

Conference

**Low-Tech as Misnomer:
The Role of Non-Research-Intensive Industries
in the Knowledge Economy**

29 + 30 June, 2005

Charlemagne Building, Room S1, Rue de la Loi 170, Brussels

Abstracts of the conference papers

Hartmut Hirsch-Kreinsen:

Low-tech industries – innovativeness and development perspectives

The contribution introduces the PILOT project and its main findings. The starting point – a critique of the widely held focus on high-technology – and the context of research on low-tech industries are summarised. Secondly, the project's objectives and methodology are discussed. Generally, the project aims at deepening the understanding of growing knowledge intensity of the economic and social development in Europe. It is assumed that the process depends not only on industries with frontline technological knowledge but also on low-tech industries. Thirdly, basic findings of the project will be presented. This part aims at an generalised overview of project results which will be elaborated in more detail in the conference papers. Fourthly, the author discusses policy issues derived from the findings. One key policy issue is to start and support activities and measures raising the awareness on low-tech industries and their specific needs and conditions. A fundamental precondition for this is the development of a new, broader understanding of innovation that does not equate innovative ability with excellence in R&D alone. Finally, it is emphasised that in spite of globalisation and growing competition, prospects for low-tech and medium low-tech (LMT) sectors and companies are not necessarily bad in the high-tech countries of the European Union.

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Aris Kaloudis, Tore Sandven & Keith Smith:

Structural change, growth and innovation – the roles of medium and low tech industries, 1980-2000

It is often argued that high tech industries drive growth processes. This approach argues that low and medium low-tech industries have declining shares of output for two reasons: their growth is lower, and they are relocating to low wage economies. If true, this would imply that shares of high tech output are rising significantly in

growing economies, while low tech shares are falling significantly, and that countries with larger high tech sectors will exhibit higher growth rates. The paper examines such claims, using OECD manufacturing and trade data for the period 1980-1999. It challenges the argument that high tech industries drive growth, that growth in low tech is lower and that low tech relocate to low wage economies. The paper shows that overall economic structures of OECD economies have changed, particularly reflecting the growth of services. Within manufacturing, however, structural change has been rather small, and does not account for the growth that has occurred. Comparative industrial structures persist, and growth performance across countries is not correlated with shares of high tech. The slowness of structural change means that LMT sectors remain the largest components of manufacturing output and employment in OECD economies. Trade patterns for LMT sectors are examined, showing that changing domestic demand for low tech manufactures has largely been met by changing domestic production. There has been no trade-driven 'hollowing out'. It is argued that LMT industries persist because of pervasive innovation within them – they are constantly renewed by technological upgrading, which accounts for their survival and growth.

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**Staffan Laestadius, Trond Einar Pedersen & Tore Sandven:
Towards a new understanding of innovativeness – and of innovation based indicators**

The aim of this paper is to contribute to a new start of measuring innovativeness and creativity within the business sector and thus to widen perspectives in analysing and promoting capabilities and processes that contribute to profitable firms and growth. Basically it is a technical paper arguing for a renewal of our toolbox of indicators for capturing knowledge formation in industry. It starts with a discussion of the original Schumpeterian concept of innovation; a concept which has no necessary connection to science or technological originality at all. What counts is not the science base but all professional creativity which can attract the market. This opens for a better understanding of the creative processes taking place in so called low-tech manufacturing sectors as well as in many service sectors, not the least those labelled Knowledge Intensive Business Services. The core section of the paper is devoted to a discussion of an alternative to the system of technology indicators used within the OECD and the EU. The authors argue for a family of five indicators all of which may be based on a small set of variables. Instead of compiling these indicators to a composite index – which is common practice within the EU – the paper suggests that using them together may capture the variety of innovativeness within and between sectors. Indices related to design intensity, technological intensity, skill intensity and innovation intensity are supposed to add to the more traditional R&D intensity in the work to capture different aspects of firms capabilities to innovate and to stay competitive. The suggested family of indices is finally “tested” on Norwegian data. Although they have been collected for other purposes the test reveals that the suggested system of indicators is capable to show the variety within sectors and

between firms as regards knowledge formation and innovativeness. In fact, this limited test, already, provides a more diversified picture on the innovativeness of the business sector than what is provided by the conventional tools.

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Gerd Bender & Staffan Laestadius:

Non-science based innovativeness – on capabilities relevant to generate profitable novelty

The starting point of the paper is the widely held assumption that the ability to permanently generate and market innovations is one major precondition to maintain competitiveness of European based units and thus to contribute to employment. The authors argue that R&D in the established sense is only one and mostly not the most important asset for an organisation's innovativeness. Drawing on the literature on dynamic capabilities a concept of innovation enabling capabilities is introduced. It is composed of two dimensions, transformative and configurational capabilities. The former focuses on the enduring ability of an organisation to transform globally available general knowledge into locally specific knowledge and competence, the latter on the enduring ability to synthesise novelty by creating new configurations of knowledge, artefacts and actors. Three specific aspects of configurational capabilities are established, cognitive: configuring distributed knowledge of different kind; organisational: configuring distributed actors and other repositories of knowledge and know-how; and design: configuring functional features and solutions. The distinction between transformative and configurational capabilities is strictly analytical; empirically the two dimensions are tightly interwoven. And innovations require both. The different dimensions of innovation enabling capabilities are illustrated drawing on examples from a selection of company case studies conducted during the PILOT project.

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Klaus Schmierl & Holm-Detlev Köhler:

Organisational learning – knowledge management and training in low tech companies

With special regard to matters relating to the work force the paper discusses distinct features and strategies of LMT companies which allow them to generate and reproduce a competitive and innovative knowledge base. It addresses two main questions: What characterises knowledge management and personnel policy in successful LMT companies? And how is knowledge in LMT companies being created, organised and mobilised in the long run? Both knowledge management and personnel policy are activities of major importance for the development of what we call transformative capabilities of a firm. This concept refers to processes of adaptation, use and recombination of available knowledge, processes which are

shaped internally mainly by a company's technological or organisational means of knowledge management and by its dominant personnel policy (including training and the use of skills and qualifications). The authors present evidence from the PILOT company case studies that LMT firms are characterised by a predominance of incremental knowledge accumulation and of informal training on the job. The paper concludes with the thesis that though these LMT specific ways of knowledge management and personnel policy add to high transformative capabilities they may at the same time be an obstacle to the creative reproduction of transformative capabilities in the long run.

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Francesco Garibaldo & David Jacobson:
The role of company and social networks in low-tech industries

Drawing on empirical data from PILOT field research as well as current theoretical literature on globalisation the authors examine firm embeddedness and the importance of the social context for innovation and competitiveness in LMT industries. They highlight some challenges brought about by globalisation, namely the new international division of labour led by cost competition and a devaluation, in the global value chain, of the manufacturing activities that are typically the main feature of LMT firms. Facing these threats means adopting new company strategies and upgrading managerial capacities. But beyond firm-level changes, the authors stress the importance of the social context in which the firm operates for innovative capacity and international competitiveness. In other words, besides the technical context for innovation, equally important is the social environment. Environments that favour innovation are characterised by high levels of social cohesion, based on collective decision-making processes, or governance, involving all relevant stakeholders from government, the business community and labour. The paper concludes that, given the role of LMT industries in driving employment and growth, policy must focus on building the innovative capacity of low- and medium-tech firms, in particular by strengthening firms' social environments through the creation of strong intermediate institutions and institutional infrastructure for the provision of local, collective goods. Such institutions should be created through the combined effort of public institutions and local stakeholders in order to create social contexts that favour a process of continuous innovation and evolution. More generally, policy should be aimed at creating a sound industrial environment by guaranteeing a sophisticated organisational setup, a highly skilled work force, and encouraging cooperation among different actors at all levels.

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Paul Robertson & Pari Patel:**New wine in old bottles – technological diffusion in developed economies**

As new and old technologies generally co-exist in the complex production methods that characterise major sectors of modern developed economies, it is important for policy makers to analyse them together in order to take full advantage of complementarities and optimise outcomes for entire economies rather than for individual industries. In this paper, we look at the interrelationships between technologies of different vintages from three perspectives. Firstly, we develop a short theoretical model to demonstrate the *reciprocal* connections between industries that are generally described as being “high technology” with the other sectors that rely more heavily on “non-high tech” methods. Through the use of patent data, we then show that long-established industries that are not generally thought of as being high tech often employ cutting-edge knowledge in their own research and development and, by extension, in their other activities. Finally, we use sectoral case studies to show how so-called high tech knowledge is used in specific long-established industries. Our conclusion is that relationships between high tech and non-high tech sectors are highly symbiotic and that the health of high tech firms and industries depends heavily on their ability to sell their outputs to other sectors in developed economies.

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Tadeusz Borkowski & Aleksander Marcinkowski:**Dilemmas of Policy on LMT Industries – the Polish case**

The paper discusses some aspects of the specific status of LMT industries in Poland and – to some extent – in other new EU member states. The LMT sector in Europe has been shaped by numerous historical forces which still influence the observable differences between enterprises located in western and eastern part of the continent. The agrarian past of a majority of Central and East European societies, poor industrial traditions, strong impact of the so called socialist industrialisation, years of communist ruling and finally transformation process and imperatives of market economy – all this resulted in a lower level of innovativeness of Polish LMT sectors and of the country’s economy as a whole. The authors develop a sociological model helpful to grasp such diversity of conditions. Central idea of the model is that every organization (enterprise) has its own *innovative competency* composed of intra- and extra-organisational knowledge as well as of practices of their productive (e.g. for innovation) use. Such practices are influenced not only by systemic traits of organisations but also by impact of the environmental institutional and cultural forces operating from outside. Historical and contemporary effects make economic policy on LMT sectors difficult – the main difficulty is a “dilemmatic” structure of choices planners of the economic future of this sector have to make; a list of basic dilemmas is presented. The final part of the paper is devoted to policy conclusions and recommendations.

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**David Jacobson & Kevin Heanue:
Policy conclusions and recommendations**

In the first section of the paper we consider, from the policy perspective, the problems that arise from the tendency that still exists in policy-making circles to concentrate to a disproportionate extent on R&D-based innovation at the expense of other kinds of learning and innovation. There emerges from this discussion, evidence of substantial improvement in recent but there remain problems arising from the remnants of the 'linear model'. Exploring the conceptualisation of non-R&D based innovation and the associated issue of the appropriate indicators that should be used to describe such innovative activity was a central component of the PILOT project. Some reflections from this analysis are included in first part of this paper. In the second part of the paper we present some of the empirical policy findings from the PILOT project which were collated at three governance levels, European, National, and Regional, and also from case studies of individual firms. Also derived from the case study material, and outlined in this section, is a discussion about the firm capabilities necessary for innovation. In the third part of the paper the emerging policy conclusions and recommendations are presented. Among the main conclusions, ranked from the general to the specific, are the following:

- There has been an increased awareness in the policy community of the complexity of innovation issues, but policy gaps remain. Arising from this, we suggest a specialist LMT unit in the European Institute of Technology/European Research Centre.
- There is a lack of awareness among firms of policy for innovation in LMT industries;
- some policies are perceived very differently by different firms;
- training is a problem, particularly in relation to the particular bundles of skills required by firms in LMT industries;
- recruitment is a problem, due to the negative image of the LMT industries and to skill shortages.

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