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### **Scale, scope and entrepreneurship**

By

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#### **Abstract**

To exploit the economies of scale and scope in multi-product technologies, enterprises in advanced capitalist countries grew in the last 150 years in three directions. By substituting in the place of traditional entrepreneurs professional managers, they developed organisational capabilities to coordinate effectively activities that were widely dispersed geographically and functionally. They promoted rapid innovation by resorting to systematic Research and Development efforts. And, finally, they enhanced control over their markets by introducing innovations whose application required large-scale investment.

In the course of these transformations the material standards in the respective countries rose to unprecedented levels. But simultaneously they led to losses in market coordination because these transformations increased market imperfections. As a result the economies of scale and scope appear to be negatively related to the ratio of coordination to innovation in the economy. Hence, to the extent that policy makers strive to achieve the priorities of citizens, they are advised to allow for the implications of this relationship to the best of available information.

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## 1. Introduction

When asked to define what is economics, quite frequently economists respond that economics is whatever economists do. In an analogous way, if one were asked to define what is entrepreneurship, one might reasonably be expected to respond that entrepreneurship is whatever entrepreneurs do. Hence, to understand entrepreneurship, a convenient approach is to focus on the role(s) of entrepreneurs in the economy.

To this effect a cursory look at the relevant literature would reveal that entrepreneurs perform six roles. They act as coordinators in the firm, in the market and in the economy. They absorb the costs of uninsurable risks that are associated with uncertainty. Quite frequently they perform as innovators by introducing new products, new production techniques and new organizational schemes. In their great majority they function as imitators of new products and new production techniques. By setting goals and inspiring employees and associates to achieve them, they provide leadership. And, lastly, they exercise alertness in discovering previously unforeseen profit opportunities. So by placing the emphasis on one or more of these roles various authors have come up with various theories of entrepreneurship. For example, neoclassical economists working in the tradition of Ricardo (1821) view entrepreneurs primarily as coordinators. Knight (1921) conceives of them as undertakers of risk and uncertainty. The entrepreneurs of Schumpeter (1942) are innovators, whereas those of Machlup (1958) and Kirzner (1985) act respectively as imitators and discoverers of profit opportunities. Here I will concentrate on the activities of entrepreneurs as coordinators and innovators.

Regarding their function as coordinators, entrepreneurs act in two domains, that is, their firms and the markets where they operate. In the firms the main task of entrepreneurs is to extract economies of scale and scope from modern multi-product technologies so as to remain competitive. In the markets their main task is to perceive opportunities for profit brought about by disequilibrium situations and try to exploit them by shifting resources from less to more valuable uses. If their perceptions prove correct, their actions benefit themselves and the economy. But if they are wrong they absorb the losses and learn to be more careful the next time around. As for their function as innovators, entrepreneurs apply an invention for the first time in order to develop a new product, a new service, or a new productive method on the perception that they may have good possibilities to pass the market test. If the

innovations survive this test, the entrepreneurs and the economy benefit because of the superior value engendered by the new applications. Otherwise the innovation is abandoned and the entrepreneurs waste their time and efforts. By implication then, any attempt to investigate how scale and scope may affect, if at all, the inclination of people and business concerns to exercise entrepreneurship must dwell on the nature of two links: one linking scale and scope to firm and market coordination and another linking scale and scope to innovation.

The objective in this paper is to address the possible existence and characteristics of these two links. In doing so I draw on the views held in contemporary economic theory as well as the results from empirical research. From this review it turns out that the economies that are associated with scale and scope are important driving forces in the expansion and deepening of coordination within firms. At the same time it is found that this inside or organizational type of coordination has been taken over to a large extent by managers who act as administrators and intrapreneurs. So the evidence points to the conclusion that scale and scope limit the role of traditional entrepreneurs in both these functions. But their impact on market coordination and innovation is somewhat uncertain because it is inextricably tied to the structure of various markets in the economy. In this regard it is suggested that we should watch out for two implications. Namely, first, there may exist a trade-off between smaller business units with high market coordination to innovation ratios and larger business units with low market coordination to innovation ratios. And, second, the designing of scale- and scope-related policies may be misguided if the responsible public authorities fail to allow for this trade-off to the best of available information.

Next section is devoted to the relationship of scale and scope to coordination within firms. Its focus is to explain why and how scale and scope have led to the formation of giant enterprises and to the substitution in them of entrepreneurs by professional managers. In the next two sections the presentation turns to the consequences of these two developments for market coordination and innovation. Then, in the following section, the relationships of scale and scope to market coordination and innovation are brought together in an effort to highlight their implications for economic theory and policy. The final section summarizes the conclusions.

## 2. Coordination within modern enterprises

Consider an enterprise whose production technology is characterized by the following simple system of equations:

$$\begin{aligned} Q_1 &= f_1(K_1) \\ Q_2 &= f_2(K_2; Q_1), \end{aligned} \quad (1)$$

where  $Q_1$  and  $Q_2$  are the products produced and  $K_1$  and  $K_2$  are the resources devoted to the respective facilities or product lines. From Figure 1 it is easy to observe that this technology exhibits three important characteristics.

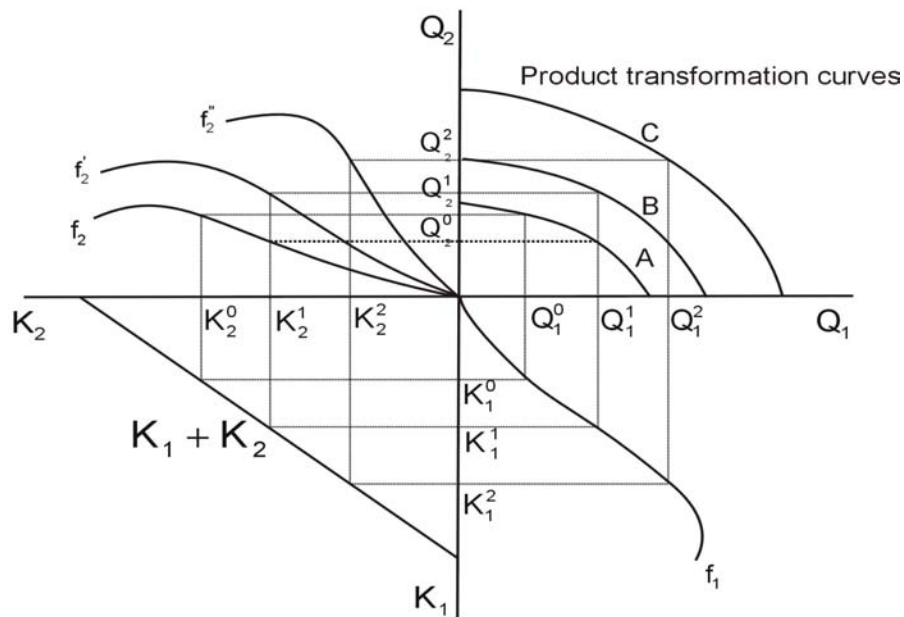


Figure 1

First, looking at the graphs of the production functions  $f_1$  and  $f_2$  we see that they display initially increasing returns to scale, then decreasing returns to scale, and finally if production is extended beyond a certain level the returns to scale turn negative.

Second, notice that as the quantity of output  $Q_1$  increases from  $Q_1^0$  to  $Q_1^1$  the resources that must be devoted to its production increase from  $K_1^0$  to  $K_1^1$ . Consequently with the overall amount of available resources fixed, normally this enterprise would have to reduce the production of  $Q_2$  to the level shown by the bold line in order to free up the

additional resources  $K_2^0 - K_2^1$  that are required for the increased production of  $Q_1$ . But because of the positive impact of  $Q_1$  on the production of  $Q_2$ ,  $f_2$  shifts to position  $f_2'$ , thus pushing the production possibility frontier outward to B. What these changes imply is that the unit cost of producing  $Q_1$  and  $Q_2$  jointly is lower than the unit cost of producing them separately and reveals the existence of economies of scope.

Finally, in order to achieve the economies of scale and scope the role of management becomes quite complicated. To understand the reasons why, assume that the facilities for  $Q_1$  and  $Q_2$  are located several thousand miles apart. Then, most probably, the units for purchasing raw materials, the departments for hiring workers, the departments for selling the two products, the offices for carrying out numerous administrative tasks, and so on will become geographically and functionally dispersed. As a result the management will have to develop skills and support systems to monitor and coordinate the activities of many decision centres that may have the tendency to operate on their own. Would traditional entrepreneurs be able to undertake these tasks? Certainly they would find it increasingly difficult, as their enterprises would grow. For this reason realizing the economies of scale and scope presupposes a basic imperative. This is that eventually the management must be entrusted to people with the necessary knowledge and skills to develop the required organizational capabilities.

In view of the simplicity of the model from which this proposition was derived, one might be tempted to surmise that it has little relevance for explaining the evolution of modern enterprises. Such a conclusion would be unfounded because piles and piles of empirical research corroborate it from several standpoints. One of them emanates from the persistent findings by many studies of economies of scale at the plant level and of constant returns to scale at the enterprise level. Clearly if expanding organizational capabilities were subject to diseconomies of scale, the economies of scale and scope at the plant level would tend to vanish at the level of the enterprise. Hence, what these findings imply is that the development of organizational capabilities is a necessary condition for turning the economies of scale and scope to one's advantage.

The second standpoint springs from the voluminous evidence that pertains to the development of industrial capitalism. In this regard we know that the giant enterprises in

the advanced market economies managed to compete in international markets and grow by extracting economies of scale and scope from multi-product technologies. How did they do it? For an answer one need look no further than the monumental work by Chandler (1990). What he finds is that the development of industrial capitalism in the United States, Great Britain and Germany from about 1870 to 1970 could be attributed to merely two factors: one being the separation of ownership from control, which made it possible to amass tremendous amounts of capital under a single management, whereas the other has to do with the development of organizational capabilities.

Last but not least, consider the more recent developments in the forms of downsizing, divestiture, restructuring, outsourcing, and so on. If diseconomies of scale, scope and management were allowed to creep into the operations, from Figure 1 we would expect management to resort to such policies in order to return the enterprises back to profitability. But this is exactly what has been happening in recent years with many large companies, as they try to control their costs and improve their balance sheets.

In conclusion, reaping the economies of scale and scope that are inherent in multi-product technologies and large-scale operations presupposes (a) the control of enterprises by professional managers, (b) the development of organizational capabilities to coordinate and efficiently integrate widely dispersed activities, and (c) the encouragement of intrapreneurial activities through well-defined systems of motives. In advanced market economies these conditions were met with spectacular success, thus raising material standards in these countries to unprecedented levels. But in the process the role of the traditional entrepreneur as manager and coordinator was confined to small-scale enterprises.

### **3. Coordination in the market**

Neoclassical economics has been blamed by various schools of thought for various failures. One of them, levelled in a particularly uncompromising manner by neo-austrian economists,<sup>2</sup> is that its blind faith in the coordinating powers of entrepreneurship is misplaced, the reason being, according to Loasby (1982, p.122, and also 1989, p. 161), that there is nothing in the market to assure that entrepreneurial perceptions of existing disequilibrium situations will not be so seriously in error as to lead in quite the wrong directions. To be sure, at times of speculative bubbles this criticism gains credibility. But

from several historical incidents we know that exuberant optimism does not last for long and no matter how painful the adjustment may turn out to be, bubbles burst and markets return to their normalcy. Consequently, taking the coordinating powers of traditional and managerial entrepreneurship for granted, what I propose to do next is to investigate how these powers are related, if at all, to the scale and scope of modern enterprises.

### 3.1 Coordination in the absence of innovation

Let us start by assuming that we observe a fully competitive market in long-run equilibrium. From Marshall (1890) we know that, in the absence of innovation, the situation will be like the one shown by points  $E_1$  and A in Figure 2 where the prevailing price is  $P_1$ .

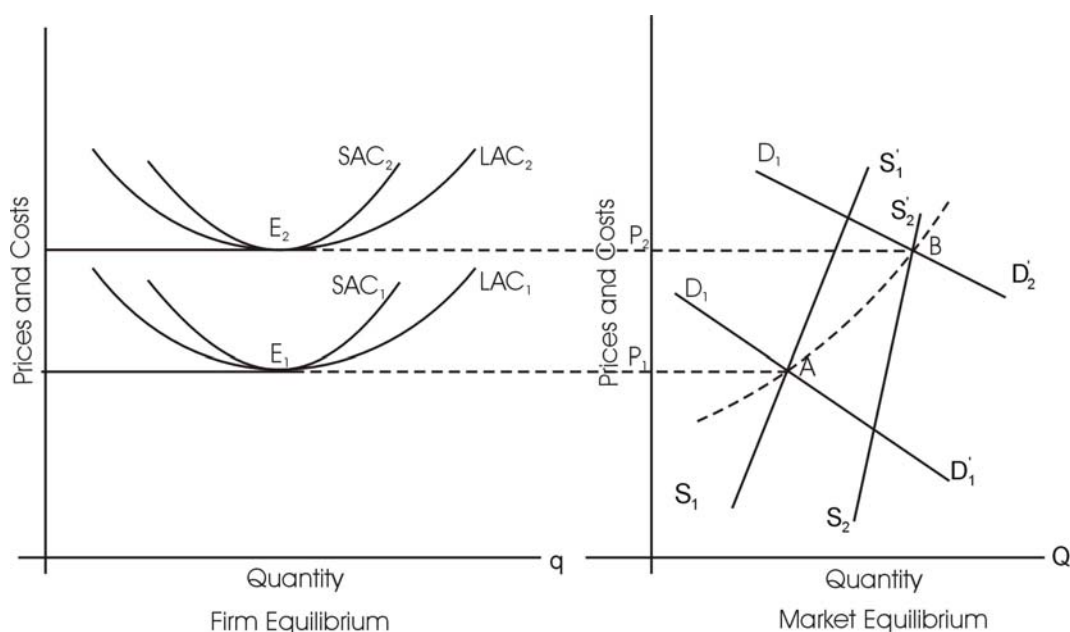


Figure 2

Now if demand increases for some reason and the demand curve shifts from  $D_1D_1'$  to  $D_2D_2'$  the enterprises in this market will feel the pressure because the price will start to climb. For some time the enterprises will try to benefit from the improved price by taking easily reversible measures to increase the supply of the product. During this period neither they nor other enterprises from outside the market will make any move to increase the scale of operations because the nature of the increase in the demand will be uncertain. However, as time goes by and the uncertainty surrounding the shift in the demand is reduced, the enter-

prises will succumb to the pressure of the potential competition from within and from outside this market. So assuming that supply does increase through a combination of new firms entering the market and old firms expanding their productive facilities, if the industry is an increasing-cost industry, a new long-run equilibrium will be established at  $E_2$  and B.

From the last sentence it follows that, in order for the explanation of the transition from A to B to be satisfactory, the model in Diagram 2 must be able to explain the path that increasing supply will follow. In particular, the model should be able to predict (a) the expansion of capacity by firms that operate already in the market, (b) the capacity that may be added by enterprises entering the market for the first time, and (c) the rate at which these changes will converge to the new long-run equilibrium.<sup>3</sup> With regard to these issues researchers in the neoclassical tradition have worked out one general and several particular approaches. The general approach provides for the introduction of an additional market in which entrepreneurship is demanded and supplied like all other inputs. For example, according to Stonier and Hague (1953, p. 325), Vickrey (1964, p. 143) and other more recent authors the demand curve in this market represents the marginal productivity of entrepreneurship, whereas the supply curve derives from the notion that Schultz (1975) has defined as ‘the value of the ability to deal with disequilibria’. Finally, regarding the particular approaches, these are found in an ever-increasing literature in the direction of new microeconomics initiated by Phelps (1970) and his associates.

To my mind the above represent all there is to the neoclassical analysis of coordinative powers of entrepreneurship in a market without innovation. Are there margins for error on the part of entrepreneurs? Of course there are since the perceptions about the shift in the demand curve are unknowable. But under the pressure of potential competition, on the one hand, and the lure of profits, on the other, perceptions are adapted so as to drive the decisions of entrepreneurs towards the new equilibrium. Therefore, taking into consideration the qualification expressed in note 3, if there is any substance to the criticism of extreme neoaustrians regarding the equilibrating function of entrepreneurship, I myself fail to see it.

Having clarified this point, I turn now to the more thorny issue of the implications of scale and scope for the speed of convergence to the new equilibrium. Figure 2 depicts a possible path of moving from point A to point B. How then might the existence of economies of scale and scope influence the speed of adjustment? To an overwhelming extent the answer



depends on the nature of potential competition, which in turn depends on the amount of sunk cost of each enterprise in the market. If this cost is negligible, in which case the economies of scale and scope will also be negligible, the market will be highly contestable and the speed of adjustment to the new equilibrium could be instantaneous.<sup>4</sup> On the other hand, if the sunk cost of each firm in the market is large, in which case the economies of scale and scope will also be large, potential competition will be weak, and hence the adjustment to the new equilibrium will be slow, if ever completed.

The conclusion that may be drawn from the above analysis is that the introduction over the years of technologies characterised by economies of scale and scope may have reduced the resilience of markets to adjust from one equilibrium position to the next. However, whether this is good or bad for social welfare cannot be decided without taking into account the relationship of scale and scope to innovation.

### 3.2 Market coordination in the presence of innovation

Launching an innovation is accompanied always by an element of surprise to other market participants because it creates conditions of disequilibrium. To see what happens, consider Figure 3. This depicts the sequence of expected events in the market for a substitute good  $q_1$ , and the market for a complementary good  $q_2$ .<sup>5</sup>

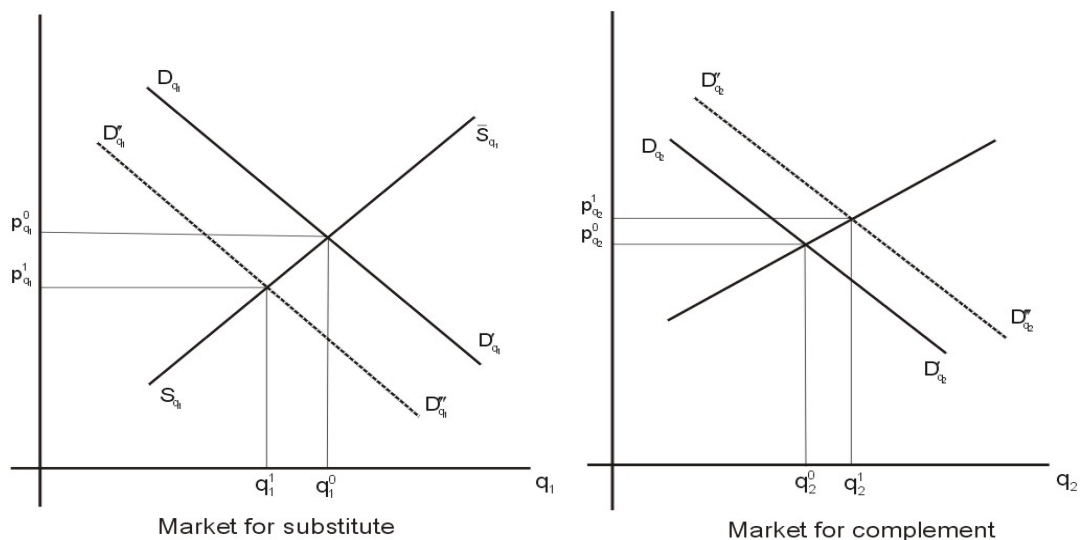


Figure 3

Upon introduction of the innovation potential users will start to experiment with it. For some initial period the suppliers of  $q_1$  will see their sales shrink, whereas the suppliers of  $q_2$  will be surprised by the improved demand for their good. During this period, in light of their ignorance about the reception of the innovation, the suppliers of  $q_1$  and  $q_2$  will stay aloof. But after the innovation takes hold in the market, the suppliers of  $q_1$  will start resisting their losses in market share by reducing prices from  $p_{q_1}^0$  to  $p_{q_1}^1$ , whereas those of  $q_2$  will respond by increasing prices from  $p_{q_2}^0$  to  $p_{q_2}^1$ . Eventually, if the innovation proves commercially successful by realising sales of, say,  $q^0$ , something quite unlikely in the majority of cases, a new equilibrium will be established in which the sales of the two products shown in Figure 3 will be  $q_1^1$ , and  $q_2^1$ .

This analysis points to two crucial links. The first of them has to do with the relationship of scale and scope to the production of innovations, and the second concerns the same relationship but with regard to the diffusion of innovations. To them I turn immediately below.

### 3.2.1 Firm size and the production of innovations

The research regarding the production and the diffusion of innovations is vast. Indicative accounts of the attention both subjects attracted in the post-war period are, for example, Mansfield (1968, 1977) and Mahajan and Wind (1986). From this literature it is safe to surmise that the first researcher who considered the relationship of firm size to innovative activity was Schumpeter (1942). He hypothesised that innovative activity is promoted by two main factors: *large firms* and *imperfect competition*. Since then both tenets of his hypothesis have been put to numerous empirical tests mostly separately (see Link (1980) but also jointly (see Mansfield, 1963b, and Acs and Audretsch, 1987). The evidence from these tests has shown that, although it is the large firms that resort predominantly to Research and Development (R&D) activities (see Table 1 below), large firms are not more innovative than their smaller counterparts. More specifically, considering the second tenet of the Schumpeterian hypothesis, it has turned out consistently that markets characterized by imperfect competition are particularly conducive to innovation by large firms, whereas markets more closely resembling the competitive model are more conducive to innovation by small firms. What these findings suggest is that the size of

firms is related positively to the rate of innovative activity not directly but indirectly through its influence on market structure. So the interesting question that arises is to identify the ultimate forces that link firm size to market structure to innovation. In this regard, Galbraith (1956) and Scherer (1980), among many others, have noted that scale economies in production may provide scope economies for Research and Development(R&D).<sup>6</sup> To the extent that this hypothesis is valid, the train of influences would be envisioned to run as follows. The capital intensity caused by economies of scale in production generates economies of scope to innovation. In turn, the economies of scope to innovation provide a barrier to small-firm innovation, thus leading to market imperfections. Finally, by enhancing the profitability of firms, market imperfections furnish the incentives and the resources for accelerating innovation. Simply put, large firms, rather than small firms, are in a better position to exploit the gains from innovation in an industry characterised by economies of scale.

**Table 1:** The Distribution of R&D expenditures by Firm Size in U S Manufacturing, 1958

Firm Size (Employees)	5,000 or More	1,000-4,999	Less than 1,000
Number of firms	384	1,459	260,000
Percent doing research	89	50	4
Percent of industry research expenditures	85	8	7

Source: Richard R. Nelson et al. (1966), p. 48.

The above leads to the conclusion that, by relating positively to market imperfections, scale and scope raise the rate of production of innovations while retarding the degree of market coordination. However, these findings highlight only one side of the story, since scale and scope are related also to the rate of diffusion of innovations. So to complete the analysis, the following section is devoted to this aspect.

### 3.2.2 Firm size and the diffusion of innovations

From the work of Mansfield (1963a, 1990) and many other researchers we may sur-

mise with relative certainty that the probability of any given percentage of firms adopting an innovation depends on two determinants. These are the profitability of the innovation and the required investment. In particular, as depicted in the two diagrams of Figure 4, the empirical evidence shows that the less profitable an innovation is and the larger the investment its application requires, the less is the probability of any percentage of firms of adopting it. Hence, given that scale and scope are positively associated with the size of investment, the larger the required investment, the slower the diffusion of the innovation and the more sluggish the rate of adjustment to the new equilibrium for two reasons: First, because large firms have the ability to adopt the innovation first; and, second, because having adopted the innovation large firms can deter its adoption by smaller firms. As a result, by slowing down the diffusion rate of innovations, scale and scope lead to further losses of coordination.

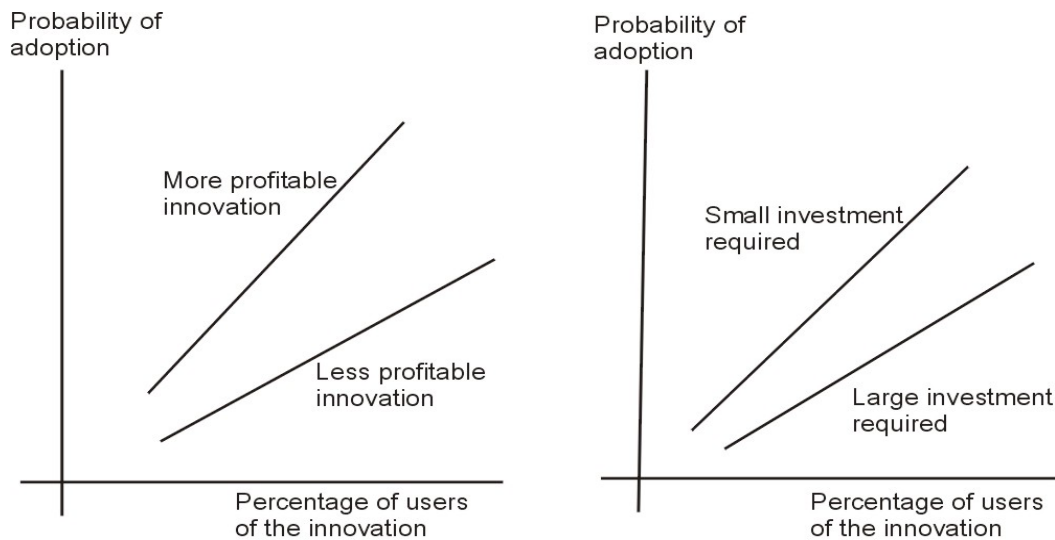


Figure 4

In conclusion, from the analysis in this section it transpires that scale and scope accelerate the production rate of innovations, retard the speed of their adoption, and impede the coordinative powers of the market. So the task that remains is to pool together all effects of scale and scope on coordination and innovation in order to evaluate their importance for social welfare.

#### 4. Policy issues

Exploiting the economies of scale and scope, which are associated with present day multi-product technologies, presupposes among other requirements the enlargement of business units and the commitment on their part to large-scale investments. In the process though, markets become increasingly imperfect with two consequences. On the one hand the rate of innovative activity increases, whereas on the other the adaptability of the economy is reduced due to losses in coordination. Drawing on these two tendencies, one is tempted to hypothesize that the economies of scale and scope are related to the ratio of coordination to innovation via a negatively sloping relationship like the one shown by curve  $SS'$  in Figure 5. The rationale for the negative slope being that, as economies of scale and scope increase, the aforementioned ratio declines because the index of coordination decreases and that of innovation increases.

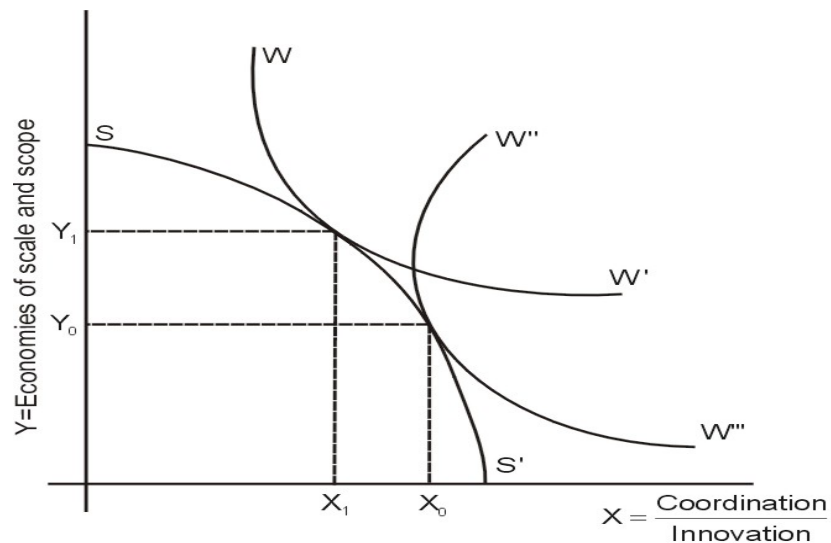


Figure 5

In view of the possibility that a relationship like  $SS'$  may exist and be fairly stable, the question that arises for regulatory and other policy-making authorities is how to account for its implications. As is the case with many other problems involving choices among conflicting social ends, the answer depends on the presumed preferences of society. If these preferences are believed to be represented by social welfare function  $W'W'''$ , authorities should aim at achieving equilibrium point  $X_0Y_0$ . At that point people would give high priority to market coordination, with emphasis on relatively small-scale enterprises and traditional en-

trepreneurs, and the growth of material welfare would be moderate. On the contrary, if social preferences are represented by  $WW'$ , people will give high priority to innovation and growth, driven primarily by managerial entrepreneurs and large-scale enterprises, and they will not mind very much about market coordination. In that event, policy-makers would be advised to aim at achieving equilibrium point  $X_1Y_1$ . Hence, which policy choices would be better suited in the case of each particular country depends crucially on the priorities of its citizens and the stage of development of its social and economic institutions.

## 5. Conclusions

For many decades now innovations have favoured the development of multi-product technologies that are characterised by economies of scale and scope. To exploit these economies and prevail in international markets, enterprises in advanced capitalist countries grew in three crucial directions. First, they attained the required organisational capabilities to coordinate effectively activities that were widely dispersed geographically and functionally. This was achieved mainly by separating the ownership from the control of enterprises and facilitating the substitution of traditional entrepreneurs by professional managers. Second, they promoted rapid innovation by resorting to systematic Research and Development efforts. And, third, they enhanced control over their markets by introducing innovations whose application required large-scale investment and which led to continuous product differentiation.

All these developments raised the material standards in the respective countries to unprecedented levels. But simultaneously they led to losses in market coordination because they increased market imperfections. As a result the economies of scale and scope appear to be negatively related to the ratio of coordination to innovation in the economy. For this reason, to the extent that policy-makers strive to achieve the priorities of citizens, as represented in the social welfare function, they are advised to allow for the implications of this relationship to the best of their information.

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## Notes

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- <sup>1</sup> The activities of entrepreneurs within modern enterprises are referred to in the literature as ‘intrapreneurship’. For an excellent account of the difficulties involved in the implementation of intrapreneurship as well as the available approaches to dealing with them see Schollhammer (1982).
- <sup>2</sup> With the exception of Kirzner (1992, pp. 3-37) and his followers who are very close to the neo-classical views as to the equilibrating powers of entrepreneurship at least in the dynamic part of the analysis.
- <sup>3</sup> Baumol (1968, 1988), Barreto (1989) and others have pointed out, and Eliasson and Henrekson (2003) ascertained recently, that the model of perfect competition does not allow for the presence of entrepreneurs and entrepreneurship. This view implies that long-run equilibrium is imposed exogenously. Yet, from the research of Nadiri and Rosen (1974), Eliasson (1984) and others, it follows that the interesting question is not how long-run equilibrium is established but how the markets and the economy move from one long-run equilibrium to another. This transition presupposes the existence of a mechanism to confront disequilibrium situations of the sort depicted in Figure 2. Evidently this mechanism is associated with the activities of entrepreneurs. But the introduction of entrepreneurship as an endogenous process of bringing about equilibrium after long-run equilibrium is disturbed remains unabated.
- <sup>4</sup> For an analysis of the relationship between the degree of contestability in a market and the amount of required costs for entry see Baumol et al. (1988).
- <sup>5</sup> Lest it is construed that the term ‘good’ in this sentence refers exclusively to final or consumer goods, it is stressed that the following analysis could be applied also to explain the sequence of events when the innovation concerns the introduction of a new technique.
- <sup>6</sup> According to Scherer, ‘Research and development projects may benefit from scale economies realized in other parts of large firm’s operations’ (1980, p. 414)