CMEA and COCOM Abolished: Restructuring Precision Engineering Industry in Hungary

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Abstract

The Hungarian precision engineering industry, although fairly successful in the pre-war period and able to survive all the adverse corollaries of planning and CMEA orientation, might be wiped out by the long-awaited marketisation: far more competitive and powerful foreign competitors can now enter both its former single most important market, i.e. the former Soviet Union, and the domestic market. Thus accumulated knowledge of R&D and production engineers as well as the experience of the highly skilled blue-collar workers, albeit of primary importance in this industry, might become completely worthless and disappear. Combined with fresh capital, access to new markets, recent technologies and up-to-date management methods, however, it can (and should) be regarded as a major asset and the indispensable basis for successful restructuring. This paper suggests that sweeping changes in size, ownership, internal organisation, and product range are also inevitable so as to be able to adjust to the new environment.

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1 Introduction

Precision engineering products are widely used: basically in all industrial sectors, as well as in public and private services, such as health care, education, energy and telecommunication networks, military, environment protection, etc. The economic and technical performance of precision (or instrument) engineering industry, therefore, has far-reaching implications: it influences the productivity and competitiveness of companies in other sectors, and hence it has bearings on prices and employment; and can significantly contribute to improve our well-being through its impacts on health services, education, and other services, as well as via effects on our environment.

These wide-ranging applications also suggest that there is strong demand for precision engineering products in a healthy economy. This has been the case in the advanced countries, indeed, in the 1980s. Various measuring, monitoring and controlling equipment are inevitable to reduce costs and improve product quality. Thus companies striving to enhance their productivity and competitiveness apply more, and more sophisticated, precision instruments. Ageing population, a major concern all over the world for national health care systems, boosts the demand for medical equipment. Environmental issues are also gaining importance, and hence there is an increasing pressure to install measuring and analysis instruments so as to investigate harmful effects on man, animals, plants, soil, air and food. Thus precision engineering has enjoyed increasing demand in the 1980s. Hence production and employment have shown a more or less steady growth in all the three major economic regions. (See Table 1)

Recent political and concomitant economic developments, however, have completely different impacts on the Hungarian precision engineering industry. It has been hit most severely by loss of markets, hence production and employment have been shrinking rather sharply, some 30-40% a year, since 1988-89. The industry might be wiped out by the long-awaited marketisation of the Hungarian economy (and that of its former major customer, the ex-Soviet Union) though its track record would deserve a much brighter future.

Hungarian precision engineering companies, relying on their own R&D results and licences, well-trained engineers and skilled labour, had produced a wide range of high quality instruments since the 1880s. Until the Second World War they had been *interconnected to the world economy* by *exporting* civilian and military products as well as having *subsidiaries* in European and South-American countries while both co-operating and competing with *foreign firms* in Hungary. Major European companies, e.g. Siemens, AEG, Zeiss, Brown-Boveri, Philips, Goerz, had either subsidiaries or joint ventures in Hungary. *Technology transfer* had been intense in both directions, due to ownership relations and licence agreements.[1]

By the late 1940s precision engineering companies had been *nationalised*, like all others. Internal organisation and management methods had been changed in due course in order to comply with central planning and meet CMEA, primarily Soviet, demands. Contacts with former Western owners and trading partners had been severely curbed due to the fundamental political conflicts between East and West, notably in the 1950s. Due to the nationalisation and reorientation towards CMEA needs Hungarian precision engineering industry *had lost its*

[1] For more detailed historical accounts see Koroknai [1975] and Pintér [1971].

former international competitiveness. Since the 1960s, however, quite a few companies were able to exploit opportunities stemming from the imperfect 'insulation' of the 'capitalist and socialist world economies': they had *imported advanced Western technologies* through licence and know-how agreements, and exported their products in bulk to the CMEA and developing countries at a premium price. COCOM restrictions, somewhat ironically, had even strengthened this special competitive advantage of the industry. These measures had effectively blocked the entry of major Western companies but not prevented R&D efforts to develop advanced products (or replicate them via reverse engineering). Hence companies producing military instruments and dual-use IT products used to enjoy a fairly comfortable, safe position, both in the domestic and CMEA markets. All in all the industry has remained reasonably successful - though in a rather different political and economic setting.

As the long-lasting success story ended in 1988-89 some sort of restructuring, e.g. in the forms of reorganisation of large companies, incorporation of plants, emergence of small private companies, started before the systemic change and the collapse of the Soviet Union. These latter moves, however, have required even more radical steps and substantially accelerated the wrenching changes. The fateful challenge this sector faces right now is whether it is possible to save, at least partially, the accumulated skills and knowledge by means of restructuring and privatisation.

This paper, relying upon sector statistics and enterprise case studies, is aimed at providing some building blocks for a comprehensive answer to the above question by describing and analysing the ongoing restructuring process. Restructuring theoretically can occur in several ways: via the turnabout of existing firms, through the emergence of new ones, including the entry of foreign firms, and/or as a combination of these methods. Though new firms apparently abound in the sector, most of them have been established as a consequence of the reorganisation of existing large enterprises; in other words they are not genuine new entrants. Only a few foreign companies have entered the industry until the end of 1992 but none of them through green-field investment. The following discussion, therefore, focuses on the former rather than the latter way of restructuring.

The remaining part is organised as follows. *Section 2* highlights current changes as reflected by basic statistics (absolute and relative size of the sector, openness, financial indicators and market structure). Then *Section 3* summarises the major findings of the case studies with regard to the external effects and influences, such as the loss of markets, competition, suppliers; and the internal changes, like management strategy, product range and quality, technology and investment, internal organisation, skills and training. Finally, conclusions and a tentative industrial taxonomy are presented in *Section 4*.

2 Severe decline, radical reorganisation

2.1 Absolute and relative size of precision engineering

The notion of precision engineering refers to an industrial sector, defined by the Central Statistical Office, rather than particular activities throughout this paper. The major products of this sector include scientific, medical, industrial, electronics, and optical instruments and devices, both military and civilian ones. Since all products of large, diversified precision engineering companies are reported in the sector's output, statistics cover quite a few other

types of goods as well. The sector accounted for 2.4% of net sales and 4.3% of exports (8.7% of exports conducted in roubles while only 1.7% of those conducted in hard currencies) of manufacturing industry in 1989.[2] Some 2% of the capital stock (1.9% of gross value, 2.2% of net value) of manufacturing industry was deployed in precision engineering in the same year, and 2.4% of investment took place here. As Table 2 reveals, all these indices have diminished by 1991, i.e. *the sector is shrinking*. Taking into account that manufacturing industry has also declined in this period, it clearly reflects that precision engineering has suffered even harder times. Employment data suggest the same conclusion: the number of employees fell by almost 30% in the sector while only by 13% in manufacturing as a whole from 1990 to 1991.

Table 3 reinforces the observation that precision engineering has been hit hard: net sales (on constant 1989 prices) dropped by almost 30% in 1991 compared to the previous year.

1992 data are only available for companies with at least 50 employees. These figures, reported in Table 4, indicate that this segment of the sector has declined even more dramatically: by some 50% in 1992, after a similar drop in output and revenues in 1991. A considerable part of this shocking fall is most likely due to the splitting up of former large companies. (See below in Section 3.4.)

2.2 Exposed to the export markets

Precision engineering companies exported a significant part of their output until the late 1980s (some 45-46% in 1988-89). The vast majority of exports, of course, was conducted in roubles (three quarters of total exports, or, in other terms, 34.3% of output in 1989, see Table 5). Due to this skewed structure of exports and the collapse of CMEA, *export-sales ratio plummeted* to a mere 26.8% by 1991. *Imports almost tripled* between 1988 and 1991 (doubled from 1989 to 1991).

Case studies indicate that exports continued to fall in 1992 while imports further climbed.

2.3 Financial difficulties

Loss of markets has entailed *fatal financial difficulties* for most firms, indeed. As costs can never be reduced proportionally with sales (see in more detail in *Section 3.4.*), significantly lower revenues cannot cover expenses. Thus *most companies' balance sheets were in the red* both in 1990 and 1991. Hence gross and net profit margins aggregated at the sector level were negative numbers. (See Table 7) Most likely similar financial results can be expected for 1992 as well. Banks, coping with a mass of doubtful loans, are unwilling to grant credits to companies in a declining industry, let alone if they are in a near-to-bankruptcy situation. In such an environment companies do not trust each other, hence require a rather *obsolete method of payment*, that is *cash*, instead of supplying in advance and waiting for uncertain bank transfer. One can also witness the *renaissance of barter* deals, as companies are eager to seize any opportunity to sell their products. A somewhat bizarre corollary of this development

[2] Hungarian statistics have also been undergoing major changes in the transition period. The Central Statistical Office has published only estimates (i.e. not exact data obtained from questionnaires) on firms with less than 50 employees until 1992 though these firms' output has been of a growing importance since the mid-1980s. Data on all firms, obtained from balance sheets, have only been available since 1989. Therefore it is not possible to compile consistent, unambiguous times series so as to provide a clear-cut comparison between the last `peaceful' years (1987-88) and the present `revolutionary' ones.

is that precision engineering companies' managers now try to act as brokers, e.g. on the fuel market.

2.4 Market structure: dissipating dominance of mammoths

Contrary to the pre-nationalisation period - which can be characterised by a peculiar size distribution, that is, a host of small enterprises together with a few really large firms - monopoly-type situations had been prevailing in the sector, just as in the whole economy. Though during the so-called 'reform waves' the notion of competition had been praised, practical measures had not promoted it substantially.[3]

Entry *of private firms* had been limited by a number of factors, e.g. lack of legal and economic opportunities to accumulate capital and invest it; unfavourable regulations and taxation for the private sector; also 'tailored' obstacles to purchase raw materials, especially imported ones, as well as to access to loans and other financial services; lack of appropriate legal forms. It should be noted, however, that some of these barriers were `lowered' already in 1982. Since then quite a few small private and semi-private enterprises have been established. Some of them have been really successful and grown at least to medium-sized or even large.

Entry *of state-owned firms* had also been a rare phenomenon for obvious reasons. Planners had favoured 'coping with' fewer and larger enterprises, rather than establishing small and medium-sized ones, as it would have made their life more complicated.

The only consistent time series on current changes in the size distribution comprises solely 1990 and 1991 data.[4] In spite of this snag significant changes can be observed quite clearly. Table 8 reveals that *the number of companies has considerably increased,* in particular that of *small firms*,[5] and more importantly, *small and medium-sized companies account for an increasing share of employment and net sales*. In other words, *companies above 500 employees are losing their weight*. Firms with 101-300 and 301-500 staff exhibited a rise both in employment and sales, while their number remained the same. This implies that *medium-sized firms were best able to stabilise their positions during the turbulent transition period*.

It should be stressed, however, that *these apparently new companies should not be regarded as genuine entrants* for two reasons. *First*, most of them used to be operated in the sector as production units of large, multi-plant enterprises, with hardly any autonomy. *Second*, these 'new', 'independent' companies are still governed by their former headquarters, especially in those cases in which a majority stake was retained in these recently incorporated companies, frequently 85-95% of shares. (Their current and would-be impact on competition is discussed at a greater length in Section 3.2.)

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[3] An extensive literature has addressed these problems. Space limits prevent referring even to major contributions. For empirical analyses, different assessments and further readings see studies by Havas, Schweitzer and Voszka given in the References.

[4] 1988, 1990 and 1991 data on size distribution are only available for companies with more than 250 million forint turnover. As smaller companies accounted for 23.8% of the sector's sales in 1989, this time series is only relevant to reveal changes in a certain segment of the sector, but definitely not to characterise it as a whole. 1990 and 1991 data are available on the aforementioned `smaller' companies, i.e. on those having less than 250 million forint turnover. The most important details of these two time series will also be analysed.

[5] E.g. from 189 to 262 in the case of firms with not more than 20 employees, and from 17 to 28 in the 51-100 size category.

It is also worth highlighting some details of the two other time series:

- as for companies with more than 250 million forints turnover, two size categories have shown a significant rise: companies with 51-100 employees and those with 100-300 staff. Their shares have increased from 0.2% (1988) to 3.1% (1991) and from 3.8% to 13.7% in terms of employment, in the two categories respectively, and from 0.03% to 7.3% and from 7.2% to 23.7% as far as net sales are concerned. In the meantime the number of companies with more than 1000 employees has been halved and their share in net sales plunged from 70.5% to 36.4%. It clearly indicates that *large companies have been split up to medium-sized ones*, i.e. not genuinely new entrants have entered the sector.
- in the case of firms with less than 250 million forints turnover, really small ones, i.e. those with not more than 20 employees, have expanded their share, e.g. from 28.8% to 41.9% in terms of sales, as their number has increased by almost 50% in a year, i.e. by 1991, from 182 to 254. This suggests that besides splitting up the large companies, *new small firms have also been established*.

Concentration indicators also reveal that *large companies are losing their weight*. The share of the 5 largest companies (in terms of sales) in employment, net sales and exports was around 40-50% in 1988-89 but only 20-30% in 1991. (See ***Table 9***) This is a long-awaited, favourable development, without doubt. However, figures clearly suggest that this is *due rather to the severe market crisis of these mammoth companies than to the healthy mushrooming of small and medium-sized enterprises*. In other words *large companies are shrinking much faster than the sector*:

- In two-three years, their personnel has slumped by two thirds, hence their share in employment has plummeted by 50% (from 42% in 1988 to 21.3% in 1991).
- As for net sales, their share has halved by 1990. Though it notably recovered in 1991, still remained below the 1988 share by one quarter. Their domestic market share has shown exactly the same pattern.
- Their weight in exports has also considerably declined by 1991 (by 13.2 percentage points, or by 28.9%).

2.5 Privatisation

Privatisation data are not available at sector level. Case studies and other information suggest that quite a few state-owned enterprises, like in other sectors, have already incorporated into joint stock companies or *kft* (a legal form similar to the German GmbH), but the `new owners in the most cases are the former headquarters or other state-owned enterprises and banks. (Others also have to be incorporated by 30 June 1993 according to a government decree but some exceptions cannot be ruled out.)

Data on foreign direct investment are not collected at sector level either. What is available from balance sheets, however, is the foreign stake in founding capital. (See Table 10) It should be stressed, however, that further investments after the foundation are *not* reflected by these data. It would be therefore misleading to use them to analyse the role and extent of foreign direct investment.

3 Adjustment at firm level

This section juxtaposes the most important challenges of transition and enterprises' capabilities and competences. First external effects and influences are discussed, such as loss of markets, competition, suppliers and infrastructure, in the latter case 'intra-mural' components, too, then the internal attributes of enterprises, i.e. management strategy, production range and quality, technology, investment, internal organisation, as well as skills and training. The underlying issue is adjustment: what sorts of strategic responses have been formulated, what measures have already been taken, and what factors hinder restructuring at firm level. The analysis is primarily based on enterprise case studies.

3.1 Loss of markets

The most striking characteristic of the transition is the loss of former markets. This development should not be surprising at all if one considers that transition itself has been made possible by the collapse of the Soviet Union - due to the long-lasting and severe economic crisis the political power required to maintain the Soviet type economic and political system was eventually lost.[6] This, in turn, has led to the termination of the CMEA, the most important market of the Hungarian economy for decades, including, of course, precision engineering as well.

The rather bitter general picture obtained from the sector statistics has been reinforced by enterprise case studies. A 50-60% fall in sales and employment is not a rare phenomenon, neither are bankruptcy and liquidation. Quite a few companies, even some long-established large enterprises, traditionally bailed out by government measures, have gone into *bankruptcy* and now are being either reorganised or liquidated. In other words, a virtually unknown phenomenon in the planned economies, that is *exit*, has also occurred.[7]

These tough changes can be attributed to the skewed export orientation of the sector, that is, the heavy weight of the former CMEA. (See Table 11)

Case studies have revealed that a significant share of domestic trade had meant indirect exports to the CMEA. In other words, major Hungarian buyers had been large enterprises exporting their products, for instance buses and other vehicles, to other Central and Eastern European countries. Therefore the former ***CMEA countries***, in particular the ex-Soviet Union, used to be the main markets for most precision engineering companies. The majority of these enterprises can now export to the CIS countries *only a small fraction of their former sales, if any*. Demand for their products has vanished, e.g. in the case of military goods and electronics components (see in more detail later on); or their former buyers, for instance hospitals or declining engineering companies, are not in a position to pay in hard currencies or offer `hard goods' for barter deals. (On the effects of import liberalisation and competition of Western firms in these countries see Section 3.2.)

Some products, however, are still sold to the CIS countries in a *considerable volume*. These are crucial to control, maintain or extend large energy systems or communication networks, and their users, occupying strong positions in the CIS countries, for instance oil and

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[6] From the vast body of literature see e.g. Antalóczy [1989], [1992], Csaba [1992], Hughes, Hare [1992], and Zon [1992].

[7] For details on the Hungarian bankruptcy legislation see Chapter .. by A. Inzelt.

gas companies, are able to offer 'hard' goods for barter or can even open letters of credit. On the other hand, these buyers are in a (semi) *lock-in situation* since switching costs (including not only buying new equipment and scrapping the old, but learning effects and network externalities as well) would be prohibitive.

In these cases there is a *significant gain for the Hungarian exporters*. In the late 1980s, when intra-CMEA trade was still conducted in roubles, 1 rouble was equal to some 26-27 forints while 1 US dollar to around 70 forints. The exchange rate of the rouble, though, was around 0.9 US dollar. Thus prices of Hungarian goods, expressed in forint, automatically increased by 2-3 times when the US dollar replaced the rouble. It should be emphasised, nonetheless, that only a few Hungarian firms have benefited from this peculiar development.

Other items, such as medical and measuring instruments or painting robots, might regain their market once these countries recover. *Competition with advanced and newly industrialising countries' companies*, though, has become genuine since all trade is conducted in hard currencies and this might prevent Hungarian producers from recouping their former position.

Military products, which used to account for a significant share of exports to the former Soviet Union, *can hardly be marketed* for a number of reasons: *(a)* as the former military barter agreement was ceased by the late 1980s due to the severe budget cuts in Hungary, the Soviet interest in procuring these goods had disappeared (before the Soviet Union was abolished), *(b)* the Cold War has ended, COCOM restrictions have eased, thus Western suppliers could enter, *(c)* overall military demand has also declined as scarce hard currency should be used to purchase badly needed food and investment goods. What is more, case studies have unveiled that *arms conversion is extremely difficult* or sometimes even hardly possible.[8]

Electronics components have been wiped out literally overnight. Their suppliers lost immediately their former competitive advantages when prices had to be paid in hard currency instead of transferable roubles. Obviously it is more rational to buy much cheaper south-east Asian products in this new situation.

A *substantial fall* can be observed in the ***domestic*** market as well. As mentioned above, a significant part of this drop is due to the collapse of the CMEA. Other important reasons for the loss of ground include *import liberalisation*, in particular in the case of consumer goods, promoted aggressively by Western suppliers, and *cuts in defence procurement*. A few exceptional cases indicate, however, that firms producing simple, widely used, general-purpose industrial instruments basically for Hungarian buyers can enjoy relatively stable market opportunities.

A radically *new opportunity* has recently evolved for the Hungarian precision engineering enterprises in the domestic market as major car manufacturers, Suzuki, GM and Ford, have established plants in the country. So far only a few of them have been accepted as suppliers of various parts and components, since the requirements of the above automotive companies, both in terms of quality and timing, are too rigorous for an average Hungarian firm belonging to any industrial sector. In addition, these (potential) customers, having long-established

[8] See e.g. Havas [1992b].

relationships with their former suppliers, tend to rely on them.[9] Nonetheless, they have to find some more Hungarian partners rather soon for two reasons. First, some of them have promised to 'localise' their production up to a certain degree in exchange for obtaining lower-risk investment terms by special agreement with the Hungarian government. Second, if 'outsiders' want to sell their cars in the EC, which is a must once the Hungarian market is saturated in few years, at least 60% of their value added has to be produced in the EC or its associate member countries. (Otherwise they would either be subjected to heavy tariffs or compelled to import parts and components from EC countries, which seems to be a more costly solution, given higher wages and transportation costs.)

Developed industrialised countries have accounted for a fragment of sales. Hungarian products can only be sold in these markets if their suppliers have their eyes open to find *niches* where they can compete on *quality* with producers from developing countries, and on *costs* with indigenous ones, broadly defined. These products are either *knowledge-based, but produced in small batches*, e.g. specific measuring instruments in telecommunications, and hence *product development costs do matter*, or require *highly skilled labour*, like sophisticated optical components and instruments. In some other cases both development *and* production costs are of significance, e.g. in the instance of so-called 'soft' medical laser applications. It is, of course, much easier to maintain or even increase these exports, if Western partners, known through former trading relationships, set up joint ventures in Hungary. In general, privatisation with foreign investors is deemed in this sector, too, to be of crucial importance to provide access to new markets, especially in the developed countries.

3.2 Competition

The *pre-war period* can be characterised by rather *fierce competition* of a number of domestic and foreign suppliers. It also should be noted, however, that in spite of the rather intense competition and the presence of major Western firms, *market forces had been significantly constrained* by

(a) cartel agreements of Hungarian and foreign suppliers,
(b) government regulation of employment and production in exchange for subsidies, and
(c) military procurement.[10]

After nationalisation, however, entry barriers, in particular administrative ones, had been prohibitively high for decades in the Hungarian economy. Moreover, so-called parallel capacity of companies had been ceased by ministerial decrees, and the number of firms substantially reduced by centrally decided mergers and acquisitions. Hence *competition had hardly been possible, simply for lack of competitors*.

The other source of competition could have been the supply of foreign manufacturers, but ***imports*** *had been severely restricted for the previous decades*.

Hence most firms had enjoyed a monopoly situation in the ***domestic market***. To a lesser extent this had been the case in the ***CMEA countries*** as well, due to specialisation agreements, though in these markets other suppliers, both Eastern and Western companies,

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[9] In more detail see Havas [1992a].

[10] To characterise this complex situation, it is worth mentioning that special forms of competition had evolved, e.g. competition for subsidies and/or major government procurements or various, sometimes even orchestrated steps to prevent competitors from being granted subsidies or receiving government orders.

had also been present. In the ***world market***, on the contrary, they had had to face fierce competition. Hard currency revenues, therefore, had been collected primarily in the developing countries (unlike in the successful pre-war period).

Both market structure and import regulations have been altered by transition. Their impacts on competition, albeit pointing to the same direction, are of considerably different importance in the ***domestic market***.

Entry of indigenous manufacturers has not caused significant changes yet. Quite a few of them should not be regarded as new entrants, strictly defined, as they have operated in the sector for decades as plants of large companies. On top of that, most new legal entities are not really autonomous businesses. They are still owned and controlled, at least in strategic issues, by their former headquarters, hence mammoth enterprises have not been really split up. To boost competition, these 'new' companies have to become really independent actors, and learn how to do business, as the vast majority of them had only been responsible for manufacturing, and thus had no experience in R&D, finance, buying and selling, etc. Clearly, this learning process takes time. Once their market positions have been established they might have an impact on the behaviour of the other actors. Moreover, quite a few of them are *still the only Hungarian producer* of certain goods, e.g. lenses, crystals.

From an efficiency point of view the most advantageous development is likely to be that a rather significant capacity - e.g. foundries and other general-purpose material processing equipment, installed so as to circumvent shortage of parts and components, and available exclusively for the former parent companies, hence dreadfully under-utilised in most cases - *will (should) be used much more exhaustively so as to make profits*.

There are *genuine new entrants* as well, but *their impact is even weaker as yet*, since they are really small enterprises.

Foreign companies have entered merely through privatisation, i.e. no green-field investment has been undertaken by them. Hence *the number of suppliers has not increased this way*. Nonetheless, their impact on competition has not been negligible, and, indeed, is likely to be really significant as they have introduced new products and technologies as well as new financial and marketing management techniques. These developments *compel their Hungarian competitors to be innovative, broadly defined*, if they are to survive. Foreign companies' behaviour as buyers should also be taken into account since *their requirements*, e.g. reasonable prices, high quality and timely shipment, *has considerable influence on the performance of their suppliers*, including Hungarian precision engineering companies as well.

Import liberalisation, on the contrary, *has drastically rearranged the domestic market*. Some products, e.g. electronics components, have been *wiped out* as imported ones are much cheaper. In other cases, for instance in the water meter market, a *severe price war* has started between Hungarian and foreign suppliers. *Aggressive marketing methods*, including not only forceful advertisement campaigns, but bribery as well, have also been mentioned quite frequently by the interviewees. While the former is so obvious that it does not require any proof, the latter one by its very nature can neither be verified nor disproved with scientific methods. It is a fact, however, that most Hungarian firms can finance neither costly promotions, simply for financial reasons, nor bribes, as the notion of 'constitutional costs' is unknown in the Hungarian accounting system.

Yet there are even more tough steps taken by foreign suppliers to increase their market share in Hungary. A simple one is to acquire a majority stake in a competitor company and, after a while, close it down. A rather more sophisticated one from legal point of view, but otherwise a quite straightforward action, is to offer a certain amount of money if the Hungarian competitor terminates the production of given goods.

Competition has become genuine in the ***former CMEA countries*** as well since all trade is conducted in hard currencies. As buyers now have to pay with '*real money'*, as opposed to the 'transferable rouble', they consider how to spend their money. Moreover, they now have a *real choice*, as major Western firms, eager to seize the market opportunities emerging from the opening up of these countries, are flooding in. In such a situation, *price and quality do matter*. As mentioned above, quite a few Hungarian products were not able to survive this unaccustomed, harsh selection. Some other factors are also at work to fortify this adverse development. While *Western companies* are in a position to offer *favourable loans*, usually guaranteed by their governments, Hungarian firms cannot afford to do so, as they badly need cash and the government has not elaborated any large-scale, effective scheme to back exporters.[11] *Bribery* has been mentioned as an important 'marketing tool' in these markets as well. Again, it has not been possible to verify this information.

To conclude, quite a few Hungarian companies are likely to lose partially or entirely their market shares in these countries, but others can make of use their fairly strong positions, such as long-established relationships with buyers and (semi-) lock-in positions of their customers.

As the domestic market is likely to shrink in the coming years, and the former CMEA countries do not really offer bright perspectives either, *restructuring should result in becoming competitive in the* ***advanced countries***. A relevant measure of the success, therefore, would be the sales in these markets, say, in 5 years.

3.3 Suppliers

Now it is usually easier to find reliable suppliers than few years ago, but *there are still problems with the quality and timing* of shipments, and *prices are considerably higher*. Moreover, domestic suppliers tend to require *cash*, whereas foreign ones either *advance payment* or letter of credit. Hence it is even more expensive to purchase parts and components.

It is worth mentioning other adverse developments, too, as they are at odds with simplified text-book economics. One would expect that *demonopolisation and unleashed market forces should result in competition among suppliers*, hence in lower prices, higher quality and better customer service. In some cases, however, *quite the opposite change has occurred*. Special equipment, e.g. shaking (jolting) machinery, so-called clean workshops, used to be operated exclusively by large precision engineering enterprises. As their financial positions have been deteriorating and orders diminishing, they have shut down these workshops, leaving those who would still need these products without any supply. New firms have not entered yet since

[11] Further research might clarify to what extent this is due to ideological reasons, and to economic ones, namely trade and industry policy considerations, lack of adequate financing because of budget deficit and indebtedness, etc.

these technologies are rather costly to install and require special skills to operate. Thus users now have to import these parts and components, i.e. usually to pay higher prices.

The other unexpected phenomenon is that *in spite of the seemingly intense competition some suppliers are unreliable*. They want to make 'easy' money by charging high prices but do not really strive to keep their contracts. However, competition should oust these firms in the longer run.

3.4 Infrastructure

As for external infrastructure, the precision engineering industry has also had to suffer head-aches, but none of them is of sector-specific. Major problems include a slow and costly banking service (a simple transfer usually takes 2-3 weeks); cumbersome customs procedures; an overloaded, obsolete telephone network (preventing the introduction of up-to-date information systems required for efficient decision-making); and tardy communication between Budapest and other regions.

'Intra-mural' infrastructure also poses problems. First, obsolete heating systems and insufficient insulation put energy bills up. Second, shrinking companies require less space for production but buildings are not 'elastic'; they do not contract with falling output, thus infrastructure costs do not diminish proportionally with sales, hence significantly lower revenues cannot cover expenses.[12] Once buildings are substantially under-utilised, it might be better to clear and sell them so as to collect some money. Yet, it is rather costly to move machines to another building.[13] Moreover, in certain areas, both in Budapest and elsewhere, there is an excess supply of empty industrial buildings. Superfluous machines cannot be sold easily either.

3.5 Management strategy

The most important strategic goals of firms, regardless of their ownership, include trying to retain at least partially their former markets, find new ones, introduce new products, and, as a result, move from the red into the black (or reduce losses in the shorter run). It is worth emphasising that some of them, while facing the challenges of loss of markets and diminishing sales, have started to enlarge their R&D budgets and intend to continue this course in the coming years.

Special attention is paid to CIS countries as the former most important markets. The question to be answered here is whether these economies are likely to recover and provide market opportunities for their former Hungarian exporters. Most managers interviewed opt for 'yes'. If they are right, their 'simple' task is to analyse which products - whether present ones, slightly modified variations, or substantially re-designed and improved versions, or brand new goods - will be marketable on these would-be markets, then elaborate and implement a strategy based on this analysis. Nevertheless, there is no ground to exclude the other scenario,

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[12] It is even worse if the costs of idle buildings have to be shared among various units which are becoming independent firms but using the same infrastructure. Of course no one is willing to cover the costs of unused infrastructure, stressing that they have never used those buildings.

[13] Costs include actual dismantling and re-installing as well as wages for this `non-productive' job and lost revenues.

namely a long-lasting series of deepening crises, hence chronically sluggish markets. Then firms have to decide whether to divest their machinery, partly or completely, or, on the contrary, invest in new machines and/or R&D so as to become competitive in other markets, either in the advanced or developing countries.

In most cases, except private and privatised companies of course, privatisation itself, or more precisely preparation for privatisation, is the predominant aim of the current management. Briefly, privatisation is deemed inevitable for bringing capital (in particular cash injections to ease paralysing burdens of indebtedness), up-to-date technology and management techniques in, and getting access to new markets. Though it is clear for them that a 'final' strategy should be elaborated in line with the new owners' plans, it does make sense to devise at least a draft. In doing so they can delineate the perspectives of these companies for the potential investors, and, not least, convince them about their managerial capabilities.

3.6 Changes in product range and quality

Most firms have already started to introduce new products; others intend to do so in the near future - otherwise they would not survive. The rate of this process depends on the available financial and technological sources (including intangible assets as well) and on the market opportunities.

Privatised firms are in the most favourable position as they can rely upon the resources of their foreign owners. Some of them are going to replace all the former products in 3-5 years. Others have significantly improved the quality of existing products by introducing new technologies and retraining their staff in other factories of the parent companies.

Non-privatised companies draw on their own R&D projects and/or purchased licences and know-how. *High-tech companies* usually have long-established tradition in R&D, thus the effective constraints on the introduction of new products have been economic rather than technological ones. In other words they possess the technical expertise required to improve former products or develop new ones, but not the financial resources necessary to complete their R&D projects, i.e. they are unable to scrap obsolete machines and install new ones, to promote their new products through massive and costly promotion campaigns, etc. As quite a few high-tech companies have been heavily involved in defence production it is a rather gloomy realisation that arms conversation seems to be hardly possible.

3.7 Technology and investment

To provide competitive products, firms need to possess both first class development capabilities and appropriate machines. These two aspects of technology are discussed in the following paragraphs, first R&D issues then production.

As mentioned above, quite a few precision engineering companies have accumulated a fairly impressive body of technological knowledge and experience, in most cases comparable to those of their Western competitors.[14] Thus it can be regarded as perhaps their most

[14] It should be stressed that *CMEA-orientation had not been able to force complete isolation:* through licence and co-operation agreements some sort of contacts with major Western suppliers had survived the Cold War, or been re-established, in particular since the 1970s. Other factors had also been at work, e.g. ever stronger incentives of managers to export for hard currencies. These contacts with industrialised countries, as well as

important asset, and should be a significant part of their valuation, as they prepare for privatisation. A crucial problem is that these technological assets have not been used in an appropriate way, i.e. translated into economic success. One of the most important aim of restructuring should therefore be to alleviate this problem.

Privatisation by foreign investors is likely to promote this turnabout, providing access to complementary knowledge and technologies, adequate finance and up-to-date managerial techniques to foster innovation.

Preliminary experience, however, suggests that *privatisation might cause adverse effects as well*. The new owners want to centralise all aspects of technological development, from the very beginning of the process, e.g. attending conferences and trade fairs so as to collect most recent information, to the end of it, i.e. producing prototypes and the required documentation. The new task of the R&D units in the Hungarian plants is, therefore, primarily to introduce, and adapt, if necessary, the results of centralised R&D projects. Hungarian R&D personnel, though, have been accustomed to being involved in far more exciting and significant projects. What is more, engineers had been respected as the most important employees, since financial and sales issues used to be given less emphasis compared to technological ones. Now the whole situation has been completely altered, and might dissatisfy them: financial and sales people have become the most influential staff; moreover, decisions on technological issues, in particular on R&D projects, now are made by the parent company. To conclude, this sort of privatisation might cause ambiguous feelings for the R&D staff: they have more funds to perform particular tasks and considerably upgraded facilities on the one hand, but far less influence on R&D strategy and far less exciting projects, on the other.

It is needless to stress, however, that without privatisation they might not have any funds, any tasks - not even boring ones -, any autonomy, as their company might have been liquidated. Or, in a less dramatic scenario, R&D units of former large enterprises might have been transformed into 'usual' manufacturing companies, producing principally medium-tech products, at best, and some high-tech ones. Nonetheless, it would probably be preferable for both parties to design such an arrangement where necessary centralisation on strategic issues can be maintained, while accumulated R&D capabilities are better exploited. Hence people would be more satisfied with their job, i.e. work harder and in a more efficient way, and some really innovative, promising ideas might arise, as 'by-products'.

The other aspect of technology, that is, *production machinery, entails far less complicated issues* from analytical point of view. Precision engineering companies have been vertically integrated in a fairly typical way which can be termed as 'socialist' vertical integration. Given the corollaries of central planning - that is, lack of competition, severe shortages of parts and components, hence dependence on unreliable suppliers, on the one hand, and centralisation and redistribution of, among other things, investment resources, on the other - literally all Hungarian managers had wanted to acquire any new machine whenever new machines were available and whenever their superior authorities allowed them to do so.[15] No doubt this had

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technical requirements of defence production had prevented becoming completely obsolete. In other words, R&D, including reverse engineering in some cases, had enjoyed top priority in most companies so as to meet military demand and/or to produce goods marketable outside the CMEA as well.

[15] The most influential, albeit different, analyses have been produced by Antal [1985], Bauer [1981], Kornai [1980] and Soós [1986].

been rational behaviour in an irrational system: it had eased the headaches of shortage and dependence, and even created the illusion of having a 'free lunch'. Of course, it should not be forgotten that these investments were financed out of the centralised pool of enterprise profits.

In fact, *it was a rather costly 'policy'*. First, investment projects had not been really harmonised in that period. In other words, the assets of most companies consisted of an apparently random selection of obsolete and up-to-date machines by the 1990s. Quite a few bottlenecks were created in that way, making production costly and inefficient. Second, efforts to become independent had led to autarchy, hence a wide range of technologies - from basic material processing technologies, e.g. foundries, die-casting, galvanisation and cutting machines, to sophisticated, complex optical, nuclear and precision engineering equipment - had been installed.[16] As most of these machines could not be optimally utilised, it had proved to be a dreadfully costly 'investment policy'. However, when these decisions were made, it was simply out of question. By the 1980s, though, at the latest, costs did matter.

The other drawback of the former investment policy is that *the above features of technology prevent privatisation of companies as a whole*: potential investors, especially foreign ones, are not willing to buy companies with such heterogeneous set of technologies, for obvious reasons: they simply do not want to have, for instance, their own foundry, since *(a)* it cannot be economical, and *(b)* they are accustomed to relying upon specialised suppliers of raw materials, parts and components. Moreover, *(c)* they are not interested in buying obsolete technologies at all. Moreover, it is not sufficient to incorporate former plants: even they are too large and diversified, or, to put it more accurately, heterogeneous, both in terms of their technologies and their product lines.[17] *Vertical disintegration* is, therefore, a *sine qua non* for restructuring.

Privatisation has been of vital importance in the modernisation of production. Substantial 'cleaning-up' has been done in these cases, i.e. quite a few technological phases have been contracted out so as to reduce production costs. New machines have been brought in (quite often not brand new ones, but superfluous equipment from other factories of the parent companies), and production layout rearranged in order to alleviate bottlenecks.

Non-privatised firms are usually not in a position to replace their machinery, but they have also started to contract out general material processing tasks, and thus, to a limited extent, to modernise their technology, and reduce their costs. Yet, as already mentioned, it is getting harder to sell these excess materials processing machines.

Surface-Mount Technology (SMT) is a good example to characterise the technological level of Hungarian precision engineering companies relative to their Western competitors. While major foreign competitors apply automated SMT, Hungarian companies do it without automation. Thus it can be regarded a medium level technology. Automation is inhibited by small batches: typically they only produce few dozens or hundreds of a given instrument. Mechanisation of soldering, however, would be economical even for small batches but in most companies this is prevented by lack of money.

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[16] An optical company used to produce even tents and boxes for its instruments, thus have joiner and saddler workshops, too.

[17] Similar lessons can be drawn from former IKU research projects on privatisation, see Inzelt *et al.* [1991], [1992] and Havas [1992b].

To conclude, *product and process innovations are believed crucial* in most cases. However, *lack of adequate finance* - to cover all costs of the whole process, including modernisation of production equipment and sales promotion, or even 'creation of demand' - *hinders the conducting of significant projects, except in privatised firms*.

3.8 Internal organisation

The internal organisation of both privatised and other firms has been substantially altered for several reasons.

The most striking changes have occurred in large, multi-plant enterprises. Earlier they had wanted to grow through mergers and acquisitions, in order to become powerful enough in bargaining with authorities for resources, and thus banned any would-be reverse developments, i.e. efforts of their plants to become independent firms. The late 1980s, however, saw an opposite phenomenon, namely incorporation of plants. That way large enterprises could maintain their organisational integrity while getting badly needed fresh loans through their plants becoming new and independent firms from a legal point of view.[18] Besides loans, some equity was also raised. Now, on the other hand, they have recognised that *organisational integrity cannot be maintained: privatisation, crucial for survival, is only possible for smaller, 'streamlined' units, not having to cope with the aforementioned problems of heterogeneous technology and product range*.

Incorporation has entailed considerable organisational changes both at the headquarters and plants. *Headquarters* have become drastically smaller and their responsibilities have also completely altered. Now, usually being the principal owners of the recently incorporated plants, they are supposed to operate as *trustee companies* and not to perform their former primary tasks, namely centralised, meticulous production management, purchasing and selling. *The new-born companies*, on the other hand, have to build up their own finance and trade departments, R&D units, etc., as most of them used to be mere production units.

There have been some other organisational steps taken by most firms, regardless of their ownership and size, as they have to alleviate almost identical problems. As production has dropped, some workshops and plants have been shut down, and production management staff has been reduced. Meanwhile other tasks, such as co-ordination of suppliers, trade and finance (controlling), have been given considerably more emphasis, hence these departments have had to be supported with more staff, possessing adequate experience. In some cases it has been difficult to hire suitable persons, in particular for declining companies with hardly any perspectives. *The number of staff employed in managerial posts has dramatically reduced*, sometimes by 50-70%, for two reasons. *First*, fewer managers are required to control the shrinking staff of firms. *Second*, former rigid wage regulations had not allowed the provision of adequate remuneration for qualified staff without managerial titles. As these rules have been relaxed, it is not necessary to give such 'ranks' any more.

Privatised firms go along the same line, since they have to face quite similar problems, as emphasised above. The only difference is that they can draw upon the managerial expertise of their parent companies.

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[18] Some government measures, introduced in this period, also encouraged transformation: e.g. tax incentives for `new' companies; release from wage controls.

3.9 Skills and training

Foreign owners and managers of privatised firms and other Western business partners are satisfied with Hungarian blue-collar workers, technicians and engineers. They are well trained and experienced as the Hungarian education system has provided appropriate knowledge at all levels, from apprenticeship to secondary schools and technical universities.[19] Some companies have operated their *own schools* to educate skilled labour, one of them since the 1910s. Indeed these schools have been highly respected in the sector. Engineers have regularly attended further training and post-graduate courses. It has also been a common practice to run *special workshops for R&D and production engineers* whenever a new technology has been evolved or is to be introduced. University teachers have often delivered lectures at these courses, while engineers and physicists working in the industry given seminars at technical universities.

Though Hungary abolished mandatory plans and implanted some sort of simulated market into her economic system in 1968, and hence managers have had some ideas and practice about competition, marketing, finance, business strategy, etc. by the time when transition occurred, lack of these skills and expertise poses a more significant problem. Management schools - some of them with international faculty and curricula - providing a wide selection of courses on particular topics, have been mushrooming since the mid-1980s. Grants for trainees have also been available. Nonetheless, transition is not the ideal period for managers to leave their companies for a longer period either to attend a management course or to work abroad as a trainee since they have to face the challenges of the loss of markets, the threat of bankruptcy, privatisation negotiations, etc.

Privatised enterprises are in a more favourable position as their staff can be retrained at their parent companies while foreign managers can be transferred to Hungary. They can also provide an international career opportunity to their Hungarian employees.

Significant changes have occurred recently in managerial positions, again regardless of the ownership and size of firms in the sample. Quite a few managers have retired; some others have been dismissed as they were not able to cope with the problems of transition. Young, capable employees have been promoted, thus now they are highly motivated.

4 Concluding remarks

The Hungarian precision engineering industry, although having been fairly successful in the pre-war period and survived all the adverse corollaries of central planning and CMEA orientation, might be wiped out by the long-awaited marketisation of the domestic economy and that of its former major customer, the ex-Soviet Union: far more competitive and powerful foreign competitors can now enter these markets. Hence the accumulated knowledge of R&D and manufacturing engineers as well as the experience of the highly skilled blue-collar workers - the *élite* of the industrial labour force -, albeit of primary importance in this industry, might become completely worthless and disappear unless new market opportunities can be found quickly.

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[19] Nevertheless, the future of the education system is more doubtful due to severe budget cuts and recent, apparently ideological rather than professional, policy. Clearly, a detailed discussion of these threats would go much beyond the scope of this paper.

It is worth stressing, however, that blaming the severe industrial decline and unemployment on the economic transition would be misleading. Transition and loss of markets have common roots; they are, in fact, 'by-products' of the disintegration of the Soviet Union and the collapse of its 'wider empire'. Had the Soviet political and economic system been feasible in the age of the progressively costly armament race and the fierce globalised economic competition, neither transition nor industrial contraction in the former planned economies would have occurred.

This research would suggest, however, that the Hungarian precision engineering industry must not be left to further decline, let alone to disappear, because *a)* it has a considerable impact on our well-being, and *b)* it also has significant assets. Measuring and controlling instruments play a vital role in enhancing quality and productivity, that is, competitiveness, of other industries; medical equipment contribute to ease and lengthen our life; while analysis apparatus and other devices are badly needed to tackle vital environmental problems. Precision engineering skills are also of significant importance in other major industries with far-reaching impacts on the economy as a whole; the most notable example is electronics. On the other hand, entry barriers are rather high in this industry, unlike, say, in textiles, due to the importance of specific skills. Thus it is unlikely that new private firms can start from scratch when the economic climate is favourable again, and precision engineering products are in high demand.

Accumulated skills and experience of engineers and blue-collar workers, therefore, should be saved and exploited in an efficient way. Indeed, this body of knowledge can (and should) be regarded as a major asset and the indispensable basis for successful restructuring. Nonetheless knowledge alone is not sufficient for survival of the industry; it should be combined with fresh capital, access to new markets, recent technologies and up-to-date management techniques. As the Hungarian capital market is still fledgling, and access to new markets is as important as capital injection, privatisation by foreign investors seems to be the only viable solution in most cases. Hence the most important tasks of politicians and managers is to facilitate this type of privatisation.

There are a number of obstacles to successful privatisation, though. This research also indicates that the industry, first due to the World War II and then because of the CMEA-orientation and Cold War, has grown oversized. Hence basically all companies, and the sector as a whole, should be substantially restructured and 're-sized' otherwise they would be unable to adjust to the new environment. The underlying task, therefore, is to find *appropriate size and internal organisation* which allow fast adjustment and attract potential investors. Most former multi-plant, diversified mammoth companies have indeed already embarked upon radical restructuring programmes.

One of the most important steps has been taken - or yet to be taken in other cases - is *vertical disintegration*, and *split up of large firms*. This is, of course, not to claim that a 'healthy' industry can exist without large companies and mutually beneficial division of labour between small and medium-sized enterprises (SMEs) and large firms. The current large Hungarian firms, however, have been created by 'administrative' mergers and acquisitions, thus they do not show the advantageous attributes of 'organic' large companies (e.g. sufficient funds for successful R&D projects, international competitiveness, stable 'hinterland' for SMEs on the basis of the above features). The first step should, therefore, be to split up these

'administrative' conglomerates so as to pave the way for the 'organic' emergence of viable large companies, hopefully in the near future.

One should not overlook, however, that *privatisation might cause adverse effects as well*. Hungarian R&D personnel have been accustomed to being involved in exciting, significant projects, as well as in the decision-making process. However, decisions on technological issues, in particular on R&D projects, are now made by the parent company. This might cause ambiguous feelings for the R&D staff: they have more funds and considerably upgraded facilities to perform their tasks on the one hand, but far less autonomy and influence on R&D strategy and far less exciting projects on the other.

Privatisation by foreign investors is not the only way, of course, to introduce new products and technologies. Some non-privatised firms expand their R&D budgets in spite of declining sales so as to find new markets by developing and/or designing new products, e.g. based on their buyers' specification.

If restructuring is to be successful, it should result in genuine *competition*. Most plants of former large firms have already been incorporated, and hence *the number of companies increased by some 30%* from 1990 to 1991. Thus one could expect a fierce competition. However, this has not been the case. Most new legal entities are not really autonomous businesses. They are still owned and controlled, at least in strategic issues, by their former headquarters; hence mammoth enterprises have not been really split up. To *boost competition*, these 'new' companies have to become independent, and learn how to do business, as the vast majority of them had only been responsible for manufacturing, and thus had no experience in R&D, finance, buying and selling, etc. Moreover, quite a few of them are *still the only Hungarian producer* of certain goods, e.g. lenses, crystals. However, Hungarian precision engineering companies have to face rather fierce competition in both the domestic market, due to the liberalised imports, and in the former CMEA countries, given that trade is now conducted in hard currencies.

Major characteristics and prospects of the sector can be summarised as follows. Quite a few firms, accounting for the majority of sales and employment, are only behind their major Western competitors a *little* in terms of technology, product characteristics and quality, but not at all as far as skills are concerned. Others, accounting for a smaller share of employment and sales are behind *more*, in most or all respects, while a few firms *a lot*, in particular their technology and product characteristics. The organisational structure and the managerial behaviour have already been changed in most cases, therefore *further efforts* to alter production, improve quality and strengthen marketing *require new resources*. As adjustment takes time, prospects are generally poor in the short run, but are better at least for some firms in the medium run. Intra-sectoral differences in terms of size, ownership, products/technologies and markets do matter in this respect. A tentative sector taxonomy, based on these major organisational aspects, has been developed to highlight these differences. These findings are reported in Table 12. (Finance and skills seem to be of less significance; the former is almost equally bad throughout the sector, while the latter does not pose problems.)

As already mentioned, precision engineering has grown oversized in Hungary, output and employment, therefore, unlikely to reach again their mid-1980s' peak. In other words, *the sector as a whole inevitably continues to shrink* in the near future and some companies should

exit. There might be crucial variance, however, between different scenarios. To illustrate these differences the two extreme cases are summarised here.

In the *worst case* most companies fail to gain access to new markets (due to the lack capital injection and up-to-date management techniques required for adjustment), and to recoup their former markets (due to the ongoing crisis in the CIS countries and/or the entry of competitors from Western and newly industrialising countries). Small and medium-sized enterprises face severe difficulties as their domestic buyers are insolvent, and hence cannot have a solid production and financial background for their export activities. Thus only a substantially shrunken sector can survive.

In the *best case*, on the other hand, no significant drop in sales and employment occurs in the short run, while in the medium run foreign investment in 'streamlined' large companies (or in their former plants) and in medium-sized firms continues at a considerable rate. This process contributes to the introduction of up-to-date management techniques and gaining access to new markets, in part via improved competitiveness. Exports are increasing to the recovered CIS and neighbouring countries (given that political conflicts are also resolved), and so is demand in the domestic market (due to good engineering market opportunities in general, and increased military and health procurement in particular). Small and medium-sized firms, meanwhile, can survive and grow exploiting strong and solvent demand in the stable domestic market and niche opportunities in export markets.

There is a number of opportunities for a *competent* government to act so as to reduce losses and facilitate a successful restructuring in this sector. To promote the above best case scenario it is of critical importance

- to maintain vocational training (e.g. apprenticeship), used to be performed (at least partly) by companies. These firms might well be liquidated by now, or cannot afford to finance such a 'luxury' while fighting for survival. E.g. special schemes might be devised to cover a substantial part of the costs of vocational training undertaken by enterprises. As learning (competence building) takes time for obvious reasons (the very notion of accumulation clearly indicates this attribute of learning), skills cannot be acquired instantly, once they are destroyed but needed again. In other words, to let vocational training deteriorate (let alone disappear) would cause enormous losses in the medium and long run throughout the whole manufacturing industry, not only in the precision engineering sector.
- to facilitate privatisation, to encourage both foreign and domestic investors with a variety of schemes and measures. Besides these so to say normative measures, however, there is another important task as well, due to industry specific factors. Multinationals tend to favour talks with government officials, rather than to start directly with company managers for a number of well known reasons. It is even more so in this sector because of the nature of products (military devices are always special, "sensitive" goods, moreover, together with the other principle products, such as medical and scientific instruments, also entail the delicate issue of large government procurement programmes). Therefore the government has a role to facilitate privatisation negotiations between companies and potential investors.
- to split up large companies (if it has not been done yet, or not genuinely). It requires direct actions in some cases, at least the formal approval of the decisions prepared/made by managers of state-owned enterprises. What is more important, to make clear the

distribution of rights and responsibilities among the State Property Agency, the State Asset Management Company, and the managers.

- to boost the domestic demand with well-established procurement programmes to modernise the Hungarian army, the health care, educational and scientific infrastructure.
- to facilitate some export activities, again due to some industry specific factors. As already mentioned, selling of military, medical and scientific instruments often entails the delicate issue of government procurement. It applies for the exports as well, of course, and also for other products, in particular telecommunication, automation and control technology equipment, where former buyers are in a sort of locked-in situation, hence there are relatively good chances to retain these markets. Western and NIC competitors, however, might also enter, moreover backed by the powerful weapon of huge, long-term favourable loans, guaranteed by their government. This is obviously a considerable threat. The Hungarian government should, therefore, provide both political and financial assistance. (Probably the most urgent and important task is to improve the political and economic relationships with all the former CMEA countries, especially with the neighbouring ones.)

Table 12: Scenarios

Size	Ownership	Products and Markets	Best Case Scenario (in the medium run)	Worst Case Scenario
Large, multi-plant	State	Advanced, primarily military, products Former CMEA countries, Hungarian army and health service	Substantial reorganisation (incorporation of streamlined former plants so as to establish viable smaller firms, following a strategic business unit type approach) Privatisation of these new firms, primarily by foreign investors providing fresh capital, access to new markets, new products, complementary technologies and up-to-date management techniques Successful conversion of military technologies Recovery of CIS countries (i.e. re-opening some of the former markets) Massive government procurement to modernise the Hungarian army, health service, and R&D infrastructure	Failure of reorganisation Lack of interest of potential investors Failure of military conversion Long-lasting economic and political crisis, hence further disintegration of CIS countries Further severe budget cuts in Hungary, thus hardly any government procurement Major Western military contractors seize all the opportunities both in the domestic market and in the CIS countries
Large or medium-sized	State	Advanced control technology (components and systems) Locked-in buyers in the former CMEA countries (large energy and telecom companies)	Complex restructuring as an efficient preparation for the inevitably coming fierce competition with major Western suppliers in the breathing space given the locked-in situation of their buyers, including the establishment of joint ventures or other forms of alliances, and then Exploitation of the considerable sales opportunities stemming from large infrastructure projects in the CIS countries to extend their current networks and, to a lesser extent, from the need to maintain them	Failure in preparation for this competition Loss of these enormous, and most likely further growing, markets
Large or medium-sized	State	Mid- (or in few cases high)-tech products Insolvent buyers in the former CMEA countries	Complete and successful turnabout (privatisation, efficient internal organisation, appropriate size, new product-market mix, up-to-date management techniques) Recovery of the CMEA countries (especially that of the CIS), hence considerable investment programmes to modernise both their manufacturing industries and their health care system	Failure of the restructuring process Long-lasting economic and political crisis, hence further disintegration of CIS countries
Medium-sized	State	Mid-tech, general-purpose industrial instruments Primarily Hungarian buyers	Recovery of the Hungarian industry, stronger demand for investment goods Successful implementation of export-led growth strategy	Long-lasting recession in Hungary, hence flat or declining demand for investment goods Entry of low-cost developing countries' firms: fierce price competition, decreasing market share

Table 12 (continued)

Size	Ownership	Products and Markets	Best Case Scenario (in the medium run)	Worst Case Scenario
Medium-sized	State	Low- or mid-tech products Domestic market, with fierce import competition	Complete and successful turnabout (privatisation, introduction of an efficient internal organisation, new product-market mix, up-to-date management techniques) so as to gain competitive strength for survival	Failure of restructuring Successful entry of further foreign competitors Loss of market Liquidation
Medium-sized	Privatised (foreign investors)	Mid-tech essential consumer goods Export (hard currencies) and domestic markets	Further technological improvement (both in terms of products and production processes) Safe position in the domestic market Increased exports	Failure to improve production technologies and products Successful entry of foreign competitors Declining domestic market share Loss of export markets
Medium-sized	Privatised (foreign investors)	Mid-tech, commodity type goods Export (hard currencies) and domestic markets	Introduction of differentiated products and/or new production processes to gain cost advantages) Recovery of the Hungarian economy, strong demand Safe position in the domestic market Increased exports	Failure to differentiate products and/or reduce costs Long-lasting recession in Hungary, weak demand Successful entry of foreign competitors Declining domestic market share Falling exports
Small	Private (individuals, ESOP)	Mid- or high-tech products Domestic market	Continuous managerial and technological improvement Favourable macro-economic environment (access to loans, special services, strong demand due to the recovery, etc.) Bold growth opportunities (recovered large and medium-sized companies demanding parts and components, 'healthy' niche markets, e.g. for special medical and scientific instruments)	Failure to improve management practices, to introduce new products and processes Unfavourable macro-economic environment (lack of special loans and services, weak demand, insolvency of potential buyers) Stagnation or bankruptcy
Small	Private (individuals, ESOP)	High-tech products Export markets (hard currencies)	Continuous managerial and technological improvement Favourable macro-economic environment (access to loans, efficient bank and foreign trade services, etc.) Bold growth opportunities due to their cost advantages and technical excellence	Failure to improve management practices, to introduce new products and processes Unfavourable macro-economic environment (lack of loans; inefficient bank and foreign trade services) Stagnation or bankruptcy

Table 1: Production of the EC, US and Japanese precision engineering industry, 1980-1990

(current price, million ECU)

	1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
EC	4670	4888	4884	5133	5707	6792	7144	7201	7606	8217	8744
Index	68.8	72.0	71.9	75.6	84.0	100.0	105.2	106.0	112.0	121.0	128.7
US	7047	9668	11824	13159	16174	17965	14147	12682	n.a.	n.a.	n.a.
Index	39.2	53.8	65.8	73.2	90.0	100.0	78.8	70.6	n.a.	n.a.	n.a.
Japan	2391	3486	3439	4514	5855	6596	7404	7339	8469	8815	n.a.
Index	36.2	52.9	52.1	68.4	88.8	100.0	112.2	111.3	128.4	133.6	n.a.

(constant price, million ECU)

EC	n.a.	6115	5634	5593	5925	6792	6992	6910	6995	7187	7406
Index	n.a.	90.0	83.0	82.3	87.2	100.0	102.9	101.7	103.0	105.8	109.0

Source: Panorama of EC Industry, Statistical Supplement, 1992

Table 2: Absolute and relative size of the Hungarian precision engineering industry
(current price, million forints)

	1989	**1990**	**1991**	**1989 = 100**
Net sales	42579	46013	41688	97.9
% of manufacturing	2.42	2.39	2.31	95.5
				1990 = 100
Employment	n.a.	39433	27782	70.5
% of manufacturing	n.a.	3.44	2.79	81.1
				1989 = 100
Investment	1088	1147	489	44.9
% of manufacturing	2.44	1.81	0.71	28.9
Capital stock, gross	16658194	18663658	16604961	99.7
% of manufacturing	1.88	2.01	1.43	76.1
Capital stock, net	10563623	12348913	11622688	110.0
% of manufacturing	2.21	2.32	1.38	62.6

Source: Author's calculation based on balance sheet data

Table 3: Real growth indices (constant 1989 prices, previous year = 100)

	1990	**1991**
Net sales	106.2	73.8
Domestic sales	120.3	92.0
Exports	89.6	n.a.

Source: Author's calculation based on balance sheet data and CSO price indices

Table 4: Declining larger companies* (constant price, previous year = 100)

	1990	1991	1992
Output	89.8	51.9	49.0
Industrial activities' revenues	100.1	52.1	53.2
Domestic sales	91.8	59.8	65.2
Exports	115.7	45.2	42.4
Employment	87.0	76.9	69.2

Source: Central Statistical Office
* companies with at least 50 employees

Table 5: Exports and imports, 1989-1991 (current price, million forints)

	1989	1990	1991	1989 = 100
Exports				
Conducted in roubles	14592	12678	1046	7.3
% of manufacturing	8.72	11.75	13.40	153.7
Conducted in hard currencies	4967	5227	10122	203.8
% of manufacturing	1.71	1.53	2.46	143.9
Total	19559	17906	11167	57.1
% of manufacturing	4.28	3.98	2.67	62.4
Imports	32227	38378	62505	194.0
% of manufacturing	7.16	8.46	9.14	127.7

Source: Author's calculation based on balance sheet and KOPINT-DATORG data

Table 6: Openness indicators, 1988-1991

	1989	1990	1991
Export-sales ratio (per cent)	45.9	38.9	26.8
Import penetration (per cent)	58.3	57.7	67.2

Source: Author's calculation based on balance sheet and KOPINT-DATORG data
Note: Import penetration = Imports/(Net sales-Exports+Imports)

Table 7: Financial indicators

	1989	1990	1991
Receivable/Payable (%)			
precision engineering	67.1	54.5	51.2
manufacturing	55.4	52.6	48.1
Gross profits (million Ft)			
precision engineering	2967	-727	-887
manufacturing	87862	40326	-23035
Gross profit margin (%)			
precision engineering	7.0	-1.6	-2.1
manufacturing	5.0	2.1	-1.3
Net profits (million Ft)			
precision engineering	1946	-540	-247
manufacturing	45429	30268	-5940
Net profit margin (%)			
precision engineering	4.6	-1.2	-0.6
manufacturing	2.6	1.6	-0.3

Source: Author's calculation based on balance sheet data

Table 8: Size distribution of the Hungarian precision engineering industry, 1990-91 (per cent)

Size (employees)	**Number of firms**		**Employment**		**Net sales**	
	1990	**1991**	**1990**	**1991**	**1990**	**1991**
0 - 20	59.6	65.7	2.4	4.6	8.2	13.4
21 - 50	16.7	15.0	4.7	6.7	8.2	9.2
51 - 100	5.4	7.0	3.2	7.3	5.4	10.4
101 - 300	8.8	7.0	11.5	15.8	16.7	19.9
301 - 500	2.5	2.0	7.5	11.0	9.1	13.0
501 - 1000	3.5	1.5	20.8	13.9	18.3	8.9
1001 -	3.5	1.8	49.9	40.7	34.2	25.1
All firms*	317	399	39433	27782	46012	41688

Source: KOPINT-DATORG data bank

* Net sales are reported in million Hungarian forints.

Table 9: Major figures for the 5 largest companies and concentration indicators, 1988-1991 (current price, million forints)

	1988	**1989**	**1990**	**1991**
Number of employees	16991	n.a.	9070	5930
% of precision engineering	42.0	n.a.	23.0	21.3
Net sales	12951	12983	10680	12965
% of precision engineering	40.8	30.5	23.2	31.1
Exports conducted in rouble	5529	6466	3901	17
% of precision engineering	50.1	44.3	30.8	1.6
Exports conducted in hard c.	1535	1681	2060	3299
% of precision engineering	45.8	33.8	39.4	32.6
Domestic market share[a] (%)	14.4	8.8	7.1	10.4

Source: Author's calculation based on balance sheet data

[a] Estimated as the 5 largest companies' domestic sales divided by total domestic sales (i.e. the sector's net sales minus exports plus imports)

Table 10: Foreign stake in founding capital (million forints)

	1989	**1990**	**90/89** (%)	**1991**	**91/90** (%)
Founding capital	20978	26922	128.3	24237	90.0
% of manufacturing	3.4	3.9	112.6	2.7	70.1
Foreign investment in founding capital	1228	2226	181.3	2187	98.2
% of manufacturing	8.3	4.9	58.4	1.8	36.8
Foreign stake (%)	5.9	8.3	141.2	9.0	109.1

Source: Author's calculation based on balance sheet data

Table 11: Composition of net sales by markets, 1989-1990 (per cent)

	1989	**1990**
Domestic sales	54.1	60.9
Exports conducted in roubles	34.3	27.6
Exports conducted in hard currencies	11.6	11.5

Source: Calculation based on balance sheets

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