

Globalization and Industrial Development in East Central Europe: The Example of Tungsram 1945–1989

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ABSTRACTS

This is a business history case study of a globalization project analysing the strategy of a Hungarian company during the socialist era. The paper is structured around three main questions. First, how did that company, Tungsram, adjust to the changed hegemonic political structure in East Central Europe, world market conditions, and the requirements of technological development after the WWII? Second, to what extent was it able to develop means to respond to the varying demands of markets at a different stage of industrialization, and third, to what extent did trade and industrial policy measures support these efforts? The paper aims to contribute to intensifying research on the participation of state socialist companies in the world economy and to the development of new concepts as “alternative globalization” from a business history perspective.

Dieser Artikel ist eine unternehmenshistorische Fallstudie zu einem Globalisierungsprojekt, in der die Strategie eines ungarischen Unternehmens während der sozialistischen Ära analysiert wird. Die Arbeit ist um drei Hauptfragen herum aufgebaut. Erstens: Wie passte sich das Unternehmen Tungsram an die veränderte hegemoniale politische Struktur in Ostmitteleuropa, die Weltmarktbedingungen und die Anforderungen der technologischen Entwicklung nach dem Zweiten Weltkrieg an? Zweitens: Inwieweit war das Unternehmen in der Lage, Strategien zu entwickeln, um auf die unterschiedlichen Anforderungen der Märkte in einem neuen Stadium der Industrialisierung zu reagieren? Drittens: inwieweit haben handels- und industriepolitische Maßnahmen diese Bemühungen unterstützt? Der Artikel soll einen Beitrag zur intensivierenden Forschung über die Beteiligung staatssozialistischer Unternehmen an der Weltwirtschaft und zur Entwicklung neuer Konzepte, wie der „alternativen Globalisierung“, aus unternehmenshistorischer Sicht leisten.

1. Theoretical Background

Globalization – understood in the economic sense as growing international trade, increased cross-border flows of capital, people, information, and ideas, and growing interdependences among countries and regions – is not a linear process. From the time of the Industrial Revolution, especially the 1880s, cross-border integration accelerated, creating the first global economy, which was progressively destroyed by political and economic shocks from the beginning of WWI. The Great Depression hurried on the disintegration of the first global economy characterized by political nationalism, trade protectionism, falling cross-border capital flows, rising commodity price gaps between markets, and hindrances to migration. After WWII, major restrictions on the flow of capital, trade, and people across borders developed between the two main political and economic blocs centred around the USA and the Union of Soviet Socialist Republics (USSR), but these remained far from restrained in the rest of the world. Starting with the reduction of trade barriers under the General Agreement on Tariffs and Trade (GATT) of 1947 and the formation of regional trading blocs, the global economy was slowly restored. From the end of the 1970s, the pace of globalization intensified, creating the second global economy.¹ During these waves of globalization, the opportunities for late industrializing and resource-scarce economies regarding the terms of integration into the world economy varied considerably. This, in turn, had an impact on their responses to globalization, which ranged from full integration to autarchy.

“Caesuras” in long-term integrating processes, such as the world wars, the Great Depression, the end of state socialism in 1989, and recently, the COVID-19 crisis, prompt the reorganization of global production chains and capital markets, making it especially important for smaller countries to develop prompt and efficient answers.² Industrial and trade policy measures can considerably support but equally well create hindrances to the adjustment efforts of private economic actors. For example, trade diplomacy may open new trade routes, or tariff protection might nurture new industries. Industrial development policy can support companies’ efforts to adjust their product portfolio to changes in market demand by supporting technological innovation or subsidizing workers’ education. Public investments may offer reference projects and openings for company growth before stepping out into (new) export markets.

This paper presents the case study of United Incandescent Lamp and Electric Co. Ltd., after its well-known trademark called shortly Tungstram,³ from Hungary. After the dissolution of the Austro-Hungarian Monarchy, Hungary became a small country heavily

1 G. Jones, *Multinationals and Global Capitalism. From the Nineteenth to the Twenty-first Century*, Oxford 2005, pp. 18–38; some difference in timing pointed out in: N. Ferguson, Ch. S. Maier, E. Manela, and D. J. Sargent (eds.), *The Shock of the Global: The 1970s in Perspective*, Cambridge 2010.

2 E. A. G. Robinson (ed.), *Economic Consequences of the Size of Nations*, London 1960.

3 In Hungarian, *Egyesült Izzólámpa és Villamosság Rt.* (EIVRt); from 1984, it was Tungstram Rt., from December 1989, GE Lighting Tungstram, then GE Hungary; since 2018, it has been Tungstram Group/Tungstram Operations Kft.; hereafter Tungstram.

dependent on foreign trade and capital, consequently highly vulnerable to shocks and major shifts in the world economy.⁴ After WWII, the integration of Hungary into the Soviet hegemonic sphere led to the establishment of a planned economy; it also greatly influenced the terms of integration of the country into the world economy and the policy measures supporting economic development and world economic integration. Focusing on the experiences of an export-oriented company in the technology-intensive electro-technical industry that had been particularly well organized across national borders via mutual capital ownership, license and cartel agreements from the late nineteenth century⁵ the paper analyses one example for ECE business actors' coming to terms with the aforementioned changes after WWII and their efforts to widen their room for manoeuvre during the slow emergence of the second global economy.

Also, a business history perspective may contribute to recent reinterpretations of the role of the socialist states of ECE in the globalization processes of the second half of the twentieth century. One such avenue of research has recognized state socialist economies as a dynamic force of globalization from the 1950s, as the model of the planned economy was attractive for countries in the Global South that sought to build national economies independent from their former colonizers.⁶ The intensification of these relations has been interpreted as an alternative to the globalization led by Western market economies and followed a different dynamic insofar as it decreased from the 1970s.⁷ The concept of "alternative globalization" and similar interpretations of ECE's globalization during the socialist era concern the intensification of these countries' contacts with the "developing countries" of the Global South – or, to use the then contemporary expression, the "Third World" – as efforts to counterbalance political, cultural, and economic marginalization in the world dominated by the Western market economies.⁸

Another avenue of research has been the reinterpretation of the importance 1989, the system change, for ECE's globalization.⁹ In contrast to traditional narratives interpreting the system change as a turning point in the integration of ECE into the global economy, some interpretations regard it merely as a choice about a new form of this integration, a decidedly Western-oriented one; indeed, this region's decreasing contacts with the Global South even prompted to interpret 1989 as a point of deglobalization in the history of ECE.¹⁰ Furthermore, ECE socialist countries' experiences gained prior to

4 B. Tomka, *Globalizáció Kelet-Közép-Európában a második világháború után: Narratívák és ellenarratívák* [Globalisation in Central Eastern Europe after WWII. Narratives and Contra-Narratives], Pécs 2023, pp. 33–82.

5 For the early organization of the industry, e.g., British Electrical Allied Manufacturers' Association, *Combines and trusts in the electrical industry. The Position in Europe in 1927*, London 1927.

6 J. Mark and T. Rupperecht, *The Socialist World in Global History: From Absentee to Victim to Co-Producer*, in: M. Middell (ed.), *The Practice of Global History: European Perspectives*, London, 2019, pp. 81–113.

7 E.g. J. Mark and P. Betts, Introduction, in: J. Mark and P. Betts (eds.), *Socialism Goes Global: The Soviet Union and Eastern Europe in the Age of Decolonization*, Oxford 2022, pp. 1–24, at 22.

8 *Ibid.*, p. 10; also J. Mark, A.M. Malinovsky, and S. Marung (eds.), *Alternative globalizations. Eastern Europe and the postcolonial world*, Bloomington 2020; M. Trecker, *Red Money for the Global South: East-South Economic Relations in the Cold War*, London 2020.

9 E.g. U. Engel, F. Hadler, and M. Middell (eds.), *1989 in a Global Perspective*, Leipzig 2015.

10 J. Mark and P. Betts, Introduction, in: J. Mark and P. Betts (eds.), *Socialism Goes Global: The Soviet Union and East-*

1989 in integrating the global economy have been valorized for their post-1989 world economic integration: The organizational capabilities these countries had built during the reform period of the 1970s when ECE industry had begun to participate in chains of transnational production that cut across the East-West political divide opened the path for these countries' integration into the world economy after 1989 and also explained their divergent market specialization.¹¹

However, some authors – though recognizing the merits of these new narratives in remediating the previous dominant view of socialist ECE as a passive and rather isolated region in the emerging second global economy – have pointed out their limits. The degree of globalization of the state socialist ECE countries measured in trade openness, capital relations, transfer of people and information, that is in the four major areas of socio-economic processes of globalization, rapidly and substantially increased after 1989, and the Global South had never been able to substitute for the East's pre-1945 contacts with Western market economies, especially concerning knowledge production and technological innovation. Thus, the concept of “alternative globalization” has been questioned just as much as the actual degree of the planned economies' preparation for the “hyper-globalization” after 1989 based on their pre-1989 global connections.¹²

This paper is centred around three questions:

- 1) How did an export-oriented company in the electro-technical industry that was already established before 1945 learn to act globally again, having adjusted to new hegemonic structures, the planned economy, and the fundamental changes in the world economy?
- 2) To what extent was Tungsram able to develop means to respond to the varying demands of markets at a different stage of industrialization?
- 3) How did industrial development policy and trade policy affect Tungsram's ability to access foreign markets?

The case study is based primarily on records from the company archive¹³ and the Hungarian National Archives (HNA) along with interviews with former Tungsram managers. A summary of the company's pre-1945 history and a short review of the post-1989 era serve to put the experiences of the socialist era into perspective.

tern Europe in the Age of Decolonization, Oxford 2022, pp. 22, 24; J. Mark et al., 1989: A Global History of Eastern Europe, Cambridge 2019, p. 30.

11 B. Pula, Globalization under and after Socialism: The Evolution of Transnational Capital in Central and Eastern Europe, Stanford, CA 2018.

12 Tomka, Globalizáció, pp. 13–82.

13 Due to the ongoing liquidation of Tungsram, records of the former Tungsram company archives (TCA), of the Tungsram Historical Collection (THC) and various non-classified documents are being delivered to the HNA (Hungarian acronym: MNL). The classification of these documents under the main file MNL_Z_XXIX-F-378 is ongoing. This main file is referenced if the former classification is not recognizable.

2. Tungsram in the Interwar Era¹⁴

Following the dissolution of the Austro-Hungarian monarchy at the end of WWI, Hungary, a relatively late industrializing, capital-scarce economy, ceased to be part of a European Great Power and became instead a small country of just over eight million people. The territory of Hungary itself was reduced by two-thirds. Exhausted by the war, the economy suffered from hyperinflation, the dissolution of the imperial monetary and customs union, more direct exposure to foreign competition, and the need to find new markets and fresh capital to support technological development.¹⁵

Tungsram was one of the few larger Hungarian companies that adjusted successfully to the territorial changes and the challenges of the disintegrating first global economy of the interwar era. Directed by Lipót (Leopold) Aschner, CEO of Tungsram from 1921 until 19 March 1944, Tungsram established in-house research and reinforced its pre-war export orientation by specialization: The production profile was reduced to just two vacuum-technology mass products, incandescent lamps and radio valves, and full vertical production facilities were developed for them. Until 1934 Tungsram held 49 per cent shares in the Hungarian Standard Ltd., the former Tungsram telephone and telegraph department. In 1931, it acquired controlling interest in the incandescent lamp, radio valve and set producer *Elektrische Glühlampenfabriken Joh. Kremenezky A.G.*, with factories in Austria and Hungary and the renowned trademark Orion.

Furthermore, Tungsram became integrated into the knowledge production and marketing networks of the leaders of the lighting and telecommunication industry. By the early 1930s, GE, ITT/ISEC (International Standard Electric Corporation), Osram, and Philips all had a roughly 10 per cent share of Tungsram's share capital. License and technical exchange agreements with the industry leaders helped to direct and focus the work of the research staff. Tungsram was member of the international cartels that set the rules for its main product groups concerning access to technological information and sales markets on a global scale. Tungsram also strived to counteract trade protectionism by the establishment of local production units. By 1938, it had incandescent lamp, radio valve or glass production units in Italy, Austria, Poland, the UK, France, the Netherlands, Romania, Yugoslavia, and Slovakia, along with sales organizations in 14 countries (13 in Europe, one in Egypt). Until 1938, many industrial and trade policy measures supported these efforts (e.g. tax exemptions favouring import substitution, subsidized rail tariffs, "premium system" supporting convertible exports from the time of the Great Depression, or creating no hindrances to Hungarian companies' participation at international cartels).

14 The presentation of the era 1918–1949 is based on the author's PhD thesis, M. Hidvégi, *Anschluss an den Weltmarkt. Ungarns elektrotechnische Leitunternehmen 1867–1949*, Göttingen, 2016. Archive sources are referenced there.

15 Gy. Ránki, *The Great Powers and the Economic Reorganization of the Danube Valley after World War I*, in: *Acta Historica Academiae Scientiarum Hungaricae* 27 (1983) 1–2, pp. 63–97.

Tungsram's successful adjustment to the interwar era is best represented by its production of approximately five per cent of the world's incandescent lamps in the 1930s. Tungsram also supported Hungarian economic policy efforts to catch up with Western Europe by establishing itself in a higher value-added industry, participating in modernizing the country's communication and electricity supply infrastructure, spreading information about proper lighting, and channelling knowledge towards the Hungarian electro-technical industry and academic research. Indeed, this role can easily be compared to that of Nokia for Finland or Ericsson for Sweden.¹⁶

3. Tungsram in the War Economy

During WWII, Tungsram delivered radio valves and sets, incandescent lamps, and cutting-edge (radar) technology to the military. Furthermore, the company's efforts to safeguard its position on the most important foreign markets coincided with the war economy's hunger for convertible currencies. Although the geographical radius of exports gradually decreased, Tungsram continued to deliver lightbulbs and radio valves to Portugal, Sweden, Switzerland, and Turkey (i.e. beyond the countries occupied by Germany) at least until late 1943.

From 1938, the management of Tungsram prepared for the establishment of an international order similar to that which had developed after WWI. Swiss and British holding companies were established to protect Tungsram's foreign assets from the grasp of Germany or sequestration by the Allies. These were based on long-established contacts with Austrian and Swiss banks and the company's American shareholders – that is, on trust. Furthermore, in full expectation of the former market leaders' ability and willingness to reinstall global control structures after the war's end, Tungsram's efforts were directed towards continuing cooperation within the remnant frameworks of the lamp and the radio valve cartels despite the ever-more thinly disguised hegemony of the German members. Indeed, after the lost war, during the short democratic period in 1945–1947, there was a faint hope that Hungary would be allowed to remain a capitalist economy – though with strong socialist elements – and enjoy free contact with the Western democracies. In such a scenario, the delicate international holding structure would have supported Tungsram in protecting its assets and overcoming trade barriers against products from or bans on doing business with producers from former enemy countries. However, the post-war era witnessed the formation of the two political and economic blocs centred around the USA and the USSR, the start of decolonization, and the creation of a system of multi-

16 J. Ali-Yrkkö and R. Hermans, *Nokia in the Finnish Innovation System*. ETLA, The Research Institute of the Finnish Economy. Discussion Paper No. 811; B. Dalum, J. Fagerberg, and U. Jorgensen, *Small Open Economies in the World Market for Electronics. The Case of the Nordic countries*, in: C. Freeman and B.-A. Lundvall (Ed.), *Small Countries Facing the Technological Revolution*. London/New York 1988, pp. 113–138; T. Lemola and R. Lovio, *Possibilities for a Small Country in High-technology Production*. *The Electronics Industry in Finland*, in: *ibid*, pp. 139–155.

lateral institutions. In this new era, Tungsram needed to adjust to the regime change in Hungary as well as to the new obstacles and opportunities in international trade.

4. Tungsram in the Socialist Era (1949–1989)

4.1 From the Establishment of a Planned Economy until the New Economic Mechanism

In the hope of a revision of the WWI border settlements, Hungary entered WWII as an ally of Germany. The country was first besieged by the German and then the Soviet army. Some 10 per cent of the population died,¹⁷ and around 40 per cent of national wealth was destroyed. Similarly, to the end of WWI, hyperinflation wiped out much of the remaining capital. The communication and transport infrastructure was severely damaged. Budapest, the country's industrial, cultural, and political centre lay, for the most part, in ruins. According to the stipulations of the Peace Treaty, Hungary was not compensated for unpaid wartime deliveries to Germany, while it had to hand over German property on Hungarian territory to the USSR. The reparation deliveries, costs of supplying the Soviet army on Hungarian territory, dismantling of production capacities by the Soviet army, and international isolation of Hungary hastened trade reorientation towards the USSR under the circumstances of dire economic need.¹⁸ Soviet economic influence over the economy was also furthered by the around 400 Soviet-Hungarian joint enterprises in key sectors, such as oil, aviation, and the iron and steel industry, using the former German property (the term was applied in an extended sense) as the USSR's part in these companies.¹⁹

Hungary became incorporated into the Soviet hegemonic structure, and an economic and political regime following the Soviet model was established. Despite a clear election result favouring democratic parties in November 1945, a coalition government was established with Communists in a few key posts such as the Ministry for Internal Affairs. Backed by the USSR the Hungarian Communist Party became the ruling political party by 1948.²⁰ From November 1945 until 1949, the communist-led *Gazdasági Főtanács* (General Economic Council) took control over the allocation of credit and raw materi-

17 L. Borhi, Magyarország a hidegháborúban. A Szovjetunió és az Egyesült Államok között, 1945–1956 [Hungary in the Cold War, 1945–1956. Between the Soviet Union and the United States], Budapest 2005, p. 60; T. Stark, Magyarország háborús embervesztése [Population Loss of Hungary During the War], in: Rubicon 11 (2000) 9, pp. 44–48.

18 I. Pető and S. Szakács (eds.), A hazai gazdaság négy évtizedének története 1945–1985. I. Az újjáépítés és a teremtés irányítás időszak 1945–1968 [The History of Four Decades of the Home Economy 1945–1985. Vol. I. The Era of Reconstruction and the Centrally Planned Economy 1945–1968], Budapest 1985, pp. 17–24; Borhi, Magyarország a hidegháborúban, p. 33.

19 L. Borhi, A vasfüggöny mögött, Magyarország nagyhatalmi erőterében [Behind the Iron Curtain. Hungary among the Great Powers 1945–1968], Budapest 2000, pp. 31–49.

20 From 1948, the party, which merged the remnants of the Social Democratic Party, was named the Hungarian Workers' Party, and from 1956, the Hungarian Socialist Workers Party.

als and the regulation of prices and wages and exports and imports, thereby laying the foundation for the planned economy.

The National Planning Office (NPO), established in June 1947, designed the first three-year plan (1947–1949) to support reconstruction. Between 1946 and 1949, all mines, power plants, and banks, along with all companies with first over 100 and then over 10 employees were nationalized. Similarly, property rights in agriculture changed rapidly as the hasty post-war land distribution was followed by a forced collectivization following the Soviet model. The now centrally planned economy concentrated the majority of resources on Soviet-type heavy industrialization at odds with the natural resource endowment of the country which contributed to setting economic development on a path resulting in energy dependency from the USSR, insufficient resources for investment into high-tech industries, and frequently recurring crises.²¹ The finalization of the regime change and the country's integration into the Soviet hegemonic bloc was symbolically performed by its non-participation at the Marshall Aid conference in 1947 and participation instead, two years later, as a founding member of the Council for Mutual Economic Assistance (CMEA) followed by the commencement on 1 January 1950 of the first five-year plan.²²

The dismantling of Tungram's main factory in Újpest on the outskirts of Budapest by the Soviet army in the spring of 1945 was followed by a quick, heroic reconstruction, a gradual increase in production and resuming of exports already in 1946. The company engaged in reconstruction on the pre-war technological basis, that is, by using those machines that had been saved during the occupations or by engineers drawing plans for production machines from memory. The USSR did not acknowledge the factory dismantling in the Hungarian reparations, and Tungram was never compensated for damages and losses of around USD 12 million (Hungary had to pay USD 200 million as reparations to the USSR).²³ Around 12 per cent of Tungram shares, formerly owned by Osram, became Soviet property. The production units in ECE were nationalized by the respective countries. Most of the Western European Tungram companies were sequestered during the war and not yet released in 1948.

The persecution of the leading managers in addition to the fiscal and financial measures taken to make the company indebted toward the state were intended to nationalize Tungram without compensating foreign shareholders for their losses. The scenario was similar regarding Hungarian Standard, the former Tungram telephone department, as well as the Hungarian-American Oil Company.²⁴ By mid-1948, the leading Tungram

21 J. Honvári, 20. századi magyar válságok [Twentieth Century Hungarian Crises], in: J. Katona (ed.), *Gödörből gödörbe. Mindennemű válságok Magyarhonban a 19. és 20. században* [From one Pitfall to the Next. All Kinds of Crises in Hungary in the Nineteenth and Twentieth Century], Szombathely 2011, pp. 94–116.

22 Pető-Szakács, *A hazai gazdaság*, pp. 37–50.

23 The actual amount far surpassed the USD 200 million as prices for delivered goods were set by the USSR; nevertheless, these figures indicate the importance of Tungram in the Hungarian economy.

24 A. Szörényi, *A Standard-per előzményei és előkészítése* [The Prehistory of and Preparations for the Lawsuit against Standard], PhD-thesis, Piliscsaba 2012; L. Srágli, MAORT. Olaj, *Gazdaság, Politika* [The Hungarian-American Oil Company. Oil, Economy, Politics], Budapest 1998.

managers had fled the country.²⁵ As the assets of Tungsram in Western Europe came under the threat of not being released from sequestration, the nationalization was quickly redirected. Formally, Tungsram remained a joint stock company; to all intents and purposes, however, it was managed as a state-owned company during the socialist era.²⁶

The establishment of the planned economy made the reintegration of Tungsram into the electro-technical industry of the post-war era difficult. For example, following the centralization of foreign trade in 1948, the company lost its right to export and import goods. Production and sales suffered from a partial reorientation of raw material supply and the loss of long-established market relations. In 1947, Hungarian law declared cartels illegal, which made it impossible for Tungsram Budapest to participate in reorganizing this type of transnational networks. Although cartels had gradually been declared illegal in the Western market economies,²⁷ parts of the lamp market were reorganized into national cartels. In early 1947, Tungsram was able to renew the license agreement with GE, which promised a quick catch-up concerning light-source technology and, potentially, electron tube production as well as a possible new path of development as the supplier of production machines for GE factories in industrializing countries. However, the agreement was sabotaged by the Hungarian authorities, demonstrating the growing tension between the USA and the USSR and the inclusion of Hungary into the Soviet hegemonic sphere.²⁸

The separation of Tungsram from the transnational market sharing and knowledge production network of the lighting and telecommunication industry made it much harder for the company to acquire up-to-date market information and specialize in research and development (R&D). As the war had accelerated technological change in the telecommunication industry, this was a loss beyond repair. Moreover, the reorganization of the national industrial R&D system meant that Tungsram had to part with quite a few members of its research staff, which had already suffered heavy losses during the war, to the new Research Centre for Telecommunications (*Távközlési Kutatóintézet*, TKI, founded in 1949/50).²⁹ In the early 1950s, enhanced military requirements greatly restricted TKI's capability to support Tungsram in launching into new terrains, such as

25 Z. Bay, *Az élet erősebb* [Life is stronger], Csokonai/Püski, Debrecen/Budapest 1990, pp. 201, 228–230.

26 Interview with Dr György Martin, head of Tungsram legal department, executive manager in 1989, 1990–1994 GE Lighting Tungsram vice-CEO, Budapest, 4 October 2021. Company records still need to be traced to closely follow up the development of the ownership structure of Tungsram and of its organisations abroad. By the 1980s, ISEC was the only Western stakeholder from the pre-war era. Its share was made redundant by capital increase in 1988.

27 H. G. Schröter, *Cartelization and Decartelization in Europe, 1870–1995. Rise and Decline of an Economic Institution*, in: *Journal of European Economic History* 25 (1996) 1, pp. 129–153, at 142–143.

28 Bay, *Az élet erősebb*, pp. 187–190.

29 M. Herpy and I. Sipőcz, *Távközlési Kutató Intézet, a magyar mikrohullámú kutatás fellelőgára 1950–1990* [The Research Centre for Telecommunications, the citadel of Hungarian microwave research 1950–1990], Budapest, 2021. http://real-ms.mtak.hu/25924/1/tavkozlesi_kutato_intezet_1950-1990.pdf (accessed 13 January 2024); F. Kardos, *Az Egyesült Izzó Kutató Laboratóriumának története* [History of the Tungsram Research Laboratory]. Manuscript, Budapest, 30 September, 1958, reprint in: *Holux hírek* No. 183, December 2018, pp. 13–20. http://www.holux.hu/publikaciok/Az_Egyesult_Izzo_Kutato_Intezetenek_tortenete.pdf (accessed 13 January, 2024).

semiconductors.³⁰ Therefore, in 1953, another research centre for telecommunication (*Híradástechnikai Kutatóintézet*, HIKI) was founded from parts of TKI and the research units of other companies to support civilian research.³¹ The tight pre-1949 cooperation between research and production at Tungstram had been impeded by these organizational changes and the national research centres' being separate entities.

Political control was established over every aspect of company management, from price policy over the promotion and remuneration of staff to the sourcing and allocation of funds, which reduced human and material resource efficiency. Fulfilling the plan became a top priority and made resetting targets (adjusting to changing market needs) difficult. The coordination of industry via centres for individual branches was to enhance productivity and reap the benefits of mass production in a very small market – in theory. As it broke up companies and changed their production profiles arbitrarily and occasionally even multiple times, in cases of well-organized companies with a vertical production structure and extended sales network, such as Tungstram, the nationalization and central coordination of industry led to mounting inefficiencies, bottlenecks, and declining product quality.

The Tungstram power plant in Ajka had been nationalized in 1946, although not long before, in an effort to prevent the plant from being dismantled, Tungstram had bought similar equipment in Switzerland for the USSR.³² The Kremenezky company, the radio set production unit of Tungstram from 1931, was nationalized separately (Orion Radio and Electrical Company), similarly to other companies formerly in Tungstram's sphere of interest. Though Tungstram remained a company with a vertical production structure, its energy and raw material supply became more uncertain, leading to hoarding materials, unfinished shifts, and rising production costs.³³

Without a clear strategy, management authority, or adequate investment in production technology, company growth was extensive in nature, built mostly on the pre-war knowledge base. In the 1950s, the ratio of semi-skilled labour grew along with a decrease in skilled labour, especially that of people employed in product development. During the 1956 revolution, 763 employees left the country, some eight per cent of all Tungstram personnel, further increasing the lack of skilled personnel.³⁴

By the mid-1960s, the limits of extensive growth were reached, and the servicing of short- and medium-term public debt grew too heavy. Instead of allowing for Hungary's formal application for membership of the International Monetary Fund and the World

30 For a personal account, see Z. F. Váradi, *Rések a bástyán avagy voltak még hibák, elvtársak* [Comrades, Mistakes Were Made], Budapest 2010.

31 P. Gadó, *Az Egyesült Izzó Kutató Laboratóriumának története* [History of the Tungstram Research Laboratory]. Manuscript, Budapest, 30 September, 1958, p. 49; Á. Herman and Gy. Wolitzer, *Elemek a HIKI történetéből. Híradástechnikai Ipari Kutatóintézet (1953–1981)* [Elements from the History of Research Centre for Telecommunication (1953–1981)]. <https://www.ett.bme.hu/~vago/hiki/elemek.html> (accessed 13 January 2024).

32 A. Forgács, *Jóvátehetetlen jóvátétel*, in: *Újpesti Helytörténeti Értesítő* XXIX (2022) 2, pp. 17–19.

33 Koroknai, *A Tungstram Rt.*, pp. 109–110. These problems were typical for the 'classical socialism' as described in J. Kornai, *The Socialist System: The Political Economy of Communism*, Oxford and New York, 1992.

34 *Ibid.*, pp. 98–99, 110–112.

Bank in the hope of securing credits to modernize the economy, in November 1967, the USSR made trade concessions and extended credits that Hungary had taken to participate in the armament efforts of the Warsaw Pact, thereby preventing insolvency.³⁵ On 1 January 1968, after decade-long theoretical discussions and the first successful experiments with capitalist incentives in production and Western technology import,³⁶ a reform concept was launched. The New Economic Mechanism (NEM) essentially aimed to “closely integrate national planning and the market mechanism”, implementing guideline-based planning.³⁷ More leeway for individual initiatives in collective farms and greater scope for small household farms led to substantial increases in agricultural production. State enterprises gained more autonomy over production and resource allocation, and managers and workers were made financially interested in their company’s profits. The reform also intended to open towards the Western market economies, aiming to modernize the economy via technology imports paid by increased convertible exports.³⁸ The reform could not materialize to its full potential because the political regime remained unchanged, but it certainly hit the right moment to profit from the USA-USSR détente (1967–1979), which saw an easing of Cold War tensions.³⁹ The Hungarian NEM was one of the most comprehensive of the institutional reforms that the socialist states of ECE began introducing around 1968, when economic problems like technological backwardness, low productivity, and poor product quality became apparent to communist leaderships across the region. In the 1970s, the ECE socialist states were increasingly engaging with the capitalist West to expand access to markets, technology, and capital for development. Links between West and East European economies proliferated: ECE countries began to privilege exports to Western European markets,⁴⁰ and an integration of Eastern European industry into value chains that cut across the East-West political divide started to emerge via product licensing, joint production, and, occasionally, joint R&D.⁴¹

35 J. Honvári and Cs. Torda, Magyarország csatlakozása az IMF-hez és a Világbankhoz I. [Accession of Hungary to the World Bank, part I], https://www.archivnet.hu/gazdasag/magyarorszag_csatlakozasa_az_imfhez_es_a_vilagbankhoz_i_resz.html (accessed 13 January, 2024).

36 E.g. Zs. Varga, *The Hungarian Agricultural Miracle? Sovietization and Americanization in a Communist Country*, Lanham, 2021, pp. 166–167.

37 Citation from Rezső Nyers, CP Central Committee Secretary in P. Scranton, *Managing Communist Enterprises: Poland, Hungary & Czechoslovakia, 1945–1970*, in: *Enterprise & Society* 19 (2018) 3, pp. 492–537, at 534, 529.

38 Refusing convertibility was a strategy Soviet bloc states used to insulate their economies from importing capitalist-world inflation. Scranton, *Managing Communist Enterprise*, p. 512.

39 P. Germuska, *Failed Eastern Integration and a partly successful opening up to the West: The economic reorientation of Hungary during the 1970s*, in: *European Review of History* 21 (2014) 2, pp. 271–291.

40 J. Mark and T. Rupperecht, *The Socialist World in Global History: From Absentee to Victim to Co-Producer*, in: M. Middell (ed.), *The Practice of Global History: European Perspectives*, London 2019, pp. 81–113, at 96.

41 B. Pula, *Globalization Under and After Socialism. The Evolution of Transnational Capital in Central and Eastern Europe*. Stanford 2018; business history case studies like K. J. Freeze, *Unlikely Partners and the Management of Innovation in Communist Europe: A Case Study from the Czechoslovak Textile Machine Industry*, in: *Business and Economic History On-Line*, 5 (2007); P. Szobi, *Lizenz- und Gestattungsproduktion westdeutscher Unternehmen in der ČSSR und der DDR*, in: *Jahrbuch für Wirtschaftsgeschichte/Economic History Yearbook (JBWG)* 58 (2017) 2, pp. 467–487; A. Steiner, *Ostgeschäfte: Westliche Unternehmen in der DDR*, in: *Zeitschrift für Unternehmensgeschichte (ZUG)* 63 (2018) 2, pp. 221–234.

4.2 The “Two markets strategy”: Light Sources to the West, Machinery to the East (and South)

The following sections describe how Tungsram adjusted to act globally within the new hegemonic structure and how trade and industrial policy supported or hindered these efforts. The description is divided into three sections according to Tungsram’s main product groups – light sources, that is all type of lamps from incandescent to halogen, fluorescent, gas-discharge or later compact fluorescent lamps, machines, and electronics – as market conditions, challenges, and opportunities were diverse enough to require specific business strategies. The following four figures illustrate the product-specific responses to these.

Figure 1 shows the development of Tungsram sales between 1968 and 1985 as developing most impressively for deliveries outside the home market and CMEA region. The following three figures show sales divided among product groups and currency areas in 1955, 1970, and 1985. Here, the orientation of light sources’ exports towards the non-ruble markets and that of machinery towards the ruble markets is clearly visible. Electronics, on the other hand – referring to a variety of goods, from radio valves and television and laser tubes to semiconductors – were increasingly delivered to the home and ruble markets. The steady growth of exports paired with the different market orientation of the main product groups displays that Tungsram had learnt to seize the opportunities of both the CMEA integration and that of capitalist markets. The following sections describe some of the elements and the limits of this achievement, too.

Figure 1: Development of Tungsram’s Sales 1968–1985. Source: Tungsram Statistical Pocket Book I, p. 25.

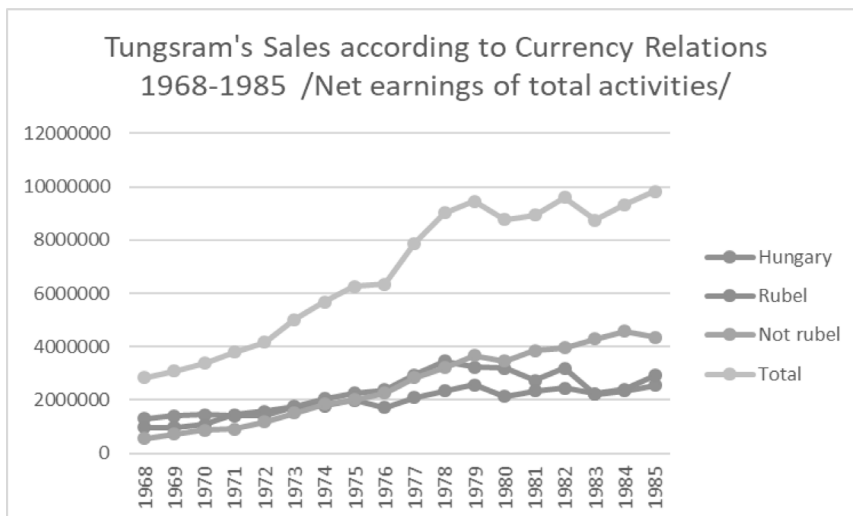


Figure 2: Sales divided by foreign exchange-relation and product groups (%) 1955.
 Source: Tungsram Statistical Pocket Book I, p. 35.

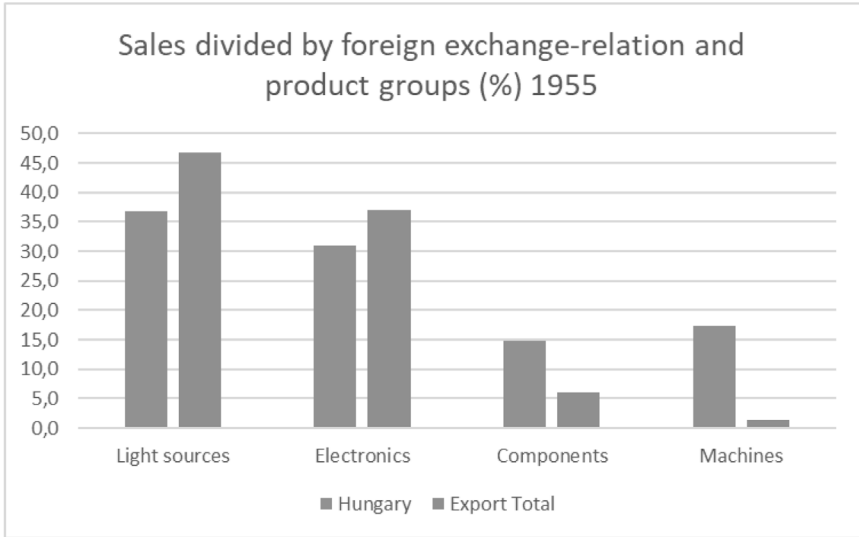


Figure 3: Sales divided by foreign exchange-relation and product groups (%) 1970.
 Source: Tungsram Statistical Pocket Book I, p. 35.

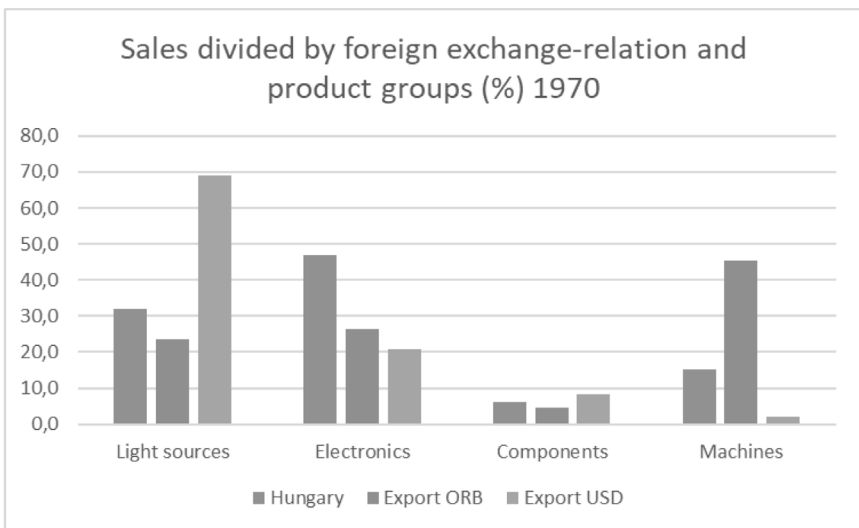
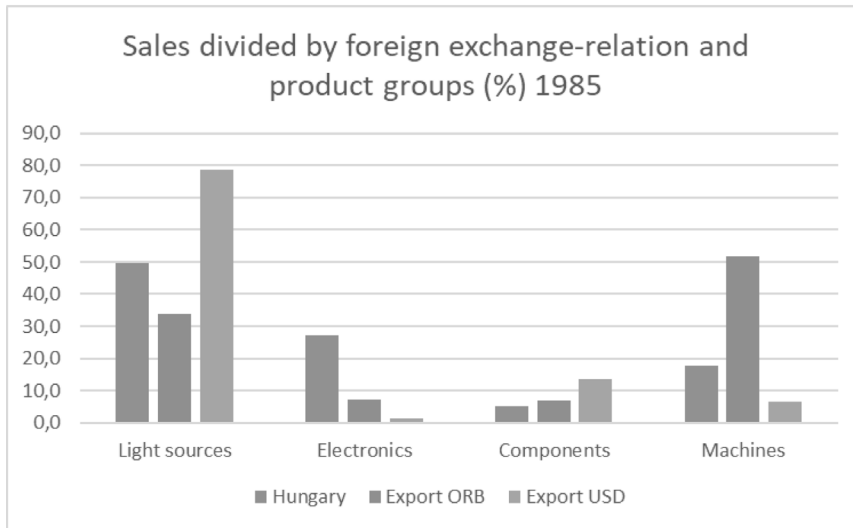


Figure 4: Sales divided by foreign exchange-relation and product groups (%) 1985.
Source: Tungram Statistical Pocket Book I, p. 35.



4.3 Light Sources

In the first two decades after WW II, the Cold War weighed heavily on Tungram's light-source production. Isolated from the knowledge circulation among the leading producers, Tungram had to keep up with technological development on its own. Soviet science and technology were no substitute for lost Western contacts. Indeed, Tungram was the most advanced producer of the lighting industry in the socialist bloc, and it had to disseminate knowledge about krypton gas production and other technologies.

Co-Com, the Coordinating Committee on Multilateral Export Control, a NATO-linked structure, established lists of items not to be sold to the Socialist bloc in order to hinder knowledge transfer there, especially technologies that could be used by the military, thus reducing product and production technology development in high-tech industries. The Co-Com-lists did not completely hinder knowledge transfer, but they did restrain and divert innovation processes and made them more cumbersome and expensive. Tungram's Western European sales offices, and especially Tungram Austria, could only channel information about technological development in the form of scientific documents or samples of new products that competitors had already launched. Some much sought-after production machines could be purchased, but only via agents who overpriced them for producers on the wrong side of the Iron Curtain, and warranty

claims were even more difficult to make.⁴² Thus, keeping up-to-date became much more resource-intensive and difficult for Tungsram than it had been during the interwar era. Although Tungsram could only follow the path of technological development as led by GE, Philips, and Osram, it did gradually manage to regain much of its pre-war standing. This was achieved by continuous efforts to develop the new products launched by market leaders as quickly as possible, matching their quality, and developing production technology.⁴³ That is, Tungsram succeeded in realizing a strategy of the close follower. Its most important achievements included increasing the durability and resistance of tungsten wire and, based on that, developing halogen car lightbulbs, and from high-intensity discharge (HID) bulbs metal halide lamps and high-pressure sodium lamps (for outdoor lighting), along with the production technology of the new generation of high-pressure sodium lamps (H-box).⁴⁴ An educational system for personnel was reestablished which served to convey specialized knowledge and was key to the continuous development of production quality.

Accelerated electrification all over the post-WWII world increased market demand for light sources. Tungsram needed to extend its production capacities, which required land and workers far beyond the reach of its central factory in the capital. In 1962, Béla Dienes, former chief engineer of Konverta, a company attached to Tungsram, then chief engineer of the telecommunication industry in the Ministry for Metallurgical Industry and Machinery (MMIM), was assigned as CEO of Tungsram. CEO for two decades (1962–1983), Dienes proved to be a manager with a vision for the company and the capacity to realize it, partly through his connections to the HSWP.⁴⁵ Embracing an important goal of Hungarian economic policy in the 1960s and 1970s – rural industrialization –, led by the new CEO, Tungsram established production facilities in several towns across the entire country.

Without these new production facilities making components for light sources together with complete products, such as radio valves or specific types of lamps, Tungsram would not have been able to meet growing market demand and enhance product quality. Tungsram's machine-building capacity was similarly extended by factories which supplied machines and whole production lines mostly following designs by Újpest. However, the de-centring of production went well beyond the optimum due probably to political reasons; for example, failing companies with an obsolete machine park and product portfolio were “rescued” by attaching them to Tungsram (e.g. the machine-building factories Gábor Áron, Budapest, and Sophianae, Pécs). Costs incurred by integrating the companies

42 Interview with Péter Billing, 1987–1990 technical director of Tungsram, 1992–2001 general manager of GE Lighting Tungsram, then of GE Lighting Europe (GELE), Budapest, 24 February 2021.

43 Billing, interview.

44 Interview with Miklós Csapody, head of light-source development Tungsram, 1987–1990, technical director of GE Lighting Tungsram, then of GELE (1992–2000), Budapest, 3 October 2021.

45 In 1982, Dienes was a member of the Budapest Commission of HSWP, of the Executive Committee, and of the Central Committee of HSWP. P. Kertész, *Vezéri székben – kiváltások nélkül* [In the Leader's Chair – Without Privileges], in: Budapest 20 (1982) 8, pp. 8–10.

into Tungsram (including their product portfolio changes) and by high management overheads (by the late 1970s Tungsram had several factories in Budapest and in 11 rural towns); furthermore, this type of growth also reduced inducement for automatization. Credits to invest in developing the production capacities of products that could reasonably be expected to be sold in markets with convertible currencies offered opportunities to modernize production technology and thus played a crucial part in the success of the close-follower strategy. The most notable such investment was the modernization of lightbulb production using cutting-edge American technology. A prerequisite for such a step and, in general, rebuilding Tungsram's relations with the market leaders was Hungary's re-establishment of diplomatic relations with capitalist countries; this had started in the mid-1950s with agreements over partial compensation for pre-war public debts and foreign subjects' nationalized property.⁴⁶ Following agreements with Austria and Great Britain in the mid-1960s, Hungary succeeded in agreeing with the USA about the terms of repayment of (mostly) pre-war debts, the partial compensation of damage to American citizens' property during the war and the subsequent nationalization in 1973.⁴⁷ It is hard to see it as a coincidence that it was at that time when – circumnavigating Co-Com regulations⁴⁸ – the American Corning Glass Works sold Ribbon lightbulb production equipment to Tungsram, the only producer from the socialist block judged capable by Corning of integrating such advanced equipment.⁴⁹ Furthermore, in line with the loosening restrictions on Western technology imports, Tungsram updated its tungsten wire production and fluorescent lamp assembly with Japanese machines that were tailor-made for Tungsram using Hungarian know-how on light-source production.⁵⁰ The need to sell surplus bulbs prompted the proper organization of component sales at Tungsram, which resulted in a considerable export supplementing light source exports, mostly sold in USD-relation.⁵¹ Bulbs continued to constitute the bulk of component exports, with Italy and Yugoslavia the main markets.⁵² Rebuilding the organization necessary for market presence played an equally important part in Tungsram's quest to reestablish its position in the lighting industry more broadly. In 1957, it was among the very first companies in Hungary to regain the right to export its own products. Tungsram was also permitted to resume the management of Tungsram

46 J. Honvári, *Pénzügyi és vagyoni tárgyalások és egyezmények Magyarország és az Egyesült Államok között, 1945–1978* [Financial and Property Right Negotiations and Agreements between Hungary and the United States 1945–1978], in: *Századok* 143 (2009) 1, pp. 37–82, at 48.

47 The Hungarian Standard Ltd., the Hungarian-American Oil Company, and Vacuum Oil Ltd. constituted the largest posts of nationalized American business property, see: Honvári, *Pénzügyi és vagyoni jogi*, p. 43.

48 Elek Bonyhády, 1971–1978 MMIM, Department for Strategic Development, responsible for the development of the electronic components industry and of technological equipment, interview, Budapest, 17 October 2020.

49 Interview with dr. Péter Wohl, deputy commercial director of Tungsram 1983–1990, East European sales and marketing director 1993–2001, vice-chairman of GE Hungary 1997–2001, interview, Budapest, 2 March 2022.

50 A. Kuti, *Az Egyesült Izzó külpiazi politikája, értékesítési szervezete*. [Tungsram's Sales Policy and Sales Network Abroad] Master degree thesis, Marx Károly Közgazdaságtudományi Egyetem, Budapest, December 1983, p. 68.

51 Kuti, *Az Egyesült Izzó*, p. 59.

52 Ibid.

sales offices and production sites abroad.⁵³ Within five years, Tungsram's share in the incandescent lamp market of capitalist countries increased from 2.8 to 3.5 per cent,⁵⁴ and the export ratio within Tungsram's total production grew from around 47 to 57 per cent.⁵⁵ In 1968, Tungsram regained the right to import products, making the import of production inputs (e.g. rare metals, special glasses), sourcing of product samples for R&D, and barter arrangements less cost-intensive.⁵⁶

By the mid-1980s, Tungsram had production sites in Austria and the USA, sales organizations in Switzerland, Germany, Sweden, Norway, Finland, Denmark, Belgium, Spain, Ireland, Australia and planned to establish sales organizations in France and the UK. The small production sites that were acquired during respectively built immediately after the war in Sweden and in Switzerland remained insignificant in terms of production capacity and market share and operated at relatively high costs due to outdated machinery; therefore, they were shut down in 1961 and in the 1970s, respectively.⁵⁷ The oldest foreign production site of Tungsram in Vienna remained the only one in Europe and was only shut down after 1989. In the 1970s to early 1980s, Tungsram Austria was useful for gathering technological and market information, conveying embargoed products; a World Bank development credit to Zaire financing Tungsram machinery export was also channelled via Tungsram Austria as Hungary was not a member of the World Bank at that time.⁵⁸

In 1977, quite exceptionally for a Hungarian company, Tungsram established a factory in the US, a joint venture with Action Industries in East Brunswick, Pennsylvania. Action Tungsram Inc. produced General Lighting Service (GLS) and decoration lamps, mostly via large general stores (it could not enter the high-end lightbulb market, partly due to various technical factors). The very existence of this joint venture until the end of the socialist era was an achievement, not to mention the sizable exports – Tungsram carved out around four per cent of the US lightbulb market.⁵⁹ Geographical distance and rigorous quality standards of Japanese car manufacturers required the foundation of Nippon Tungsram Tokyo in 1986, which conducted a final quality inspection of the lamps delivered from Hungary.⁶⁰ Besides a few Tungsram offices (e.g. India, Algeria), in

53 Koroknai, A Tungsram Rt., p. 109.

54 Marx Károly Közgazdaságtudományi Egyetem Kereskedelem Gazdaságtana Tanszék, A fényforrások termelése és forgalma a világpiacon. Készült az Egyesült Izzólámpa és Villamossági Rt. megbízásából [Production and Sales of Light Sources on the World Market. Study prepared by Karl Marx University for Economics, Chair of Trade Economics, commissioned by Tungsram], Budapest 1964, p. 10.

55 Koroknai, A Tungsram Rt., p. 109.

56 Tungsram Rt., A Tungsram Rt. statisztikai zsebkönyve I. Lezárva 1985. december 31-én. [Tungsram Statistical Pocket Book I. Closed on 31 December, 1985] Budapest, [1986], p. 6.

57 Tungsram had a production site in Sweden during the war via Juturna A.B., Stockholm, bought by Svenska Orion. Orion Fabriks oh Försäljings A.B. Stockholm was established in 1948. Tungsram A.G. Carouge started production in 1948. Koroknai, A Tungsram Rt., p. 86, 131, 141; Wohl, interview, Budapest, 10 June 2019; MNL_Z601_260_1020 letter by [Dr. Neményi], Tungsram, to the Hungarian National Bank, 24 April 1947 and other documents of this folder.

58 Wohl, interview, Budapest, 10 June 2019.

59 Kuti, Az Egyesült Izzó, pp. 165–169. Exports to the US peak in 1982 at 140 million lightbulbs, adding to the 40 million produced locally. Wohl, interview, Budapest, 2 March 2022.

60 Martin, interview.

the Global South, political and economic instability, cultural differences, and cost differences in contrast to established local partners caused Tungstram to direct sales via agents, wholesalers, and “shippers”.⁶¹

In those countries where, after WWII, Tungstram’s competitors owned the right to use the Tungstram trademark, Tungstram sold its products under the Orion trademark. In France, it was only in 1984 that Tungstram finalized an agreement with the then-owner Sylvana on regaining its right to use the Tungstram trademark there, while an agreement with Philips about the same issue in Italy was achieved just before the regime change.⁶²

Industrialization in CMEA countries followed similar paths, resulting in parallel capacities and leading also to competitive under-pricing in third markets. This occurred in the lighting industry, too. In the 1960s and 1970s, pre-war light-source production capacities were also extended in the ECE using Tungstram know-how and production machines, too. These producers, fuelled by the need to earn convertible currency, were opposed to cooperation with regard to sales prices.⁶³ The products of the CMEA light-source producers could not compete with Tungstram on quality, product range, or reputation; the lack of cooperation, therefore, only disturbed Tungstram’s business temporarily – when, during the recession caused by the oil shocks, Western market economies tightened import controls to protect local industries from the “dumping” of products from state socialist countries. Tungstram succeeded in defying such charges as its products’ prices were nearly at par with that of the market leaders.⁶⁴

In the early 1980s, Tungstram, as one of the largest export companies of Hungary, realized convertible exports in value of slightly over 100 million USD.⁶⁵ Traditionally, the lion’s share of light source production was exported. Over 50 per cent – over 60 per cent in the early 1980s – was sold in convertible currencies, mostly in Western Europe – where the largest markets were the Federal Republic of Germany, UK, France, and Italy – along with the USA⁶⁶ and the Near and Middle East. By the early 1980s, as in the 1930s, Tungstram was again producing 3.5 to 4.8 per cent of the world light source supply, had a 6–7 per cent share in the Western European lamp market, and 12–13 per cent of its technologically more demanding car lamp market segment. Strategic problems were captured, however, in Tungstram’s negligible market share (1–2 per cent) in special

61 Kuti, *Az Egyesült Izzó*, p. 174–184.

62 P. Wohl, *Visszaszerzett márkajogok [Regained Trademark-rights]*. 30 March, 2020. <https://tungstram-tortenetek.webnode.hu/l/visszaszerzett-markajogok> (accessed 13 January 2024).

63 M. Rácz, *A magyar vállalatok KGST-kapcsolatairól hat elektronikát jelentősebb mértékben alkalmazó feldolgozóipari vállalat kapcsán [About Hungarian companies’ CMEA-relations Based on the Experiences of Six Companies Using Electronics to a Considerable Extent]*, in: A. Inotai (ed.), *Magyar vállalatok KGST-kapcsolatai. A vállalati magatartás, a belső szabályozás és a külső környezetváltozás egy évtizede [Hungarian companies’ CMEA-Relations. A Decade of Companies’ Practices, Internal Regulation and Changing External Framework]*, Budapest 1984, pp. 203–248, at 244–245.

64 Kuti, *Az Egyesült Izzó*, pp. 78–79; one such successful defense of Tungstram’s sales against local producers’ claims for boycott happened in the US in 1978. Honvári, *Pénzügyi és vagyoni jogi*, p. 79.

65 Kuti, *Az Egyesült Izzó*, p. 16; Koroknai, *A Tungstram Rt.*, p. 143.

66 In the late 1970s to early 1980s, incandescent lamps constituted around 10 per cent of Hungarian exports to the US market. Honvári, *Pénzügyi és vagyoni jogi*, p. 71.

and new types of light sources, such as photo or gas-discharge lamps (and even less in complex lighting systems) and the fact that its products only gained a strong foothold at the lower end of the US lamp market.⁶⁷ Tungsram sales prices were usually 10–15 per cent higher than that of its ECE competitors in Western markets, displaying the effect of the decades-long market presence but also the difference in quality and reputation of the trademark; they were however, 5–10 per cent below those of GE, Philips, and Osram, indicating disadvantages in delivery time or constant product quality⁶⁸ – and suggesting the need for organizational and product development.

From the technological point of view, Tungsram partly regained its position among the leading producers. This is illustrated by its being the first company from the socialist countries to implement the Ribbon bulb machine in its production and its participation at conferences on tungsten development.⁶⁹ Probably the most important indicator, however, was its share in the car lightbulb market. Tungsram not only sold car lamps on the so-called “after-market” (as replacement lightbulbs), it also became a supplier to the largest car manufacturers, including Volkswagen, Opel, BMW, Ford (in GDR and UK), Fiat, Volvo, Renault, or Nissan, respectively of the “first tiers” in the production chain, that is of suppliers of whole lighting equipment for cars. The steady rise in Tungsram’s product quality responding to quality standards’ increasing to zero tolerance, along with the car lamp division’s customer service, were the main elements of this success.⁷⁰

Thanks to post-war rapid growth rates in consumer electronics all over the world Tungsram sales of radio valves grew rapidly with a peak of 18 million pieces in 1971.⁷¹ As semiconductors gradually replaced radio tubes, sales declined and concentrated more on the socialist and the so-called developing countries until, in 1982, Tungsram terminated production. At the end of this product’s life-cycle Tungsram, to some extent reestablishing pre-war cooperation, took over production and supply of all Philips and Telefunken radio valves (for replacement of valves in Philips and Telefunken radio sets).⁷² Other

67 MNL_Z_XXIX-F-378 Függelék az Állami Tervbizottság részére készített 1011/1983. Sz. előterjesztéshez. Tárgy: Az Egyesült Izzólámpa és Villamossági Rt. jövedelmezőbb gazdálkodásának megteremtésével összefüggő intézkedések. 2. Sz. Függelék: Az Egyesült Izzó termékszerkezetének és piaci helyzetének elemzése [Appendix to Proposal No. 1011/1983 to the State Planning Commission. Re: Measures to Establish a More Profitable Financial Management at Tungsram Appendix 2. Analysis of Production Structure and Market Situation], pp. 8–13.

68 MNL_Z_XXIX-F-378 Függelék az Állami Tervbizottság részére készített Ig-846/198. Sz. előterjesztéshez. Tárgy: Az Egyesült Izzólámpa és Villamossági Rt. jövedelmezőbb gazdálkodásának megteremtésével összefüggő intézkedések [Appendix to proposal to No. Ig 846/198 to the State Planning Commission Re: Measures to Establish a More Profitable Financial Management at Tungsram], p. 21; Wohl, interview, Budapest, 10 June 2019.

69 Interview with István Mészáros, 1983–1995 head of Tungsram Department for metal component development, 1995–1998 head of GE Metal development, Cleveland, USA, 1998–2009 GE Lighting Hungary metal component development engineer, Budapest, 25 October 2021. Tungsten: 1990. Proceedings of the Fifth International Tungsten Symposium Budapest 14–18 October 1990. Budapest 1990.

70 Interview with Gabriella Mózes, from 1977 at Tungsram, head of the car lamp division of GE Hungary Kft. - GE Lighting, 2018–2020 that of Tungsram Operations Kft. Budapest, 1 February 2021; Kuti, Az Egyesült Izzó, p. 48.

71 S. Mészáros, A 90 éves Tungsram vevőcsőgyártásának története [The History of Radio Valve production of 90-years-old Tungsram], in: Híradástechnika 37 (1986) 10, pp. 436–446.

72 Interview with Egon Sárdi, 1980–1989 head of Tungsram component sales, 1990–1998 head of GE Tungsram sales office in Bangkok, Budapest, spring 2019.

products such as transmitting, cathode, monitor or microwave tubes, theatre lighting systems, or, from the second half of the 1980s, control systems or medical laser equipment did not prove successful enough to utilize the production capacities.⁷³

4.4 Vacuum-technology Machinery: A Lucrative Business – with a Future?

One new interpretation of the globalization of ECE stresses the important role these socialist countries and the USSR played by supporting countries of the Global South in the form of credits, trade and expertise to build up their national economies independent from the former colonizers. The fate of Tungsram vacuum-technology machine-building exemplifies both the potential and the limits of regarding these relations as an “alternative globalization”, as described in the introduction.

In the interwar era, all leading lamp producers had established machinery production to a certain extent in order to meet the specialized machinery demand for lamp production. In the early 1930s, for example, Tungsram was able to rebuild GE machines adjusted to the capacity Tungsram required and built the production equipment for its foreign production sites. The vacuum-technology machinery factory was established in 1951 when the requirements of post-war reconstruction greatly increased demand, and Tungsram was unable to draw on Western sources of supply. In the following decades, Tungsram became the sole socialist supplier of light-source production machines for the CMEA, and it developed other vacuum-technology machines – for television tube production, for example, and for the glass and pharmaceutical industry.

During the early 1970s, machine design cooperation with the German Democratic Republic came to an end – the GDR declared it would import light-source production machines, mostly from Tungsram – while the remaining socialist countries had never had such machine-building capacities.⁷⁴ The slogan of autarchic supply within the CMEA, well-known from the 1950s, was just as unrealizable in this product group as it was in most others. Tungsram itself modernized production technology on its main sites using American and Japanese equipment, while the production equipment developed by Tungsram had a Western import share of four–eight per cent extending to 15–20 per cent for some components, which was crucial for their quality.⁷⁵

Sales of vacuum-technology machinery were conducted differently from that of light sources, partly due to the different marketing requirements of consumer and investment goods. In the CMEA, for which Tungsram mainly produced machinery, trade was regulated by monetary means (prices and currency rates, subsidies, and drains) and by directives and contingents fixed in bilateral agreements, which were intertwined with the

73 Koroknai, A Tungsram Rt., pp. 123–125; MNL_Z_XXIX-F-378 Tungsram’s Directors’ Meeting in Stockholm, 16/17 March 1987.

74 THC 1-380-76001/ No. 004-382 EIVRt Vákuumtechnikai Gépgyártás Fejlesztési és Rekonstrukciós Program I. [Tungsram Vacuum-technological Machine-Building Development and Reconstruction Programme Part I], Budapest, May 1976, pp. 12–13.

75 Rác, A magyar vállalatok, pp. 219–221.

planning mechanisms of the two countries. The value of specific goods in intra-CMEA relations was reflected in the price in transfer roubles and the goods the partner was willing to deliver in exchange. As quite a few Hungarian companies used Western imports to produce goods that were sold on the CMEA market, the exchange goods and the currency rates were crucial for the balance of payments.⁷⁶ Deliveries of light-source and other production machines for the upcoming planning periods were fixed in the contingents of bilateral trade agreements. Specialization and cooperation with all CMEA partners were agreed on in the permanent commissions for radio electronics, machine-building, and working group No. 8 of Interelectro, the International Organization for Economic and Scientific-Technical Cooperation in the Electrical Engineering Industry. As in most other industries, these agreements covered only a specialization in finished products, not in components and sub-assemblies, which would have required close cooperation at the company level.⁷⁷

The CMEA market, especially the Soviet market, which absorbed two-thirds of Tungsram's CMEA deliveries, was advantageous for Tungsram as the agreements allowed for a short- or mid-term planning horizon, and the machines were priced high and paid for mostly in hard goods.⁷⁸ The CMEA market unlocked a growth potential for this product group at Tungsram, both in quantitative terms and, to some degree, by inducing product development. Accelerated electrification – most of all, in the vast Soviet market – created a demand beyond the production capacity of Tungsram, especially as the reputation of Tungsram light-source production machines also opened up the possibility of supplying production equipment for the pharmaceutical and glass industry. Soviet demand induced knowledge production (including copying, or rather adapting Western machines) so that Tungsram could deliver simple industrial robots – for example, for the production of television tubes and cars.⁷⁹ Quality requirements were especially high concerning equipment that would eventually be converted for munition production.⁸⁰

However, the lamp market did not fully reward production equipment development, as Tungsram light-source exports were mostly directed towards capitalist countries, where sales prices were dictated by the market leaders. Furthermore, the less demanding Soviet market regarding some aspects of workmanship or promptness of delivery along with

76 M. Rácz, Összefoglaló tanulmány a magyar vállalatok KGST-kapcsolatairól [Summary Study about Hungarian Companies' CMEA relations], in: Inotai (ed.), *Magyar vállalatok KGST-kapcsolatai*, pp. 1–46, at 11–12, 34–35; P. Germuska, Eastern Intelligence with Western Components: Development of Radio Reconnaissance Instruments in Socialist Hungary, in: ZUG 53 (2008) 2, pp. 177–191.

77 Rácz, Összefoglaló, pp. 33–34; about the difficulties of technology-intensive industries concerning specialization within the CMEA see also: R. Ahrends, Spezialisierungsinteresse und Integrationsaversion im Rat für Gegenseitige Wirtschaftshilfe: Der DDR-Werkzeugmaschinenbau in den 1970er Jahren, in: JBWG 49 (2008) 2, pp. 73–92.

78 THC 1-380-76001/ No. 004-382 Vákuumtechnikai Gépgyártás I., pp. 12–16; Interview with Péter Kőrösi, deputy commercial manager of Tungsram (1987–1990), Budapest, 2 August 2019. Rácz, *A magyar vállalatok*, pp. 231–232.

79 Interview with Péter Báry, executive manager of Mayer HW & SW, former electrical engineer at Tungsram Gyöngyös, Gyöngyös, 8 April 2022.

80 Interview with Ferenc Koleszár, member, then head of Moscow Tungsram office (1980–1985), Budapest, 2 July 2021.

the volume and composition of market demand and the level of skill formation in most equipment markets in the Global South perpetuated a product portfolio focused on second-generation machines.

Until the 1960s, Hungary had no lasting or regular trade contact with countries of the Global South. The dimension of the Hungarian economy, the geographical distance, and scarce financial resources had always limited the extent of financial and technical assistance. By the mid-1970s, the trade volume of these countries with Hungary grew to only 5–7 per cent of its total trade, and was subject to considerable yearly fluctuations. Development assistance, largely given in form of credit for deliveries of machines and equipment, was not insubstantial for the size of the Hungarian economy; it grew from USD 10 to 142 million in 1964–1975.⁸¹ By mid-1975, 108 projects, that is, turn-key factories and complex agricultural or utility establishments, had been realized in these countries, thus transferring technology and providing technical assistance.⁸² Tungsram established a few light-source factories based on international and Hungarian development credits (Tanzania, Zaire), most of the projects were however, financed by local public and private actors.⁸³

Tungsram developed a capacity to support the industrialization efforts of these countries beyond the mere delivery of production equipment – that is, Tungsram also calculated market demand, designed and delivered production equipment, built turn-key light-source factories, transferred know-how, supplied components and offered factory management services. As these countries were keen on economic independence, Tungsram was a good partner for the supply of good quality equipment and ready-to-license production technology without seeking partial or full ownership in the new factories (in contrast to GE, Philips, and Osram).⁸⁴

Light-source factories, mostly producing GLS and fluorescent lamps, were built by Tungsram from the Arab countries (Morocco, Egypt, Iraq, Iran, Syria) through India to the Far East (e.g. Indonesia). The development of new factories was usually followed by the introduction of high import tariffs on the type of light sources produced there. Tungsram found financial compensation in component supply, a better position for supplying machines to extend production, and the sale of special types of lamps. Thus, Tungsram contributed to strengthening the Hungarian presence in the Global South, whose market requirements, in turn, prompted the development of organizational capabilities at Tungsram. The share of these markets in Tungsram light source and machine

81 I. Dobozi et al., *Economic Cooperation between Hungary and the Developing Countries*, in: I. Dobozi (ed.), *Economic Cooperation between Socialist and Developing Countries. Proceedings of the UNCTAD Seminar Economic Cooperation between Socialist Countries of Eastern Europe and the Developing Countries*, Budapest, 6–10 March, 1978, Budapest 1978, pp. 87–138, at 137.

82 T. Szentes, *The Development of Economic, Technical and Scientific Relations between Hungary and the Developing Countries*, in: Dobozi (ed.), *Economic Cooperation*, pp. 139–159, at 142–146.

83 Interview with Pál Teravagimov, 1976–1985 director of Tungsram Component Factory in Zalaegerszeg, 1985–1994 head of Montage Department, then 1994–2002 of Quality Assurance of Vacuum-Technology Machine Factory, Budapest, 31 March 2020; interview Wohl, Budapest, 2 March 2022; Dobozi et al., *Economic Cooperation*, p. 135.

84 THC 1-380-76001/No. 004-382 Vákuumtechnikai Gépgyártás I., pp. 22–23.

deliveries remained, however, too small and fluctuating to regard them as an alternative to the Western and the CMEA markets, and even less could these developing countries provide the know-how to replace Western technical knowledge; thus, Tungsram became one of the competing technology providers in these countries.

4.5 Semiconductors: From Gradual Development according to Tungsram Tradition to the Failure of the Central Development Programme

Tungsram started its research and development of semiconductors belatedly, in 1953. In 1957, the company built its first small-scale diode production unit, and in 1962, mass production was established in Gyöngyös, northern Hungary (Tungsram Semiconductor and Machine Factory). Although the diode manufacturing equipment purchased from Telefunken 1974–1977 enhanced quality and productivity, it still resulted in a technological lag of at least 12 years due to the equipment's outdated technology. Therefore, the cutting-edge diode manufacturing equipment developed in Gyöngyös some years later which Telefunken and Philips acquired from a producer of a socialist country, marked a rare success.⁸⁵ Taking up the production of mesa transistors, then planar silicon transistors Tungsram kept up with the direction, if not the speed of semiconductor development, due to the Co-Com-lists.

It was of strategic importance that, according to Tungsram's own traditions, the company aimed to base production on Western technology of bipolar linear (analogue and digital) integrated circuits (ICs) used in consumer electronics. As chips could be bought from various sources, Tungsram judged the assembly and measurement steps of IC production more important to start with. In 1974/5, it succeeded in signing a license agreement for IC assembly and measurement technology with a leading US-American semiconductor producer, Fairchild Camera and Instruments Company (Mountain View, California). Increased product quality resulted in the initiation of exports to capitalist markets, as well.⁸⁶ Despite these achievements, the 1979 renewal and extension of the Fairchild license agreement on chip production, the first step in IC production, was practically sabotaged until the USSR decided on joint CMEA IC production, in November 1980.⁸⁷ Following personal changes at Fairchild's top management, the tightening of Co-Com restrictions in the early 1980s, and Hungarian economic policy decisions (see below)

85 <https://sites.google.com/view/magsys-vilagcsucs/home> (accessed 13 January 2024); interviews with Dr. Elek Csizmadia, physicist, Iván Várallyai, project manager, and other employees of the erstwhile Tungsram semiconductor production in Gyöngyös, Gyöngyös, 7 April 2022.

86 Mátra Museum, Gyöngyös, Folder EIVRt, A hazai félvezetőgyártás 1958–1985. évi termelési és értékesítési adatai, 1986. ápr. 1. MEV Gyöngyös. [Development of Hungarian Semiconductor Production and Sales 1958–1985, MEC, Budapest/Gyöngyös, 1986]; Interview with József Pálosi, technical vice-CEO of Tungsram Ltd. (1982–1985), Budapest, 25 May 2022; Memoirs of J. Pálosi, Manuscript, Budapest, 7 March 2005, pp. 36–43.

87 THC 1-380-81001/No. 005-549 Mikroelektronikai program. Félvezető elemgyártás létesítése és szerelés-mérés bővítése. Beruházási javaslat I. [Programme for Microelectronics. Establishment of Chip Production and Extension of IC Assembly and Measurement. Investment Proposal part I.] Budapest, June 1981, p. 13.

the opportunity for upgrading one segment of microelectronic components production based on Western know-how and according to Western standards slipped by.⁸⁸

In 1982, realizing a “government programme” for microelectronics, the research institute HIKI, Tungstram Újpest semiconductor R&D and trial production, and Tungstram Gyöngyös were merged into the new Microelectronic Company (MEC), which was to supplement semiconductor imports from the West. The idea was to shift from the development path of mass production based on Western licenses towards producing semiconductors according to customers’ specifications using Soviet and outdated Western machines.⁸⁹ Theoretically, centralizing the research and production capacity of a relatively small country made sense. As a reviewer of the programme remarked, however, founding IC production on Soviet machinery and on technology developed by HIKI meant building production and technological development on nothing.⁹⁰

The amount of regular investments required in the fast-growing and rapidly improving IC production technology made however, the success in IC production for Hungary – and indeed, for all ECE producers – appear unlikely once it became clear that the trade restrictions created by the Cold War were to disappear. In retrospect, leading Tungstram experts recognized that direct integration into the global production chain of one of the market leaders, such as Fairchild, was the only realistic long-term option for Tungstram and the Hungarian semiconductor industry.⁹¹ Indeed, that scenario prevailed; in 1998 the former MEC was turned into a production unit of Vishay.⁹²

4.6 The Collapse of the Planned Economies and Integration into the Second Global Economy

Despite attempts to reform the socialist economic system, Hungary, like the other ECE countries with planned economies, failed to master the challenges of structural change that came with the “third industrial revolution” and the intensifying globalization from the 1970s.⁹³ The oil price hikes (1973, 1979) and the suddenly increased costs of public debt refinancing as Western creditors raised interest rates to combat inflation at home led to declining growth rates in the 1980s.⁹⁴ Thus, when the USSR unilaterally decreased its oil supply to Hungary the country was brought to the brink of insolvency by early 1982.

88 Pálósi interview; Memoirs of J. Pálósi, Manuscript, Budapest, 7 March 2005.

89 Báry interview.

90 THC 1-380-81001/No. 005-549 Mikroelektronikai program, remark on the inside cover.

91 Interview with György Telegdy, deputy leader of Tungstram Semiconductor Development Department (1972–1982), leader of MEC Chip production unit (1983–1989), Budapest, April 2020.

92 Mátra Museum, Gyöngyös, Folder EIVRt, Vishay Hungary Kft., 2nd edn, [Budapest] 2002.

93 U. Müller, Introduction: Failed and Forgotten? New Perspectives on the History of the Council for Mutual Economic Assistance, in: U. Müller and D. Jajeśniak-Quast (eds.), *Comecon Revisited. Integration in the Eastern Bloc and Entanglements with the Global Economy*, Leipzig 2017 (= *Comparativ* 27 [2017] 5–6), pp. 7–25.

94 T. Vonyó and A. Klein, *Why Did Socialist Economies Fail? The Role of Factor Inputs Reconsidered*, in: *Economic History Review* 72 (2019) 1, pp. 317–345.

Its integration into the World Bank and the International Monetary Fund was crucial for the restoration of financial stability.⁹⁵

Monetary and trade policies did not necessarily support companies efficiently in terms of earning convertible currency, as exemplified by the experience of Tungsram. From the 1970s, Tungsram found support for increasing hard currency exports in the form of management bonuses or targeted investment credits. Indeed – and strikingly – sales of light sources and their components in hard currencies nearly quadrupled during 1970–1981.⁹⁶ This drive, however, induced the pushing of sales even at low prices and to buyers with unchecked creditworthiness, which resulted in increasing overdue claims, which, in turn, tied up working capital. It also indirectly contributed to two failed foreign direct investments, a Tungsram factory established in Ireland in 1980 and a joint venture in Pakistan in 1979. Although the investment in Ireland was based on a miscalculation of market needs, while in Pakistan, unexpected changes at the local market upset calculations, both short-lived factories were closed down with a financial loss.⁹⁷ Furthermore, the capacities of some large investments to boost convertible lamp exports suffered from decreased sales prices in the main markets, while others were dampened from the start as the credits did not cover investments beyond the mere production facilities (that is investments into warehousing, handling, packaging, etc.). Undercapitalization of the foreign subsidiaries resulted in high interest for credits taken in order to keep up with buyers' expectations of longer periods of payment.

Since the mid-1970s, the regulation of exchange rates, production and consumption prices, so as company earnings and their use intended to stabilize the balance of trade while maintaining living standards, that is reducing inflation. Due to the complexity of the regulative measures, their contradictory nature and frequent change these goals were not realized. Reckoning probably that stabilizing the balance of trade depended more on various direct financial means of supporting exports and processes of internal consumption than on the aforementioned regulative measures, in 1980, the real appreciation of the Hungarian currency was decided on.⁹⁸ As two thirds of Tungsram' revenues came from exports, especially exports in not-rubel relations constituted over 60 per cent of its total exports at that time, export revenues were considerably reduced.⁹⁹

95 J. Honvári and Cs. Torda, Magyarország csatlakozása az IMF-hez és a Világbankhoz III, [Accession of Hungary to the World Bank, Part III], ArchivNet 9 (2009) 3, https://www.archivnet.hu/gazdasag/magyarorszag_csatlakozasa_az_imfhez_es_a_vilagbankhoz_iii_resz.html (accessed 13 January 2024).

96 Rácz, A magyar vállalatok, p. 217.

97 Wohl. Interview, Budapest, 2 March 2022.

98 J. László and M. Hőgye, Gazdaságpolitikai célok és a gazdasági szabályozók az V. ötéves terv időszakában [Economic Policy Goals and Regulative Measures during the Fifth Planning Period], in: Egyetemi Szemle 4 (1982) 1/2, pp. 25–50, at 32–34; J. László and M. Hőgye, Gazdaságpolitikai célok és a gazdasági szabályozók II. (1980–81) [Economic Policy Goals II.], Egyetemi Szemle 3 (1982) 1/2, pp. 35–56, at 45–47.

99 MNL_Z_XXIX-F-378 Előterjesztés az Állami Tervbizottság részére. Tárgy: Beszámoló az Egyesült Lézslámpa és Vilamosági Rt. működéséről, Javaslat a jövedelmezőbb gazdálkodás megteremtésére. Tervezet [Proposal to the State Planning Commission. Re: Report about Tungsram. Proposal to Establish a More Profitable Financial Management], Budapest, September 1982, p. 11; Attila Kiss, in: G. P. Szabó et al. (ed.), Tungsram (arc)képek, 2nd edn, Budapest 2015, pp. 128–129; Tungsram Rt, Statisztikai zsebkönyv I., p. 25.

Tungsram's machinery division had little chance to rapidly reorient exports, that is substantially increase convertible exports. As the leading light-source producers supplied their factories with their own machines, the demand for light-source production equipment outside the CMEA market was restricted. Furthermore, in the late 1970s, a large investment programme for modernizing and extending the machine-building capabilities in the hope of increasing convertible exports had used the majority of resources on a new production site in Pécs, leaving insufficient funds to modernize production technology at the main machinery sites (at Újpest, Gyöngyös, and Győr).¹⁰⁰

Thus, by 1983, high overhead costs due to organizational inefficiencies, high interest rates on investment loans, and some failed investments coupled with decreasing prices on the main sales markets and policy changes further decreasing the profitability of exports had all resulted in the need for a complete company restructuring.

In 1983, the technical CEO of Tungsram, Károly Demeter, was appointed as CEO. He directed the design of a reconstruction programme, which was accepted by the National Planning Office. The renewal of the organization and management structure of Tungsram started with steps to decentralize decision making in order to increase productivity, to enhance the efficiency of coordinating the Tungsram organizations' activities abroad and, in view of the strategic importance attributed to electronics, to centralize and upgrade related R&D and production capacities. In the same year, the Tungsram-Schröder Lighting Equipment Ltd. a Belgian-Hungarian joint venture based in Hungary was established. The production of lighting fixtures was to further Tungsram's efforts in supplying complex lighting systems instead of just individual light sources, a trend set by the European leaders of the industry. In 1984, the company was renamed Tungsram Ltd., and preparations for its reorganization as a proper joint stock company began. The state supported the reconstruction by allowing for the detachment of some factories from Tungsram, the dismissal of some and prolonging of other credits, and the stocking up of working capital.¹⁰¹

However, state support for the restructuring plan and stabilization of the financial situation of the company was ambivalent. For example, the factory in Gyöngyös, which had a substantial profitable export to the USSR, was merged into the MEC.¹⁰² Although a dynamic new electronics team was created in Újpest that embraced the opportunity to develop control systems for light-source production equipment, laser equipment, and industrial robots,¹⁰³ the loss of Gyöngyös robbed Tungsram of the knowledge already accumulated there of pairing machinery and electronics. Furthermore, as a restructur-

100 THC 1-380-76001/ No. 004-382 Vákuumtechnikai Gépgyártás I.

101 Koroknai, A Tungsram Rt., pp. 136–140; Tungsram Rt., Statisztikai zsebkönyv I., p. 7; Kuti, Az Egyesült Izzó, p. 193.

102 TCA box 493, Stratégiai Tervezési Főosztály, Világbanki Ügyek Iratai [Main Department for Strategic Development, Documents related to projects with the World Bank], Letter by CEO András Gábor to Dr. Sándor Bognár, Under-Secretary of State for Industry, Budapest, 21 May 1986, Tervezet [Draft] (attachment).

103 Interview with Péter Schwarcz, development engineer at Tungsram Ltd (1984–1991), technology leader at GE Current (2013–2017), 2018–2022 at Tungsram Group (director of professional lighting strategy), Budapest, 19 August 2023. MNL Z_XXIX-F-378 CEO András Gábor, A Tungsram Rt. feladatai a gazdasági kibontakozás jegyében. [Tungsram's tasks for economic recovery] Budapest, March 1988, p. 9.

ing plan from 1986 stressed, any productivity gains Tungsram had achieved were lost as the taxes that the company had to pay were higher than its profits; Tungsram was not allowed to substantially increase sales prices in the home market, and it certainly could not dictate them abroad.¹⁰⁴

Months after CEO Demeter's early death in 1985, reconstruction was resumed under CEO András Gábor, a former technocrat from the Ministry of Industry. Examples of internal organizational renewal were the integration of the geographically scattered tungsten-wire production and the establishment of all Tungsram factories as autonomous financial units in order to enhance productivity.¹⁰⁵ One example of attracting foreign investors was the establishment of Tungsram Laser Technology Inc. with MLI Lasers Ltd Atidim (Israel) in 1987.¹⁰⁶ In early 1989, Tungsram Holding Co., Amsterdam, was founded to coordinate the capital and credit supply of foreign subsidiaries.¹⁰⁷ Tungsram also found ways to overcome the collapse of the Soviet economy via barter directed by Tungsram Trading House, established in 1989.¹⁰⁸

In the spring of 1989, after Tungsram had been turned into a genuine joint-stock company, the majority of its shares were sold to a consortium of Western European banks led by the Austrian Girozentrale. However, Tungsram was in need of a strategic investor. The shortage of capital was hindering product and production development at a pace sufficient to uphold its competitive position. The most telling story in this regard concerned compact fluorescent lamps (CFL). As following the oil shocks energy-intensive production, especially in Europe, was markedly reduced, cutting back on energy consumption in lighting became an imperative. Philips and Osram forged ahead in developing new energy-saving light sources. Tungsram also developed such a product, but investment funds only allowed for small-scale production from 1987.¹⁰⁹

Accumulated economic and social problems culminated in the collapse of the centrally planned economies in ECE in 1989. The depth of the transition crisis in Hungary is displayed in the level of cumulative GDP, which dropped by 30 per cent between 1990–1994¹¹⁰, deindustrialization, and a high rate of unemployment (in 1996 3.6 million people had employment, 1.3 million less than in 1989).¹¹¹ Foreign direct investment

104 TCA box 493 Letter by CEO Gábor to S. Bognár, Budapest 21 May, 1986; see also Tungsram Rt., *Statistikai zsebkönyv* 1, pp. 59–60.

105 Dr. László Csedreki, in: Szabó et al. (ed.), *Tungsram-(Arc)Képek*, pp. 60–61; András Hiripi, former chief technologist, Component Factory Hajdúböszörmény, member of GELE's technical development Senior Leadership Team (1992–1999), GEL Tungsram Ceramic production (2004–2015), project manager at Tungsram (2018–2022), online interview, 28 January 2021.

106 MNL_Z_XXIX-F-378 Társasági Szerződés, 2. tervezet. Gábor András Elnök Titkársága, Igazgatói anyagok, 1989. [Deed of association, 2. draft. Secretariat of CEO Gábor, Directors' documents, 1989].

107 Attila Kiss in: Szabó et al. (ed.), *Tungsram (Arc)Képek*, pp. 128–129.

108 Interview with Ferenc Koleszár, Budapest, 1 March 2022; Kőrösi, interview.

109 Billing, interview.

110 J. Kornai, Transformational Recession: The Main Causes, in: *Journal of Comparative Economics*, 19 (1994) 1, pp. 39–63.

111 Központi Statisztikai Hivatal (KSH), Magyarország 1989–2009. A változások tükrében [Hungary 1989–2009. In the Mirror of Change], Budapest 2010, p. 10.

was crucial for modernization of production; complete new industries were established (electronics, automotive), while many of the traditional flagship branches and firms of Hungary shrunk or disappeared. Already in the mid-1990s, the European Economic Community, prominently Germany, were the country's main trading partner.¹¹²

Tungsram managed this transition fairly well, since already before 1989 the majority of its exports were directed towards capitalist markets and it was able to attract GE as a strategic investor. As part of GE's quest to become number one in the lighting industry, which necessitated a substantial increase in its market share in Europe, in December 1989, GE acquired a controlling interest in Tungsram. Its main assets for GE were its Western European market share (ca. seven per cent) and organization, market penetration in the CMEA, skilled, low-cost workforce, and traditionally strong scientific and technological capability.¹¹³ By 1994, GE had become sole owner of the Tungsram.

In 1990, when Jack Welch, CEO of GE, visited the representation of the newly acquired company at the Budapest Spring Fair, he was astonished to learn about the drop in energy consumption of the Chain Bridge, the iconic symbol of Budapest, after its light sources had been replaced by Tungsram CFLs. Welch instantly grasped the importance of the European competitors' head-start in energy-saving light sources – a demand for energy-saving light sources had not yet sufficiently manifested in the US – and provided the necessary resources to establish the mass production of CFL.¹¹⁴ From 1992, Tungsram's plant in Nagykanizsa was designated GE Lighting's (GEL) sole worldwide producer of this modern product, furthermore R&D on CFL were carried out by Tungsram. Other Tungsram plants became sole producers of certain types of lamps and components for GE Lighting Europe (GELE) or for GEL worldwide.¹¹⁵ The production of various light sources were relocated from various GE-factories in Europe, Asia, and the USA to Hungary.¹¹⁶ After a painful restructuring and substantial investment in modernizing production technology, R&D organization and internal education, Tungsram had become the centre of GELE. In contrast to many Hungarian companies serving only or mostly, initially, as the foreign investors' workbench, Tungsram became equal R&D partner of GEL already from 1993.¹¹⁷

However, the importance of the lighting industry gradually decreased for GE. It neither took sufficiently substantial steps in lighting systems provision nor assumed a leading position in the next technological stage of light-source development, light-emitting diode (LED) technology.¹¹⁸ Following a management buy-out in spring 2018, which included taking over GEL's business in Europe, the Middle East, Africa and Turkey, as well as its

112 KSH, Magyarország 1989–2009, p. 34, 84.

113 P. Marer and V. Mabert, Tungsram, in: J. C. Brada and I. Singh, *Corporate Governance in Central Eastern Europe. Case Studies of Firms in Transition*, Armonk, NY 1999, pp. 57–79.

114 Wohl, interview, Budapest, 10 June 2019.

115 Marer and Mabert, Tungsram, p. 77.

116 *Ibid.*, p. 78.

117 Koroknai, A Tungsram Rt., p. 148, 154; Csapody, interview.

118 Letter to the author by M. Csapody, Budapest, 13 November 2023.

Global Automotive business, Tungsram became an autonomous Hungarian company again. The Tungsram Group aimed to reorientate towards complex, smart lighting solutions and convert know-how and production capabilities in rare metals, glass, and ceramics into advanced component production and services.¹¹⁹ Efforts were cut short, however, by the combined shocks of COVID-19 and global transport blockades, followed by soaring prices in shipping and energy and then the Ukraine-Russian conflict. Since January 2023, Tungsram has been in liquidation.

5. Conclusion

This case study has analysed how an export-oriented company in the electro-technical industry that was already established before 1945 learnt to act globally again after adjusting to new hegemonic structures brought on by the (increased) East-West division, the regime change in Hungary, and fundamental changes in the world economy. Once management authority was reestablished as far as possible within the framework of what was now a planned economy, Tungsram quickly resumed its course and developed its production and R&D capabilities to assume the strategy of a quick follower in the lighting industry. From the late 1960s, it profited from the opportunities provided by institutional reforms, the opening of trade with Western Europe, and USSR-US détente by taking investment credits to modernize its production capabilities with technology from the advanced industrial countries. It also rebuilt its pre-war network of subsidiaries abroad, which were key to its market presence.

The most telling indicators of Tungsram's position were its share of the world light source market (three-to-four per cent), its strong foothold in the ever more demanding car lamp market, and the slightly lower price level of its products as compared to industry leaders. Additionally, Tungsram was able to develop a business strategy, product portfolio, and management capabilities to assume the role of supplier of vacuum-technology production equipment for the CMEA market and for countries of the Global South. Thus, Tungsram regained its reputation in the advanced market economies, and, learned to turn the integration of Hungary into the CMEA into both an opportunity to grow and a way of gaining a firm foothold in the Global South as a technology provider for industrialization and a supplier of higher-end products.

Furthermore, the continued presence of Tungsram in the West – with its sales organizations and a few production sites in its most important markets and only one direct investment proving to be a real miscalculation of market needs – combined with its market entry into the Global South –makes Tungsram one of the rather few companies from the socialist states of ECE which developed organizational capabilities to operate globally and adjusted their strategy fairly successfully to different market conditions

119 Tungsram – Innovation is our Heritage, <https://lighting.tungsram.com/en/news/tungsram-innovation-is-our-heritage#> (accessed 13 January 2024).

worldwide.¹²⁰ Nevertheless, the importance of Tungsram's relations to countries of the Global South did not justify to regard them as an alternative to that with the Western market economies, underlining limits to the concept of "alternative globalization" from a business history perspective.

However, the swift process of turning Tungsram into a large socialist enterprise, which went beyond the optimal size and composition, increased production costs and led to the need for organizational restructuring. Large credit-based investments were required to modernize production capacities to meet the quality levels demanded in the advanced capitalist markets. The return on these investments was not easy to secure due to the combination of decreasing sales prices after the recession following the oil price shocks and Tungsram's inability to dictate prices. The excessive drive (supported by policy incentives) to increase exports to the West contributed to a deterioration of profits and a failed investment in Ireland, while other policies restricted profits on exports. Thus, from the late 1970s, the traditional export orientation of Tungsram came to contribute to its deteriorating financial stability, in part, due to ambivalent industrial and trade policy measures. During the deepest crises of the company's history – after WWII and in the early 1980s – the planned economy failed to provide a framework supporting lasting competitiveness in the global environment. The investments into human capital, production capacities and organizational capabilities so as the fairly successful reintegration of Tungsram into the lighting industry were, however crucial to attract GE as strategic investor and to prove a reliable European partner so that Tungsram could master the transition crisis and continue in the lighting industry until 2022.

120 R. King, M. Hill, and J. Cornforth, *From "Red Multinationals" to Capitalist Entrepreneurs?*, in: *European Journal of Marketing* 29 (1995) 13, pp. 6–22, at 7; C. H. McMillan, *Multinationals from the Second World. Growth of Foreign Investment by Soviet and East European State Enterprises*, New York 1987, p. 164.