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***Will Restructuring Hungarian  
Companies Innovate?  
An Investigation Based on Joseph Berliner's Analysis  
of Innovation in Soviet Industry***

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# **Will Restructuring Hungarian Companies Innovate?**

**An Investigation Based on Joseph Berliner's Analysis of  
Innovation in Soviet Industry\***

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## ABSTRACT

Based on insights from Joseph Berliner's work on innovation in the Soviet centrally planned economy and its reform variants, we analyze process innovation (technological development) and product development in restructuring Hungarian companies from 1992 to 1995. Using data from a survey questionnaire responded to by 325 Hungarian companies, we conclude that decision-makers recognize the increasing uncertainty in their business environment and respond to it by taking more aggressive strategies. However, Hungarian companies practice product imitation rather than product development as only about a third of the new products introduced are new to either Hungarian or global markets. Furthermore, although technological development is recognized as important, only about a third of the respondents indicate any improvement in the company's technology and, of these, only about a quarter report that the change resulted in an up-to-date technology.

Berliner identifies public ownership as a major impediment to innovation and considers the invisible foot of market competition to be a significant incentive for innovation. From cross tabulations of responses to various questions probing a company's implementation of new production processes, we find that foreign-owned companies are more likely to be involved in such activity and, of all companies engaged in this process innovation, state-owned companies find it less profitable than do companies of other ownership types. Regarding research and product development, we find that state-owned companies spend significantly less on applied research than do foreign-owned firms. Measuring exposure to external market competition by export intensity in a sub-sample of the companies, we find that a company with higher export intensity is more likely to introduce minor technological improvements. Although ownership type is not a significant determinant of export intensity, state-owned companies tend to adjust their product lines in foreign markets to compete with other Hungarian companies. Global market competition promotes minor technological development and makes state-owned companies more conscious of product development while public ownership deters process innovation in Hungary. Hence, in transition economies, the imitation stage comes first as restructuring companies try to catch up to world class standards in both technologies and products; however preventing foreign participation in the privatization process is likely to impede innovation and stall company restructuring.

JEL Classifications: P31, L21, and D21

## EXECUTIVE SUMMARY

Evidence indicates that Hungarian state-owned companies are increasing productivity faster than their counterparts in other transition economies. To what extent is this due to significant foreign participation in the privatization process forcing such behavioral change? To what extent is it due to increasing global market competition inducing improvements in product mix and modernization of technology? Using data from a survey questionnaire responded to by 325 Hungarian companies representing a broad cross section of the economy, we examine technological improvements and product development from 1992 to 1995 in companies of various ownership types and with different degrees of exposure to foreign markets.

Regarding technological improvements and using cross tabulations when appropriate, we find that:

- only about a third of all Hungarian companies in the survey reported improvements in their technology and, of these, only about a quarter claim that the resulting technology was up-to-date,
- foreign-owned companies are more likely to be involved in such innovation,
- of the companies engaged in this activity, state-owned companies find it less profitable than do companies of other ownership types, and
- companies that are more involved in export markets are more likely to introduce minor technological improvements.

With regard to research and product development, we find that:

- state-owned companies spend significantly less on applied research than do foreign-owned firms,
- state-owned companies adjust product lines in export markets to compete with other Hungarian companies, and
- although three-quarters of the companies report introducing new products, only about a third of these claim that the products are new to either Hungarian or global markets.

Hence, we conclude that:

- foreign majority ownership is crucial to promoting innovation in restructuring companies,
- global market competition may induce companies to consider product development and research but, in transition economies, the imitation stage comes first as companies try to catch up to world class standards, and
- attempts to prevent foreign participation in the privatization process in a transition economy will impede innovation and stall company restructuring.

## 1. Introduction: Berliner on Innovation

In his essay on the historic transformation of the Soviet Union, Joseph Berliner claims that the Soviet experience dramatizes the importance of technical progress as an indicator of systemic performance. He writes:

“It is only a slight exaggeration to assert that if the Soviet Union had succeeded in matching the technological attainment of the leading capitalist countries, there would have been no Gorbachev, no *perestroika*, and no retreat from socialism on the massive scale of the past few years.” (Berliner, 1993, p. 190.)

In his earlier influential book, *The Innovation Decision in Soviet Industry*, Berliner analyzes innovation and product development at the firm level and identifies the major obstacles to innovation in the Soviet centrally planned economy. In an essay written as the concluding chapter to a compilation of his previously published papers, Berliner writes that the elimination of central planning is a necessary condition for the resistance to innovation to disappear, the quality of goods to rise, and other informal practices to vanish but it may not be sufficient to stimulate innovative activity (Berliner, 1988, p. 292). Many of his insights into the impediments to innovation facing firms in a centrally planned system apply equally to restructuring firms in the transition economies.

One of the hypothesized advantages of the planned system over the market economy was the ability to disseminate rapidly and thoroughly new methods of production and new products. Since supply not demand was the limiting factor in the centrally planned economy, “innovation by order,” as Berliner called it, could proceed without encountering bottlenecks on the demand side. Hence, the diffusion of new technology and new products should be easier and faster in the planned economy. Considering diffusion as the improvement in technology actually employed in production by analyzing both process innovation and product development, Berliner notes that

financial support for innovation in the Soviet economy was focused primarily on process innovation (1976, p. 195.) To explain the neglect of product development, he emphasizes the planners' cost-reduction mentality that encouraged economies of scale in production; hence, product variety and changes were eschewed.

In analyzing the stages of innovation, Berliner describes the extreme uncertainty present in the design stage and the natural disruption that accompanies the early development and implementation stages (Berliner, 1993). The dominance of current output as a success indicator for the enterprise manager in Soviet-style central planning made the short-term disruption inherent in tooling up to introduce new technology too costly to bear. Innovation ordered from above by the planners resulted in expectations of higher output. Innovation initiated by the manager from below required that information be passed on to the higher authorities to justify the request for the necessary additional or new materials. In either case, the material benefits to the manager were reduced significantly because the improved performance expected from innovative activity was already built into future output targets. Any manager undertaking, or acquiescing to, innovation was incurring substantial risk in terms of a decrease in short-term performance without much, or any, significant additional long-term reward.

The risk/reward nexus is crucial to understanding the incentives to both produce and implement innovation in any economic system. The planned economy did not suffer from excess demand; rather shortages were pervasive as they reflected the pressure imposed from above to produce more with less. In such a sellers' market, Adam Smith's invisible foot of exit, as Berliner called it, does not function. He reconstructs the foot as a Darwinian struggle to retain market share and considers this to be the firm's primary

reason for seeking and adopting new technology and developing new products (Berliner, 1976, p. 528). The diffusion of innovation can not be separated from the incentives to produce it. Ultimately, material self-interest and the instinct for survival in the market economy are the essential motivating forces leading agents to produce, implement, and disseminate innovations.

Regarding the entry side, Berliner reports that new small companies, especially those created by spin-offs from existing larger companies, are important engines of innovative activity in market economies (Berliner, 1976, p. 533). He provides examples in the U.S. of innovation by former employees who set up new small firms, e.g., IBM and several Connecticut companies. Links with universities also promote innovative activity as is evidenced by the Route 128 corridor around Boston. Silicon Valley provides some of the best-known examples in the U.S. of innovation by start-up ventures. New small firms are the riskiest type of business activity in any economic system. The initial capital structure of start-ups consists almost exclusively of self-financing in market economies. Hence, the reward for success must be sufficiently high to induce people to incur the risk of losing a substantial portion of their own wealth.

In his masterful, future-looking essay on Soviet planning and management reforms, Berliner analyzes the possibility for true reform of the Soviet centrally planned economy by the millennium (Berliner, 1983). He provides key insights into the problems of innovation under Soviet planning with the example of the Fasel' firm.

“It was formed by a small group of engineers and scientists from Novosibirsk for the purpose of providing research, development, and innovative services to industry on a spare-time basis. Operating out of a few dormitory rooms, they solicited contracts from enterprises, drawing upon consultants' services as needed from specialists in the area. In about four years they received 3.5 million rubles from 263 contracts, which they claim to have saved 35 million rubles for the

economy, for which they received fees for themselves and their consultants. Their activities sparked an intense controversy, and they were finally forced to close down because of the objections of the State Bank and the Ministry of Finance.” (Berliner, 1983 citing Lowenhardt, 1974).

The inability of small innovative firms to escape the grasps of the planning bureaucracy coupled with the public suspicion of entrepreneurs who earn sizable returns made such “innovation by invasion” by start-ups difficult, if not impossible, in the planning system.

In a later essay on a hypothetical market-socialist economy, Berliner (1993) identifies three key factors for promoting innovation at the firm level. First, companies must have the freedom to source their own materials autonomously and without the consent or participation of the government bureaucracy. A necessary condition is the end of the supply-constrained, shortage economy. Second, resources must be free to move to new and better uses. Hence, exit must be a real threat not only a remote possibility and spin-offs must be allowed not vilified as asset-stripping behavior. Entry is equally important because it provides an opportunity to found a start-up firm for the purpose of designing and introducing a new product or a new process. Third, and most important, the appropriate balancing of risk and reward must be struck. In particular, entrepreneurs must be allowed to make returns commensurate with the risks taken without the impunity of social outrage or without facing a confiscatory tax structure. Berliner is skeptical about the likelihood of innovation under market socialism because of the weakening of, or lack of, this wealth incentive.

The advanced-reforming transition economies are no longer supply-constrained, shortage economies. To varying degrees, exit is a real possibility. In many instances, privatization has taken the form of spin-offs or asset-stripping. In most countries,



preferential credit facilities are available for new start-up small businesses. But has the appropriate balance between risk and reward been struck? For Berliner, the major impediments to innovation in a reforming socialist system are public ownership, because state-owned firms lack the incentive and expertise to adapt to rapidly changing economic conditions, and the lack of a strong wealth incentive, which retards entrepreneurial activity. In this paper, we take Berliner's work as a springboard for analyzing the capabilities of restructuring Hungarian companies to engage in innovative activity.

In the next section, we discuss the restructuring of former state-owned enterprises and provide evidence of the relative success of Hungarian state-owned companies in restructuring their business activities. In section 3, we use survey data compiled for a project on the competitiveness of Hungarian firms in the global economy to explore the business strategies and innovative activities of all restructuring Hungarian companies. Section 4 considers the impact of ownership-type and export-intensity on process innovation in Hungarian firms. The first of these characteristics captures one of the impediments to innovation identified by Berliner, i.e., public ownership. As a measure of the invisible foot of market pressure, we take the second to represent the threat of the loss of market share and the major driving force compelling firms to innovate. Section 5 concludes with observations about promoting further innovative activity in Hungary and with policy prescriptions for other transition economies based on the lessons learned from the experiences of restructuring Hungarian firms.

## 2. Enterprise Restructuring: What is It and What Does It Mean in Hungary?

The literature on enterprise restructuring in transition economies concludes that financial restructuring is easier than operational restructuring. The former has been

achieved in many of the fast-track reforming countries while the latter is often still not undertaken (Carlin, *et.al.*, 1995). Financial restructuring focuses on the capital structure of the company, in general, and the inherited debt overhang, in particular. Operational restructuring involves labor shedding and developing business strategies that promote profitability by focusing on core activities, modernizing technology, and developing new products for the changed business environment. However, a symbiotic relationship exists between the two as rationalization of the company's capital structure can not occur without the appropriate operational restructuring to make the company suitable for the market economy. Moreover, Pohl *et.al.* (1997) conclude that operational restructuring reduces the need for financial restructuring as cash flows increase whereas financial restructuring, especially when it is initiated and supported by the state, may inhibit operational restructuring because it reduces the need to define new business strategies. This interesting conjecture suggests that the policy decisions taken in many fast-track reforming countries in which state-led financial restructuring preceded operational restructuring may have been misguided.

To examine operational restructuring more concretely, we explore the activities of Hungarian companies adjusting to their changing economic environment. Why choose Hungary? Pohl *et.al.* (1997) identify significant differences between enterprise behavior in Hungary and the other countries in their study, namely, Bulgaria, the Czech Republic, Poland, Romania, the Slovak Republic and Slovenia. They claim that privatization is the key to operational restructuring. Using as their definition of a private firm that at least 33% of its shares have been transferred to private owners, 67% of the Hungarian industrial firms in their data set by number and 65% of its industrial output are private.

As expected from this definition, the two countries that used voucher privatization have higher percentages of private firms and of privatized industrial output; specifically, the corresponding numbers for the Czech Republic are 89% and 93% and for the Slovak Republic 79% and 83%. Poland has comparable numbers to those in Hungary at 61% and 60%, respectively.<sup>1</sup> These authors use the percentage of firms with positive cash flow in 1995 as one measure of restructuring and report that 90% of the sample firms in Hungary, the Slovak Republic and Slovenia had positive cash flow compared to 98% of the firms in the Czech Republic and 87% of the firms in Poland.<sup>2</sup> Despite the middling ranking on both privatization and restructuring, Hungarian firms exhibit strikingly different performance characteristics than the firms in the other countries.

Pohl *et al.*, (1997) compare labor productivity growth from 1992 to 1995 for privatized firms and state-owned firms (SOEs) in each country.<sup>3</sup> The average growth rate across all countries is 7.2% for privatized firms versus a slightly **negative** rate of - 0.3% for SOEs. However, the growth rates in Hungary are 6% for private firms and 3.2% for SOEs with this difference being the smallest by far of all countries. In only two other countries, Poland (1.4%) and Slovenia (1.8%), was labor productivity growth positive for SOEs. Three observations about Hungary are offered as possible reasons for the different performance of its SOEs. First, by the end of 1995, foreign revenues as a percent of total receipts from privatization were much higher in Hungary than in any other country: 58% vs. 24% for the next highest, which was Bulgaria! Second, in 1993, an increase in bank lending to a firm was associated with either constant or declining productivity in all countries **except Hungary**. Third, wage growth in the state sector during this period was

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<sup>1</sup> The data are from Pohl *et al.* (1997), Table 6, p. 9.

<sup>2</sup> The data are from Pohl *et al.* (1997), Table 5, p. 8.

higher than in the private sector in only Hungary and Poland. Nonetheless, the relationship between real wage growth and the annual changes in labor productivity in private firms in Hungary was similar to that same relationship in all the other countries in the study. Furthermore, the relationship between real wage growth and the annual growth of labor productivity in SOEs was similar for the three countries for which SOEs exhibited positive productivity growth, namely, Hungary, Poland and Slovenia.<sup>4</sup> Can the different performance of Hungarian state-owned companies be explained by the influence of foreign-owned companies in Hungary and global market competition?

To probe this issue, we use survey data collected and compiled by students at the Budapest University of Economic Sciences (BUES) for a project on the competitiveness of Hungarian firms in the global economy.<sup>5</sup> Four questionnaires were completed by each company in the survey: one by the CEO and one each by the heads of marketing, production and finance. The survey was designed by a task force of economists at BUES. The resulting data set contains responses to questions about business activities, plans, and strategies during 1992 to 1995 from representatives of 325 out of the 665 companies contacted. The companies contacted were all independent legal entities using double-entry bookkeeping with more than 50 employees and had been in existence prior to 1992. These companies constituted only 0.6% in number of the entire population of Hungarian companies but they make up about 10% of all companies with the listed characteristics. In 1994, these 665 firms produced 18% of Hungary's GDP and provided 46% of its exports. They employed 18% of the active population.

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<sup>3</sup> Pohl *et. al.* (1997) Table 7, p. 10.

<sup>4</sup> Pohl *et. al.* (1997) Figure 6, p. 14.

<sup>5</sup> The project report appears in English as Chikan *et. al.* (1997).

In 1994, the participating 325 companies generated 10.2% of Hungary's GDP and 24% of its exports. Of the companies in the sample, 44% are in manufacturing, 19% in wholesale and retail trade, and 26% in public or private services. The remaining 11% are in agriculture (8%) and extractive industries (3%). Measuring firm-size by number of employees, 21% of the companies had over 1000 employees, 20% between 500 and 1,000, 19% between 300 and 500, 25% between 100 and 300 and 15% between 50 and 100. Although larger companies, measured by number of employees and by asset value or sales, are slightly over-represented by design, the sample corresponds broadly to the overall structure of the Hungarian economy. The World Bank data set consists of 1044 industrial firms only and covers 41% of Hungary's industrial output. Hence, the BUES data set is more representative of the entire economy even though it contains fewer firms. Furthermore, the responses to its questionnaires provide interesting insights into the restructuring activities and business strategies of Hungarian companies.

By 1993, Hungarian banks had curtailed lending to firms in financial distress (Schaffer, forthcoming) so that operational restructuring should have been a necessary undertaking for the survival of many loss-making Hungarian companies during the data period. Hungary is considered to be the transition economy that has gone furthest in rationalizing its domestic banking sector (*Business Central Europe*, October 1997, pp. 43 - 58). The umbilical chord between state-controlled banks and SOEs that keeps afloat firms in financial distress in other countries has been cut in Hungary. Hence, the relatively good comparative performance of Hungarian SOEs may lend support to the conjecture that (state) bank-led financial restructuring does not promote true operational restructuring by companies. In what follows, we investigate the extent to which

innovative activity, which is an important component of operational restructuring, has been encouraged by foreign-funded privatization and driven by the invisible foot of global competition.

### 3. Are Hungarian Companies Restructuring?

Pohl *et.al.* (1997) characterize restructuring as a complex and continual process to maintain profitability in the face of a changing economic environment, recent technological progress and heightened competition from other firms. Hence, the capacity to restructure is related to a company's flexibility in adapting its business strategies to new challenges. When asked about the sources of uncertainty in their business environment, the respondents for the Hungarian companies in our sample identified as the three most important in 1995: domestic markets (about 65% of the respondents checked this category), financial markets (about 50%) and legal regulations (about 50%). When we calculate the change in the percentage of respondents attributing uncertainty to various categories from 1992 to 1995, we find that the increase in uncertainty over this three-year period due to technological/technical development is over 10%. This increment is as large as that for any other factor over the same time period and matches the increase reported for both financial and domestic markets. Interpreting such increases as new challenges to which restructuring Hungarian companies must adapt, we conclude that technological/technical development ranks at the top with domestic markets and financial markets as the three most important sources of heightened environmental uncertainty.

The managers of Hungarian companies claim to have reacted to this perceived

increase in uncertainty by adopting more aggressive business strategies. Respondents were asked to choose among five options, namely, attacking, growing, stabilizing, defending and withdrawing, to characterize the company's business strategies for each of the four years from 1992 to 1995. The percentage of those choosing the two passive strategies of "withdrawing" or "defending" fell from 40% in 1992 to 18% in 1995. In contrast, the percentage of companies pursuing the two aggressive strategies of "growing" or "attacking" increased from 28% in 1992 to 50% in 1995. Hence, the survey data indicate that heightened economic uncertainty was met with more aggressive business strategies in Hungarian companies.<sup>6</sup>

Given that one of the largest changes in environmental uncertainty is attributed to technological/technical development, we investigate the reported business strategies and plans of companies in the sample as they relate to two categories identified by Berliner, process innovation and product development. Taking the latter first, relatively few new products were introduced by Hungarian firms. Thirty-eight percent of the companies have had the same product menu since 1992, while only a third of the products considered by the respondents to be renewed or modernized were reported to qualify as new products in either domestic or global markets. If process innovation is construed as technological improvement, more than one-third of the companies reported that technology had improved since 1992. However, only 27% of these improvements yielded up-to-date technologies, defined in the survey as meeting one of two criteria: world-class standards or technologies first-applied in Hungary. Does this seeming neglect of both product development and process innovation indicate that Hungarian companies are not adapting to one of the largest changes in their economic environment?

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<sup>6</sup> This data and all that follow are taken from various sections of Chikan *et. al.* (1997).

In a question asking respondents to rate seventeen factors according to their relative importance to the success of their company using a scale from one (not important) to five (very important), the importance of process innovation was recognized since "technical development," which was the only category in this question related to innovative activity, had the third highest mean score. In another question that asked respondents to rate the importance of various production objectives for their company using the same scale, "improving product quality" and "reducing unit costs" were chosen as the two most important by mean score. In contrast, objectives that are directly related either to process innovation, i.e., shortening production development cycles, reducing set-up time and reducing production lead time, or to product development, i.e., widening the range of products of existing plants and improving ability to change products, received below-mean scores on this question.

When asked to rate the profitability of production-oriented programs using a scale from one (not profitable at all) to five (very profitable), respondents scored "inventing new production processes" high enough for it to be above the mean for all strategies. With respect to the profitability of programs, the only category related to product development was the redesign of products/value analysis for which the responses yielded a below-mean rating. Finally, the proportion of companies using various plans indicates a neglect of overall innovation in business planning as only slightly more than 20% of the companies have a R&D plan. This is the second lowest percentage of the thirteen plans listed; only a maintenance plan is used by fewer companies. To put this number in perspective, 60% or more of the companies use the following plans: business, annual company, marketing, sales, production, investment, liquidity, and cash-flow.



In summary, although the respondents from the Hungarian companies in the sample recognize the increasingly uncertain environment in which they do business and react with more aggressive business strategies, they neglect both product development and process innovation in company planning and in their production objectives. Since these same respondents recognize the importance of technical development to business success and the profitability of process innovation at least, this neglect is surprising. One possible explanation is found in the response to a question concerning factors in the company that need to be improved. The respondents ranked technical development fourteenth of seventeen such factors and gave it a score well-below the mean in importance. Does this answer indicate that these Hungarian companies are now sufficiently restructured to meet the heightened uncertainty concerning technological development? Since we doubt this to be the case, we examine the responses to more specific questions about innovation.

The respondents were asked to rate factors that both promote and hinder overall innovation on a scale from one to five. The highest mean score given to factors promoting innovation was for the support of top management followed in order by qualified employees, cooperation with customers, and teamwork. Surprisingly low on the list of factors promoting innovation were cooperation with universities and research institutes (last) and changes in ownership (ninth of thirteen). The most important factor hindering innovation was reported to be the lack of financial resources followed in order by taxation (presumably too high), low innovation potential of the company, and uncertainty due to privatization or operational restructuring. Low on the list of hindrances were lack of technical innovation (fifteenth of sixteen) and risk too high

(eleventh of sixteen). Hence, Hungarian managers in the sample perceive that their ability to innovate depends strongly on a favorable internal organization, sufficient company resources, and good relationships with their customers. They consider the major impediments to be a lack of external financing, a hostile fiscal environment, the company's own low self-image of its innovation potential, and the possibility of impending changes in internal governance.

In the next section, we corroborate the importance of a proper corporate culture for process innovation in Hungary by linking current innovative activity to plans for future process development. Then, we examine empirically the effects on innovative activity of the factors identified by Berliner as major impediments to innovation. To discern the effect of public ownership, we investigate the relationships between ownership type and both current improvements in the production technology and the plans for future process innovation. The financial incentive for pursuing innovation is established by relating the respondents' perceptions of the profitability of process innovation to actual innovative activity in their company. Finally, we explore the impact of global market pressure, using export-intensity as a measure, on the Hungarian company's innovative activity and business strategies.

#### 4. Do Restructuring Hungarian Companies Innovate?

A corporate culture oriented toward innovation is identified as an important contributing factor to innovative activity by the respondents. Hungarian companies that have been successful innovators in the past are likely also to emphasize innovation in the future. We examine this connection for process innovation by analyzing the cross

tabulated responses to the following two questions. “Does your company create new production processes?” “Will your company place special emphasis on new production processes in the next two to three years?” Table 1 presents the responses for the companies that answered these questions.<sup>7</sup> Of the 122 companies that create new production processes currently, 50% will emphasize process innovation in the future; whereas among those that do not (199 companies), only 11.6% will begin to try.

Focusing on the 84 companies that plan to emphasize new production processes in the future, which constitute almost 25% of all respondents, about 75% of these reported that they were already involved in process innovation. We use the chi-square statistic from a cross tabulation to see whether or not the two variables are independent. The null hypothesis is that these two categorical variables are independent. The p-value is sufficient to reject the null hypothesis at better than a 0.1% level of significance. Thus, the sample evidence is consistent with the perception that the proper corporate culture is an important determinant of the successful Hungarian innovator.

To test the impact of ownership structure on innovation, we use four classes of ownership type that were self-reported in the sample. “State majority” refers to state-owned companies in which the state holds a majority stake and there is no foreign ownership whatsoever. This group contains 23.7% (77 in number) of the companies in the sample. These are SOEs by anyone’s definition. “Foreign majority” refers to foreign-owned companies in which the aggregate foreign ownership stake is greater than 50% ; this group consists of 16.9% (55) of the companies. These firms are clearly private, majority foreign-held companies but they may not have a core foreign investor. “Mixed and other” refers to companies in which neither the state’s stake nor that of foreign

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<sup>7</sup> Of the 325 companies that returned questionnaires, only 321 answered these questions.

owners grouped together is a majority holding and, hence, other entities hold shares as well. This mixed category captures 57.5% (187) of the companies. A fourth category with a majority state-ownership stake and a minority foreign stake applies to only 1.8% (6) of the companies. We drop this group from the analysis because of its small size.

From Table 2,<sup>8</sup> we see that a much higher percentage of foreign-owned companies currently engage in process innovation, as defined by the creation of new production processes. More than half (51.9%) of the foreign-owned companies create new production processes whereas the comparable percentages for mixed and state-owned companies are 39.1% and 26%, respectively. Cross-tabulation analysis using the chi-square statistic indicates that the difference is significant at better-than a 1% level. However, no significant differences were found to indicate that ownership type mattered to future process innovation when we considered answers relating to either new production processes or new production technologies. Hence, we conclude that foreign-majority ownership is an important determinant of whether a Hungarian company is currently engaging in process innovation but that ownership type does not influence significantly planning for future process innovation.

To investigate the financial incentive to innovate in Hungary, we consider the responses to a question concerning the perceived profitability of creating new production processes in a company. The respondents were asked to score the perceived profitability of new production processes from 1 (not profitable at all) to 5 (very profitable). The statistic for the cross tabulation between the perceived profitability of new production processes and placing emphasis on new production processes in the future was highly

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<sup>8</sup> The six firms that are in the ownership group that we dropped are not included; there are also four firms in the included ownership groups that did not answer this question..

significant with a p-value of 0.006. Hence, the financial incentive appears to be a strong inducement for Hungarian managers when they consider making plans for future process innovation.

Table 3<sup>9</sup> considers the relationship between the perceived profitability of new production processes and ownership type but only for companies that are currently creating new production processes. Respondents from foreign-owned and mixed firms find process innovation profitable as 77.8% and 77.3% of them, respectively, score profitability in the two highest categories. Only 62.5% of the respondents from state-owned firms claim that new product processes are profitable to the same extent. The p-value indicates a significant difference at the 1% level between ownership type and the perceived returns to new production processes. We conclude that the financial incentive to engage in process innovation is more important if foreign owners are present. In other words, even when SOEs do create new production processes, they perceive process innovation to be less profitable than do firms of other ownership types.

Exploring the financial incentive to innovate further, we consider the responses to a question asking for the amount of money spent on four specific areas of R&D, namely, basic research, applied research, product development, and technology development. Only six companies in the sample spent money on basic research, a number too small for meaningful analysis. However, forty firms in the sample spent money on applied research and spending and this spending is influenced significantly by ownership type. On average, foreign-owned companies spent 84,428 thousand forints whereas SOEs and mixed firms spent 13,452 and 19,150 thousand forints, respectively. Analysis of variance

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<sup>9</sup> Of the 120 companies in these ownership groups that were creating new production processes currently, only 109 answered the profitability question. Of the eleven non-responding firms according to ownership

yields a p-value of 0.063 so that this relationship is significant at between the 5% and 10% level. No meaningful differences could be discerned for the other spending categories. To summarize these findings, decision-makers in foreign-owned Hungarian companies are willing to spend more money on applied research and are more likely to create new production processes because they think that process innovation is sufficiently profitable.

Regarding the relationship between product development and ownership type, the results from the survey questionnaires are ambiguous. One question asked whether your company has introduced new products since 1992 and, if so, what percent were new world-wide, new in Hungary only, or new only to the company. With respect to the percentage of companies introducing new products since 1992, ownership type was irrelevant as about 72% of the companies in each group did so. Of these new products, the mixed firms introduced more products that were new to world-wide markets, 43.1% versus about 26% for each of the other two. At the firm level, the percentage of products introduced that were new only to the company was relatively invariant to ownership type with SOEs leading at 78.5% followed by mixed firms at 76.5% and foreign-owned at 69.4%. Between 1992 and 1995, SOEs needed more time to develop new products with an average development time of 216 days compared to 178 for foreign-owned companies and 161 for the mixed group. However, none of these differences was statistically significant at even the 20% level. In summary, although almost three-quarters of the Hungarian companies in our sample introduced a new product sometime between 1992 and 1995, most of these were not new to global markets. There were no statistically significant influences of ownership type on new product development. To summarize,

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type, four are "state majority", six are "mixed and other" and one is "foreign majority."

Hungarian companies introduce already developed products to their line; for the most part, they are product imitators not product developers.

To probe the effect of Berliner's invisible foot of market competition on innovation by Hungarian firms, we use the ratio of export sales to total sales as a proxy for global market pressure. Unfortunately this statistic had to be computed directly using supplementary income statement data when available for the firms in the sample. We were able to calculate such an export-intensity ratio for 40 firms; its median value is 29.9%. We separated the companies in the sub-sample into two groups using the median as the dividing measure. Table 4 presents the relationship between export type, high for above-median and low for below-median, and the introduction of new production technologies as a result of a minor development in the company's technology. The responses were to a question that asked if the firm had introduced a new production technology that was new world-wide, new to Hungary, a result of major development in the company's technology, or a result of a minor development in the company's technology. Of the companies in the sub-sample, 9 or 22% introduced new production technology as a result of minor development compared with 38% of the companies in the full sample responding that they had done so. Consequently, our sub-sample is not representative of the companies that were engaging in this type of process innovation in the larger sample. Nevertheless, we consider the results as examples.

For the firms in our sub-sample, high exporters are more likely to introduce new technology that is a result of a minor development. The p-value for the cross tabulation in the table is 0.038 indicating a level of significance of better than 5%. The p-values for the other three categories are all over 0.50 and hence, insignificant. Furthermore,

ownership group and export type are not significantly related for these 40 firms. Hence, the majority foreign-owned firms in our sub-sample are not more focused on export markets than are companies of the other ownership types. The one statistically significant relationship between export-intensity and process innovation that we are able to discern in the sub-sample applies to minor technological development only. Hence, we can not conclude that the invisible foot of global competition is kicking Hungarian companies very hard to undertake significant process innovation.

Regarding product development, the BUES study contained a question that probed the *structure* of export sales by asking what percentage of export sales in 1995 came from basically unchanged products, from products with minor changes, and from either products with major changes or new products. Using the full sample of firms, SOEs have the lowest percentage of export sales from unchanged products at 55% compared with 60.4% for mixed companies and 70.5% for foreign-owned companies. The p-value from the analysis of variance between export sales from unchanged products and ownership type is 0.058 indicating significance at almost the 5% level. Similarly, SOEs have the highest percentage of export sales from new products at 44.6% compared with 38.7% for mixed companies and 27%. There is virtually no difference in the responses concerning products with minor changes. We interpret this as weak support for the hypothesis that SOEs are forced to adjust their product lines to compete in export markets with companies of other ownership types. Hence, global competition encourages state-owned companies to keep up with their domestic competitors by upgrading their product lines.



## 5. Conclusion: Miles to Go Before We Sleep<sup>10</sup>

Emerging from the responses to a survey of 325 Hungarian companies is a clear indication that the decision-makers in these companies have recognized the heightened uncertainty in their economic environment since 1992, have responded to this increased uncertainty with more aggressive business strategies, and are now focusing on profitability, expanding their product line, and increasing productivity. To what extent are these restructuring Hungarian companies promoting innovation? The survey indicates that, as Berliner found to be the case for Soviet firms, product development is neglected. New products are introduced to the lines of almost three-quarters of the companies but these are predominantly products that have been developed elsewhere. Only about a third of these “new” products are considered by the respondents to be new to either Hungarian or global markets. Product imitation rather than product development is the strategy chosen by Hungarian companies. Interestingly, this tendency is robust to ownership type with little difference between state-owned companies and foreign-majority-owned ones.

The importance of technological development is recognized as one of the top three sources of heightened uncertainty for Hungarian firms. However, only about a third of the respondents reported improvements in their company’s technology since 1992 and, of these changes, only slightly more than a quarter resulted in up-to-date technologies defined either as world-class standard or as technologies applied for the first time in Hungary. Since 1992, the vast majority of technological changes undertaken by Hungarian companies were minor improvements only. Hence, process innovation is pursued in a minor way only and probably by imitation.

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<sup>10</sup> With apologies to Robert Frost!

Berliner identified the cost-cutting mentality of the planners as an impediment to innovation in the Soviet system. Interestingly, “reducing unit costs” was reported to be one of the two most important factors promoting the successful operation of a Hungarian company. In contrast, respondents rated factors related to both process innovation and product development at below-mean scores in contributing to business success. It is thus not surprising to find that only about 20% of the companies have an R&D plan.

According to Berliner, the two major impediments to innovation in a reforming socialist system are public ownership and the lack financial motivation. Regarding the latter, the respondents considered “inventing new production processes” to be above the mean in promoting increased profitability when compared with the other production-oriented programs considered. Given that profitability is now the most important concern of Hungarian companies, the financial incentive for process innovation seems to be present. Indeed, we find a highly significant statistical relationship between the perceived profitability of new production processes and an emphasis on new production processes in the future. However, the only program in the group that is directly related to product development was scored below the group mean. Hence, product development does not have the same financial inducement as does process innovation.

Regarding Berliner’s other impediment, i.e., public ownership, our data set uses a rather strict definitions for state-ownership. A firm is considered to be state-owned if the state has a majority stake **and** there is no foreign ownership whatsoever. Almost 25% of the companies in the sample fall into this category and are thus publicly owned. A firm is considered to be foreign-owned if the aggregate foreign ownership stake exceeds 50%.

About 17% of the companies are foreign-majority-held and thus privately owned;

whether or not any foreign owner has a core-investor stake is not discernible from the survey data. The remaining 58% fall into a “mixed” category as they have neither state nor foreign majority ownership. From Berliner’s work, we would expect to find significant differences between ownership type and attitudes toward innovation among these Hungarian companies. Our empirical analysis indicates that foreign-majority-owned companies are much more likely to be engaged currently in creating new production processes. However, ownership type is not found to be a significant determinant of planning for future process innovation.

For Hungarian companies that were actually implementing new processes, significantly fewer of the respondents from state-owned firms found these to be reasonably or highly profitable. Spending on applied research by state-owned firms was significantly less than it was for foreign-owned firms. Hence, the financial motive to innovate is less strong for state-owned forms and the decision-makers in SOEs respond accordingly by spending less on R&D and engaging in less process innovation. Thus, the behavior of Hungarian state-owned companies is consistent with Berliner’s predictions concerning public ownership as an impediment to innovation.

To explore the possible impact of Berliner’s invisible foot of market competition on innovation, we used export-intensity as a measure of the strength of global market pressure. Most process innovation by Hungarian companies was perceived to be only minor technological development by the respondents so we investigated the relationship between export-intensity and the introduction of new production technology resulting from minor developments. High-export companies are more likely to engage in this activity and the difference is statistically significant. However, in a sub-sample of forty

firms for which we were able to calculate export-intensity, ownership type was not a significant determinant of export activity or process innovation. In the full sample, we did find some evidence that state-owned companies were adjusting their product lines to compete with other Hungarian companies in export markets. The invisible foot of global competition does not seem to be kicking sufficiently hard to encourage meaningful process innovation or product development by Hungarian companies.

In summary, Hungarian managers have “miles to go” before they can be characterized as vibrant Berliner innovators. They tend to be product imitators as they introduce products that have been developed elsewhere. When they engage in process innovation, they change their technology in a minor way only and again mainly by imitation. Even though they recognize the importance of dealing with heightened uncertainty due to technological change and attempt to be more aggressive in their business strategies, most Hungarian managers are not engaged in current innovation nor are they planning future innovative activity. However, foreign-majority-owned companies spend significantly more money on R&D, perceive the financial inducement to process innovation to be stronger, and engage in more current innovation than their counterparts in other companies. Finally, the perception by Hungarian managers that corporate culture is a key factor in successful process innovation is born out in the data as current innovators tend also to plan for future changes in their production processes. Although they may have “miles to go,” Hungarian managers have also come a long way. The innovative culture is implanted and has taken root, especially in the subset of companies that are majority foreign-owned.

The lessons for other transition economies from the Hungarian experience relate

to the insights from Berliner's work. Private ownership in the form of foreign-majority-ownership and the perception of a strong financial return are crucial factors in promoting innovation at the firm level. Eventually the invisible foot of global-market competition may also be a strong inducement for companies in transition economies to focus on product development and R&D. However, the imitation stage comes first as managers try to catch up to current world-class standards. Hungarian companies are well along this road thanks to a significant number of leading firms that have majority foreign ownership. Therefore, the most important lesson for transitions economies that we take from the Hungarian experience is that any attempt to exclude foreign owners from participating in the privatization process will stall operational restructuring. Thus, countries pursuing such protectionist policies with have even more "miles to go".

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**Table 1:** The relationship between current creation of new production processes and future emphasis placed on them (*number of firms, row percents in brackets*)

		Emphasis on new production processes in 2-3 years		Total
		No	Yes	
Creating new production processes	No	176 (88.4%)	23 (11.6%)	199
	Yes	61 (50%)	61 (50%)	122
Total		237	84	321



**Table 2:** The relationship between the current creation of new production processes and type of ownership (*number of firms, row percents in brackets*)

		Creating new production processes		Total
		No	Yes	
Type of ownership	<i>State majority</i>	57 (74.0%)	20 (26.0%)	77
	<i>Mixed and others</i>	112 (60.9%)	72 (39.1%)	184
	<i>Foreign majority</i>	26 (48.1%)	28 (51.9%)	54
<i>Total</i>		195	120	315

**Table 3:** The relationship between the profitability of new production processes (among firms currently creating new production processes) and type of ownership  
(number of firms, row percents in brackets)

		Profitability of new production processes					Total
		<i>1 - Not profitable at all</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 - Very profitable</i>	
<b>Type of ownership</b>	<i>State majority</i>	0 (12.5%)	2 (12.5%)	4 (25.0%)	7 (43.8%)	3 (18.8%)	16
	<i>Mixed and other</i>	1 (1.5%)	1 (1.5%)	13 (19.7%)	38 (57.6%)	13 (19.7%)	66
	<i>Foreign majority</i>	0	0	6 (22.2%)	17 (63.0%)	4 (14.8%)	27
	<i>Total</i>	1	3	23	62	20	109

**Table 4:** The relationship between export intensity and the introduction of minor production technology developments (*number of firms, row percents in brackets*)

		Introduced new production technology - as a result of a minor development		<i>Total</i>
		<i>No</i>	<i>Yes</i>	
<b>Export sales</b> (% of total sales)	<i>Low</i>	19 (90.5%)	2 (9.5%)	21
	<i>High</i>	12 (63.2%)	7 (36.8%)	19
<i>Total</i>		31	9	40