

Labour market rigidity and firms' R&D strategies

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Abstract. The traditional explanations of Italian industry's low commitment to R&D activities mainly rest on the firms' size and relative specialisation of the national economy. We argue that they are not sufficient to justify the Italian anomaly; instead, in our opinion, it above all depends on the well-known rigidity of the Italian labour market. To show this, we first take into account the variability of innovation patterns through the economic system by adopting Pavitt's taxonomy as our analytical instrument. We then demonstrate that the main factor underlying Italian industry's management strategies in research is that supplier-dominated and scale-intensive industries in Italy are desperately superficial in their commitment to R&D as a source of innovation. This situation, as unusual as it appears at first sight, has been so far economically viable, because in the supplier-dominated and scale-intensive categories, and within the limits of technology, research and investment in machinery are interchangeable to some extent as means of innovation. Our results seem to suggest that a substitution effect between spending on R&D and investment in machinery indeed is working in Italy in these two sectors. The fact that the low R&D commitment continues at all stages of the economic cycle suggests that the Italian phenomenon may be the result of a constant tendency among companies to counter the rigidity inherent in the deployment of labour as a factor of production. This rigidity is a circumstance very frequently accounted for in the explanation of the higher economic growth in the US with respect to European countries. The novel and major finding of our study is that the rigidity of the labour market - besides being classifiable in economic models as a generic cause of the slower growth in a European country - emerges as a specific cause in models based on innovation theory, via firms' lower commitment to R&D.

Keywords. Technological Innovation; Industrial Research; Industrial Policy; Market Labour

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Some alternative explanations for company investment in research

To carry out our analysis, we first have to set it within a methodological discussion in which both the nature of the questions to be asked as well as the replies should clearly be defined. As a consequence, we shall be able to adopt a model of spontaneous behaviour for innovating firms in Italy.

Till the 1980s, one of the best reputed analytical models was the explanation proposed in the wake of Schumpeter's theories and Galbraith's elaboration of them. According to this model, a direct correlation obtains between a company's level of innovation and its size. A widely accepted variation affirms that if the innovation variable is measured against the ratio between what a company spends on research and development (R&D) and its turnover, the innovation will be found to decrease as the company size itself, measured by, say, the number of employees, decreases (Kamien and Schwartz, 1982). Yet, the testing of this Schumpeter-Galbraith hypothesis failed to produce any decisive corroboration (Scherer, 1984), which was both disappointing and perplexing for academics in the field, because the formulation had seemed so well-founded (Scherer, 1992). It attributed the cause of the low investment in R&D of small companies to the "threshold-effect" (i.e. a company must attain a certain dimension before it can afford to set up an R&D department), and to the fact that since R&D projects are by their very nature risky, research tends to become too costly for small companies, which cannot afford to invest in a sufficiently diversified portfolio of R&D projects (Acs and Audretsch, 1990).

We can explain the problem of the weak predictive value of the Galbraith-Schumpeter hypothesis by considering those groups of manufacturing companies whose behaviours clearly contradicts the model. A notable distinguishing feature of these groups is that they contain a preponderance of companies belonging to particular industrial sectors. For example, companies whose business is the

manufacture of production machinery will typically invest a comparatively large proportion of their turnover in R&D, even if the companies are relatively small (De Marchi *et al.*, 1996). Conversely, companies in other sectors, such as the steel industry, will typically be rather large, but this does not mean they will tend to invest as great a proportion of their turnover in R&D as, say, companies in the electronics sector.

By the mid 1980s, researchers, admitting that this analytical model was leading them into a blind alley, came up with an alternative approach. Experimental evidence had by now proved that the traditional method relied on an excessively simplified view of the phenomena under examination, and so the new method of studying innovative behaviour by companies is taxonomic, far more varied in scope and includes companies and some of their characteristics in the analysis. The new approach accords full recognition to the variability in innovative patterns among different industrial sectors, and takes account of their many distinguishing features. The taxonomic approach also draws distinctions between various modes of technological innovation, and rejects the notion that innovation only consists of R&D activities. The study of technological change in companies through the analysis of technical progress across several industrial sectors found its first and essential expression in the theoretical model devised by Pavitt. Henceforth, for the sake of simplicity, and in compliance with the now-established bibliographic use, we shall refer to this model as his "taxonomy" (Pavitt, 1984).

Pavitt's taxonomy considers the behaviour of an innovating firm as a multi-faceted phenomenon that must be explained by several determinant factors, each acting in a complex fashion. He divides companies following an innovation trajectory into four macro-sectors, or taxonomic categories, namely: supplier-dominated, scale-intensive, specialised suppliers and science-based. To assign an innovating company to one of these four taxonomic categories, Pavitt looked for the following characteristic traits: the industrial sector to which the innovating company typically

belongs; the technology sources that the company uses; the degree to which users of the products measure their worth by price or performance; the means by which the producers derive economic benefit from their innovations; and the technological trajectories followed. (It should be noted that we are speaking here of the technological trajectories of innovative companies rather than the trajectories of innovative products, which have traditionally been the object of consideration; for a definition of the latter, see Dosi, 1982).

Of these characteristics, the following elements are particularly relevant to our analysis, which remains centred on a source of new knowledge, research, and the innovative strategies that are linked to it: the technology sources and the technological trajectories. Another essential aspect that we shall consider here is the typical size of a company, which Pavitt included among the “measured characteristics” of innovating firms.

Taking our cue from him, we can use the following table to summarise and simplify these characteristics.

The constant, gradual process of convergence by companies towards the typical patterns of innovation described by Pavitt can be explained

with reference to the principles of “evolutionary economics”. This particular analytical approach has proved itself particularly fertile in the study of technological change. Following its precepts, we can work on the natural assumption that the technological trajectories that most companies in an economic system tend to follow will be the result of a process of selection that is driven forward by the reaction that occurs when market mechanisms combine with the variable and spontaneous behaviour of innovating firms. The evolutionary theory is capable of forecasting what will actually occur (Nelson and Winter, 1982): existing firms will tend to evince innovative behaviour that enables them to survive through a process of trial and error that we may describe as “adaptive”. This assumption is all the more reasonable if we consider how crucially important innovative activities are to the success of a company in a market economy. Indeed, given that it is inconceivable that any company could survive indefinitely without actively engaging in the processes of innovation that characterise market economies, Pavitt’s taxonomy may ultimately be viewed as a taxonomy for *all* existing companies, and not just those introducing innovation within a restricted period of future time.

Figure 1
Categories of innovative firms and some of their characteristics in Pavitt's taxonomy

<i>Category of innovative firms</i>		<i>Typical sectors of main activity</i>	<i>Technology sources</i>	<i>Technological trajectories</i>	<i>Size of firms</i>
Supplier dominated		Traditional manufacturing (furniture; clothing)	Suppliers; research-related services; major users	Cost-saving	Small
Production intensive	Scale intensive	Mass production of materials (steel and glass) Assembly of consumer durables, automobiles	Production engineering; suppliers; R&D	Cost-saving (product oriented)	Large
	Specialised suppliers	Machinery; precision tools	Design and development; users	Product oriented	Small
Science based		Electronics, electrical; chemicals	R&D; public science; Productions engineering	Intermediate	Large

Source: Pavitt, 1984

Characteristics peculiar to research in the Italian manufacturing industry

At first glance, the comparatively low level of R&D by Italian companies would appear to be the consequence of the relative specialisation of the Italian economy, and the effect of this on industrial research and development (Malerba, 1993).

A significantly large presence of scale-intensive industries in total R&D would appear to be perfectly consistent with this reasoning and is, in fact, confirmed by data from the ISTAT survey “RS1 2000” conducted on all the 2277 Italian companies carrying out R&D activities in 2000. The companies in question are engaged in mass production (steel, glass and so on) as well as mechanical assembly (cars, consumer durables, machine tools), in which large-scale production is crucial to contain costs.

In these industries, innovation is introduced primarily by means of process engineering, in which constant watch is maintained on the efficiency of the manufacturing processes and new techniques are incorporated within the machinery purchased from the macro-sector of innovating specialised suppliers (which develops in symbiosis with the scale-intensive buyer sector). The taxonomy, however, predicts that the in-house R&D activities of scale-intensive companies will also have a major impact. But the technological trajectory of a

scale-intensive company is, generally speaking, aimed at cost-saving and is therefore geared more towards process innovation than the trajectory of, say, a science-based company would be.

In the general scheme of industrial research, the R&D done by supplier-dominated firms is marginal. Once again, these companies are oriented towards cost saving. In this category, which includes textile, furniture and footwear manufactures, innovation mainly consists of the new techniques conceived by the suppliers of the manufacturing machinery. Even so, Pavitt's model does not necessarily imply that supplier-dominated firms do not carry out research. In fact, it predicts that the research services that industrial research centres provide these firms (research extension services) are an essential source of technology for this category. Yet, if we consider the absorption approach, it is hard to see how supplier-dominated companies can absorb the knowledge generated by these services unless they, too, carry out a not insignificant amount of R&D. This point is crucial if we are to find an explanation for the relatively low engagement of Italian manufacturers in R&D, and we shall return to it later.

As Pavitt's taxonomy leads us to expect, science-based industries have a dominant place in Italian industrial research. (See Table 1).

Table 1
Total R&D expenses in Pavitt's macro-sectors in Italy in the year 2000
and proportions of R&D expenses to Value Added in Italy and US in the year 1999

<i>Total R&D expenses in Italy (*) (million national currency)</i>				<i>Proportions of R&D expenses to Value Added (%) (**) (percentages)</i>				
				<i>Italy</i>				<i>US</i>
Science based	Scale intensive	Specialized suppliers	Supplier dominated	Science Based	Scale intensive	Specialized suppliers	Supplier dominated	Total manufacturing
2576,9	642,1	1475,0	177,4	16.0	5.1	2.0	0.5	7.9

Source: (*) Istat; (**) Ceris elaboration on Oecd data

It is well known that the proportion of R&D spending to Value Added (from now onwards “technological intensity”) in Italian industry is lower than in the economies of competitors. In the case of the US, of course, the comparisons provides even more desparaging results.

If we look more deeply at the situation shown above, however, it reveals that, contrary to the common wisdom, the relative disadvantage of Italian firms does not lie mainly in high-tech sectors. Indeed, this disadvantage is greater in several medium- and low tech industries; for instance, the technological intensity in the “Chemical” sector of the Italian is about ten times smaller than that of the American one, but the analogous difference amounts to 30 times when we consider the “Metal products” sector.

In the light of this empirical evidence, it is very difficult to continue advancing the usual explanation for the low level of R&D in the Italian system of production as lying *solely* in the sectoral distribution of Italian industries, which admittedly are little present in high technology sectors.

A fundamental reason would appear to be that supplier-dominated and scale-intensive industries in Italy are desperately superficial in their commitment to R&D as a source of innovation. We have indeed seen that the manner in which these two categories in Italian industry disregard research would appear to go well beyond that of the other two macro-sectors.

By taking an evolutionary view of the economy and the spontaneous innovative behaviour of firms, we are able to get an idea of how the extraordinary deviation in the technological trajectories of Italian scale-intensive and supplier-dominated firms with respect to those followed by American firms may be ascribed to the difference in the underlying conditions, which in Italy cause firms to behave in a very atypical manner.

In the following section, we shall be suggesting what we see as the criteria that regulate the innovative choices of firms in the more technologically mature sectors. In particular, we intend to examine whether research spending may be considered a form of fixed capital investment. This is essential to investigate a possible a trade-off between R&D

spending and other forms of capital accumulation, which will be of a great significance in our explanation of the anomalous behaviours of Italian firms in the Supplier dominated and Scale intensive categories.

Investment in Research versus Investment in Machinery

Companies often count the cost of R&D projects as part of their current expenses, without specifying exactly what they mean by this. This practice is misleading, because spending on research is undeniably a form of fixed capital investment. Indeed, R&D is a natural part of fixed capital investment, even more so than the item that economists consider as epitomising fixed capital investment, namely the purchase of machinery.

As Salter (1966) observed in relation to investment in new machinery, the irreversible nature of the initial expense that the company must bear causes it to be counted as a sunk cost whose value may only be recovered by continuing with the investment, no matter what the effective returns are over several production cycles. As we know, this extension of the investment over several production cycles is what distinguishes fixed from current capital expense.

When it comes to investment in R&D, the sunk-cost element is, if anything, even more pronounced than in spending on machinery. After all, a company can at least hope to recover some of the cost of purchasing or building machinery either by recycling it to other companies (usually located in less developed countries), or else by cashing in on its scrap value, whereas the only way of recovering costs incurred on R&D is to make productive use of whatever results it may produce.

The “capitalist” nature of R&D is, if anything, even more apparent than that of the machinery that a company buys from its supplier of capital goods. In fact, the gradual accumulation of capital through sustained investment over time in R&D projects is, if considered in relation to a company’s profit profile, similar to the gradual construction of a production plant.

Table 2
Sensitivity of investment in an R&D project in relation to the annual rate of interest
and the average duration of R&D projects for the creation of new products in each taxonomic
category for the year 1998 (a)

	<i>Annual rate of interest</i>			
	<i>0</i>	<i>5%</i>	<i>10%</i>	<i>20%</i>
Science based (24 months)	1	1.053	1.106	1.216
Scale intensive (14.2 months)	1	1.032	1.063	1.125
Specialised suppliers (15.7 months)	1	1.035	1.069	1.138
Supplier dominated (11.3 months)	1	1.025	1.050	1.099

Note: (a) see Figure 1
Source: our elaboration of Istat data

The depreciation of research spending begins even before the productive use of the capital good the spending is actually intended to create (the original and possibly useful knowledge it produces). The same does not hold true for machinery purchased ready for use, in which case depreciation generally begins immediately after it has entered the company and begun to produce.

For this reason, the volume of total investment (by which we mean the sum of current spending plus interest for the calculation of pre-amortization costs) on a company research project is susceptible to variation in the interest rate, in just the same way as any other investment project that extends over a period of time such as, for example, the building of a dam.

Table 2, which is based on data relating to the effective length of research projects in Italy, shows the relationship between the costs arising from the execution of research projects for new products by Italian firms belonging to the various categories and the effective value of fixed capital investment made by these firms - as the corresponding pre-amortisation costs occur (before the start of the profitable life of

any products that the research might create) - at various interest rates.

To interpret the values in the table above, it is necessary to bear in mind that the total unitary R&D current expense divided into “n” monthly pre-payments (where “n” is the duration in months of the research project) is as follows:

$$M = (1/n)(1+i)((1+i)^n - 1)/i)$$

Clearly, for a given total monetary outlay sustained by a company to support a research project, the sensitivity of the total value of the investment “M” to interest rate variations can radically alter in relation to the value “n”, which refers to the duration of the project (Sraffa, 1960, section 83). We have identified the relative values of the total capital costs sustained by companies in the four taxonomic categories into which the ISTAT sample is divided, depending on the average duration of the R&D projects and the application of one of several indicative annual interest rates.

These interest rates include the rather high figure of 20%, which may, at first glance, seem rather unrealistic. But we must bear in mind that the compensation for investment risk, which

must be added to the normal cost of capital, can be very high indeed for very risky research projects in industries in the science-based category. Accordingly, we should also not be surprised to encounter profit rates that are even higher.

Our observations here should not, of course, be taken to suggest that research and investment in machinery are two innovative activities either one of which may simply substitute the other. Substituting innovation through research with innovation through the input of new machinery is practically unheard of in categories of firms oriented to product innovation. It is highly unlikely in these sectors that an under-performing product could be compensated for simply by reducing the costs of its production through increased automation. On the other hand, in the supplier-dominated and scale-intensive categories and within the limits of technology, it is conceivable that research and investment in machinery might be interchangeable to some extent as means of innovation.

To the extent that it exists, this interchangeability could attenuate a hypothetical correlation over time between investment in machinery and investment in research. The dynamics of this possible relationship springs from the fact that during times of economic expansion, firms tend to increase their investment in research with a view to coming up with product innovations capable of exploiting increasing demand. The result of this over time would be that direct relationship between expense on industrial R&D and investment in fixed capital in general emerges. We put this proposition to two tests, one referring to Italy and the other to the United States, which we have already used for benchmarking purposes because it is a country where companies, operating in accordance with the “normal” mechanisms of a market economy, show a more “natural” type of innovative behaviour. The are based on OECD statistics referring to R&D spending in the period 1987-2001 and the magnitude of “Gross capital formation” in the manufacturing industry (reported in Table 3).

Table 3
Time series of R&D expenditure and Gross capital formation in Italy and Usa (million national currency)

<i>R&D Expenditure in Italy</i>													
<i>Years</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>
Science based	1640,2	1802,4	2026,9	2223,4	2183,9	2259,6	2230,9	2228,2	2108,6	2222,1	2029,8	2053	2329,5
Scale intensive	1019,7	1213,1	1352,4	1620,9	1659,1	1604,5	1424,9	1267,5	1377,8	1538,1	1397,2	1290,9	1329,1
Specialised suppliers	425,8	518,1	595,9	679,9	664,1	637,1	558,6	574,7	652,2	670	1003,2	765,8	728
Supplier dominated	137,2	141,5	161,2	203,4	169,1	198	211,3	237	243	235,7	186,8	263,7	214,1
<i>Gross capital formation in Italy</i>													
<i>Years</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>
Science based	585	691	984	921	982	1921	1936	2235	2630	2783	2903	2612	2434
Scale intensive	9178	10918	12085	12327	13148	15425	13689	14494	18168	18962	19912	22143	4859
Specialised suppliers	3391	4039	4575	4673	4455	3619	3481	4247	5627	5696	5568	6443	6076
Supplier dominated	10686	11720	12609	14253	15366	15839	14960	15225	17121	16765	17311	18548	10828
<i>R&D Expenditure and Gross capital formation in American - Manufacturing industry</i>													
<i>Years</i>	<i>1987</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>
R&D Expenditure	84311	86502	88258	89178	88784	90469	86911	91152	100507	112216	121025	120401	117434
Gross capital formation	90056	93056	112658	121472	122299	125337	123803	136721	158523	172733	179027	188198	179710

Sources: Ceris elaboration on data from Oecd's STAN and MSTI data bases

Table 4
Correlation coefficients between R&D expenses and
Gross capital formation in the 1987-99 period (P-values within brackets)

<i>Italy</i>				<i>US</i>
Science based	Scale intensive	Specialized suppliers	Supplier dominated	Total manufacturing
0.5 (0.08)	0.13 (0.66)	0.69 (0.01)	0.8 (0.001)	0.91 (0.0001)

Source: Istat elaboration on Oecd data

The experiment on the United States appears to corroborate the hypothesis that a strong direct relationship between the two magnitudes exists. Spending on R&D and investment in machinery in the USA correlate positively to one another with the very high coefficient value of 0.91 (see Table 4).

On the other hand, when the test was carried out on the four Pavitt's categories in Italy, the results were quite puzzling.

In the Science based category, where the relationship between R&D investment and gross capital formation was expected to be very close and significant, it resulted in a correlation coefficient of just 0.5, not significant at the 5% level of significance.

In the Specialised supplier and Supplier dominated macro-sectors the coefficients were rather high (see Table 4) and quite significant; but these two categories only invest a small part of the total industrial R&D expense.

Above all, in the Scale intensive category, i.e. the macro-sector which constitutes the very core of Italian industry, no definite relation emerged, since the correlation coefficient between the two magnitudes turned up to be 0.13 and is not significant at all, corresponding to a P-value of 0.66.

In view of this results, the direct "natural" relationship between spending on research and spending on plants and machinery that shows up in the U.S. does not hold in the Italian industry. In other terms, Italian companies, especially

those belonging to the Scale intensive category do not pay particular attention to investment in research through periods of economic boom: even during these phases the share of total investment that might otherwise have gone into research is diverted elsewhere – possibly towards cost-saving innovations incorporated in new machinery, a category of investment which is somewhat alternative to R&D, as we saw in the previous section.

The rigidity of the labour market and firms' R&D investment

The reasons that have traditionally been advanced to explain the low propensity of Italian companies to invest in research do not strike us as being sufficient to account for the specificity of the phenomenon. For instance, the notion that Italian companies in general, and those in the low-technology fields in particular, seem to be poor innovators because they are relatively small is still widespread and current. Yet it is a thesis that rests on the Schumpeter-Galbraith interpretative scheme which has by now been superseded, and clashes head-on with more modern and realistic models describing innovative behaviour by manufacturing companies. Nor can we really try to explain away the low propensity to invest in R&D by claiming it is somehow an innate characteristic of Italian business leaders who are particularly

risk-adverse owing to some sort of cultural shortcoming, because this claim simply does not stand up to empirical investigation. It is flatly contradicted by the findings relating to Italian industries producing machinery and precision measurement tools where a high propensity to invest in innovation on the part of daring and active business leaders has made it possible for a number of Italian companies to dominate their market, thanks precisely to their capacity constantly to introduce innovative products.

We need to come up with other explanations for why Italian companies, which are generally on average as innovative as those of other developed nations, (see Table 5) are so disinclined to invest in R&D activities.

Table 5
Percentages of innovating firms over total number of firms during the 1994-96 period in several European countries.

<i>Countries</i>	<i>Percentages</i>
Austria	67.3
Belgium	34.3
Denmark	70.6
Finland	36.4
France	42.8
Germany	68.8
Ireland	73.5
Italy	48.3
Luxembourg	41.9
Spain	29.0
Netherlands	62.2
Portugal	25.8
United Kingdom	59.0
Sweden	54.2
European Union's average	51.5

Source: Cis 2 survey, carried out by Eurostat

The evolutionary approach that we have assumed immediately suggests that in the case of Italy certain factors exist that are preventing innovative companies from favouring technological trajectories which are natural in other countries. The fact that companies in Italy depart from the trajectory that Pavitt's taxonomy

predicts they should follow and invest more heavily in machinery with a view to increasing automation, and that this process continues at *all stages of the economic cycle*, including those stages that in other countries lead to a greater relative concentration of resources in research, suggests that the Italian phenomenon may be the result of a constant tendency among companies to counter the rigidity inherent in the deployment of labour as a factor of production.

Policy and management conclusions

If our explanation is correct, then the problem of the low level of research carried out by companies in Italy would need to be addressed through innovation policy. Yet it would also be a phenomenon on which the classic tools of innovation policy would have little effect. Rather, the determination of low-technology firms to expand their market share by engaging in research into new products, and the corresponding increase in the number of workers needed to meet the increased demand, is something that the state should encourage through industrial policies (of a considerably greater scope than envisaged hitherto) aimed at curtailing the propensity of Italian firms' managers to keep cutting back on the number of workers involved in the process of production.

First of all, it appears that these measures ought to deregulate the Italian labour market, allowing firms to tune their labour force on effective demand, as it happens in the U.S. This way, labour rigidity and the pressure that companies constantly experience to invest in labour-saving capital accumulation (i.e. investment in advanced machinery) would ease. Devising their management strategies, firms could then concentrate a larger part of their current investment in R&D, focusing also on product innovation aimed at higher shares of the market.

Summing up, we suggest that a relevant part of the anomaly in Italian firms' R&D management might be corrected by making the labour-market rules by which they operate more similar to the looser ones that American companies face.

References

- Acs, Z. and Audretsch, D. (1990) *Innovation and Small Firms*. Cambridge (Massachusetts): Mit Press.
- David, P. (1997) From market magic to calypso science policy. A review of Terence Kealey's *The economic Laws of scientific Research*. *Research Policy*, 26, 229-255.
- De Marchi, M., Napolitano, G. and Taccini, P. (1996) Testing a model of technological theories. *Research Policy*, 25, 13-23.
- Dosi, G. (1982) Technological Paradigms and Technological Trajectories. A suggested Interpretation of the Determinants and Directions of Technical Change. *Research Policy*, 11, 147-162.
- Kamien, M. and Schwartz, N. (1982) *Market structure and innovation*. Cambridge University Press.
- Malerba, F. (1993) *The National System of Innovation: Italy*, in Nelson R. (editor), *National Innovation Systems: a Comparative Study*. Oxford University
- Nelson, R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*. Cambridge (Mass.): Harvard University Press.
- Pavitt, K. (1984) Sectoral patterns of technical change: Towards a taxonomy and a theory. *Research Policy*, 13 343-373.
- Salter, W. (1966) *Productivity and technical change*. Cambridge (Mass.): Cambridge University Press.
- Scherer, F. (1984) *Innovation and growth: Schumpeterian perspectives*. Cambridge (Mass.), Mit Press.
- Scherer, F. (1992) Schumpeter and Plausible Capitalism. *Journal of Economic Literature*, XXX, 1416-1433.
- Sraffa, P. (1960) *Production of Commodities by Means of Commodities. Prelude to a Critique of Economic Theory*. Cambridge (Mass.): Cambridge University Press.

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