BRAND EFFECTS, MOBILITY COSTS AND INDUSTRY EVOLUTION

Ricardo Mamede

Novembro de 2005

WP nº 2005/41

DOCUMENTO DE TRABALHO

WORKING PAPER

DINÂMIA
CENTRO DE ESTUDOS SOBRE A MUDANÇA SOCIOECONÓMICA

FCT
Fundação para a Ciência e a Tecnologia

BRAND EFFECTS, MOBILITY COSTS AND INDUSTRY EVOLUTION

Ricardo Mamede
(ricardo.mamede@iscte.pt)

WP nº 2005/41
Novembro de 2005

INDEX

Abstract

In this paper I present a model that was built in order to analyse the interdependencies between labour market dynamics and the evolution of industries' structure. Being inspired by the case of consultancy services, the model integrates many of the features typically found in those industries. In particular, problems of incomplete information, the role of 'brand effects', and constraints in the supply of specialised labour, are taken into account. This model is able to reproduce many of the empirical regularities that have been identified in studies of industrial dynamics on the basis of causal mechanisms that are absent from most theoretical models, and it shows to be a useful tool in understanding some features of the evolution of real world industries.

* Dinâmia/ISCTE – Lisbon, and Università Bocconi – Milan. E-mail adress: ricardo.mamede@iscte.pt. This paper is part of my PhD research at Bocconi University, which is being partly funded by the Portuguese Science and Technology Foundation (grant ref. SFRH/BD/8765/2002). I also benefit from a three-years teaching leave by the Economics Department of the Higher Institute for Firm and Labour Studies (ISCTE – Lisbon). The support by both these institutions is gratefully acknowledged. I would also like to thank the participants of the SIME workshop at Strasbourg in April 2004 (in particular, Marco Valente, Esben Andersen, and Koen Frenken) for their helpful comments in the designing phase of the model, and my colleagues at Dinâmia (namely, José Gusmão, José Caldas, Sofia Esteves and Bruno Gonçalves) for their technical support during the implementation phase. The usual disclaimers apply.

1. INTRODUCTION

Industrial evolution and labour market dynamics are two fields of economic research with many commonalities. Both deal with some relevant dynamic features of modern capitalist societies. Both have experienced a significant increase in the number and quality of contributions to their development as academic disciplines in the past two decades. In both cases such development was very much related with the increased availability of micro data, and of statistic and econometric tools suitable to their treatment; and these, in turn, have favoured the identification of a number of empirical regularities (which are often taken as 'stylised facts' in both domains). Partly as a

consequence, new theoretical models were proposed, aiming at explaining the regularities found in the data. There are even cases of authors who have worked in both fields, either on the theoretical front (e.g., Jovanovic, 1979, 1982) or on the empirical one (Addison and Portugal, 2002; Mata and Portugal, 2004).

In spite of all those common features, the development of those two fields of research has been essentially parallel in nature, with virtually no attempt to consider the co-evolution of industries and the corresponding labour markets. The most quoted models of industrial dynamics (for surveys see, e.g., Dosi et al., 1997; Sutton, 1997; Caves, 1998) tend to focus on the technological or financial determinants of changes in the structure of industries. In the same vein, the reference models of labour mobility and job matching (for a survey see, e.g., Farber, 1999) typically ignore the mutual influence between industry dynamics and labour market forces.

Still, historical accounts of specific industries often show that the patterns of firms' evolution and of labour force mobility are intrinsically related. This is specially so in the case of those services industries which are highly dependent on a specialized labour force. For example, in a paper on the evolution of the IT consultancy industry in Portugal (Mamede, 2002) I have suggested that the growth of firms was strongly dependent on their capacity to recruit new specialists (and to avoid the tendency for a high incidence of "braindrains" to competitors). I have also suggested that the general level of employee's skills strongly influences the quality of the services provided, and therefore firms' reputation and their prospects for future growth. The same conclusions are usually drawn from other studies on professional services industries (see Gallouj and Gallouj, 1996).
In this paper I present a model that was built in order to analyse the interdependencies between labour market dynamics and the evolution of industries' structure in such contexts. Being inspired by the case of consultancy services, the model reproduces many of the features typically found in those industries. To start with, it is assumed that the services to be provided are an instance of "experience goods", whose quality can hardly be assessed before they are actually provided. Furthermore, consultancy is a highly idiosyncratic process in which the employees of both the services providing firms and of the client organizations interact extensively; and the outcomes of which strongly depend on the quality of the interactions between the personnel of both organizations. This means that the contracts to be drawn between services providers and their clients are necessarily very incomplete. In such conditions, potential clients evaluate services providers on the basis of their reputation; that is, reputation is a main source of firms' competitiveness.

Reputation building is, in itself, a complex process. In consulting activities it is generally related with the perceived success of the projects each firm was responsible for in the past. Successful projects in the past help to strengthen a brand name; but it is also true that an established brand name typically brings advantages to firms – both in getting new contracts and in recruiting more qualified personnel. Highly skilled workers are, in turn, an important resource for services providing firms, since they contribute to the success of consulting projects and therefore to the future reputation of their employers.

On the other hand, services providers are themselves confronted with uncertainty in their recruiting decisions. In a context where idiosyncratic elements can be so important to the success of the services provision, individual skills are not easily assessed on the basis of diplomas or other certificates. Individuals' past employment trajectories, on the contrary, tend to be taken as a relevant – though, sometimes misleading – 'proxy' of individual skills.

Finally, uncertainty constitutes a burden to the specialised workers as well. When deciding whether to take or leave a job offer by a specific firm, an individual typically considers (among other things) the financial costs and benefits of such option, which are partially dependent of the overall market performance of the firm in the future (due to the relevance of performance prizes in the industry)[1]. This means that the uncertainty faced by the firms is somewhat passed to the specialists in their job decisions.

Without all those sources of uncertainty – affecting both the consultancy services market and the corresponding labour market – one would expect a very straightforward result in the evolution of the industry: most successful firms would employ the most skilled specialists and would unequivocally grow (and possibly eliminate all the rivals). Analysing the consequences of introducing information incompleteness in the functioning of both the services and labour markets (a phenomenon actually present in the real world) is a central goal of the model presented below.

The next section of the paper presents the model. In section 3 the main results of the simulation are discussed. Section 4 sums up the conclusions and implications.

[1] Consulting projects are most of the times a work done by teams of specialists, and it is often the case that firms are not able to differentiate between the individual contributions of each of the members involved. Therefore, to a large extent performance prizes tend to compensate the several members of the teams without discriminating on the basis of individual efforts.

2. THE MODEL

There are two types of agents in the model: firms and specialised workers. Firms provide consultancy services to the market, while specialists are employed by those firms. The consultancy services are assumed to be in high demand, so the size of the industry is constrained only by the number of specialists available (the number of hours worked is assumed to be equal among specialists). In what follows I present the assumptions concerning the decisions of firms and individuals, the functioning of the labour market, and the dynamics of the industry.

2.1. The decision of firms and individuals

In the present model, firms aim at earning higher profits, and profits increase monotonically with the scale of services provision and with the fees charged by the services provided. This means that firms want to grow as much as possible (the model imposes some restrictions on the speed of growth[2]) and they can do so by recruiting more specialists. The level of fees per specialists is assumed to be dependent on the reputation attached to each firm. A firm's reputation at each point in time is determined according to the following equation:

$$(1) \qquad RP_{jt} = RP_{jt-1}*\alpha + PF_{jt-1}*(1- \alpha)$$

where RP_{jt} is the level of reputation of firm *j* at time *t*, PF_{jt} is the performance of firm *j* at time *t* (see below), and α is the autocorrelation factor of reputation. In some of the simulations the presence of a 'brand effect' is considered, in order to take into account the impact of a firm's brand name on its reputation, independently of past performance[3]. In those cases, the following more general formulation of equation (1) is used (γ is the weight attached to the 'brand effect' in determining the reputation of each firm):

$$(1') \qquad RP_{jt} = BR*\gamma + [RP_{jt-1}*\alpha + PF_{jt-1}*(1- \alpha)]*(1-\gamma)$$

[2] I assume that the pace of growth can be faster to smaller firms. The maximum number of contracts each firm can do each period, MC, is fixed according to the equation: $MC_{jt} = N_{jt-1}*(\delta+5/ N_{jt-1})$, where N_{jt} is the number of employees of firm *j* at time *t*, and δ is a growth rate parameter.

[3] When the 'brand effect' is considered, firms' brand levels are randomly independently and identically (normally) distributed, with mean equal to 1 and standard deviation equal to 0.25, at the beginning of the simulation.

The performance of a firm at each period, PF_{jt}, is defined as the average real skills of the firm's employees, that is:

$$(2) \qquad PF_{jt} = \Sigma RS^{j}_{it}/N_{jt}$$

where RS^{j}_{it} represents the real skills of an individual *i* who is working for firm *j* at time *t*, and N_{jt} is the number of individuals working for firm *j* at time *t*.

Since performance contributes positively to profits, and since the former is determined by the level of specialists' real skills, firms' are interested in recruiting the most skilled individuals[4]. However, it is assumed that individuals' real skills cannot be directly observed and, alternatively, are approximated by their expected skills, ES. These, in turn, are determined by the reputation of the firms each individual has worked for in the past[5], according to the following equation:

$$(3) \qquad ES_{it} = ES_{it-1}*\beta + RP^{i}_{jt-1}*(1-\beta)$$

where β is the autocorrelation factor of individuals' expected skills.

For the sake of simplicity, I assume there are no costs to the firms except for the wages paid to specialists. Furthermore, it is assumed that, in this industry, specialists' wages are a function of individuals' expected skills, and that the fees per worker paid by clients are more than enough for firms to cover their wage costs. The difference between total revenues and total wage costs is partially used by firms to give performance prizes to their employees. This has implications for individuals' choices, has will be clear right away.

Individuals will prefer to work for firms with higher reputation, and this is so for two cumulative reasons: first, their immediate financial benefits tend to be higher due to the fact that firms with higher reputation pay higher performance prizes; second, since specialists are paid according to their expected skills, and since the latter depend on the reputation of the firms they have worked for in the past, they have here a further incentive to work for firms with high reputation levels.

[4] Individuals' real skills are randomly independently and identically (normally) distributed at the beginning of the simulation and stay fixed all along.

[5] This formulation is similar to the one used by Gusmão and Caldas (2004) in their study on the possibility of collective action.

2.2. The functioning of the labour market

Let me sum up what was stated above. Firms want to recruit as many specialists as possible and want to attract the best specialists in the market. In this intent they face a number of constraints: first, the total number of specialists available in the market is limited by a certain amount, so firms compete among them in recruitment; second, firms are not able to assess the real skills of specialists, and have to take expected skills as an approximation to their real value; third, the model imposes a limit to the growth rate of firms per period. On the other side of the market, specialists are willing to work for the firms with higher reputation. On this they as well face a basic constraint: firms have a limited number of job positions to fill, therefore only the specialists with the highest levels of expected skills will be recruited by the firms with the highest reputation.

In addition to those assumptions, the model allows for the presence of positive costs of mobility, both to firms and to specialists. In the presence of mobility costs to specialists, an individual will only decide to move from one firm to another if the reputation level of the new possible employer is some percentage points above the reputation level of the present employer. On the firms' side, it may happen that a firm is interested in recruiting a new specialist, but it has no more free job positions to fill; in this case it may decide to fire the (expected) worst specialist in its ranks in order to be able to recruit the new one; in the presence of firing costs to firms, the substitution of one specialist for another will only take place if the expected skills of the new possible specialist is some percentage points above the expected skills of the lowest ranked specialist working in the firm.

Every period the labour market opens up. The list of specialists in the market is sorted in decreasing order of their expected skills, and the list of firms is sorted in decreasing order of their reputation levels. The first specialist in the list is allocated to the first job position within the first firm, the second specialist is allocated to the second job position of the first firm, and so on, until all the positions in that firm have been filled with the first N individuals in the specialists list. After this is done, the $(N+1)^{th}$ specialist in the list is allocated to the first job position in the second firm, and so on. The process is repeated until all specialists have been allocated to some firm[6]. If there are no mobility constraints, this allocation is the final one – and all the new attributes of firms and specialists are computed accordingly; otherwise, the difference between the reputations of the present and the possible new employer is computed for each specialist, the difference between the expected skills of the present (expected) worst specialist and of the possible new one is computed

[6] With the present assumptions of the model there will be no unemployment. On the contrary, firms may end up with no specialists at all in their payroll.

for each firm, and the labour market move will only take place if it complies with the conditions imposed by the mobility cost constraints.

2.3. The dynamics of the model

In the beginning of each simulation the level of expected skills of all individuals is the same – and equal to the mean value of the distribution of real skills. The same value is used to fix the initial reputation levels of all firms[7]. As a consequence, in the first step of the simulation specialists will be randomly distributed among the firms (all firms start with the same scale of production). But since individuals' real skills differ, from the very first simulation step firms will have different performance levels, and will immediately start to differ in reputation levels – and, accordingly, in their capacity to recruit (expectedly) good specialists. As a result, specialists will immediately start to differ in their expected skills according to the firms they have been working for.

Along the process, some firms will grow and others will shrink. In its present version, the model assumes that for each firm that looses all its employees, and therefore exits the industry, a new firm will be ready to enter[8]. This new potential entrant, however, will not necessarily succeed in entering the market – that depends on its capacity to attract specialists to its rank at the moment of entry[9]. I turn now to the analysis of the possible outcomes of such dynamics.

3. THE RESULTS OF THE SIMULATION

The main aim of the model which was presented in the last section is the study of the possible interdependencies between brand effects, labour market dynamics and industry evolution. In order to do that I focused on the analysis of changes in some parameters of the model, while other parameters were left unchanged.

[7] When 'brand effects' are present, firms' initial reputation will vary due to the impact of their brand name on their reputation.

[8] This means that the industry has a fixed number of potential incumbents.

[9] The reputation level of potential entrants is equal to the mean value of the real skills distribution. Therefore, a potential entrant will be able to recruit specialists as long as the incumbent firms with levels of reputation above this mean value cannot hire all the specialists in the market. In the case where brand effects are present, it is assumed that the same firm can try to get back to the market, maintaining its brand level. Or, alternatively, that a firm with the same brand level is ready to enter the industry.

In all the simulation runs, the results of which will be discussed below, the number of potential incumbent firms was fixed at 50, the number of specialists at 500, and the length of each simulation run at 250 steps[10]. The autocorrelation factors of firms' reputation and of individuals' expected skills was fixed at 0,9. The initial maximum scale of potential entrants was fixed at 5, and the growth rate parameter (see footnote 2) was fixed at 1%. Small changes in these values do not modify the main conclusions to be drawn below.

The parameters whose values vary across the simulations runs are the ones concerned with firing costs to firms, with mobility costs to specialists and with the brand effect. Each simulation for each set of values of these parameters was repeated 100 times in order to test the robustness of the results. The results presented below are all robust, unless it is stated otherwise.

3.1. The baseline simulation

The simplest case one can have of the present model consists of the situation in which there are no brand effects, no mobility costs constraints (either to firms or to specialists), and where the autocorrelation factors of firms' reputation and of individuals expected skills are set to zero[11]. However, as was said above, in the simulations to be discussed below the autocorrelation factors were taken as fixed at the value of 0,9. The decision to do so was based on the intuition that, in real world industries, both firms' reputation and individuals' expected skills tend to be very much dependent on their recent past values, instead of varying dramatically from one period to another. As a matter of fact, the differences between the two cases – the one I classified as the simplest possible one and what I will henceforth call 'the baseline simulation' – are very small and will soon be made explicit.

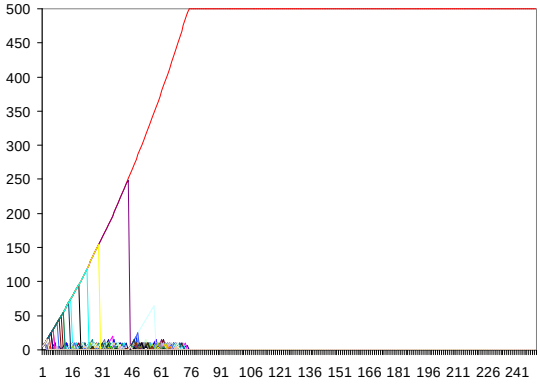
Chart 1 – The behaviour of the model in the baseline simulation (first case) [12]

[10] With the parameterisations used, the most interesting phenomena usually take place before step 100.

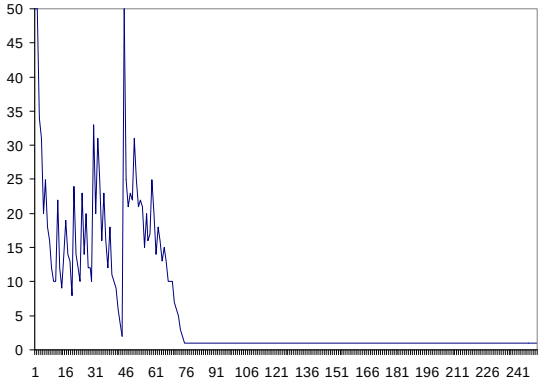
[11] In such case, firms' reputation depends only on their performance in the last period, and individuals' expected skills depend only on last period's reputation of their employers.

[12] Each chart shows four figures: the upper-left one shows the evolution in the number of employees for each firm, the upper-right figure shows the evolution in the number of incumbent firms (i.e., firms with a positive number of employees), at the bottom-left there is the Hirschman-Herfindall index, and at the bottom-right the sum of the market shares of the four biggest firms (the two statistics related to industry concentration are based on the number of individuals per firm – which in the present case corresponds to the firms' scale of services provision).

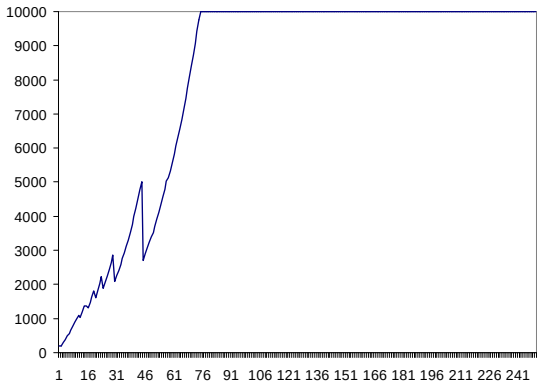
Firms' scale



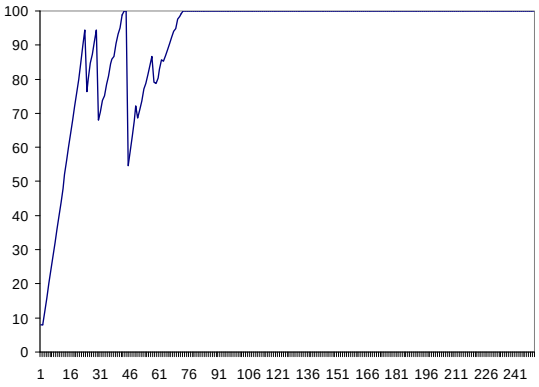
Number of incumbents



Hirschman-Herfindhal Index



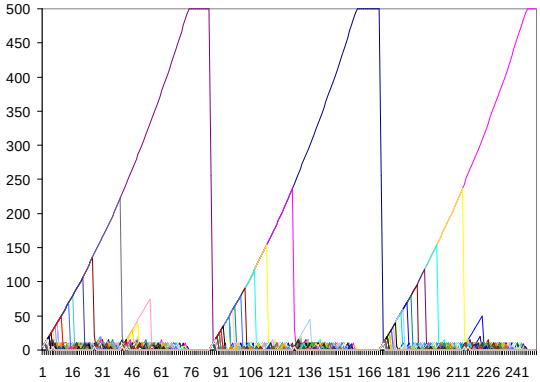
Top 4 firms concentration ratio



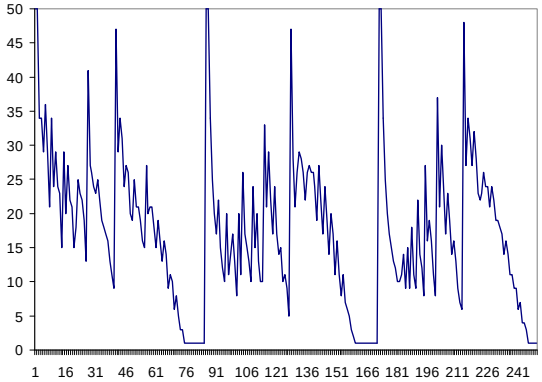
The behaviour of the model in the baseline simulation follows two basic patterns (see charts 1 and 2): about 60% of the times the industry's structure collapses into a monopoly (usually at step 74) and stays as such until the end of the simulation run; in the remaining cases one observes the cyclical emergence of monopolist positions that break down after some periods.

Chart 2 – The behaviour of the model in the baseline simulation (second case)

Firms' scale

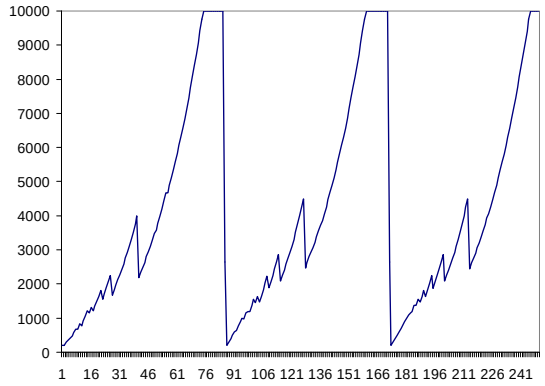


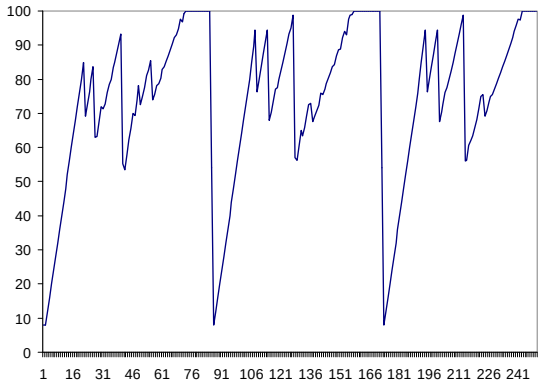
Number of incumbents



Hirschman-Herfindhal Index

Top 4 firms concentration ratio





It is not difficult to understand the causes for these alternative patterns. In both cases we have a tendency for a monopoly to emerge. This should not come as a surprise, since we have that, by the logic of the model, the best firms should be able on average to attract the best specialists, thereby gaining an even better position. What has to be explained is the reason why sometimes the monopoly is not enduring. The cause of such outcome is the assumption that there is a fixed number of potential incumbents with an entry reputation level equal to the mean of the real skills distribution. Since individuals' real skills is a random variable following a normal distribution, we have that the average of real skills in the market will tend to be below the average in half of the simulation runs and above the average in other 50% of the runs. Since the reputation level of a monopolist will approximate its performance after some periods (see equation 1), and since the performance of a monopolist is equal to the average of the real skills of all individuals in the market, after a firm has reached the monopolistic position one of two things must happen after some periods: (i) either its reputation level stays above the mean of the real skills distribution and the potential entrants are never able to attract specialists to their ranks, (ii) or its reputation level eventually falls under that threshold and all the potential incumbents enter the market.[13]

It is interesting to note that in the second case (the one of transitory monopolies) the successive monopolists usually do not correspond to the same firm. This too should not be surprising, since firms do not have any permanent distinctive features in the baseline simulation. The next step in this simulation exercise is precisely to introduce a permanent distinctive element between firms – i.e., to introduce a 'brand effect'.

[13] The reason why the baseline simulation ends in a monopoly more often that not can be understood by simple inspection of charts 1 and 2: even when the monopolist structure is not enduring, it usually lasts for some periods, and sometimes the end of the simulation coincides with a monopoly phase. This clarifies the role of the autocorrelation factor of firms' reputation – when it is equal to zero the transitory monopolies do not last more than one period.

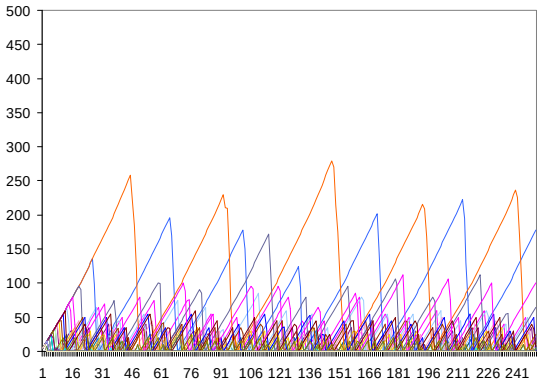
3.2. 'Brand effects'

In a market where contracts are necessarily highly incomplete and available information is often misleading, credibility can be a relevant asset. In the consultancy business, in particular, brand names play a role which is to some extent detached from the actual performance of firms in the past. In order to take consideration of this phenomenon, as noted in section 2, the model allows for the presence of what I have called 'brand effects'. As explained above, the 'brand effects' are introduced in the model by attaching to each firm a fixed brand level, and by computing firms' reputation at each step as a weighted average of past performance, past reputation, and brand name.

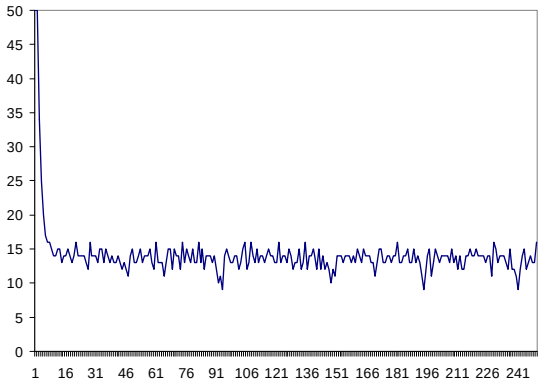
As could be expected, if one fixes the weight of the brand name's contribution to firms' reputation at very high levels, there will be practically no updating of reputation levels from period to period. This means that the firm with the highest brand level will invariably end up in a monopolist position. Similarly, very small levels of brand effects will have little impact on reputations and the outcome of the simulation will be similar to the first case of the baseline simulation. What is interesting to check is the impact of intermediate levels of brand levels on the results. Chart 3 below shows the typical behaviour of the model when the brand effects' weight on reputation is fixed at 0,05.

Chart 3 – The behaviour of the model with 'brand effects'

Firms' scale

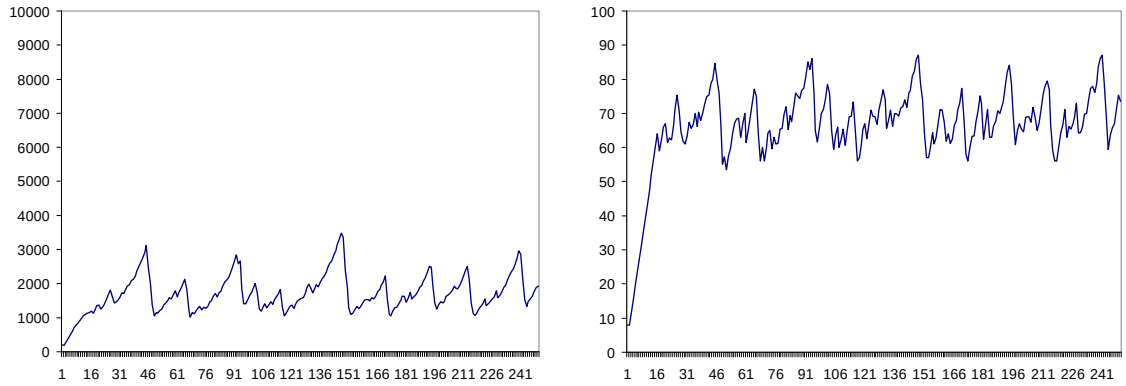


Number of incumbents



Hirschman-Herfindhal Index

Top 4 firms concentration ratio



Even when the 'brand effect' parameter is fixed at such relatively low levels, some departures from the behaviour of the baseline simulation are worth noting. First, the tendency for the emergence of a monopoly has vanished: after an initial shake-out, the number of incumbents oscillates within the interval from 8 to 16 firms until the end of the simulation. Second, the concentration indexes remain at relatively high levels, suggesting the presence of oligopolistic structures. However, if one analyses the upper-left figure in chart 3, it becomes obvious the peculiar nature of the resulting market structure. What we get is a recurrent situation where some successful firm tends to grow above the others for some periods and then it invariably starts shrinking until it looses all its employees.

The cause for such strange behaviour resides on a paradoxical process in which success is itself the cause of firms' failure. In fact, as firms increase their reputation they also increase their capacity to attract specialists. But after some time firms will start to hire specialists whose skills are below the firms' current performance and its reputation will start to be eroded accordingly. The presence of autocorrelation in reputation levels avoids this process to be an abrupt one, but the decline is unstoppable. The most direct competitors will soon surpass the first firm's reputation level and start to attract its employees. The second firm eventually becomes the biggest one in the industry, and as it reaches its highest level of performance, the same process happens again and again, until the end of the simulation.

The market process that has been discussed up to now is one in which workers move freely from firm to firm, and firms can always employ the best specialists available to them, irrespectively of the fact that they may have to fire some workers to hire new ones. It is as if the allocation of workers to job positions in the last period had no influence in the current job matching process. The next section discusses the impacts of introducing mobility costs constraints to the model.

3.3. Mobility costs constraints

Mobility constraints can either appear on the employers' side or on the side of workers. Individuals can attach a cost of moving to a new firm, and decide not to move unless the benefits compensate the losses. As explained in section 2, this was introduced in the current model by considering the relative gains to specialists in terms of her/his employers' reputation levels. On the other side of the labour market, firms often pay a cost when they decide to substitute an employee for another one. In the present context I have modelled the firm's decision as one in which it compares the differences in the (expected) skills of both individuals with the costs of firing in order to act in one way or the other.

Both kinds of costs constitute constraints to labour mobility, though their effects in the current model are somewhat different in nature. Mobility costs to specialists exert their influence every single time an individual faces the opportunity to move to a firm with higher reputation, while mobility costs to firms only influence the labour market dynamics when the firms' facing an opportunity to hire a better specialist have reached the maximum number of contracts for that period (and have to fire someone if they want to make the new recruitment effective) – which is often not the case. Furthermore, with the current parameterisation there are 10 times more specialists than potential incumbent firms, while the values of firms' brand levels and specialists' expected skills follow exactly the same distribution. It results from both facts that mobility constraints to specialists (which depend on differences between firms' reputations) tend to have a much stronger impact in the simulation outcomes than the mobility constraints to firms.

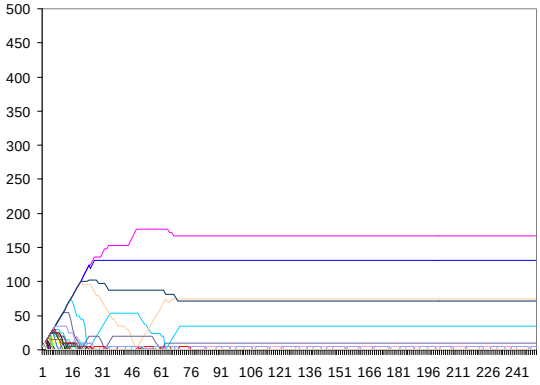
Charts 4 and 5 below show the typical alternative behaviours of the model when the values of the two kinds of mobility costs are fixed at fairly low levels[14]. As can be seen in the charts, in both cases we have oligopolistic-like industry structures, the difference between the two residing on the stability of those structures. In the first case (chart 4), after an initial period of turbulence (with many exits, entries, and changes in market shares), the industry stabilizes in terms of number of firms, firms' size and reputation levels. In the second case (chart 5) the initial industry turbulence continues until the last step of the simulation, with the dominant firms being incapable of maintaining their positions.

[14] They are both fixed at 0.1, meaning that the gains to specialists (in terms of employers' reputation) of moving to a new firm, and the gains to firms (in terms of expected skills) of substituting a current employee for a new specialist must be both greater than 10% if the move is to take place.

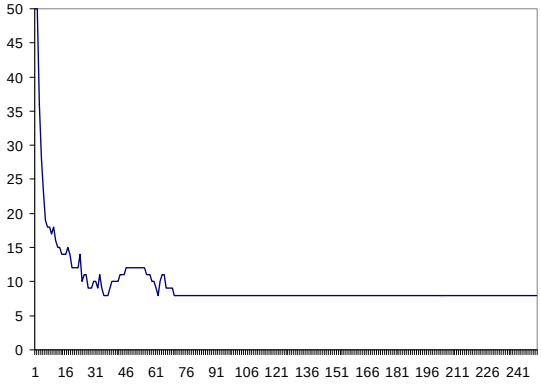
These alternative industry trajectories are explained by one central element: the distribution of brand levels among the dominant firms. When the random distribution of brand levels results in close levels of this variable (and, therefore, of firms' initial reputation) among the firms which are highest in the rank, dominance cannot last for long. The distance in reputation is not enough to prevent specialists to move between the best reputed firms and therefore changes in market shares eventually occur. On the contrary, if some firms among the dominant ones start with a sufficient lead in reputation, and if the chances of labour mobility allow them to increase that lead in the beginning of the simulation, the industry will stabilise as described above. One should note, however, that, in the latter case, the 'winning' firms are not necessarily the ones that start with a lead in term of brand levels: the fact that firms hire specialists on the basis of their expected, and not real, skills occasionally lead to reversals in the ranking of market shares.

Chart 4 – The behaviour of the model with 'brand effects' and mobility costs constraints (first case)

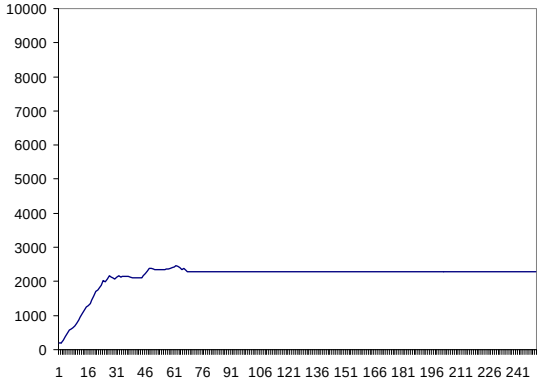
Firms' scale



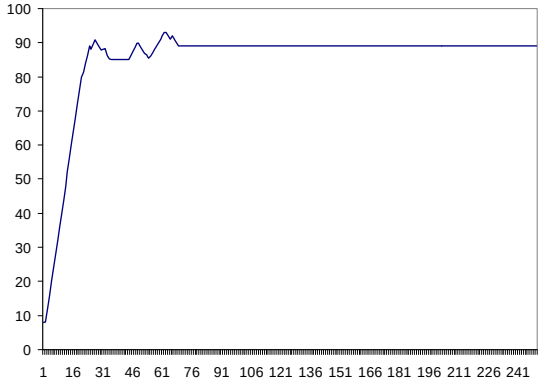
Number of incumbents



Hirschman-Herfindhal Index



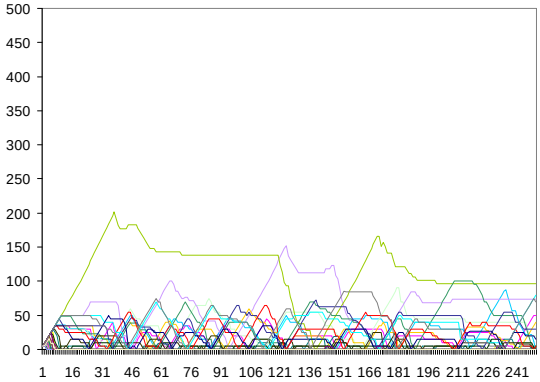
Top 4 firms concentration ratio



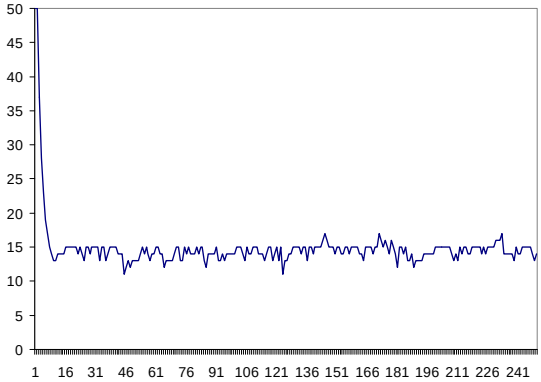
Finally, it is interesting to note that the first case above shows many of the features that are usually taken as 'stylised facts' of the evolution of many industry, namely: the decreasing incidence of entry, the occurrence of a shake-out during the first periods followed by a decrease in exit rates, and an initial period of turbulence in market shares followed by the stabilization of firms position in the market.

Chart 5 – The behaviour of the model with 'brand effects' and mobility costs constraints (second case)

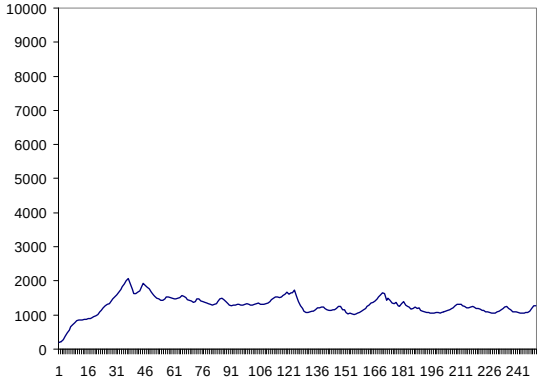
Firms' scale



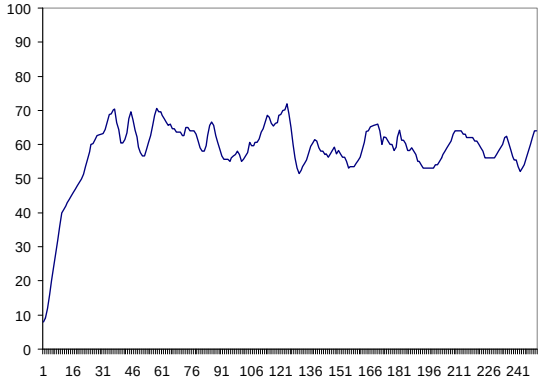
Number of incumbents



Hirschman-Herfindhal Index



Top 4 firms concentration ratio



4. CONCLUSIONS AND IMPLICATIONS

The simulation model presented in this paper constitutes a first attempt to study formally the interdependencies between the evolution of industries and labour market dynamics, taking as a reference the case of consultancy services industries. One of the reasons simulation models can be useful as a research tool is the fact that they help to assess the robustness of one's thoughts about the functioning of real-life economic forces. Along the way, the researcher often learns more than he/she expected from the simulation exercise. Some of the results thus obtained were trivial from the beginning, others seem much more trivial after they are obtained than they actually were in the beginning. Since it is hard to tell in which case we find ourselves in the aftermath, I summarize below what seem to be the most important results that were presented above.

The first result is related to the inherent indeterminacy of the outcome of the baseline simulation (to recall, the one with no brand effects or mobility constraints, and with significant autocorrelation factors of reputation levels and expected skills). One should have in mind that the model favours a process of cumulative causation, where the best reputed firms tend to attract the most skilled specialists, thereby tending to strengthen their leading position. And still, about half of the times the industry outcome will not be a stable monopoly. Even though the extreme simplicity of this configuration of the model prevents any attempt to generalize these results, it is still not without interest to consider how the growth of a firm can contribute to the erosion of its own reputation and ultimately of its dominant positions. This paradoxical process of firms' success generating their own failure became even more apparent after the introduction of 'brand effects', where the increase of firms capacity to attract specialists makes them prone to reputation-harmful recruitment.

The inclusion of mobility costs in the model reveals two other interesting results. On the one hand, it leads to the emergence of oligopolistic structures, whose stability depends on the exact distribution of brand levels among the firms. On the other hand, it was shown that the role of that exact distribution is not necessarily a deterministic one – since a firm can ultimately attain a position in the market shares ranking which is higher than its brand name level would suppose (this is again a consequence of the imperfectness of both skills and reputation assessment).

Finally, it is also interesting to note that the mechanisms emphasized by the current model (based on labour market dynamics and brand effects) are enough to generate some patterns of industry evolutions that have been usually explained on the basis of either technological or financial variables. It should go without saying that the appropriateness of these mechanisms for the understanding of real world phenomena can only be assessed on a case-by-case basis.

In this paper I have focused on the implications of the model to the analysis of the evolution of industries. The current model, however, has many potential implications concerning the dynamics of labour markets and, particularly, the patterns of job duration and mobility. The analysis of such dimensions will be the object of another paper.

5. BIBLIOGRAPHY

Addison, J. and P. Portugal (2002). "Job search methods and outcomes". *Oxford Economic Papers* 54(3):505-533.

Caves, R. (1998). "Industrial Organization and New Findings on the Turnover and Mobility of Firms." *Journal of Economic Literature* 36:1947-82.

Dosi, G., F. Malerba, O. Marsili, and L. Orsenigo (1997). "Industrial Structures and Dynamics: Evidence, Interpretations and Puzzles." *Industrial and Corporate Change* 6(1):3-24.

Farber, H. (1999). "Mobility and stability: the dynamics of job change in the labour markets." In O.Ashenfelter and D.Card (eds.), *Handbook of Labour Economics*, pp. 2439-2483. Amesterdam: Elsevier.

Gallouj, C. and F. Gallouj (1996). *L'Innovation dans les Services*. Paris: Economica.

Gusmão, J. and J. Caldas (2004). "The (im)possibility of collective action". In H.Coelho and B.Espinasse, *Proceedings of the 5th Workshop on Agent-Based Simulation*, pp.25-31. Lisbon: SCS.

Jovanovic, B. (1979). "Job matching and the theory of turnover". *Journal of Political Economy*, 87: 972-990.

Jovanovic, B. (1982). "Selection and the Evolution of Industry." *Econometrica* 50(3):649-70.

Mamede, R. (2002). "Does innovation really matter for success? The case of an IT consultancy firm". *Dinâmia Working Paper 2002/25*, Lisbon.

Mata, J. and P. Portugal (2004). "Patterns of Entry, Post-Entry Growth, and Survival: a Comparison Between Domestic and Foreign Owned Firms." *Small Business Economics* 22(3-4):283-98.

Sutton, J. (1997). "Gibralt's Legacy." *Journal of Economic Literature* 35(1):40-59.