

**THE RUSSIAN TECHNICAL SOCIETY AND BRITISH TEXTILE
MACHINERY IMPORTS**

By

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Abstract

The strident nationalism that characterised Tsarist Russia's final decades, compounded by the anti-capitalist stance of its Soviet successor, have served to downplay in Russian historiography the role of foreign entrepreneurship in pre-Revolutionary Russia and to portray in negative colours the contribution of native entrepreneurs to the country's social and economic development. However, recent Russian historiography has sought to show native Russian entrepreneurship in a more positive light. The leading Russian textile dynasty, the Morozovs, for example, which accounted for about 10 *per cent* of Russia's textile production in the early twentieth century, who were condemned in the Soviet era for their allegedly ruthless labour relations and their slowness to embrace new technology have recently undergone a rehabilitation. The time would seem apposite, therefore, for a reappraisal of the flow of textile technology from Britain to Russia and to re-examine the charge made in the 1890s by the Russian Technical Society (RTO) in particular that British textile technology exercised a retarding influence on the development of the Russian textile industry. In essence this involves an examination of the role of the Bremen born entrepreneur, Ludwig Knoop (1821-1894), who after a brief sojourn in Manchester working for the cotton exporters, De Jersey & Co., went to Russia to become the main conduit for the flow of English machinery into Russia's textile sector.

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This example of cross-border technological diffusion provides an opportunity to analyse the extent to which Russia's experience mirrors the process elsewhere. It has

been argued that in any respects Russia's development process is *sui generis*.² Admittedly all embracing models of technology transfer pose complex if not insuperable problems. But as Jeremy has suggested, 'if the process is considered as a movement across international and cultural boundaries of at least two societies, then the elements involved may be arranged in relationships which constitute a model analogous to real world experience.'³ He has characterised the cross border diffusion of technology as being a four stage process with certain defining characteristics (See Table 1). The extent to which Russia's assimilation of English textile technology conforms with Jeremy's model will be an important sub-theme of this chapter.

Among the factors considered helpful for a country embarking on the path of rapid industrialisation technological borrowing ranks among the most important. Postponed economic development, observed Gerschenkron, 'implies the opportunity for borrowing highly developed foreign technology while deriving additional benefits from the process of capital cheapening which has occurred outside a country's borders'.⁴ Yet important as technological transfer is deemed to be, the mechanics of the process are much less familiar. Here case studies can do much to illuminate the process. By analysing the debate on the significance of the pre-1914 flow of textile technology from Britain to Russia, this study seeks to contribute to its understanding.

Russia's cotton textile sector had a fitful beginning. Despite the state subsidised establishment by two Englishmen, William Chamberlain and Richard Cozzens, of Russia's first large scale cotton printing and dye works in 1753, it went the way of most of Russia's state subsidised enterprises of the time, quickly going into decline.⁵ With the country's cotton textile sector advancing only slowly over the rest of the

century, it was arguably an implant before its time.⁶ But by the time the government established in 1798 a model spinning and weaving plant, the Aleksandrovsk State Textile Mill, the pace of development had quickened and this plant is accorded a key role in spreading improved production methods in the emerging cotton weaving industry in the Baltic area and in the provinces of Moscow and Yaroslav.⁷ The Continental Blockade and the tariff of 1810 provided a fillip for Russia's cotton weaving industry and while the 1812 Napoleonic invasion and the ensuing fire of Moscow destroyed cotton enterprises there, it did facilitate the industry's development in the towns and villages outside Moscow.⁸ Thereafter the fall in the price of cotton yarn imported from England allied with the high 1822 tariff on imported cloth brought about a rapid growth of the cotton weaving sector in the second quarter of the century. Russia's cotton spinning industry on the other hand was stunted by competition from its more technologically advanced English rival and accounted at this time for less than ten *per cent* of the Russian yarn market. Although it was possible for Russia to obtain English textile machinery before the British proscription on machinery exports was lifted in 1842, it was both complicated and expensive to do so. The infant cotton spinning sector instead relied on French and Belgian machinery or that produced by the above-mentioned Aleksandrovsk works. Once English machinery could be freely imported, those mills that had the financial resources to do so, such as the Lepeshkin Mill, quickly installed English machinery.⁹ But in the first four decades of the nineteenth century it was the cotton weaving and finishing sectors that benefited most from Russia's growing market for cotton goods.¹⁰ Cotton spinning expanded rapidly from the 1840s with much of the yarn being produced in mechanised mills using English machinery. The dominant role in that process was played by Ludwig Knoop, who had gone to Russia as assistant to De Jersey's Moscow agent, Franz

Holzhauser, around 1840.¹¹ His company founded in 1852, L. Knoop & Co., Moscow and St Petersburg, in conjunction with De Jersey & Co. and the textile machinery manufacturers, Platt Bros., Oldham, collectively played a major part in the expansion of Russia's cotton textile production, providing machinery, supervisory personnel and raw cotton through their branches in the United States, Egypt and India, as well as those in Manchester and Liverpool.¹²

The reasons for technological borrowing on the part of the Russian textile industry are straightforward. The technological breakthrough in Britain's cotton textile sector in the late eighteenth century put that industry in a preeminent international position. Based for the most part in Lancashire the textile machinery industry it spawned became from the 1830s the source of technological transfer to the textile industries of North America, Western Europe, the Far East, and from the 1840s to the cotton textile sector in Russia too.¹³ Western technological transfer to Russia was in any event a well established feature of the country's economic development. Indeed the impetus given by Peter the Great to the adoption of Western machinery and Western specialists has continued into the present century.¹⁴

Viewing the process in the framework of Jeremy's model, Russia by the 1840s was aware of the potential benefits to be gained by employing West European textile technology. And there is general acceptance that the equipping by Knoop of Morozov's Nikol'sk Mill at Orekhovo-Zuyevo, Vladimir province in 1847 was a major landmark in the industry's development. It was actually the sixth mill equipped by the De Jersey/Knoop nexus but its success brought about rapid technological fusion as other Russian textile entrepreneurs sought Knoop's help in

developing their enterprises. But the financial dimension of this fusion process needs some consideration. It is accepted that credits were obtained in England for the Morozov venture and Knoop indeed took a shareholding in it. What needs to be addressed is why substantial credits were forthcoming from England to allow Russia's cotton spinning sector its rapid expansion. A possible answer to this conundrum would seem to be the previous success enjoyed by the Ohta Spinning Mill set up by the directors of De Jersey & Co., Knoop's uncles, Johann Andreas and Johann Hinrich Frerichs. Significantly the Ohta Mill was 'number 1' in the coding system used by De Jersey and Knoops to maintain commercial secrecy. In Russia's process of technological diffusion in the cotton sector there were arguably two pilot plants: the Nikolsk Mill, which demonstrated the benefits of technology within Russia; and the Ohta Mill, which demonstrated the financial viability of spinning mills in Russia to credit suppliers in England. With Knoop as guarantor of solvency and as a supplier of technology, raw materials and supervisory personnel, Russia's protected cotton textile market allowed rapid technological diffusion. By 1860 Russia was almost self sufficient in yarn production. Virtually all Russia's major cotton textile firms owed their success to links with Knoop (See Table 2). And Knoop himself became a major force in Russian cotton textile production, having a controlling influence in the massive Krenholm Mill at Narva, Estonia, which he established in collaboration with the Khludov Brothers and K. T. Soldatenkov and others, as well as in the Danilevsky Spinning Mill and the Emil Tsindel cotton printing works in Moscow. Knoop was credited by Schulze-Gaevernitz with having helped to establish 122 textile mills in Russia but a government report of 1877 on the occasion of L. Knoop & Co.'s twenty fifth anniversary suggests that 154 mills were established with the help of Knoop and that in total he supplied some 187 factories with machinery.¹⁵ The coding system

used by Knoops indicates that the number, including woollen, flax and jute mills had risen had risen by 1913 to 267.¹⁶ By this time textiles accounted for 28 *per cent* of Russia's industrial output by value and employed 30 *per cent* of the workforce. Russia ranked fourth in the world for textile production after Britain, the United States and Germany.

Technological transfer is not a trouble free process. It involves the transfer of techniques created to suit the circumstances of one social and economic environment to another. In the specific case under discussion it involved the transfer of technology from one of the most advanced industrial sectors of the world's most industrialised country into the craft industry of a country that had barely embarked on the path of industrialisation. With a significant proportion of Russia's textile mills being located in rural areas and with urban based mills having to adjust to high labour turnover amongst its largely rurally recruited workforce, the working regime remained influenced by the cadences of peasant life well into the twentieth century. 'In the eyes of the peasant', observes Von Laue, 'the factory was a formidable monster. He could not comprehend its organization and motivation'.¹⁷ Wage rates were low, the living and working conditions were often both miserable and irksome and yet some enlightened employers created factory communities that could bear comparison with their west European counterparts. An English observer at the time, commenting on the situation in one of Russia's most advanced mills, Morozov's Nikolsk Mill, noted that: 'The mill hands of Russia are better fed and healthier than their fellows in England, but this is due to the fact that they live part of the year in villages....Between eighty and ninety *per cent* of the adult male workers own land and cottages in the village commune to which they are attached and to which they frequently return.'¹⁸

With such cultural and economic differences, it is suggested, technological transfers in solving one set of problems might be expected to create others, ranging from inappropriate machinery and work practices to offended national pride.

Created an hereditary Russian Baron in 1877 in recognition of his contribution to the industry's modernisation, Ludwig Knoop was nevertheless subjected to a wide ranging condemnation by The Russian Technical Society (hereafter the RTO) in 1895 for allegedly retarding the development of the Russian textile industry.¹⁹ Although the RTO was well-known for being a strong critic of backward technology and practices, its analysis of the shortcomings of the Russian textile industry and Knoop's alleged part in this merits examination, since the RTO had influence within the Russian bureaucracy. Furthermore, the critique generated a spirited defence of Ludwig Knoop by the German economist, Schulze-Gaevernitz, which for a century has provided the main source on information on Knoop for Western scholarship.²⁰ This counter-polemic was undoubtedly a powerful one but it failed to address the RTO's specific criticisms levelled at the Knoops. Given that Knoops were primarily a commercial undertaking, some weaknesses in their marketing of a wide range of imported machinery were to be expected. But the criticisms here ought more properly be levelled too at British manufacturers, who used them as intermediaries.

The RTO claimed that the house of Knoop's most important principle was that it sold and installed for its Russian clients English machinery exclusively. With the rise of Continental competitors from the 1870s such a policy brought mixed fortunes, particularly with respect to bleaching, dyeing and textile printing machinery. In Western Europe Switzerland followed by Germany were the first to establish their

independence from British textile machinery suppliers.²¹ And those German and Swiss owned textile mills operating within the Russian Empire, such as the huge German-owned Karl Scheibler mills in Lodz and the Swiss-owned AG der Moskauer Textil-Manufaktur, could provide an entry into the Russian market for textile machinery produced by their compatriots. Some Swiss concerns introduced Swiss textile machinery into their Russian mills and they tended to favour the Sulzer steam engine over its British rivals.²² How far had Russian textile concerns become less reliant on English textile machinery in general and on supplies through L Knoop & Co. in particular? The government sponsored survey of the Russian economy produced in 1893 for the Chicago Exposition regretted that due to the inadequacy of cotton machinery manufacture in Russia companies were 'forced to use English equipment'. The suppliers the survey listed, presumably in order of importance, were Platt Bros, Howard and Bullough, Dobson & Barlow, Curtis & Sons, Samuel Brooks, Hetheringtons, Crightons, and Asa Lees.²³ Of these companies Knoop only represented the first mentioned. Platt Bros outpaced Belgian and Swiss firms to become by the 1850s the largest textile machinery manufacturer in the world but its peak coincided with the RTO critique. From 1894 its profits fell sharply.²⁴ Certainly Russia's social milieu allowed Knoop to remain the dominant machinery supplier for the Russian textile industry longer than might be expected. And Platt Bros, Oldham, could certainly be satisfied with the level of orders generated by Knoop on their behalf but Knoops did take the precaution of using a numbered code for the Russian enterprises they supplied, making it difficult for English machinery manufacturers to discover the firm they were actually supplying. In the opposite direction Knoop was aided by the serf background of many of Russia's cotton textile entrepreneurs. The lack of education, ignorance of foreign languages and lack of

knowledge of the world outside Russia amongst at least the first generation of textile entrepreneurs allied with the absence of a commercial banking system before the 1860s gave a powerful advantage to an intermediary such as Knoop, who was able to access foreign credit on their behalf. As Joffe has pointed out, the authors of the RTO pamphlet failed to recognise that ‘the decisions reached by English firms to do business with Knoop and indirectly with Russian manufacturers were not the result of Knoop’s malevolent design but part of the financial and economic policies of the exporting firm’.²⁵ But while many of Russia’s cotton textile entrepreneurs were often only one or two generations removed from their serf-entrepreneur forebears, there were notable early attempts by leading entrepreneurs to forge direct links with overseas suppliers. The Yegorevsk textile magnate, A. I. Khludov, came to England in 1844-45 to purchase equipment for his factories. His son, Ivan Alekseyevich Khludov (1839-1868) after a two year spell working in a Bremen merchant house, was sent to England to study the English cotton market. In 1860 he went to the United States to study cotton production first hand. He began handling the American end of Khludov’s cotton imports from that market but the outbreak of the American Civil War made this venture unprofitable.²⁶ Shortly afterwards Khludov Bros opened an office in Liverpool to handle cotton imports into Russia, rapidly earning a good reputation in England and becoming cotton suppliers to a number of Russian mills.²⁷ But the concern which made itself most independent of foreign tutelage was the branch of the Morozov family which ran the Nikolsk mill. In the 1860s its head, Timofey Savvich Morozov, opened in Liverpool an office of the firm, Savva Morozov & Sons, which significantly handled not only cotton but machinery supplies too. It purchased weaving frames from Robert Hull, spinning equipment from Curtis & Son, and most noteworthy, without Knoops as intermediaries, spinning equipment from

Platt Bros and spare parts and gas equipment from John Musgrave & Sons. Apparently it was not so much that he wished to bypass the Knoops completely, as has been suggested, but rather that he preferred the security of several channels of supply for both raw materials and equipment.²⁸

The steam engines and power transmission systems imported by the Knoops came in for particular criticism by the RTO on account of their alleged obsolescence. Additionally the Knoops were condemned for imposing a uniform and conservative system of factory design unsuited to Russian conditions and static in the face of technological advances. Construction work, it was alleged, was often poor with foundations quite inadequate for the factory structures they were supposed to bear. Lack of data precludes a detailed analysis of textile company cost structures. Even so a *prima facie* case can be made for suggesting that the RTO's emphasis on the pursuit of technical perfection seemingly for its own sake to the apparent neglect of costs and profitability was inimical to the interests of the Russian textile industry.²⁹ For a commercially orientated concern as the Knoops the attractions of sticking with tried and tested technology, which was yielding satisfactory profit levels for its manufacturing clients would be compelling.

The retarding influence of the Knoops, argued the RTO, was not restricted to machinery and the factories, which housed it. It encompassed the factory management and working practices too. Through the Knoops Russian textile mills had been supplied with English managers, technicians and supervisory staff. Their lack of theoretical as opposed to practical knowledge earned the RTO's condemnation, the more especially since such English managements opposed the

recruitment of Russian diploma engineers. Finally the Knoops were attacked for allegedly supplying textile mills with low grade coal and on occasions cotton of such poor quality that workers would refuse to process it. Yet absent from the RTO's catalogue of complaint is any serious analysis of the profitability of the cotton textile industry under the tutelage of the Knoops or any in depth discussion of spinning and weaving machinery, which by the 1890s were both experiencing technological change and might have been considered worthy of the Society's serious attention. These omissions will be addressed below.

II

L. Knoop & Co. supplied the Russian textile industry with steam engines from two well-known English firms, John Musgrave & Sons and Hick, Hargreaves. The RTO complained that too little attention was paid to their technical efficiency. No guarantees would be given for the cost of power and regardless of the horsepower required, the engine would come from the same firm. When in the 1870s rapid advances were occurring in the development of horizontal compound engines with the availability of high-pressure boilers, Knoops continued to import low-pressure beam engines, manufactured by Hick, Hargreaves. Yet this latter company was one of the most noteworthy British firms to take up the manufacture of American designed high pressure steam engines.³⁰ And as early as 1857 De Jersey and Knoop were apparently trying to acquire the turbine technology of the predecessor German firm to the Maschinenfabrik Augsburg-Nurnberg. Two English representatives of Platt Bros.' agents in Moscow (Knoop & Co.?) asked the firm to supply a new textile plant near St Petersburg with turbines. Negotiations broke down over the English insistence that

the turbines be built in Manchester. Two years later, however, Ludwig Knoop agreed a contract for a large turbine to be installed at the Krenholm Mill, Narva. Until 1898 Krenholm was to be the German firm's best customer, purchasing no less than 10 turbines.³¹

The RTO was also concerned that Knoops did not take advantage of the improved power transmission systems but persisted with the system of wrought iron shafts and bevel gears that had evolved in England in the 1820s from the wooden shaft and gearing systems used in the eighteenth century English textile mills. The RTO were also critical of what it termed the Knoop 'passion for the Lancashire system of boilers'.³²

How far were such criticisms justified? The experience elsewhere in Europe indicates there was some substance to these complaints, at least from an engineering standpoint. The technology of stationary British steam engines in the first half of the nineteenth century lagged behind that of the United States. Although British textile equipment was employed with enthusiasm on the Continent, there was resistance to using British steam engines.³³ The British textile industry continued to use low-pressure engines much longer, for example, than did that of the United States. Even as late as 1859 the low pressure condensing engine with its poor fuel economy was still the most widely used type in the Manchester area. Coal prices were such that British manufacturers needed to pay very little attention to fuel economy.³⁴ The economic advantages of going over to the more advanced technology were not so clear cut. Comparative data on the cost of steam power are lacking but factors which needed to be considered were the costs of fuel, labour and capital. Elsewhere in

Western Europe and in the United States the relative importance of these factor costs made high pressure steam engines more economical from the mid-nineteenth century than was the case in Britain. In Russia the economic case for dispensing with the low pressure, low technology engine was less certain. Russian coal costs were higher than those in Britain but there was the option of using cheaper fuels such as timber and peat. Knoop were major importers of English coal into St Petersburg, presumably for the needs of the cotton textile sector in the Baltic region.³⁵ Most of the larger cotton textile concerns in the central industrial region had their own forests and/or peat deposits.³⁶ Despite the Nikolsk mills having enormous timber and peat reserves extending in total to more than 36,500 hectares, Savva Morozov elected to switch from using peat as a fuel source to coal and oil. Already in the 1890s he had imported three powerful steam engines of the latest design from Germany and in 1903 he got rid of low pressure steam engines entirely. But this move coincided with a sharp rise in oil prices in Russia due to a fall in Russian oil production, causing Morozov to describe peat as 'golden dirt'.³⁷ But perhaps the most potent reason for remaining with the low pressure steam engine was the capital cost, particularly when the added burden of import tariffs is taken into account. Added to that an important feature of the British steam engine was its long operating life. Seventy years was not unusual.³⁸ Having invested a substantial sum in the purchase of an engine, its boilers, associated pipework, engine house, and in delivery and erection, to scrap such a system, when it had many years of useful life remaining to it, and to replace it with a capital intensive, high pressure system did not necessarily make for good economics. Additionally high pressure steam engines were more complicated and required a higher standard of maintenance. Going over from low pressure to high pressure systems could also be dangerous as the high mortality rate from boiler explosions in

mid-nineteenth century Britain indicates.³⁹ Throughout Russian industry before 1914 the understanding of steam engine technology was deficient. Boilers tended to be badly installed and inadequately maintained. Explosions were common, prompting the RTO to concern itself constantly with the problems of steam power generation in Russian industry.⁴⁰ And the experience in the United States suggested that they wore out much more quickly than did low pressure engines. In Russia the availability of the appropriate technical personnel would be an important additional consideration for management.

While there is certainly a powerful engineering case, though probably not an economic one against British steam engines, the RTO's criticisms of British boilers on the grounds of their large diameters and excessive weight made them hard to deliver to Russia's remoter textile manufacturing regions, would be an initial extra cost. Even as late as 1927 only 20 *per cent* of mills listed in *Tekstil'nyye fabriki SSSR* had a canal link or rail head site. The remainder were supplied by animal drawn carts.⁴¹ Bulky they might be but the so-called 'Lancashire boiler' with its dual internal flues was both efficient and long lasting. In Britain mill boilers of this type 'were often insured for the original pressure sixty years later'.⁴² British boilers after all maintained their international technological lead up to 1914 and their operating efficiency surely outweighed any initial penalties arising from high delivery and installation costs. Additionally Knoop promoted the use in Russia of British 'economizers', a system of cast iron water pipes installed in the flue to raise the boiler's feed water temperature, which was invented by Edward Green in 1845.⁴³

Rope and belt power transmission systems, which were adopted in Britain in the 1880s were in most circumstances more efficient than the gear and shaft systems they superseded. As the RTO admitted, Knoop did employ the rope transmission system in Russia from the mid-seventies. But had the efficiency gains from doing so been particularly great, gear and shaft transmission systems would not have been considered for new mills in Britain after the 1860s. This was not the case. When the then largest ring spinning mill in the world, the Nile Mill, Lancashire, was planned in 1898, it used the supposedly obsolete gear and shaft system.⁴⁴

The power transmission issue for Russian mill owners in the 1890s would be essentially an economic one. Having installed the less efficient system at the outset, did it make economic sense to replace it with the more efficient one? Expensive adaptation of the engine room, possibly realignment of the steam engine and alterations to the mill structure would need to be taken into consideration, when determining possible economic gains. There was also the safety factor. The drive mechanism for gear and shaft transmission systems required much smaller apertures than did the rope and belt systems, lessening the risk that fire would carry.

III

The RTO's accusation that the House of Knoop imposed uniform and conservative factory design on the Russian textile industry and employed shoddy building methods might be explained by the Knoops putting economic considerations before aesthetics. And justifiably so, since building and machinery costs were high. In the 1890s, for example, it was claimed that Russian manufacturers had to pay three or four times

more for their spinning equipment than did their English counterparts.⁴⁵ There were also heavy social overhead costs to be borne. As the Franco-Russian Cotton Company found to its cost in the early 1900s, expenditure on housing, hospitals, schools, bath houses and churches for its workers amounted to 1,700,000 French francs instead of the 900,000 francs originally allotted.⁴⁶ In such circumstances keeping building costs to a minimum would seem a rational decision. Here English experience is instructive. Due to rising costs mill structures in England after 1900 became much less lavish. In Russia's case economic considerations may well have forced smaller concerns to make do with flimsy structures. Even so nineteenth century engravings of the more famous cotton mills show Russia was endowed with some impressive factory complexes.⁴⁷ And many mill structures inherited from the Tsarist period remain in use up to the present day, since the high priority given to heavy industry in the Soviet era meant funds were not available to replace them.⁴⁸

The RTO's claim that Knoops used their influence to impose technologically inferior British plant on the Russian textile industry is less convincing with respect to bleaching, dyeing and printing equipment, since, as its own critique points out, from the end of the 1870s the Russian textile industry began looking for such equipment from elsewhere, from Alsace for example. And independently from the Knoops finishing machinery was supplied to Russia by Mather & Platt. That company's driving force, William Mather (1838-1920) was a frequent visitor to Russia between 1860 and 1912.⁴⁹ Indeed Knoops themselves as major shareholders in one of Russia's leading textile printing concerns, E. Tsindel & Co., which used both equipment and technicians from Alsace, were not exclusively Anglocentric in their purchasing and recruitment policy as the RTO would have us believe.⁵⁰ Knoop in

any case was far from the sole supplier of cotton printing and dyeing technology. In the aftermath of the Napoleonic invasion Alsatian prisoners of war pioneered the import of such technology.⁵¹ Savva Morozov, having studied chemistry at University, became a specialist in dyestuffs. He was also able to persuade a well known expert in cloth dyeing at Moscow University, V.N. Ogloblin, to join his firm. Morozov also headed the joint stock dyestuffs company created in Germany under the style of S.T. Morozov, Krehl & Ottman, which set up a chemical dyeworks in Russia.⁵²

Complaints about the poor quality of the fuel and cotton Knoop supplied to the Russian textile industry might also be modified by considerations of commercial logic. Experience in Britain suggested that it was more economical to use inferior coal to raise steam.⁵³ As indicated above most of the major cotton textile concerns in the Central Industrial Region owned forests and/or peat bogs, which would have given them access to relatively cheap sources of fuel suitable for low pressure steam engines.

The raw cotton supply issue for Russian industry in the second half of the nineteenth century highlighted a major problem of international technology transfer. British equipment was designed to produce both high quality and low quality output.⁵⁴ The Russian mass market on the other hand required a cheap product at the lower end of the quality range. Added to this the high capital cost of Russian mills and their low labour productivity, made expensive high quality cotton an inappropriate input. From the 1880s the growing importance of Central Asia as a source of raw cotton imposed on Russian industry the challenge of using cotton inferior to that from the

United States.⁵⁵ But the type of spinning equipment most suited to processing such cotton, the mule, was both labour intensive and skill intensive. Ring spinning on the other hand was most suited to using an even, short staple cotton of the type produced in the United States.

IV

It is pertinent to consider whether ring spinning equipment, which was beginning to dominate the textile industry elsewhere in the world outside Britain, would be appropriate to Russia's needs. To some extent this would depend on the demand generated by an increase in the numbers of automatic looms for which ring spun yarn was most appropriate. The dilemma in Russia was that the end product and the skill level of the workforce pointed to the adoption of the ring spindle, whereas the uneven quality of the raw cotton to be processed would seem to favour the retention of mule spinning equipment. This absence of a clear cut advantage for ring spinning technology may go some way towards explaining the persistence of mule technology. It might also account in part for the virtual absence of the rings versus mules debate in the historiography of the Russian cotton textile sector.⁵⁶ Before 1914 both methods might be seen to have their imperfections and in Britain the two technologies were able to co-exist quite satisfactorily.⁵⁷

In Britain before 1914 the decisive factor appears to have been industrial structure. Ring spinning was much easier to introduce in vertically integrated textile concerns, where the nature of the yarn produced could be appropriate to that required by the weaving section. Additionally ring spun yarn for weft had to be rewound from

bobbins on to 'beams' prior to weaving. And because these were heavy and expensive to transport, they were uncompetitive unless used in an integrated plant. In Britain before 1914 the fragmented structure of the textile industry tipped the technological balance towards retention of the mule. In Russia on the other hand the trend in the late nineteenth century was towards integrated textile concerns, particularly in the central industrial region.

Despite the problems of using ring spinning equipment to process low grade cotton of uneven quality, the more integrated structure of the textile industry in the central industrial region would have made ring spinning an increasingly attractive option. And there was in fact a pronounced trend towards the greater use of ring spindles, the pattern generally associated with an industry seeking to employ the best technological option available. Between 1890 and 1900 the number of mule spindles went up by 40 per cent from 2,677,690 to 3,754,854; whereas ring spindle numbers increased by 271 per cent from 779,426 to 2,890,705; and the number of power looms by 74 per cent from 87,191 to 151,304.⁵⁸ English technology remained dominant. As late as 1910 between 85 and 90 per cent of all cotton spinning machinery in Russia was of English manufacture, although German competition was beginning to cut heavily into English weaving and dyeing machinery.⁵⁹ Moreover, in so far as the House of Knoop influenced the type of spinning machinery employed in Russia in the late nineteenth and early twentieth centuries, they would seem to have adopted the most technologically appropriate solution.

Russia's cotton weaving sector offered fewer opportunities for Western exporters of textile machinery and because of the structure of the industry those opportunities appeared rather late in the nineteenth century. Although calico weaving had developed rapidly particularly in Russia's central industrial region in the second quarter of the nineteenth century, cotton weaving enterprises around the middle of the nineteenth century often had what Tugan'Baranovsky described as a 'middleman character', putting out materials to cottage industry (*kustar*) weavers rather than processing cotton in-house. The lack of control over production under this system eventually proved to be a powerful incentive for entrepreneurs to go over to mechanical loom weaving. This made its appearance in the 1840s but it was only in the 1860s and 1870s that it posed a serious threat to domestic weaving. Even so up to the 1880s small scale *kustar* weaving still predominated over factory weaving. Rural artisans in the Bogorodskk-Glukhovsk area were still working up cloth for Morozov's factory there in 1914.⁶⁰ Elsewhere its demise was rapid and only in the Yegorevsk district and parts of the Kasimov district did weaving maintain its cottage industry character. Given that the steam driven loom was 20 times more productive than the handloom this was to be expected.⁶¹

The *kustar* weaver in Russia experienced the same fate as had his British counterpart some fifty years earlier. New advances in weaving technology reduced production costs and drove down *kustar* wages to the point where he could no longer compete except in niche markets. Such a relatively late growth in the power loom market in Russia arguable made the market a more open one. Whether Russia itself might hope to compete in this field, perhaps owed more to nationalist sentiment, even with the significant shipping costs and the high tariffs that were imposed on textile machinery

imports. In 1912 these amounted to 54 per cent ad valorem. It is instructive to compare Russia's position at this time with that of the United States, where for the same year it was calculated that American textile machinery manufacturers enjoyed the protection of not only a 45 per cent tariff but an additional protection of around 25 per cent arising from shipping costs from Britain. Only such high protection allied with the increasing efficiency of American textile machinery manufacturers was British competition finally ousted from the American market.⁶²

In Russia's case it is hardly surprising that with its less sophisticated machinery sector, the local manufacture of mechanical looms made little headway. Even so in 1881 Timothy Morozov set up a plant to manufacture mechanical looms, though these proved to be more expensive than imported ones. Production of such looms did increase when tariffs were raised against imported machinery.⁶³ When Savva Morozov embarked on a massive modernisation of the Nikolsk mills between 1895 and 1899 1,450,000 Roubles were earmarked for the import of foreign spinning machinery but 1,736,597 Roubles were spent on purchasing looms made by the Morozov loom building plant.⁶⁴ Significantly its other major customer, the Vikul Morozov Company, made its own looms. Such machinery of domestic manufacture was usually inferior to that produced in Western Europe and most cotton goods producers preferred to buy West European equipment, even though it meant paying higher prices. It is tempting to speculate that the involvement of two branches of the Morozov family in the manufacture of mechanical looms was motivated in part by their strong nationalist leanings and their antipathy towards the Knoop.⁶⁵ And national sentiment probably influenced German, French and Swiss owned textile

concerns operating in Russia to favour machinery imports from their own home countries.

Russia continued to import the bulk of its textile machinery from abroad, despite the high tariffs it attracted. The House of Knoop managed to retain its dominant position as suppliers to Russia's textile industry but the emergence of competitors such as Germany inevitably eroded its market position. As Gately observes: 'The more sophisticated spinning and carding machinery came from England, while much of the other equipment came from Germany and Switzerland. In the early years of the twentieth century humidifiers and water sprinkling systems copied from English models also became common in the mills'.⁶⁶

VI

The RTOs concern about the qualities of English supervisory personnel brought to Russia by the Knoops highlights the difficulties faced by receptor economies seeking to import British textile technology. The new techniques in cotton processing developed in Britain during the so-called Industrial Revolution, were evolved empirically within the framework of craft practice. New techniques were passed on by formal or informal craft apprenticeship. 'The empirical nature of the technology', observes Jeremy, 'made it especially hard to transfer by written description'.⁶⁷ The experience of both the United States and Western Europe demonstrates that with technology residing in people, in this case English artisans, a country wishing to acquire technology would have to do so by attracting to it English expatriates with the appropriate skills. Even as late as World War I all the textile mills in Petrograd (St

Petersburg) and some 40 in the Moscow region were run by British technical personnel, usually a manager, an assistant manager, a carder, a weaver and an 'engineer'.⁶⁸ The engineer in this context was not the professional engineer in the modern sense but a skilled craftsman with practical knowledge of either textile machinery or cotton processing. It became a common practice for the sons of British artisans employed in Russia to be sent to Lancashire for a period from where they would return with sufficient training to be deemed qualified to take on a supervisory role. Although Platt Bros recognised as early as the 1860s that the time was approaching, 'when it is necessary that workmen should be acquainted with the science of mechanics as well as its practical use', the engineers sent out by them to Russia through Knoops before 1914 had only a rudimentary scientific training.⁶⁹ Thus Joseph Hill (1879-1962), who left school at 13 to work in the Lancashire cotton industry, becoming a spinner 10 years later, was sent by Platts to Russia in 1911.⁷⁰ Technical education in Russia did advance in the second half of the nineteenth century. Even so an American witness to the Royal Commission on Technical instruction (set up by the British government in 1881) opined that a large number of the graduates from Moscow's Imperial Technical School owing to inadequate preliminary training 'do not rise beyond the position of superior workmen or foremen'.⁷¹

As galling as it might be for Russian diploma engineers to see lucrative technical posts being filled by foreigners with only a rudimentary scientific knowledge, it is questionable whether such a policy had a discernible effect on the efficiency of Russian spinning and weaving mills, since the English system of management in spinning and weaving mills required few management skills beyond insistence on the

quality of the product. Sophisticated cotton testing equipment did not exist in the nineteenth century. Managers had to learn by experience the crucial tasks of matching and adjusting their equipment to the available raw materials. The original skills of cotton spinning and weaving lay with the machine builders.⁷² Additionally English personnel would return to England, where they could acquaint themselves with the latest technology. This inevitably created a conflict of interests and not only in Russia. The host country would want the incomers to teach their skills to its citizens, whereas the English artisan would wish to maintain his scarcity value by keeping his knowledge to himself. It has echoes of the pre-industrial practice of apprentices swearing not to divulge the secrets of their masters.⁷³ Furthermore the enhanced status such expatriates enjoyed tended to create a barrier between them and the host workforce. The secretiveness and excessive drinking of expatriate English artisans, which clashed with American industrial values earlier in the nineteenth century had its later echoes in Russia in what Tugan-Baranovsky called Knoop's semi-literate and hard drinking English skilled workmen.⁷⁴ Expatriates were also prone to overselling their experience and host countries were often uncertain of the skills they were actually importing.

The dominance of English supervisory staff also resulted in clear parallels between the working regime in Russian and British mills. But one major difference arising from the higher capital cost of spinning equipment in Russia was that machinery was run for much longer periods. In 1893 English mills operated 2,800 hours annually while their Russian counterparts some 6,078. Russian mills also processed much more yarn per spindle, 102 pounds a year compared with 42 pounds in England.

Here Russia's production of a greater quantity of lower and medium counts was a factor too.⁷⁵

If it is accepted that the acquisition of textile technology in the nineteenth century could best be achieved through attracting English immigrants to provide the necessary managers, mechanics and skilled operatives, then their less appealing characteristics can hardly be blamed on the Knoops. Can the Knoops be blamed for prejudicing Russian textile manufacturers against Russian engineers with theoretical training in favour of the practical man? Influenced perhaps by special pleading the RTO evidently thought so. From its perspective such a policy would be deleterious to the career prospects of the Russian engineers and technical personnel, who were an important component of its membership. But the emphasis in the cotton textile sector on practical experience was against their interests. Russian diploma engineers, though they enjoyed a high reputation for their 'theoretical standing and knowledge of modern practice', they were not considered particularly effective on the shop floor. For Russian industry as a whole the majority of native engineers in factory management comprised those who had risen through the ranks on account of their practical experience rather than their academic attainments.⁷⁶ While the RTO might compare the cotton textile industry's recruitment policy unfavourably with that of other industrial sectors, the reality was that the number of foreign supervisory staff in Russian industry remained high into the twentieth century with only a few foreign firms, the more especially French and Belgian concerns, taking vigorous steps to recruit Russian supervisory personnel.⁷⁷

Yet there was some progress in the employment of Russian supervisory personnel. Morozov's Zuyevo-Nikolsk textile mills not only employed large numbers of English engineers but Russian technical personnel too. Timothy Morozov promoted engineering training in Russia by establishing scholarships for graduates of the country's Imperial Technical College, so that they might continue their studies abroad, and with the offer of employment on their return.⁷⁸ But overall attempts to Russify the managerial personnel of Russian textile mills through the establishment of technical schools did not meet with much success, despite the bulk of the industry being controlled by Russian entrepreneurs.

VII

It is likely that the RTO's concerns about the state of the Russian cotton textile industry were influenced by the difficult trading conditions it was experiencing during the early 1890s, though ironically by the time its critique was published in 1895 the industry was experiencing a boom.⁷⁹ Long runs of profit data for the nineteenth century Russian textile industry are lacking but the substantial capital base of the leading companies, the profit data for the early twentieth century, and the involvement of textile magnates in the development of the Russian banking system indicate that the contribution of the Knoops to the textile sector's financial wellbeing was positive. (see Table 2).

Certainly offended national pride coloured the RTO's attitude towards the wide embracing influence of the Knoops. While Ludwig Knoop himself had a legendary rapport with the Russian business community, his decision in 1861 to return to live

near Bremen and to conduct his business from there meant that day-to-day business dealings with Russian entrepreneurs were conducted either by his sons or by the firm's employees.⁸⁰ Ludwig Knoop's relationship with his Russian customers has been described as 'virtually dictatorial'.⁸¹ For the first generation of Russian textile entrepreneurs this approach apparently caused little friction. On the occasion of him being created an hereditary Russian baron in 1877, he was given a rapturous reception by the Russian business community.⁸² Such an approach was less acceptable from the 1880s as this first generation was giving way to the second. And, as Rieber has pointed out, the core of this group, Moscow entrepreneurs, were convinced that 'reliance on foreign skills and capital could turn Russia into a dependency of the West without a single shot being fired. Their object was to avoid the twin dangers of bureaucratic paralysis and foreign control'.⁸³ The Russian business community became more assertive but the tact and diplomacy increasingly called for on the part of the Knoops to this changing commercial environment was not always apparent. The attitude of their staff towards their Russian customers was at times insensitive to Russian feelings. The RTO's illustration of this point merits quoting at length:

'A manufacturer thinks about building some factory or another and with a respectful demeanour appears at the offices where he has called earlier to enquire whether they will do business with him in the future. His name alone is sufficient for the office to check there and then what kind of factory he has, whether there have been any misdemeanours in his relations with the firm, how much money he and his wife possess, where it is invested, and how much profit or loss his factory makes. It goes without saying that only those manufacturers on whom the information is favourable are worthy of being received. The final negotiations are conducted by Roman

Romanovich (probably Robert McGill, one of Knoop's textile engineers) and his final decision he expresses with the words, "fine, we will build you a factory".

The joyful manufacturer might venture to suggest some innovations..... but would always receive the angry response: "That's none of your business. In England they know better than you".⁸⁴

However, it is questionable whether Russia's technical intelligentsia with its greater awareness of new industrial techniques and new forms of business organisation reflected the attitudes of Russian manufacturers. To the latter, with their long tradition of submissiveness to authority and their willingness to subordinate personal feelings in pursuit of their economic interests, such a high handed approach on the part of the House of Knoop was tolerable.

VIII

The principal effect of the Knoop's emphasis on the commercial aspects of the textile business and its Anglocentric recruitment policy then can be seen as being a rational response to the economic and social circumstances prevailing in Russia at that time. Often the textile technology the House of Knoop imported was not the most advanced but it was probably more suited to Russian circumstances than the more sophisticated equipment might have been. There were difficulties and misunderstandings arising from the transfer of technology between two widely differing societies but these, it is maintained, were inevitable. They may well have caused resentments in Russia but in the final analysis they did not damage the economic wellbeing of the Russian

textile industry. Nor did the Knoops put the industry under foreign thrall. In 1900 the textile industry had the smallest share of foreign capital of all sectors of Russian industry.⁸⁵ On the eve of the First World War it was an industrial sector, which had received little direct support from the government, yet it accounted for 28 per cent of Russia's industrial output and the leading firms were earning a respectable return of around nine per cent on the capital employed.⁸⁶ Indeed the generally high and secure profits which the cotton textile sector enjoyed can be viewed as a disincentive to technological innovation.

NOTES

¹ See for example Yu. A. Petrov, *Dinastiya Ryabushinskikh* (Moscow, 1997); T.P. Morozova and I.V. Potkina, *Savva Morozov* (Moscow, 1998); and S.A. Kabanov and L.K. Kulevskiy, *Vo blago Rossii* (St Petersburg, 1997).

² C.P.G. Sinzheimer, 'Reflections on Gerschenkron, Russian backwardness and economic development', *Soviet Studies*, 17(2), 1965.

³ D. Jeremy, *Artisans, Entrepreneurs and Machines: Essays on the Early Anglo-American Textile Industry, 1770-1840s* (Aldershot, 1998), p.3.

⁴ A. Gerschenkron, *Economic Backwardness in Historical Perspective* (Cambridge, Mass., 1962), p.15.

⁵ A.V. Demkin, *Britanskoye kupechestvo v Rossii XVIII veka* (Moscow, 1998), pp.170-6.

⁶ P. Khromov, *Ocherki ekonomiki tekstil'noy promyshlennosti* (Moscow, 1947), pp.7-8.

⁷ A.K. Sorokin, *Predprinimatel'stvo i predprinimateli Rossii* (Moscow, 1997), p.58

⁸ Khromov, *op. cit.*, pp.17-8; M.F. Zlotnikov, *Kontinental'naya blokada i Rossiya* (Moscow, 1966), pp.43-4.

⁹ V. K. Yatsunskiy, 'Krupnaya promyshlennost' Rossii v 1790-1860gg.' in M.K. Rozhkova (ed.), *Ocherki ekonomicheskoy istorii Rossii pervoy polovine XIX veka* (Moscow, 1959), pp.129-30, 175-7 and 206.

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¹⁴ E. Robinson, 'The Transference of British Technology to Russia, 1760-1820: a Preliminary Enquiry', in B.M. Ratcliffe (ed.), *Great Britain and her World, 1750-1914* (Manchester, 1975), pp.1-26.

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¹⁶ Lancashire County Record Office, Records of Platt Bros, Oldham, DDPSL 15/7/4.

- ¹⁷ T.H. Von Laue, 'Russian Labour between Field and Factory, 1892-1903', *California Slavic Studies*, III, 1964, p.51.
- ¹⁸ J.F Fraser, *Russia of Today* (London, 1915), pp.180-1. Quoted in C. Ward, *Russian Cotton Workers and the New Economic Policy, 1921-1929* (Cambridge, 1990), p.33.
- ¹⁹ *Kontora Knop I Yeye Znachenije* [The House of Knoop and its Significance] (St Petersburg, 1895).
- ²⁰ G. Schulze-Gaevernitz, *Volkwirtschaftliche Studien aus Russland* (Leipzig, 1899), pp.86-106.
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- ²² U. Rauber, *Schweizer Industrie in Russland* (Zurich, 1985), pp.56-62.
- ²³ J. Crawford (ed), *The Industries of Russia*, 5 vols., (St Petersburg, 1893), Vol. 1, p.20.
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- ²⁶ P.A. Buryshkin, *Kupecheskaya Moskva* (New York, 1954), p.159; and Baring Bros, Bishopsgate, London, Ms *Reference Book 2*, p.49.
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- ²⁸ A. Vershinsky, *Khlopchatobumazhnaya promyshlennost' Rossii i angliksiye krizy 1860-ogo* (Tver, 1930), pp.1-27; and Morozova and Potkina, *op. cit.*, pp.102-4.
- ²⁹ For an analysis of this problem with respect to the British steam locomotive industry see M.W. Kirby, 'Product Proliferation in the British Locomotive Building Industry, 1850-1914: An Engineers Paradise?', *Business History*, Vol. XXX No. 3 (1988), pp.287-305.
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- ³¹ W. Kirchner, *Die Deutsche Industrie und die Industrialisierung Russlands, 1815-1914* (St Katharinen, 1986), pp. 147-8. Kirchner refers to Platt Bros. as 'Blatt'.
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- ⁴⁰ M. Spath, 'Fach- und Standungsvereinigungen: Russische Ingenieure, 1900-1914', *Forschungen zur Osteuropaische Geschichte*, Vol. 35 (1984), pp.253-4.
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- ⁴² Watkins, *The Textile Mill Engine*, Vol. 2, p.98.
- ⁴³ S.B. Saul, 'The Engineering Industry', in D.H. Aldcroft (ed.), *The Development of British Industry and Foreign Competition, 1875-1914* (London, 1968), p.205; and Watkins, *The Textile Mill Engine*, Vol. 1, p.12.
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- ⁴⁵ Schulze-Gaevernitz, *Volkwirtschaftliche Studien*, p.49.
- ⁴⁶ Archives du Credit Lyonnais, Paris, Societe Cotonniere Franco-Russe, Note, February, 1906. Quoted in J.P. McKay, *Pioneers for Profit: Foreign Entrepreneurship and Russian Industrialization, 1885-1913* (Chicago, 1970), pp. 179-80.
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- ⁵⁶ See for example W. Lazonick, 'Factor Costs and the Diffusion of of Ring Spinning prior to World War I', *Quarterly Journal of Economics*, Vol. XCVI, No 1 (1981); W. Mass and W. Lazonick, 'The British Cotton Industry and International Competitive Advantage: The State of the Debates', *Business History*, Vol. XXXII No. 4 (1990); and G Saxenhouse and G. Wright, 'New Evidence on the Stubborn English Mule and the Cotton Industry', *Economic History Review*, 2nd Series, Vol. XXXVII, No. 4 (1984).
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- ⁵⁸ M. Joffe, 'The Cotton Manufacturers in the Central Industrial Region, 1880 to 1914' (Unpublished Ph.D., University of Pennsylvania, 1981), p.52.
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- ⁶⁰ Ward, *op. cit.*, p.11.
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- ⁶⁴ Morozova and Potkina, *op. cit.*, pp.112-3
- ⁶⁵ V.Ya. Laverychev, *Monopolisticheskii kapital v tekstil'noy promyshlennosti Rossii, 1900 – 1917* [Monopoly capital in the Russian textile industry, 1900-1917] (Moscow, 1953), pp.92-3.
- ⁶⁶ M. Gately, 'The Development of the Russian Cotton Textile Industry in the Pre-Revolutionary Years, 1861-1913' (Unpublished Ph.D., University of Kansas, 1968), p.202.
- ⁶⁷ D.T. Jeremy, *International Technology Transfer*, p.13. See also D.T. Jeremy, *Transatlantic Industrial Revolution: The Diffusion of Textile Technologies between Britain and America 1790-1830* (Cambridge, Mass., 1981), pp.1-3.
- ⁶⁸ D. Mackenzie Wallace, *The Times Book of Russia*, p.67.
- ⁶⁹ House of Commons British Parliamentary Papers, *Select Committee on Scientific Instruction*, June, 1868. Evidence of John Platt, M.P., col. 5752-5838.
- ⁷⁰ *Blackpool Gazette & Herald*, 21 December, 1935.
- ⁷¹ House of Commons, Second Report of the Royal Commission on Technical Education, Vol 1, C-3981, 1884, pp. 204-6.
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- ⁷⁴ M.I. Tugan-Baranovsky, *The Russian Factory*, p.297.
- ⁷⁵ Joffe, *op. cit.*, p.48.
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- ⁸⁰ See for example the account of Ludwig Knoop's drinking bouts with Russian businessmen in P. A. Buryshkin, *Moskva Kupecheskaya* (The Moscow Merchant Community) (New York, 1959), pp.61-64.
- ⁸¹ F. Prusser, 'Ludwig Knoop', *Niedersächsische Lebensbilder*, 1939(22), p.250.
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⁸⁴ *Kontora Knop*, pp.35-6 and 39.

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