Cluster la Vista? Crisis and Response in East Germany's Silicon Saxony

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1 The Current Economic Crisis and its Repercussions on Local Production Systems in Germany

Due to weak investment and its world market exposure, having exported 47% of its GDP in 2008, the German economy has been severely hit by the current economic downturn. In the first quarter of 2009 alone, GDP dropped by 3.8% from the previous quarter and by 6.7% compared to the first quarter of 2008 (StBA 2009), which is the fourth quarterly decline in a row and the sharpest slump since quarterly GDP calculation started in 1970. As of late May, the Government expects GDP to contract by 6% in 2009, which would be the economy’s worst year since the end of World War II. Following labour market reforms introduced in 2005, unemployment came down from an all-time high of 5 million to just above 3.2 million in late 2008. Following GDP with a time lag, this figure was already up to 3.6 million by April 2009. Although many companies resort to short-time work to bridge the current weakness of demand, Germany’s Federal Government and the Federal Labour Agency expect unemployment to reach 4 million by the end of 2009, and to rise even further to touch the 5 million mark once again in 2010 (cf. FAZ 2009).

At the time of writing, disaggregated data do not yet reveal directly which local production systems are most affected by the crisis, and which emerge as the most resilient. However, some emergent industry and firm size patterns may allow for tentative assessments. As a rule of thumb, industries producing capital goods or consumer durables feel a stronger impact than those serving consumer markets with short-term needs. Conversely, these industries are among the most buoyant in cyclical upswings. The pharmaceutical industry, for instance, shows little signs of crisis since consumers are hardly willing to cut their spending on basic needs such as health. The same applies to the largest part of the consumer-oriented service sector. Regarding firm size, a survey of German small and medium-sized enterprises (SMEs) indicates that the business climate among these firms has not deteriorated as badly since mid-2008 as it has for large firms (cf. BORGER/GUDE 2009). It may thus be expected that local production systems dominated by SMEs and/or industries serving consumer markets are less affected by the current recession. Generally speaking, Germany’s most competitive export strongholds in the automotive and chemical industries, but most of all in mechanical engineering, suffer most from the weakness of foreign demand. These industries tend to cluster in the most prosperous southern German states of Bavaria and Baden-Württemberg. However, a forecast by the Federal Labour Agency argues that these regions offer sufficient alternative employment opportunities in service industries, while states like North Rhine-Westphalia or the Saarland are likely to suffer most in terms of employment due to a lack of opportunities outside manufacturing (cf. FAZ 2009). Time will tell which regions weather the storm best and emerge most strongly afterwards if industry and firm size are controlled for. After all, the literature on cluster often claims that local production systems can be more resilient in times...
of crisis than more dispersed structures, as the industrial districts of the Third Italy showed in the 1970s (cf. PIORE/SABEL 1984).

2 Silicon Saxony: East Germany’s Showcase Cluster

With 4.2 m inhabitants at the end of 2007, Saxony is the most populous of the new federal states (Länder) that joined the Federal Republic after the demise of the German Democratic Republic (GDR) in 1990. In 2006, Saxony’s per capita income topped the league of the new Länder (excluding Berlin) with 20,815 €, which is still 26 % below the overall German average (StBA 2008, p. 61). Saxony has a long history in electronics and electrical engineering that predates World-War II. In 1951, only four years after the transistor effect had been discovered in the United States and only two years after its foundation, the socialist GDR started to invest in R&D in the strategic semiconductor technology. With critical know-how in the Technical University and the emergence of large vertically-integrated state-owned companies, Saxony’s capital city of Dresden soon became the heart of the GDR’s microelectronics industry. Despite considerable effort, however, the industry was estimated to lag behind the technological frontier by five to ten years (cf. PLATTNER 2003; SILICON SAXONY 2006).

When the Wall came down in 1989 and the two Germanys reunified in 1990, the uncompetitive state-owned companies were quickly dissolved and their value chains disintegrated and diversified. Based on the region’s tradition in electronics and a large pool of specialised scientists and engineers, R&D infrastructure and suppliers, the Government offered massive subsidies to attract multinational semiconductor firms to what was soon marketed as ‘Silicon Saxony’ after a US journalist coined that term when reporting on AMD’s first wafer fab in Dresden (HORNIK 1998). With Silicon Valley in California as the mother of all IT regions in mind, Silicon Saxony is now one of over a hundred so-called ‘Silicon Somethings’. Over twelve years, 12 bn € were invested into Saxony’s semiconductor industry. From 1995 to 2008, AMD alone invested 8 bn USS to create around 3,000 jobs in the region, easily making it the most significant private investor in the new Länder (FAZ 2007). Facing a rapidly eroding manufacturing base, these subsidies were designed to preserve existing capacities such as human capital that might otherwise migrate to West Germany, and to grow ‘industrial cores’ that could stand the test of international competition. Starting with the German company of Infineon in 1993 (which later spun off its memory chip division as Qimonda), US-based AMD in 1996 and German wafer specialist Wacker Siltronic, these flagship investments brought many suppliers with them and helped integrate the local production system into the network of the global semiconductor industry. By 2009, the region’s microelectronics industry had grown to include around 1,500 companies and 43,000 employees (THE ECONOMIST 2009), with its semiconductor core comprising the whole value chain from suppliers and chip design via wafer fabrication to processing, assembly and application, as well as specialised service providers.

The European Cluster Observatory does not provide a deep enough industry breakdown to display the semiconductor industry separately, but ranks Dresden as No. 28 with 16,185 employees in information technology (IT) in 2006. In relative terms, however, the region’s specialisation in IT becomes much more visible: 3.14 % of all regional employment is in IT. This share is almost three times as high as the European Union (EU) average, resulting in a location quotient of 2.81. By both relative measures, Dresden ranks sixth among all EU regions. In 2001, Saxony’s economy exported electronic components worth 1.5 bn €, accounting for 11.5 % of the state’s total exports. By 2005, this figure had increased to 2.1 bn €, or 12.2 %.
Electronic components are thus Saxony’s second most important source of export revenue after automobiles (IHK DRESDEN 2006, p. 23).

The development of the cluster was aided by 1.5 bn € of state subsidies (DUNKEL ET AL. 2008) not including R&D grants, of which Infineon and their partners received 250 mn € for the development of 300 mm wafers, for instance. In the new German Länder, EU regulations allowed for subsidies of up to 35 % of capital investment until 2002. EU enlargement then led to an eastward shift of subsidies, reducing the subsidy cap to 12.4 % from 2003 and further to 11.4 % from 2007. Designed to reduce bidding wars for mobile investment with the EU, these regulations meant that subsidies no longer suffice to compete with e.g. the state of New York which offered 1 bn US$ to AMD for a new wafer fab in 2007. The State Government of Saxony and the regional industry are thus lobbying hard in Brussels for an exemption of the EU’s strict cap on subsidies, pointing towards the strategic role of semiconductors as a key technology generating important spillovers for European industry as a whole. This was a key finding of a study by GRUNDIG ET AL. (2008) that the State Government of Saxony commissioned to justify past subsidies and to strengthen their argumentation.

The Silicon Saxony cluster initiative was established by 20 partners in 2000 and has grown to link 265 firms, research institutes, universities and colleges. In 2008, total membership was made up by 48% suppliers, 20 % manufacturers (OEM), 12 % universities, research institutes, R&D centres and educational organisations, 16 % service providers and 5 % public bodies such as state-level and municipal economic development agencies. The initiative’s corporate members employed approximately 35,000 people and generated an unconsolidated turnover of around 4 bn € (SILICON SAXONY 2009). It organises collective action ranging from networking events through joint representation on trade fairs, human capital building through vocational training and further education, locational marketing and lobbying. As an early collaborative effort between AMD, Qimonda and Toppan Photomasks Inc., the Advanced Mask Technology Centre (AMTC) was established as a joint venture in 2002. Three years later, the Fraunhofer Center Nanoelectronic Technology CNT was set up as one of nine applied research centres of the Fraunhofer Society in the region, equipped with 80 mn € of public funding. Reflecting Fraunhofer’s mission to pursue applied research in close collaboration with industry, AMD and Qimonda provided 170 mn € of project funding. Local chipmakers also sponsor the Nanoelectronic Materials Laboratory (NaMLab) at Dresden’s Technical University. Collective R&D efforts into green IT were honoured by the federal Government’s leading-edge cluster competition in 2008 when the ‘Cool Silicon – Energy Efficiency Innovations from Silicon Saxony’ project proposal was named one of five winners in the first round of this high-profile 600 m € contest (cf. KIESE 2009, p. 40). Besides R&D, which is absolutely critical given the industry’s ever-shortening product life cycles, cluster firms also engage in joint training through the collaborative Dresden Chip Academy.

Saxony’s semiconductor industry is thus a young, emerging cluster built on a traditional regional competency in electronics that is evident from the region’s skilled workforce and specialised R&D infrastructure. Large-scale capital subsidies have attracted MNCs like AMD and Infineon, who in turn stimulated cluster growth through spin-offs and the attraction of further suppliers (cf. MATUSCHEWSKI 2005, p. 340). After two radical systems changes - marked by the foundation of the socialist GDR in 1949 and its demise forty years later - microelectronics are now once again a regional engine for growth and employment, and one of the few significant manufacturing cores that successfully sustained the last two decade of transition. However, the semiconductor industry is one of the most competitive world-wide, facing rapid technological change (miniaturisation), declining prices and an increasing shift of
manufacturing to places offering highly-skilled labour at competitive wages, combined with
government support and subsidies that are not capped by EU regulations. Through its MNCs
AMD and Infineon, Silicon Saxony is plugged into the industry’s global production network
and lacks local embeddedness despite the attraction of many suppliers. It is thus absolutely
critical for cluster policy to root this large-scale investment through networking and constant
upgrading of local suppliers, human capital, and the public R&D infrastructure. Furthermore,
start-up activity still appears unsatisfactory. To prevent the entire cluster from moving else-
where on the globe, it is thus essential to transform the hitherto MNC-driven hub-and-spoke
cluster formation into a Marshallian district that is more strongly rooted in the local fabric and
in which localised assets become a critical resource for the MNCs’ competitiveness (cf. 

3 Crisis and Response

The global semiconductor industry is on a long-term growth path fuelled by an increasing
diversity of chip applications. While the original purpose of data processing still forms the
backbone of the market, demand growth has been fuelled by industrial electronics, automotive
and consumer electronics, as well as wired and wireless communications over the last decade.
However, the industry is not only capital-intensive, but also and highly cyclical. In 2000, at
the height of the new economy boom, the industry’s world-wide revenue jumped up by
around 37 %, only to drop by 29 % the following year, which was even worse than the most
recent forecasts of minus 21 % for 2009. Investment decisions have to be made years before
the products are sold, leading to periodic oversupply and plummeting prices which can fluctu-
ate by up to 30 % within a single month (cf. DUNKEL ET AL. 2008, p. 23). In 2008, leading
Korean manufacturer Samsung alone increased output by 90 % over the previous year, adding
to global stockpiling which is estimated at more than 10 bn US$. Oversupply is further fuelled
by national governments bolstering their domestic manufacturers or trying to attract mobile
investment. If global recession adds cooling demand on top of this, a sharp drop in prices is
inevitable: From July 2007 to April 2009, the price of a 512 MB DRAM (dynamic random
access memory) chip fell from more than 2 US$ to around 0.5 US$ (cf. THE ECONOMIST
2009).

The global financial crisis and weak demand for semiconductors led Dresden’s microelectron-
ics cluster into deep trouble. AMD, which has its largest manufacturing operations in Dres-
den, had to lay off thousands of people world-wide and divest several divisions in late 2008.
The company’s two Dresden facilities have become part of Globalfoundries, a spin-off in
which AMD only holds 34 % of the shares, the rest belonging to investment funds controlled
by the Government of Abu Dhabi. Observers are in doubt about these investors’ commitment
to Saxony; they fear that production might ultimately be shifted to the Gulf state. As of May
2009, the 3,000 staff employed in AMD’s two Dresden plants are working short-time to
bridge the current period of weak demand as long as possible without lay-offs. Of Dresden’s
core manufacturers, Qimonda with its 3,200 local staff was most severely hit, losing around
€ 1.5 bn between October 2007 and June 2008 and facing insolvency when further credits
were denied in December 2008. The state of Saxony offered 150 mn € to provide the much-
needed liquidity, provided that Qimonda’s parent company Infineon give the same sum.
However, Infineon could not provide that much cash as the company had to serve short-term
credits itself. Instead, they lay off 600 employees in Dresden due to weak demand (cf. 
DUNKEL ET AL. 2008). On April 1st, 2009, Qimonda officially went insolvent, closing down its
factory for the time being. The last hope to restore operations would be an outside investor
that might be attracted by further subsidies (cf. THE ECONOMIST 2009). The State Government of Saxony is prepared to buy into Qimonda as a co-investor provided that a private investor comes up with a credible perspective for the company’s survival (cf. JURK 2009). The Qimonda insolvency is not only a sizeable blow to the regional microelectronics cluster, but also directly affects Silicon Saxony’s collective cluster action. It is as yet unclear who will take over Qimonda’s contributions to jointly funded research organisations NaMLab, AMTC or Fraunhofer CMT (see above). Globalfoundries and Infineon have already declined to fill the gap due to their own liquidity problems.

4 Outline: Silicon Saxony between ‘Cluster la Vista’ and new technological trajectories

According to the European Semiconductor Industry Association (ESIA), semiconductor manufacturing is at least twice as profitable in Asia than in North America or Europe. Estimating cumulative profits for a chip plant from 2005 to 2010, South Korea is the most competitive location with 1.43 m €, closely followed by Malaysia, China P.R. and Taiwan. A German location is expected to yield only 653 m €, with Japan and the U.S. performing even worse. Although the industry is highly capital intensive and labour makes up only a small fraction of total costs, the profitability of locations is inversely related to labour costs. For 2010, ESIA forecasts labour costs per hour in Germany to exceed 41 € and in Japan to almost reach the 40 € mark. In contrast, labour costs are still much lower in South Korea (8.60 €) and Malaysia (8.30 €), and even lower in China at 3.60 €, of course. In Germany, this competitive disadvantage is exacerbated by a comparatively inflexible workforce and a shortage of highly-skilled workers.

In the light of these locational dynamics, it remains doubtful if even the nimblest cluster policies can retain significant European semiconductor manufacturing in the long run. Europe’s share of the global semiconductor market has already declined from 15 % to 11 % between 2000 and 2007, while Asia’s share continued to rise from 29 % to 48 % (MARKT & TECHNIK 2009). Of the 40 wafer fabs that were under construction in 2007, only three were in America and two in Europe, but a striking 35 in Asia which is attractive because key customers like manufacturers of PCs and mobile phones are numerous there, and subsidies are abundant. The ESIA blames the appreciation of the euro, more generous subsidies elsewhere and too little R&D spending for this shift. However, a lack of entrepreneurial climate that has led to the emergence of ‘fabless’ firms specialising in chip design in the United States may as well be added to this list - Europe is still too much focused on manufacturing (THE ECONOMIST 2009). The shiny facades of Silicon Saxony looked like an economic miracle in German’s lagging East, but might just turn out as little more than an expensive public venture. When investors ultimately move on to greener shores, it may be ‘Cluster la Vista’ for Silicon Saxony in the end, as DUNKEL ET AL. (2008) suggest.

What strategic options does East Germany’s showcase cluster have to weather the storm jointly brought about by the industrial dynamics and the deepest recession in many decades that has hit key customers like the automotive and consumer electronics industry badly? Lobbying for further state aid is obviously a first reflex, but Federal Government is completely tied up with the highly publicised rescue of carmaker Opel, a subsidiary of the equally ailing U.S. giant General Motors. In the shadow of the Opel crisis affecting several federal states, localised Silicon Saxony fails to attract sufficient public and political attention outside Dresden in a year that confronts German politicians with a range of important elections. Exempt-
ing the industry from EU subsidy caps is highly controversial in light of the state’s limited ability to ‘pick winners’ by preferring one presumable key industry over others. While this has already been criticised by Hayek (1975) as “pretence of knowledge”, pragmatics call the manufacturing of personal computers and mobile phones into memory - both once major sources of employment, but no longer existent in Germany.

However, proponents argue that an exodus of semiconductor manufacturing in Europe would not only cost around 200,000 jobs (both directly and indirectly, cf. Markt & Technik 2009), but could furthermore have severe knock-on effects on the technological competitiveness of downstream industries, especially since R&D tends to follow manufacturing offshore. For instance, it is claimed that electronics and IT are the source of around 80% of the automotive industry’s innovations. While systematic barriers such as a lacking entrepreneurial environment obviously make it difficult to transfer the U.S. concept of ‘fabless’ firms, European semiconductor manufacturers may build on their original sources of competitiveness, which are R&D, innovation and close strategic relationships with their customers, especially in the automotive industry and generally in all markets demanding close producer-customer interaction for the customisation of their inputs. They may thus follow the German steel industry’s model which has long lost its mass markets to Asian competitors but is still competitive in high-quality steel for specific applications. It is little wonder that insolvency has struck Qimonda first, Europe’s last manufacturer of memory chips which have become the basic commodity of the information age, yet highly standardised. Inevitable as it may seem, adopting a niche strategy would almost certainly entail a reduction of employment in the short and medium term.

Silicon Saxony has found a particular response by focusing on promising new technological trajectories, leveraging on the region’s well-developed R&D infrastructure. Examples of such trajectories include energy-efficient IT or the manufacturing of solar panels which is recently emerging as the new high-tech stronghold of the East German economy. In the light of rising concerns about climate change, observers attribute huge market potential to these technological thrusts. Despite their undoubted potential, these ventures have yet to develop their markets and cannot be expected to compensate for the loss of 3,000 jobs through the closure of a chip plant in the short run. However, they allow a glimpse at what Silicon Saxony might look like when the age of wafer manufacturing should come to an end - maybe it will be a gradual transition to Saxony’s Solar Valley. Since quite a few photovoltaic firms emerged as spin-offs from the large chipmakers, the seeds for a more endogenous regional development path to replace the hitherto dominant branch plants are already in place.

References


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3 The location quotient divides an industry’s employment share in the region by its share in overall EU employment, thus indicating the region’s relative specialisation in an industry.