The Agency System in the International Distribution of U.S. Machine Tools, 1900–1915: Social Norms and Contracts

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At the beginning of the twentieth century, exports to Europe had become a typical aspect of the activities of U.S. machine tool firms. The organization of the firms' marketing activities was predominantly based on the agency system, as manufacturers assigned representation of their products to independent European distributors. The main advantage of this system was that it harnessed the distributors' knowledge of local markets to the marketing efforts of machine tool firms. A network of manufacturer-overseas distributor relationships evolved over time as pervasive asymmetric information problems were resolved. In particular, bilateral moral hazard problems were only partly addressed through contractual mechanisms. Rather, learning from experience and the sharing of information within the network of machine tool firms and distributors appear to have led to the emergence of behavioral norms that proved effective at curbing the individual incentives for opportunistic behavior.

Internationalization of U.S. Machine Tool Firms' Business Activities

During the late nineteenth century, U.S. machine tool firms dominated the technical advances that contributed to the emergence of the system of manufacture by interchangeable parts and later of mass production methods [Rosenberg, 1963; Rolt, 1965; Steeds, 1969; Woodbury, 1972; Hounshell, 1984]. In spite of its contribution to the rise of mass manufacture, the machine tool industry structure was characterized by the presence of small and medium-sized firms [Wagoner, 1968]. Machine tool firms are essentially absent from studies of the rise of big business in the United States [Chandler, 1977 and 1990] and their business practices during the 1900-1915 period differed from those

* I benefited from discussions with John Brown, Richard Nelson, Ross Thomson, and JoAnne Yates, as well as from the helpful comments of participants at the 1998 Business History Conference where I presented an earlier draft of this paper under the title "Profiting from Technological Innovation in Foreign Markets: The Role of Independent Distributors in the Machine Tool Industry (1900-1915)." The Hartness Papers referred to in the essay are located at the Library Research Annex of the University of Vermont.

BUSINESS AND ECONOMIC HISTORY, Volume Twenty-seven, no. 2, Winter 1998.
 ISSN 0894-6825.

commonly adopted in sectors where mass production and mass distribution techniques were nurtured [Scranton, 1997].

Technological leadership supported a considerable internationalization of U.S. machine tool firms. Since the Enfield Arsenal contract awarded by the British government in 1853 to Robbins & Lawrence of Windsor, Vermont, foreign sales diffused steadily among U.S. machine tool firms, especially during the 1890s. While escaping the consequences of business cycles was often the initial motive for exporting, the U.S. firms' technological advantage played a key role.[1] Although their innovative performance created sales opportunities abroad, exploiting these called for the design of adequate strategies for entry in the foreign markets [Teece, 1986].

The emergence and growth of a foreign business in many other industrial sectors was accompanied by changes in the nature of the organizational arrangements according to which U.S. firms operated abroad [Chandler, 1990; Wilkins, 1970]. For instance, Wilkins [1970] indicates that early on merchant houses were the intermediary between producers and consumers from different countries. Growing volumes of foreign sales provided the impetus for more direct involvement of U.S. manufacturing firms in the distribution of their products abroad. The marketing organization evolved according to a sequence whereby firms switched from a traveling salesmen system, to the appointment of local agents, and then later to the opening of branch offices. Several firms switched from an export strategy to the establishment of manufacturing branches abroad, or the licensing of foreign firms for manufacturing and distribution. Nicholas's [1983] discussion of the overseas activities of British multinationals suggests that firms were more likely to begin exporting through local agents in order to benefit from the latter's superior knowledge of the market. Learning from experience enabled the exporting firms to fill this knowledge gap and to internalize the marketing activities by establishing branch offices.

This pattern of internalization reflects the focus of Wilkins's and Nicholas's research on multinational enterprises, although it need not hold across industries and firms as borne out by the experience of the machine tool firms.

In this sector, early export sales were negotiated directly with users, through correspondence and visits across the ocean. Only since 1865 did the sale of U.S. tools and machines become a commercial business in Great Britain [Churchill, 1902]. The growth of machine tool imports from the United States accelerated during the 1890s (in tune with the rapid growth of the European metalworking industries), and during the 1900-1915 period export sales accounted for between 10% and 45% of total production. In spite of the growth of the foreign sales, export sales continued to dominate the U.S. firms' marketing activities abroad.

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[1] Estimates indicate that the U.S. inventors' share of British machine tool patents grew from 17% in the 1870s to 26% in the early century [Thomson and Nelson, 1996].

The alternative modes of operation, namely direct investment or contract, were not pursued by the machine tool firms to any significant extent. Foreign investment in manufacturing facilities was non-existent among specialized machine tool firms. Only a handful of firms opened branch offices overseas, although none of them relied on them for more than one European location. A few firms entered contractual agreements whereby they assigned the rights to inventions under German and British patents to local firms.

In 1898 a new firm in Berlin, the Deutsche Niles Werkzeugmaschinen-Fabrik, whose promoters wished to organize it as an American shop, secured access to all present and future patents, drawings, and technical knowledge of the Niles Tool Works Co. of Hamilton, Ohio.[2] Only a few other important agreements existed or were forged during the 1900-1915 period, including Hugo Bilgram's license to Reinecker of Chemnitz (for a bevel-gear-cutting machine), Norton Grinding Co.'s license to Ludwig Loewe of Berlin, and George Gridley's license to Craven Brothers of Manchester (for an automatic screw machine).

For the vast majority of the U.S. firms, export selling was organized through the agents' system rather than branch selling.[3] McDougall [1966] indicates that 60% of the foreign shipments by Brown & Sharpe of Providence, Rhode Island, between 1860 and 1904 were consigned to agents. For Bullard of Bridgeport, Connecticut, the share is 91% for shipments between 1881-1910. These percentages are significantly higher than corresponding values for the domestic market (26.87% for Brown & Sharpe, 25.59% for Bullard).

The Role of Contracts in the Agency System

The reliance on external distribution capabilities reflected more than one consideration. Yet, the most important concern was to tap the distributors' knowledge of the regional markets, local business, and metalworking shop practices, as well as gaining access to potential customers through the distributors' network of contacts and personal acquaintances. The importance of these capabilities should not be underestimated. For example, because of the

[2] The list of investors included Allgemeine Elektricitats Gesellschaft (AEG), Berliner Handelsgesellschaft, Born & Busse, Disconto-Gesellschaft, Dresdner Bank, and the arms and machine tool firm of Ludwig Loewe [*American Machinist*, 1901]. This and Deutsche Niles were reckoned to be the *Amerikanische* shops in the circles of German machine tool builders, no doubt with a bit of disdain [VDW, 1991]. Chandler [1990] asserts that this venture failed to achieve the investors' objectives and a modest success arose only when the company focused on a single business line, air compressors.

[3] Among the firms that established branch offices in Europe were the Niles-Bement-Pond Co. and Jones & Lamson of Springfield, Vermont, two firms whose product strategies were diametrically different. Niles-Bement-Pond, established in 1899, was the result of a merger between the Niles Tool Works, Bement, and Pond. It carried a broad product line and continued to pursue a strategy of growth through acquisitions, among which that of Pratt & Whitney is noteworthy. Jones & Lamson had instead been organized by James Hartness as a single product shop selling the flat turret lathe in only one size.

divergence of the U.S. design tradition from the British, the marketing of U.S. machine tools was often confronted with the buyers' diffidence and prejudice. Further, differences in shop practices formed the basis for the divergent views of European buyers and sellers of U.S. machinery concerning the machine requirements for a given kind of work. Although the users' experience with U.S. machine tools gradually overcame these differences [Churchill, 1902],[4] their existence meant that selling costs had to be sunk up-front and aggressive marketing strategies had to be pursued in order to generate a satisfactory volume of business.

Thus, the yield of early marketing efforts depended not only on the quality of the machine tools, but more importantly on the salesmen's reputation, trustworthiness, and intimate knowledge about the local buyers. Although in principle these assets could be developed internally, establishing agency relationships with local distributors greatly reduced the cost and the time required.

This form of organization also proved to be more popular than hiring local engineering consultants at the exporting firm's branch office. In fact, the economics of branch selling burdened the exporting firms with start-up and overhead costs, a fact that had led many U.S. firms to avoid establishing branch offices even in the domestic market. While a few firms with offices abroad acquired representation of other firms in order to achieve the requisite economies of scope, by 1910 the balance of the firms' experiences appeared to indicate that the agency system was more profitable.[5]

Although the agency system ultimately prevailed, its merits were often questioned especially in earlier years. This is not particularly surprising if one considers how conditions of asymmetric information in the manufacturer-overseas distributor relationships resulted in bilateral moral hazard problems.

The machine tool firms could not monitor the intensity and quality of the distributor's selling effort. The cost of inadequate selling effort could be the loss of business opportunities or negative effects on the users' perception of the machine tool quality and the manufacturer's reputation. Further, delegating control over pricing and payment terms to the distributor created opportunities for embezzlement. Even more important, the distributor's need for detailed knowledge about the machine tool design and operation required the manufacturer to reveal important information, creating an expropriation hazard insofar as the property rights on such intangible assets were difficult to enforce.

The distributor was also exposed to the risk of opportunistic behavior by the manufacturer. Shipment delays, defects in packaging, or mishandling of orders could damage the distributor's reputation with his customers. Inadequate

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[4] See also the discussion of the diffusion of American design principles among British machine tool firms in Zeitlin [1997].

[5] A salesman's commentary to a consular report which extolled the virtues of branch selling argues the point by indicating that branch selling "has been tried by manufacturers before, much to their regret in nearly all cases" [*American Machinist*, 1910].

information provision could reduce the effectiveness of the distributor's selling efforts. Also, the manufacturer could take orders directly from customers after the distributor had sunk his selling effort on them. Further, over time the distributor's knowledge of the local market could also leak to the manufacturer and constitute the basis for the latter's internalization of the distribution function according to a pattern that Nicholas [1983] found to be a common course of events in the manufacturer-overseas distributor relationship.

These risks were addressed in part by the design of adequate contractual incentives. The distributor's compensation was typically in the form of a percentage commission on the sales, and thus related to performance rather than selling effort. Further, manufacturers delegated to their agents neither pricing decisions,[6] nor the negotiation of payment conditions, which were usually stated as cash in a U.S. port against bill of lading. This required customers to pay in full for the equipment before having a chance to inspect it. The risks borne by the distributors were also partly curbed by contractual clauses, such as the exclusive assignment of sales territory to individual agents, which manufacturers were willing to grant subject to restrictions on the distributor's ability to represent direct competitors.[7]

These contractual solutions were far from adequate or sufficient to curb opportunistic behavior. While instances of opportunistic behavior are well documented in contemporary trade journals, consular reports, or the archival material I have reviewed, there is little evidence that legal enforcement of contractual rules played an important role.

Violations recurred with respect to the agents' territory assignments. While these occasionally involved the machine tool firms themselves,[8] a far more serious problem was that of agents' poaching in each other's territory. Demands that the U.S. machine tool firms policed the activities of agents were met with scorn as the former refused to monitor the agreements. Instead, according to a trade journal report [*American Machinist*, 1900], several builders

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[6] In a letter to Jones & Lamson's German agent, M.R. Koyemann, James Hartness reproached the discretion that sub-agents had taken to modify the user price of the machine insisting that the agent prevented such practice [Hartness Papers, Carton 6, Folder 21, J. Hartness to G. Huttner, January 17, 1913].

[7] However, distributors were not restricted to representing only one firm. In fact, they commonly carried a more or less complete line of machine tools. In this way they could increase the pool of potential customers in a given geographic market as well as the size of the potential business that could be carried out with each. The scope economies resulted from spreading overhead costs and traveling expenses over a larger volume of transactions.

[8] Brown & Sharpe's shipment records during 1900-1903 indicate that the company would occasionally sell directly to users in its agents' territories. Similarly, Jones & Lamson's German agent had occasion to complain about shipments made to distributors in Holland that violated his territory [Hartness Papers, Carton 6, Folder 63, G. Huttner to J. Hartness, September 22, 1915]. From this case and a discussion of the matter in Shipley [1910] it can also be inferred that explicit contractual clauses committing the machine tool firm to pay the agent's commission on orders taken directly from users were not always used.

threatened to establish branch offices or to quote a unique price to all the distributors and dispose of exclusive territories.

In spite of the recurrence of opportunistic behavior, contractual arrangements between manufacturers and overseas agents provided only partial relief. Breaches of explicit contractual clauses could go undetected, enforcement was weak, and unforeseen problems could arise. As late as 1910, this was the view of a machine tool firm's treasurer on the efficiency of contracts:

> Of course, it is difficult if not impossible to draw a contract or agreement which will cover all phases of the selling of machine tools, and while it is well to have salient features agreed upon, after all a spirit of absolute equity and fairness on the part of both merchant and manufacturer must be present always, if the best selling results are to be obtained; and confidence, one in the other must at all times be supreme [Shipley, 1910].

Social Norms and the Evolution of Manufacturer-Distributor Relationships

The apparent tension between the continuing reliance on the agency system of distribution and the limited effectiveness of contractual agreements can be resolved by focusing on the nature of the interactions between machine tool firms and independent distributors. The fact that these interactions were repeated over time has important implications for gauging the incentives for opportunistic behavior, especially when attention is paid to the diffusion of information concerning the behavior of firms and distributors in the industry community.

Repeated interactions can provide the contracting parties with incentives for cooperative behavior as long as the long-term nature of the relationship creates the possibility to punish opportunistic behavior [Fudenberg and Tirole, 1991]. Terminating the agency relationship could provide such a possibility only if the transacting parties sank an investment in transaction-specific assets. However, there is no strong evidence supporting this line of reasoning. Distributors' investment in knowledge about the machine tools was not necessarily transaction-specific insofar as the same knowledge could be of use while representing other machine tool firms. Furthermore, the available evidence suggests that the distributor's salesmen would often spend a training period at the machine tool firms' shop, salaried by the manufacturer, and that occasionally the machine tool firm would share the cost of a trained operator to demonstrate the machine in the distributor's market.

Instead, the possibility for punishment would arise outside specific manufacturer-distributor relationships but within the industry community if members of the latter were to withhold business from parties that had formerly engaged in opportunistic behavior [Kandori, 1994]. Widespread adoption of such behavioral norms in the industry would reduce any member's incentive to

behave opportunistically. Doing so would damage the party's reputation and make it more difficult or impossible to find another business partner.[9]

This framework appears to fit the historical evidence concerning the relationships between U.S. machine tool firms and their European distributors. The accumulating experience on both sides of the relationships gradually reduced the conditions of asymmetric information within which earlier distribution agreements were forged. Furthermore, the personal relationships among U.S. machine tool firms constituted a network where information about agents' behavior could spread rapidly and result in the appropriate punishment.

The problems of asymmetric information were more acute during the 1890s when favorable market conditions induced a wave of U.S. entry into the European markets. The U.S. firms' desire to gain access to the European market in a short time was accommodated by a rapidly growing number of distributors. Among these, many had little in the way of capabilities for marketing machine tools and the relationships that were forged proved unsuccessful for several manufacturers. In a letter to the editor of *American Machinist*, an experienced British distributor wrote:

> Many of our American manufacturers have been unwise enough to tie themselves up to firms on this side who have no special connection with the engineering trade...in all probability there are a number who will withdraw from their contracts at the expiration of the time to which they have bound themselves [*American Machinist*, 1899].

While it is possible that some firms may have faced constraints in gaining access to customers because of restrictions on the product portfolio that existing distributors were allowed to carry,[10] it is more likely that the problems experienced during that period reflected the quality of decisions made under limited information about the quality of the chosen business partners and the possibilities for opportunistic business practices created by a booming market.

By the beginning of the century, accumulating experience led to the emergence of reputation effects and the representation of U.S. firms grew concentrated in the hands of a small number of agents in each country. These had usually taken up the representation of leading U.S. innovators and brought considerable engineering expertise and a thorough knowledge of the market.

As a result of this learning process, new entrants to the European markets had a much better understanding of the risks inherent to haphazard

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[9] See Greif [1989] for a similar argument about the effects of reputation on individual behavior.

[10] Few distributors agreed to carry machine tools of one firm as a non-exclusive line. This was the case with two British houses, Charles Churchill & Co. and Buck & Hickman, which both acted as representatives for Brown & Sharpe in the British market. This unusual arrangement was possibly dictated by the quality and reputation of Brown & Sharpe's machine tools. The sales records for these two distributors indicate that they were roughly splitting the market.

entry strategies.[11] In particular, it became clear that the competence, as well as the motivation, of the sales personnel was a core element of an effective marketing effort. The commission system of payment was only a partial solution to these problems. It could avoid sustaining monetary costs when business was not forthcoming, but could not ensure that the marketing of the firm's products would be sustained by adequate efforts and conducted in the best interest of the manufacturer and the user.

The experience of foreign selling generated information about the quality and fairness of machine tool firms and distributors. The diffusion of this information among firms made it possible for a system of rewards and punishments to emerge that contributed significantly to curb the incentives for opportunistic behavior.

An important aspect of this system was the role of personal acquaintances and relationships of mutual trust and professional esteem in directing the choice of distributors by new machine tool firms entering the European market. This clearly emerges from Scranton's [1997] discussion of the Cincinnati tool builders. I have identified a similar pattern from another group of U.S. firms centered around Jones & Lamson of Springfield, Vermont.

One such firm was the Fitchburg Machine Tool Co. This firm manufactured a general line of machine tools until the first decade of the century when they concentrated on the production of the Lo-Swing lathe which James Hartness, president of Jones & Lamson, invented. The Lo-Swing lathe was intended to complement Jones & Lamson's specialty, the flat turret lathe, and in keeping with Hartness's policy of restricting the product line of Jones & Lamson, he assigned exclusive manufacturing rights to the Fitchburg Machine Tool Co. German and Italian representation was assigned to M. Koyemann of Düsseldorf and Adler & Eisenschitz of Milan respectively, agents for Jones & Lamson at that time. Early on, the firm was represented in France by Alfred H. Schütte of Paris, with whom Jones & Lamson had no dealings. In 1913 Hartness invited the company to consider carefully the possibility of turning the representation over to a newly formed distributor, F. Auberty & Co. of Paris, whose officers he was personally acquainted with and to whom Jones & Lamson was conferring its business [Hartness Papers, Carton 4, Folder 36, J. Hartness to M.A. Coolidge, March 21, 1913].

The Bryant Chucking Grinder Co., manufacturer of an automatic grinding machine invented by William L. Bryant, was another spin-off by Jones & Lamson. The company, founded in 1908, waited a few years before marketing its product abroad. The Paris office of Potter & Johnston (a machine tool firm from Pawtucket, Rhode Island) and Bonvillain & Ronceray asked Hartness for the representation of the new company. When the decision was

[11] For one thing, the experience of machine tool firms that attempted to establish a branch office abroad made it clear that only companies with a large volume of business would be able to spread overhead costs. Specialized manufacturers' branch offices carrying only their product lines were likely to suffer from the severely cyclical nature of the business.

made to enter the European market, the choice fell on Jones & Lamson's European agents, namely M.R. Koyemann and Bonvillain & Ronceray. The same pattern can be identified in the history of the Fellow Gear Shaper Co., another company spun off by Jones & Lamson during the 1890s.

The social ties among U.S. machine tool firms provided the mechanism through which information about experiences with particular distributors flowed and thus facilitated the sanctioning of punishments against distributors who failed to perform. Accordingly, a number of firms terminated their agency agreements with the French firm of Bonvillain & Ronceray because of insufficient selling effort and in 1913 turned their representation to a new distributing firm in Paris, F. Auberty & Co.

This event also provides interesting evidence about the emergence of social ties between machine tool firms and distributors. The launch of the new distributing firm was organized by F. Mandon, an officer at Fenwick Freres & Co., the largest French distributor. Mandon advised his nephew F. Auberty to spend some time training at the shops of Jones & Lamson and Norton Co. Meanwhile he asked for Hartness's cooperation in securing Jones & Lamson's agency to the new firm, as well as in persuading the Bryant Chucking Grinder Co., the Fellows Gear Shaper Co., the Norton Co., the Hendey Machine Tool Co., and the Fitchburg Machine Works Co. to terminate their agents and switch to F. Auberty & Co. Mandon left Fenwick Freres at the end of 1913, and joined the new house.[12]

The emerging personal relationships appear to have been also important in reducing the transaction costs of establishing new agency contracts. During negotiations between the Bryant Chucking Grinder Co. and F.Auberty & Co., the distributor asked that Bryant send an operator to Paris to support the marketing effort. The company replied, "it is not our intention to send an operator to France until we see enough signs of activity on the part of our French agent to warrant us in going to this expense. Of course we will send operator the moment our French agents send us enough business to warrant it" [Hartness Papers, Carton 4, Folder 36, Bryant Chucking Grinder Co. to F. Auberty, October 27, 1913]. The letter further stated that "until you are prepared to take hold of our agency in an energetic way, and unless you believe that our machine is what we claim it to be, our interests would not be particularly helped by being placed in your hands at all" [ibid.]. The distributor replied: "Your hesitation in granting us what we claim in our letter of September 2nd would make us however feel somewhat skeptical." Stating that the service to the company would certainly be superior to that offered by Bryant's agent (Bonvillain & Ronceray) the proposal was made that "you agree, decidedly, to grant us your agency from now on, and then to let our mutual

[12] In fact, another firm represented by Bonvillain & Ronceray, the Davenport Machine Tool Co., was offering Mandon the agency for the French market. Mandon consulted Hartness about the quality of the machine before acting upon the offer [Hartness Papers, Carton 7, Folder 13, F. Mandon to J. Hartness, December 19, 1913].

friend, Mr. James Hartness, settle the details of our final agreement" [Hartness Papers, Carton 4, Folder 36, F. Auberty to Bryant Chucking Grinder Co., November 13, 1913].

Conclusion

The superior innovative record of the U.S. machine tool firms during the late nineteenth century created the opportunity for them to enter foreign markets, especially in Europe where market conditions were particularly favorable. The firms' international marketing activities during the 1900-1915 period were dominated by the agency system, which allowed the U.S. firms to harness the local distributors' knowledge of the market to their own strategies.

Early on, these arrangements were fraught with uncertainties concerning the quality of distributors' marketing capabilities and beset by opportunistic behavior on both sides of the relationship. While contractual solutions to these problems were only modestly effective, the diffusion of information about firms' performance played an important role in creating the opportunity to confer rewards and penalties. The sharing of information, facilitated by the social ties permeating the industry community, reduced the asymmetric information costs borne by new entrants to the European market and increased the cost of opportunistic behavior by distributors.

The agency system that characterized international marketing during the first fifteen years of the century served well the U.S. machine tool firms efforts to profit from their innovative performance abroad. However, their technological leadership began to narrow toward the end of this period, a process undoubtedly facilitated by the weak appropriability regime protecting U.S. innovations in the European market. A combination of imitation and indigenous development of design and manufacturing skills underlie the remarkable progress of the German machine tool industry [Carden, 1909], which had become the world's largest exporter by 1910. It is likely that the growing design and manufacturing competence of machine tool firms in Germany and other European countries enhanced the competitive significance of the U.S. firms marketing strategy. Further, the outbreak of World War I undermined established business relationships and created abnormal trade conditions. How the U.S. firms strategies and the supporting organizational arrangements responded to these events will be the subject of future research.

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