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The financial crisis and the de-stocking phenomenon in the Belgian manufacturing sector

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Nederlandstalige Samenvatting

Deze nota geeft een verklaring voor de enorme terugval in industriële productie, in tegenstelling tot de zeer bescheiden inkrimping van de finale vraag in consumptie, tijdens de recente financiële crisis. Er zijn hoofdzakelijk twee redenen die hiervoor worden aangehaald: (i) het 'bullwhip' probleem (ii) de focus op cash bij industriële ondernemingen.

Het 'bullwhip' probleem, ook wel het 'whiplash effect' genoemd wijst op de complexe 'supply chain', waarbij toeleveranciers hun productie afstemmen op de vraag van hun directe afnemer. In productieketens met vele schakels en leveranciers langsheen de verticale keten zal een initiële kleine inkrimping in de finale vraag daardoor sterk worden uitvergroot verder op in de productieketen. De tweede reden is de focus op 'cash' tijdens de financiële crisis, waardoor ondernemingen besparen op voorraadkosten en daardoor aankopen beperken.

Wanneer overheidsstimuli te snel worden afgebouwd of wanneer er te weinig jobcreatie plaats vindt niettegenstaande economisch herstel, kan dit resulteren in een 'double dip' recessie vooral in regio's met een industrieel weefsel gekenmerkt door een lange verticale productieketen. Het 'bullwhip' effect kan worden vermeden wanneer ondernemingen niet alleen zich afstemmen op de directe afnemer van hun componenten, maar vooral ook rekening houden met de finale productie op het einde van de keten. Een industriebeleid zou hiermee best rekening houden.

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Introduction

The financial crisis, triggered by the bankruptcy of Lehman Brothers in September 2008, resulted in a spectacular dip of industrial production in 2009 and partly 2010. Over the same period, the retail sales remained fairly constant. The strong dip in demand for industrial products was caused by a cumulative de-stocking: the credit crisis created a strong need for cash and companies considerably reduced their inventory levels in order to free up cash. The economic turnaround occurred in the second half of 2010, and industry rebounded much faster than expected. The bulk of the growth came not because consumers were buying more, but businesses stopped reducing inventories and, therefore, had to produce more of what they sold. The upswing of industrial production created again a lot of inefficiencies such as poor customer service and increasing lead times. Manufacturers were not able to ramp up supply fast enough to meet their rebounding demand. This phenomenon is akin to a bullwhip because even small changes in demand can cause a big snap in the need for parts and materials further up the supply chain. In this paper we argue that the shockwave throughout the industrial world was caused by the inventory policy adopted by industrial companies. Due to the de-stocking and re-stocking practices, real demand was distorted along the value chain. A close follow-up and insight in the real state of consumer demand has never been more important to ensure the sustainability of the economic recovery.

1. Retail sales versus industrial production

The economic recession in 2008-2010 has brought about significant turmoil in the business world. The impact on the manufacturing sector has been particularly acute. In this paper we study the reaction of industrial firms viz. the 2008 financial crisis. The crisis is characterized by a never seen fast response of industrial companies to the difficulties in the financial markets. At the same time the industrial recovery in the second half of 2010 rebounded much faster than expected. The same sharp reactions are observed in the employment statistics.

To illustrate this phenomenon, we observe the index of industrial production and the index of industrial sales (National Institute of Statistics) over the period third quarter 2008 up to the third quarter 2010 (see Figure 1). We set the indices equal 100 for 2008Q3, constant prices and seasonally adjusted. We compare these numbers with the index of retail sales in Belgium (National Institute of Statistics) over the same period.

Figure 1 : Retail sales versus Industrial production 2008Q3-2010Q3.

We observe that the index of industrial production dropped to a minimum of 85 (2009Q2) whereas the index of retail sales averages 98.5 over the observed period. There clearly is an overreaction of industrial firms to relative small changes in retail sales. In Figures 2 to 5 (appendix) we summarize the same data for France, Spain, Germany and Sweden (we only show the index of retail sales and the index of industrial production).

US Census data (Peels et al. 2009) exhibit the same behavior in the United States. Retail sales dropped about 12% from September 2008 to the deepest point during the crisis, manufacturing sales dropped almost 30% in that period (Peels et al. 2009).

In Table 1 we show the percentage change (2009) (compared to the corresponding period the year before, 2008) in value added in the industrial sector and the percentage change in final consumer consumption (source National Bank Belgium, 2010)

	2009-Q1	2009-Q2	2009-03	2009-Q4
Value Added Industrial sector	-9.7	-9.8	-7.5	-2.5
Consumption	-0.8	-0.8	-0.1	+1.0

Table 1: percentage change in value added industry and consumption (source: National Bank Belgium)

The evidence above illustrates that consumer sales dropped marginally, whereas industrial production dropped drastically.

2. The Bullwhip effect caused by the credit crunch

The bullwhip effect is short-hand for a dynamical phenomenon in supply chains. The bullwhip effect says that as variation in consumer demand increases, demand variation will increase at each subsequent upstream supply echelon, from retailers to wholesalers, manufacturers and their suppliers. In other words, small changes in customer demand get amplified in the supply chain. The bullwhip problem (also sometimes called the whiplash effect or Forrester effect) has been given a great deal of academic attention (Disney & Lambrecht, 2007). The data in Figures 1-5 reveal something akin to the bullwhip effect, not in terms of demand variance amplification, but in terms of larger sales declines occurring further upstream in the supply chain. Consumer sales only dropped marginally, whereas industrial production dropped drastically.

The reason for this over-reaction is twofold. First, in any forecast driven supply chain, small fluctuations in demand can cause bigger oscillations further up the supply chain. This happens because in many cases, an individual link in the chain will base its desired ending inventory and production forecast mainly on the actual production needs of its direct customer, and not to the demand at the end of the value chain. For example, if a customer's production demand decreases by 5%, the manufacturer will decrease its own production not just by 5%, but even more to adjust its own ending inventory to the new, lower demand level. Based on this amplified production rate, suppliers further up the chain will decrease their production even more, causing an exaggerated demand decrease throughout the supply chain, resembling the growing waves of a bullwhip.

Just as a small dip in demand may induce increased over-reaction at the level of the individual firm, so too we observe the same over-reaction when we examine the behaviour at the more aggregate level of an economic sector. However, the speed of the cuts is significantly higher from previous economic slumps. There is a second reason why this over-reaction is more outspoken than usual. The bankruptcy of Lehman Brothers and the subsequent credit crisis resulted in a tightened focus on cash for all companies. This resulted in a strong reduction in investments and capital expenditure, as well as cost reductions. It also made companies eager to reduce their working capital. The most obvious way to do this quickly is to reduce inventories. Many industrial companies, in search of cash, decided to reduce their inventories drastically. A reduction in inventories under stable or slightly decreasing sales can only be achieved if purchases are reduced or postponed. As a consequence of the decision to reduce inventory, therefore, many companies substantially reduced their purchases of supplies and raw materials. It is the first time we observe such a prompt reaction of industrial firms. Peels et al. (2009) denote the resulting wave as the Lehman wave.

Since (national or international) data on inventories are scarce, we have to rely on recent company data to document the case. Peels et al. (2009) carefully examined two company cases, DSM NeoResins+ and Philips. The DSM case shows that retailer sales were fairly stable (January 2009 vs. January 2008) whereas the resin production dropped by 30%. A similar observation was

seen in the Philips case. Dvorak (2009) cites a semiconductor manufacturing company, where consumer demand had declined 8%, while product shipments fell 10% and chip sales fell 20% due to the de-stocking phenomenon. The Wall Street Journal (January 27, 2010) writes "During the financial crisis, (US)companies slashed $207 billion worth of inventory, helping businesses conserve cash to weather the economic storm". The paper by Dooley et al. (2010) further confirms our statement.

The drop in industrial production during the recent crisis is in sharp contrast with the often stated practice that companies prefer to smooth production (that means, a preference for production leveling to facilitate stability in the production process). A lot of research has been done to find out whether production is more variable than sales – this research question has a long history and empirical evidence shows that the issue is controversial. The recent credit crisis clearly shows that the dash for cash has stimulated firms to react sharply to shocks.

3. Rapid recovery due to re-stocking

In the second half of 2010 we observed a surge in orders and an overall improvement in industrial production. There is now a swing of the pendulum in the other direction. The bulk of the growth came not because consumers were buying more, but businesses stopped reducing inventories and, therefore, had to produce more of what they sold. As the production needs rose rapidly, companies who made severe inventory cuts due to the crisis had a hard time satisfying the new demand. Many companies have decreased staff during the crisis and they were reluctant to re-hire for fear that the surge in orders wasn't indicative of growth in consumer demand. Production capacity was insufficient and because of small inventory levels, their responsiveness was low.

As manufacturers weren't able to ramp up supply fast enough to meet rebounding demand, several industries faced parts shortages. We quote from the wall Street Journal (August 5, 2010) "Ericsson said shortages cost the company $400 million to $500 million in sales and delayed shipments. Royal Philips Electronics NV said shortages constrained sales in its TV and lighting businesses". It is very difficult for suppliers, after a period of inventory reductions, to respond to a sudden jump in orders. The constrained environment (after a sharp reduction of employment levels) caused production lead times to build up. For some components, lead times tripled during the last 12 months.

The bullwhip effect (or the roller coaster effect) now works in the opposite direction and creates all sorts of inefficiencies. Losing opportunities during a recovery period is not good for business; in some instances it can even be catastrophic. Flexible labor contracts stimulated by the Belgian government have proven to be valuable for our companies. It helped to keep the experts on board during economic difficult times.

4. Lessons to be learned from the recent bullwhip phenomenon

The contraction and expansion cycle in the industrial sector as a reaction to the financial crisis has pros and cons. Immediate right-sizing is a justified strategy in economic turbulent times. In a recent McKinsey Quarterly (2010) article, Jim Owens, CEO of Caterpillar, highlights the advantage of the flexibility in their manufacturing system. We quote "We encouraged a significant inventory reduction and we radically reduced production. […] All those built-in mechanisms for cost flexibility that we thought we had, we were able to exercise and execute on. And we actually never had a quarter even of operating loss."

We argue in this paper that the right-sizing was actually an overreaction. Periods of an abundant workforce is followed by a period of labor shortages. A period of excess stock is followed by a period of potential shortages and long lead times. Inventory shortages and long lead times anger customers. De-stocking often goes hand and hand with price reductions and in periods of re-stocking lost sales may occur. The re-sizing of production plants requires a lot of reorganization efforts. What has been destroyed has to be rebuilt in the short run by shutting down and reopening factories.

Flexibility is not the issue; it's overreaction that has to be avoided. What is missing in global supply chain networks is end-to-end visibility or multi-tier supply and demand visibility. It is essential for companies to really know their end markets. Due to the de-stocking and re-stocking practices, real demand is distorted along the value chain. It is not sufficient to merely analyzing the markets for the products that a company makes; companies should rather analyze the end markets where these products are consumed.

It has proven to be valuable for any company to have an understanding of the general stockpiling or de-stocking policies occurring in their supply chain, or in the industry in general. In the United States, US Census collects statistics, and potentially these could provide such insights. In Belgium (or Europe in general), inventory data are not systematically collected. Inventory statistics are not only lacking in national economic statistics, also companies underestimate the value of accurate inventory statistics. Companies are in need of such data to help them make better decisions. Some companies have effective collaboration with key suppliers and customers to share these data. Establishing this communication can reduce the noise, and provide a better understanding of whether reduced demand results from de-stocking or from the behavior of end consumers.

In business schools it is quite popular to play the "Beer Distribution game". This game has a rich history. Growing out of the industrial dynamics work of Forrester at MIT, the Beer Game is now by far the most popular simulation and most widely used game in many business schools, supply chain electives and executive seminars. It illustrates how marginal changes in consumer demands result in dramatic changes upstream in the supply chain. We are afraid that we played the game for real in the period 2008-2010.

5. Conclusion

In this contribution we documented how the industrial sector overreacted to small changes in customer demand. The enormous bullwhip effect was triggered by the financial credit crisis. The potential danger of a cash shortage motivated companies to follow a de-stocking strategy. In 2010 the pendulum returned and companies opted for a re-stocking policy. It reflects the lack of end-to-end visibility and coordination. Companies should reflect on the question “What did we learn from our roller coaster ride?”.

Basically, manufacturers should closely line up production with real-world demands of distributors and retailers. The magnitude of the crisis caused a lot of companies to react in panic. Seeing their revenues and profits decline, they chose to aggressively cut costs and they did that by reducing their production capacity and by laying off employees. This caused a direct hit on companies’ knowledge and expertise. This practice may seem inevitable in the short term but it can lead to even greater problems. Bottlenecks and other headaches may occur as spot shortages cause unexpected price hikes and hamper companies’ ability to meet demand.

More pessimistic economists warn for a so-called ‘double dip’ recession, indicating the situation where a small recovery after a crisis is followed again by a recession. The possible causes of such a double dip in the current economic environment could be a slowdown in demand for goods and services, for example as the temporary effects of government stimuli fade out, or because of continuing layoffs despite economic recovery, reducing consumer demand. In that case, companies will again be oversupplied and will cut back fast. The first quarter of 2011 appears to be very promising in terms of consumer sales, but a close follow-up remains needful.

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Appendix

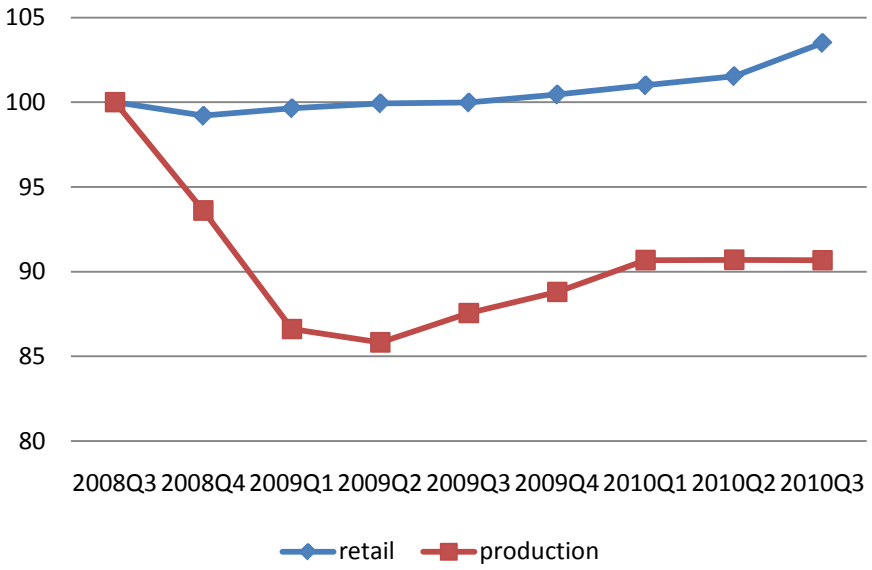

Figure 2 : Retail sales versus industrial production ***France***

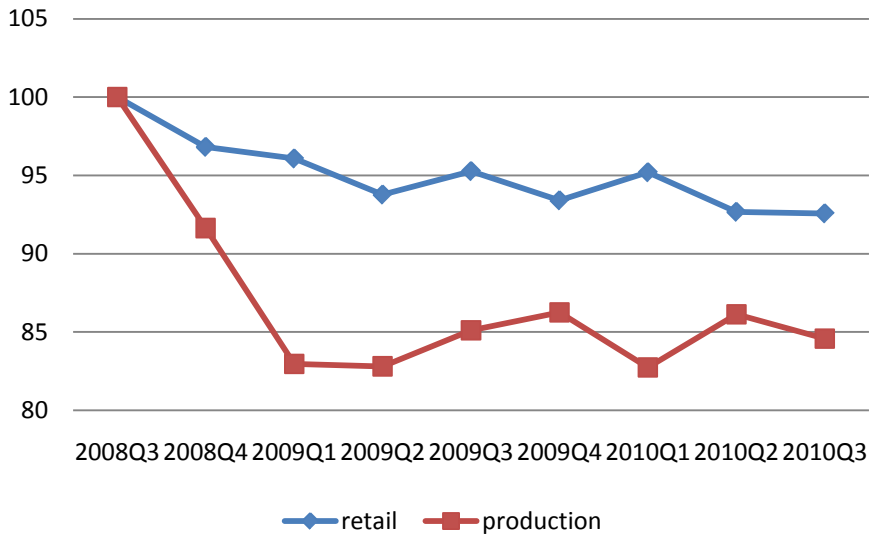

Figure 3 : Retail sales versus Industrial production ***Spain***

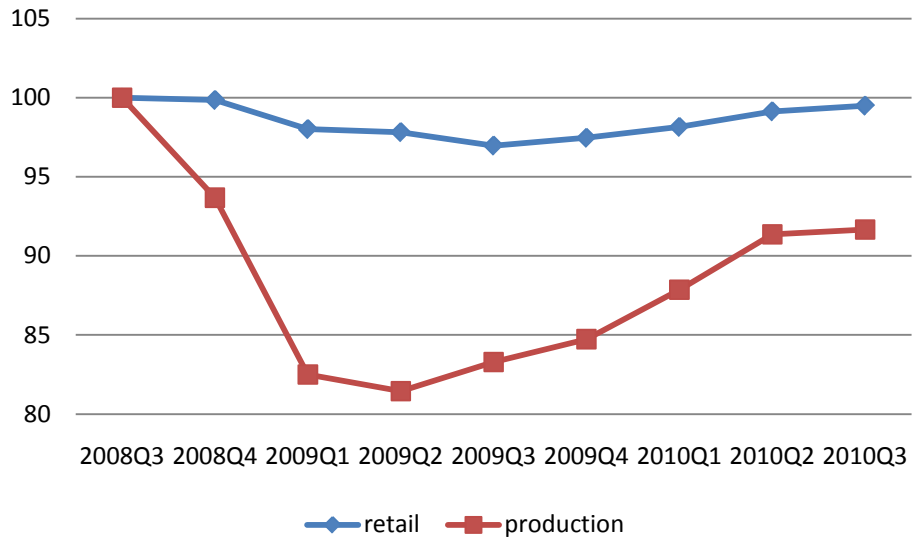

Figure 4 : Retail Sales versus Industrial production ***Germany***

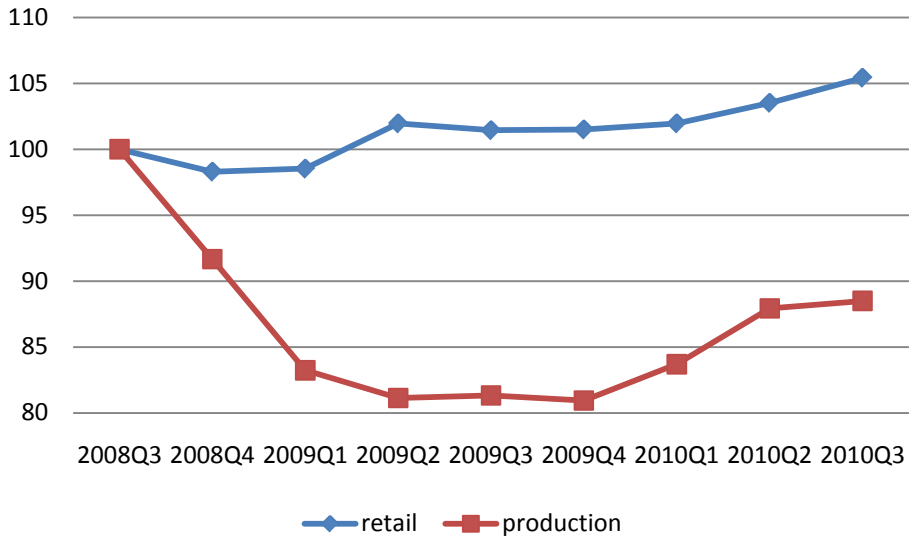

Figure 5 : Retail Sales versus Industrial production ***Sweden***