's original formulation), and the bigger is the coordination in investing in quality, both within and across production stages. Given the sequential production structure of the sector, if there is lower investment in quality in the downstream (clothing and apparel), then the returns to investing in quality fall across the board. Following Kremer's model, small differences in firms' skills along the value chain may create large differences in sector-wide output and productivity across countries. In this same vein, adverse financial and trade shocks that lower quality and capital of some firms (or force their exit) would lower the quality choices of other firms, with an exponential negative effect on sector-wide productivity, such as it was observed between 1997 and 2003. These negative effects become worse when they prompt exit

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of good quality firms, which introduces bigger uncertainty in the quality matching of surviving firms.

There is an additional dimension in the case of textiles, which is that there coexist differentiated products (higher quality products that fetch higher prices as they deliver bigger efficiency unit to consumers) and commoditized textiles (low quality undifferentiated products that fetch low prices). The segment of commoditized textiles is subject to the competition of Asian and Brazilian exporters, which is based mostly on prices.

Lower quality becomes especially problematic when perforating the floor at which textiles and apparel turn into commodities subject to Asian and Brazilian competition. At this point competition and survival become possible only when appealing to informality in the clothing and apparel stage, which feeds in to lower quality in the upstream.

The evolution of the distribution of productivity/quality in the sector since the 1990s can then be characterized in terms of the firms' responses to different adverse macroeconomic and external shocks. During the early 1990s trade liberalization and financial liberalization that reduced the cost of capital had countervailing effects on quality and productivity. Some firms were forced to exit, and others moved into informality to become competitive cost-wise, which hurt overall quality, but at the same time cheaper capital facilitated investment and the incorporation of technology.

The adverse financial shocks of the late 1990s – early 2000s induced a capital shallowing and/or an important exit process of the firms that were financially more vulnerable (those with lower net worth and less access to government support), many of which displayed relatively large productivity. This exit lowered average quality, hurting the most productive firms, and prompting a process of lower investment in capital and quality across the board. Real exchange rate appreciation during this period further pushed many labor-intensive clothing producers into informality, with deleterious effect on quality. This trend was exacerbated by the competition of the Asian exporters, together with higher

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non-wage labor costs since 2002, which further prompted lower quality and more capital shallowing in this sub-sector and in the upstream.

These shocks hurt more the weaving sub-sector, which is relatively capital-intensive and which employs technologies that cannot be adapted to changes in the quality of fabrics being demanded and to the decline in the quality of yarns, as opposed to the spinning sector. Weavers that had some vertical integration with the spinning and fabric finishing stages (like dyeing) could ensure better quality and did better. This sub-sector experienced a larger exit of firms, together with low quality investment by survivors.

After 2002 domestic demand picked up and labor costs declined because of the devaluation. Domestic firms responded with bigger investment which was not however large enough, leading to a growing sectoral trade deficit. As discussed before, our interviews reveal that there has been very little investment in technological upgrading since 2002, and that many investments targeted less productive equipment with low scale economies. Most of the recovery of production in this sector in 2003 was based on the re-opening or bigger utilization of installed capacities that were already amortized and far from the world technology frontier. This lack of investment in technology/quality appears to reflect the lower average quality in all stages and the quality bottlenecks caused by the previous shocks and also the financial constraints that followed the 2001-2002 banking crisis. The bigger availability of internal funds during the 2003-2008 was allocated mostly to expanding installed capacity without technological upgrading. As a result, sector-wide labor productivity remained stagnant since the late 1990s.

It can be argued that at the time when demand picked up there was a coordination failure to respond with bigger quality across the board, which was exacerbated by the prevailing financial constraints. The exit process was slowed down, but coordination failures prevented the entry of missing links and/or the productivity upgrade in surviving firms that would alleviate the bottlenecks. Hence moving to bigger quality/

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productivity would require both relieving financial constraints, and alleviating capital wedges, together with the introduction of policies that provide a “push” for investing in better quality/technology. Reducing informality in the downstream is another necessary condition for this quality upgrading to occur.

In this vein, the labor-intensive downstream activities were hit by many relevant wedges that discriminated against them pushing them first into poorer quality choices and then into informality in an increasing fashion, creating a vicious circle that eventually moved most of the sector into the production of commoditized goods. These wedges include: a) more stringent labor regulations since 2002, b) the growing Asian competition based on low costs, c) the coordination towards a “bad” equilibrium with low quality. These shocks led not only to lower quality in this sub-sector, but also to a lower investment in capital (because of higher cost of capital and/or wish to remain of lower size to avoid being audited, thanks to the existence of fixed costs of auditing), creating a vicious circle of low quality and low capital, moving the sub-sector further away from the optimal firm size and quality. There is indeed a stark contrast between the large and high productivity clothing retailers and demanders of design in the United States, Italy or Spain, and the atomized low quality retailers, organizers of production and chains of production outsourcing in Argentina.

This model helps interpret the evolution of the levels and distribution of productivity when the sector was hit by these shocks. In 1997 there was a bigger share of low productivity firms, but average productivity was bigger (for all groups) than in 2003 and nowadays, and it was also the case that average productivity was also bigger within each group (low, medium and high productivity; additionally average productivity was bigger for the small, medium and large firms). On the other hand, in 2003 there was a bigger dispersion of productivity than in 1997, and medium productivity firms represented a bigger share of all firms, but average productivity was lower for the sector as a whole and for each

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sub-sector (defined in terms of size and relative productivity) in particular. Hence firms across the board invested less in technology/quality (and in capital). The bigger dispersion of productivity can be attributed to the persistence of previous investments in better technologies by some firms that were made in response to bigger quality availability in the sector in previous times and that have not yet been fully amortized. The exit and capital shallowing processes caused by the combination of financial and external shocks, together with the growing technological backwardness of the downstream, brought forth lower probability of matching with higher quality firms, leading to an overall quality/productivity decline.

## **VI. Conclusions**

Given the sequential production nature of the textiles and clothing sector, and the complementarities in the quality/productivity choices made by firms in different stages and within each stage of the sectoral value chain, distortions do not hurt productivity by causing misallocation (away from the most efficient firms) but rather by coordinating the firms' quality choices towards a bad low productivity equilibrium.

The combination of adverse financial shocks, trade liberalization, recession and real exchange rate appreciation during the late 1990s induced the exit of financially vulnerable firms, capital shallowing, and increasing informality in the downstream apparel sector (which in turn created a bigger capital wedge against the informal firms). This process of exit, capital shallowing and growing informality led to choices of lower quality across-the-board that were self-reinforcing within the sector.

When the currency was devalued, demand picked up and self-financing constraints were alleviated after 2002, firms did not respond with productivity/quality upgrading because of a failure to coordinate towards better quality by surviving firms and to have the entry of firms that would alleviate bottlenecks. Moving to bigger quality/productivity would require both relieving financial constraints, and alleviating

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capital wedges, together with the introduction of policies that provide a “push” for investing in better quality/technology. Reducing informality in *taca* también downstream is another necessary condition for this quality upgrading to occur.

The case of textiles shows how low productivity in some cases may not result from distortions that reallocate resources away from the most efficient firms, but rather from a combination of shocks and wedges that affect the technological choices of some firms that are then propagated to the other firms because of the quality complementarities. Given the sequential nature of production, this case also illustrates how wedges that affect the downstream stages are the ones that are more harmful, feeding back on the upstream through lower demand for quality and demand for different small lots that conspire against scale economies.

This case further sheds light on how recessions in some cases may not have a creative destruction effect that raises productivity by prompting the exit of the least efficient firms and the entry of firms that adopt the latest technologies. Indeed, when there are quality/productivity complementarities the exits may create disincentives for entry and help coordinate towards a bad equilibrium. In this particular case there is the additional dimension that the capital shallowing caused by severe financial shocks further led to poorer quality choices that propagate through the sector. The caveat must be made that we are drawing this conclusion from an episode of economic depression, such as it was observed in Argentina during 1999-2002, rather than from a normal recession.

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## **A. Methodological Annex**

### **A1. Design of interviews**

We base our analysis on the interview methodology proposed by Javorcik, Keller and Tybout (2006). Interviews are conducted on the basis of topic modules. Although we have a standardized set of questions we want answered, the interviews are carried out as much as possible in a conversational manner, with interventions on our part to set the topics (change modules), to motivate further comments when the information is relevant to or in line with the objectives of the study, and to change the focus within a topic when the conversation veers off course. The interview ranges from general topics to more specific topics and from “easy” topics to “more difficult” ones.

The questionnaire is structured in a way that it first provides background information (history, business strategy, cost structure, financing mechanisms, human capital requirements, technology used, and risks and vulnerabilities faced) on the interviewed firm that will help understand better how the different wedges arising from government and market failures may affect its output/price, scale and technology choices. This part of the questionnaire also includes some questions regarding how some distortions affect the decision making of the firm.

The second part of the questionnaire seeks to extract information on the sector where the firm operates: What is its industrial organization? What is the role of FDI? Are there barriers to entry? What type of competition prevails? Do some firms get special (positive or negative) policy treatment?

The third part focuses on the impact of government policies and regulations on the performance of the firm and the sector.

The questionnaire and the approach to the interviews are set so as to induce the interviewee to provide non-strategic answers to difficult questions. Direct questions are used only towards the end of the interview so as to obtain answers that are not offered during the con-

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versation, or to shed light on unmentioned aspects or to test specific hypotheses.

The specific questionnaire is presented next:

*I. Information on the firm*

1. Company's history, structure and business model
    - 1.1. What is the ownership structure of the firm? (National or foreign; number of owners; family firm; public offer firm; state-owned company; structure)
    - 1.2. What is its main market? (Domestic or foreign; national or regional; type of consumers targeted)
    - 1.3. What is its business structure? (Vertical or horizontal integration; alliances with suppliers or retailers; technological alliances; outsourcing; etc)
  2. Company's strategy and product differentiation
    - 2.1. What is the firm's place within the market?
    - 2.2. What are the firm's main advantages with respect to its competitors? What are the main disadvantages?
    - 2.3. Which internal, external and policy aspects are behind the firm's advantages/disadvantages?
  3. Cost structure of the firm
    - 3.1. Which are the costs that weigh in more heavily in the cost structure of the firm?
    - 3.2. Are there significant fixed and sunk costs?
    - 3.4. How important are transportation and distribution costs?
    - 3.5. Are there economies or diseconomies of scale?
    - 3.6. How important are interest rates?
    - 3.7. Are tax costs significant?
  4. Financing mechanisms and structure
    - 4.1. How is the financing of the company structured?
    - 4.2. Has the company access to the capital market?
    - 4.3. Has it access to credit –domestic, foreign, public- or does
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it finance itself with its own resources (equity, cash flow)?

Why?

4.4. Does it reinvest all its profits?

4.5. Is financing an important issue? Does the company face financial constraints on investment or innovation?

## 5. Human Capital

5.1. Is access to human capital a major concern?

5.2. Is it part of the core business?

5.3. Does the company invest in training employees? Why or why not?

5.4. Is it a bottleneck for expansion?

5.5. Is it scarce in the market?

5.6. What proportion of employees needs industry-specific training?

5.7. Do companies steal each other's human resources?

5.8. How do the company's salaries compare to those of its competitors?

5.9. How does labor market informality in the sector affect the availability of skilled workers?

## 6. Technology

6.1. How does the technology employed by your firm and/or the quality of your products and services compare to the rest of the sector and to foreign competitors?

6.2. What is the main source of acquisition of technology by your firm?

6.3. Are there important barriers to technology acquisition?

## 7. Vulnerabilities and Risks

7.1. How important is the domestic economic cycle to the company's revenues?

7.2. Is political instability an issue?

7.3. Is security an issue?

7.4. Are there any risk-related barriers to growth?

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- 7.5. Are there fears of expropriation?
  - 7.6. Are financial risks significant?
  - 7.7. Are there institutional risks?
  - 7.8. Is policy credibility an important issue?

## *II. Information on the sector*

### 8. Competition

- 8.1. Has the industry reached its mature state?
- 8.2. Are products significantly differentiated?
- 8.3. Are there various market niches?
- 8.4. Are there economies of scope?
- 8.5. Is foreign competition important? Is it complementary? How important is the domestic market?
- 8.6. Are barriers to entry important and effective?
- 8.7. Are multinational firms important within this industry? Are they trendsetters?
- 8.8. Does the industry association play a major role?
- 8.9. Do firms have communications channels among them and with the government?
- 8.10. Are there firm-specific government support policies (e.g. small firms, exporters, multinationals) and/or differences in access to financing that may hinder competition?

## *III. Incidence of government policies and regulations on the firm and sector*

### 9. Government intervention and the firm

- 9.1. Has the company used horizontal industrial policies such as investment tax exemption regimes? Subsidized credits?
- 9.2. Has the company benefited from sector-specific government policies? Subsidies? Credits?
- 9.3. Has the company benefited from tax exemptions/deductions/incentives?

### 10. Treatment and impact of foreign competition and FDI

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- 10.1. Is there foreign competition and/or foreign direct investment?
- 10.2. Has this competition been beneficial for the market and, if so, through which channels?
- 10.3. Have supply chains and distribution chains evolved?
- 10.4. Has there been an impact from the entry of large retailers?
- 10.5. What is the effect of foreign competition on the restructuring of the industry and the performance of local competitors?
11. Goods and factor markets regulations and policy interventions
  - 11.1. Do labor market regulations prevent the achievement of optimal employment and scale of the company?
  - 11.2. Do labor, tax and regulatory informality hurt the returns on investment?
  - 11.3. What other regulations hurt your competitiveness? How? How much?
  - 11.4. Are these regulations applied equally to all firms in the sector?
  - 11.5. Do regulations promote bigger informality?

## **A2. Implementation of interviews**

Most of the interviews were done either personally or over the phone. We usually had sufficient time to go through the entire questionnaire, although at times we had to give priority to some questions due to lack of time. This was especially the case in the telephonic interviews. When some questions remained unanswered, emails were used to contact the interviewed and prompt answer was obtained.

Most of the interviews followed the order presented in the questionnaire. We first explained to the interviewees that the goal of the research was to understand the determinants of “efficiency” and “competitiveness” of the textiles sector and how it is affected by market and policy distortions. We never asked the full set of questions presented in each of the sections of the questionnaire. We rather invited the interviewees

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to discuss the general topic of each section. We asked them some of the more specific questions when they were not addressing them, or when they were veering away from the subject. The full set of questions was used to organize the answers obtained.

Our interviews were well received in the majority of cases, and interviewees were enthusiastic to provide the required information. However, in most cases it was not possible to obtain quantitative information.

### **A3. Processing of the interviews**

The interviews were processed along the structure of the questionnaire, taking into account the information and opinions of the different interviewees about the firm, the sector and the policies and regulations that affect them.

This methodology extracted majority opinions, consensus and dissensions. When available, secondary sources (firms' websites, etc.) were used.

When some previous interviews in the sector have been undertaken, some contradictory views on the same issue arose, especially among competitors. This entails that multiple sources of evidence had to be used. Interviewing multiple participants strengthened the robustness of the results.

### **A4. Choice of interviewed firms**

As a first step, the biggest, usually better known, firms and most relevant organizations of the sector were identified as the starting point. From these interviews, other relevant actors were identified. As a result, relevant smaller firms were identified in order to have a thorough understanding of different actors in the sector.

The interviewees were:

- TNPlatex (Carlos Arial, Exports Manager )
  - Guillermo Gotelli, ex manager from Alpargatas and owner of GGM Cordones, another textile enterprise.
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- Santana Textil, (Rodigo Caio, Director Comercial)
  - Alpargatas (Gustavo Frugoni, gerente de producción )
  - Estampados Rotativos (Victor Hugo Bocich, jefe Técnico)
  - PROTEJER, Sectoral Chamber (Mariano Kestelboim)
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