

Does the Concept of Property Rights Hold Relevance for Human Resource Performance?

An Applied Study of Privatized Companies in Tunisia

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ABSTRACT

In a world where information technologies (ITs) are globalizing and acting directly and explicitly on organizations, the question of property rights neutrality becomes strategic. In this study, the authors investigated whether ownership is a determinant of human resource performance or whether it is driven by factors other than ownership (e.g., technology and IT). Thus, the major objective of this research was to find out under what conditions ownership exerts a nonneutral effect on the performance of human resources and whether these effects are dependent on the technological aspects of organizations. The authors' methodology included two techniques, namely, nonparametric tests applied to the main indicators of 21 privatized companies (operating in the IT and other sectors) in the Tunisian case, and panel data to explain the impact of privatizations on human resources. The results showed that the privatization process has allowed an improvement in productivity indicators through an increase in incentive systems, particularly for companies with high technological content. The application of the econometric technique evidenced a whole policy of restructuring the allocation of human resources, in the postprivatization period. This makes sense because the incentive system of newly privatized companies strived to be more efficient. Furthermore, the second model showed that human resource dynamics after privatization depends on the business cycle and the nature of investors and IT. The third model confirmed the idea that privatization leads to an improvement in the workforce and its productivity in the long term. Overall, the study generated important managerial implications, the most important of which is that privatization can only generate a positive effect on human resource performance when employees feel involved in the process and as much as the organization is involved in new ITs.

KEYWORDS

Human Resources, Performance, Privatization, Property Rights

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INTRODUCTION

Since the early 1980s, the public sector has undergone restructuring, which has led to an unprecedented wave of privatizations. Privatization took three essential forms: A direct form of transfer of public goods to private actors; an indirect form of transfer of services, naturally public (e.g., infrastructure, education and health services, and services inherent to information technology [IT]) to private organizations; a mixed form of public-private partnership. Thus, as privatization generates significant qualitative changes in organizational modes, it is supposed to establish a new type of incentive in the management of human resources (Abdeldayem & Al Dulaimi, 2022; Al-Busaidi et al., 2021; Lemaizi, 2024). However, the stylized facts showed that the hypothesis of the effectiveness of privatization is neither mechanical nor instantaneous and depends on several factors and determinants that must be specified with caution. Consequently, the main contribution of this research was identifying all the necessary synergic organizational, sectoral, and macroeconomic factors to make privatization positively impact on the performance of the privatized organizations and their human resources.

Indeed, when the subject of property is to be considered, the fundamental question is always quasi-unique: Is private ownership intrinsically superior to other forms (especially public) of ownership? If so, why? In other words, two aspects need to be checked: The neutrality of the property and which of the different types of property is the most efficient in the economic sense (which can only happen if the property is judged not to be neutral). This second question becomes more important if its results and implications are applied to the company's human resources. In other words, does ownership constitute a variable that determines labor productivity in the firm? If so, then how? Moreover, although these questions are no longer new, they are far from being resolved because, since the collapse of the previous socialist bloc, forms of ownership have never stopped developing and have become more complex, requiring an update of their effects on the factors of production, in this case work. At this level of analysis, an important question deserves to be raised. It concerns the fact that property, as many authors (Laffont & Tirole, 1993, 2001; Tirole, 2023) highlighted, has no meaning in itself, while it has based on the economic and legal advantages it produces for the owners. As a result, the real managerial question is: What is the optimal combination of ownership which allows maximum efficiency and the manager to properly manage their (monetary, financial, and human) resources? The answer relates back to the concept of corporate governance, which is intended to be more developed than that of ownership and property rights. Eventually, it is possible to affirm, without too much risk, that it is good governance which allows to determine the optimal distribution of property rights within the company.

Kiradoo (2021) emphasized the fact that organizational shocks such as privatization can only have positive and significant effects on human resources when there is a dynamic governing of technical, IT, legal, political, and economic factors. Along the same lines, Kargas and Tsokos (2020), Staniec and Kalińska-Kula (2021), and Szegeci et al. (2023) showed that, in the case of Greece, privatization only had positive and significant effects on the employer brand in sectors operating in ITs. They concluded that, although the implementation of employer branding is still an ongoing process, it has already begun to transform the operational logic of human resources departments in organizations operating in the telecommunications sector. Also, Blair et al. (2000) investigated the optimal distribution of ownership within the company, including employees among the potential owners. Bair et al. showed that optimal appropriation must be private, but it must also involve employees at all administrative levels because they play a stabilizing role. This form may also be associated with more stable employment levels. Besides, it appears that it costs nothing in terms of productivity or financial performance, and may even improve performance.

Many other studies have converged towards confirming the existence of a causal relationship between ownership and human resources' performance. This relationship can no longer be created directly, but rather via another variable which is none other than the company's human resources.

Boudabbous (2014) tried to find out to what extent the company's strategy aimed at encouraging employee shareholding could lead to a situation where the objective function of employees would be the same as that of shareholders. The author showed that, in the Tunisian case, the implementation of employee shareholding plans allowed to generate more organizational performance for the company and allowed human resources to become more productive.

Moreover, although research on privatization is relatively abundant in extant literature, particularly with regard to its effects on macroeconomic dimensions, studies on the dimension of human resources are still very limited. This was the authors' motivation to carry out this investigation. More specifically, the authors aimed to, first, focus on the determinants and success factors of privatization both on financial performance and human resources in the postprivatization period, and, secondly, to find out how the distribution and sectoral affiliation of the company to be privatized positively impacts human resources' motivation. For example, why does the privatization of companies operating in ITs have a positive and intense impact on human resources?

Thus, in this general context, the authors' research question was: Why and how do human resources react to different modes of appropriation?

The paper is organized in five sections. The second section provides an analysis of the link between property rights and incentive programs. The third section focuses on functions related to property rights. The fourth section offers empirical analyses. The fifth and final section concludes the paper.

THE RELEVANCE OF OWNERSHIP RIGHTS FOR THE INCENTIVE SCHEMES OF HUMAN RESOURCES

Ownership can only have meaning where several possible forms of ownership can take place and where individuals are assumed to be flexible with respect to these forms. These are, ultimately, the historical product of human reflection that has occurred in well-determined spaces and times (from the state of nature in the sense of Locke and Rousseau to the present day) in different social contexts. In the economic context of business, ownership is no longer simply a way of appropriation, but a determinant of performance. It is no longer neutral as claimed by the standard neoclassical model (absence of externalities and transaction costs) and where the manager is supposed to be a *homo economicus*.

Indeed, in the real world, given the limited rationality of the agents, they no longer have the same amount of information, which triggers the phenomena of adverse selection and moral hazard. From this, it is perhaps fairly obvious that the true standard to be converted into different modes of properties is none other than the information which can possibly change in quantity and quality from a given type of property (i.e., absolutely private) to another (i.e., absolutely public). Similarly, property (as a social and legal product) is important because, in case of its absence, many negative externalities arise and risk reducing the collective well-being of organizations. In other words, it is thanks to property (well defined and well protected) that humanity has been able to transform itself from the state of nature to organized and permanent state societies.

Property Rights, Transaction Cost, and Externalities

Although the importance of property (either as the effective appropriation of certain absolute or relative rights over goods or as a theoretical concept) is ancient (as in Plato, Aristotle, Locke, Rousseau, and Adam Smith), its theoretical modeling in economics is relatively recent. Indeed, it is the neo-institutionalist theory which has given meaning to property by analyzing it within the framework of a specific theory of property rights. This has played a strategic role in the rereading of the economic theoretical hypotheses and implications which have remained for a long time under the reflexive hegemony of the neoclassicals. The state, which was often seen and analyzed as an agent external to the economy, wants to be within the framework of new institutionalism as an active agent on whom falls the main function of choosing and distributing, in an effective way,

the property rights, in order to optimize wealth socially. Once the optimal ownership is decided *ex ante*, the state must validate it *ex post*.

According to North (2016), the main idea is that no economic performance is possible outside institutions. These react with technology and determine the magnitude of transaction and production costs and therefore the degree of competitiveness of the economy. What emerges from this idea is a complex and composite idea of institutions. Indeed, for institutions of the authors intend entities which assume and execute laws and societal rules while submitting to the different constraints of countries. Therefore, these institutions are responsible for properly structuring exchanges and ensuring that markets function in a fair and fluid manner. North's analysis offers a second facet to understand the dimension and the interventionist scope of the state. He recognizes the existence of two production boundaries, namely the technical boundary and the structural boundary. The first translates the state of knowledge and the accumulation of productive resources, while the second translates the organizational aspect including legislation, regulations, and distribution of property rights.

THE RELATIONSHIP BETWEEN OWNERSHIP AND EFFICIENCY

For a long time, there has been an implicit intuitive relationship between ownership and efficiency, which explicates a strong hypothesis: Property is nonneutral, and its nature (public or private) and its form of distribution can change the fate and behavior of those who hold it. Given the importance of property as an explanatory variable of organizations' performance, a whole economic theory, the theory of property rights, has emerged. This relates ownership to economic efficiency and therefore calls into question the assumption of neutrality of ownership. In other words, the way in which ownership is distributed can contribute to improving economic efficiency within the firm. The translation of this idea on a social scale has allowed for the appearance of a neo-institutionalism which has entrusted to the state a new attribution in the choice of the "optimal" mode of ownership and in the adoption of rules which best respect these rights.

Amann (1999) went further by asserting that the existence of well-defined property rights positively influences individual initiative, which gives each individual the possibility of optimizing their objective utility function; if everyone acts in this way, then individual actions isolated and separated from the others will lead, *a priori*, to a positive externality while generating an increase in collective utility and efficiency. Amann therefore concluded that each structure of property rights results separately from the others in differential incentives.

For his part, Migué (1977) claimed that a given organization cannot in any way achieve the objectives of effectiveness and efficiency unless it clearly specifies the distribution of property rights both for shareholders and for civil servants and employees, optimally distribution of sanctions and rewards allowing them to invest their efforts in production and to derive benefits and income from it. By doing so, Migué asserted that the individual would be informed about their property (where their income and costs would suffer, in the event of deficiency), which allows the individual to clearly delimit their utility function, in the first instance, and to maximize it, in the second instance. This idea is widely confirmed as pointed out by Coriat and Weinstein (1995), who asserted that the existence of an optimal distribution of property rights (*i.e.*, guaranteed and alienable over products and productive resources), within an organization in general and in a company in particular, provides individuals with incentives to work more, since this allows them to benefit from certain residual incomes and to know how to preserve and develop assets. In other words, this refers to knowing how to manage resources in the most efficient way.

OWNERSHIP FUNCTIONS

As the authors mentioned above, ownership is no longer neutral because the results of any organization differ significantly from one form of ownership to another. Ultimately, ownership acts at two essential levels: First, it eliminates all forms of externalities and, second, it affects incentives.

Ownership Internalizes Externalities

Demsetz (1974) highlighted the relationship between ownership and externality by affirming that the fundamental objective of the theory of property rights is none other than the internalization of externalities. In general, externalities are defined as unintended or secondary effects of an individual's (or group of individuals') action which causes others to suffer (Gomez, 1996; Greffe, 1997; Laffont & Tirole, 1993, 1996).

Thus, the externality is firstly an effect (not known *ex ante*) resulting from individual actions maintained separate from each other. Consequently, initially, the market can no longer ensure the management of the said externality because it does not know it, which could lead (in a second stage) to its resolution by nondemocratic (conflictual) means. This is explained by the fact that, as the externality is an indirect consequence (not previously known), then it cannot be recognized by a third person or party (e.g., the court). On the economic level, the externality (especially the negative one) generates social costs that will not be recognized by anyone. Also, even if the state should try to finance the externality (e.g., by cleaning up polluted areas), it risks taxing those who are not responsible for the externality in order to counter the problems generated by those who are, which perhaps should be considered as an injustice and iniquity *par excellence*. The first form of costs is called private (i.e., paid by the person who issues it), while the second form of costs is called external (i.e., supported, partially or totally by other agents).

According to Coase (1960), to put an end to the problems inherent in externalities, it would be important, first and as a necessary condition, to grant them property rights. Also, for externalities which are generated because of doubts and nuances circumventing their properties, then they must be redefined. Secondly, it is necessary to clearly define a scale of sanctions and rewards in order to properly preserve and protect property. By doing so, it is possible, subsequently, to let the market function to arrive at the most efficient solutions from negotiations between those who emit and suffer the externalities.

Property as a Reducer of Informational Rent

Although informational asymmetries can arise from various possible sources, to the authors only address those that are related to the distribution of property rights. Indeed, in the case of the "corporate" organization, informational asymmetries can come from a poor specification of property rights. In other words, if property rights are attenuated, information asymmetries become important. An example is a public company which is theoretically and formally supposed to be the property of the state and/or the general public community in which the latter does not fully enjoy its effective rights. This is manifested by the corrupt activity they find concerning the control of the managers of the firm. The management, who are completely informed, create informational distances vis-à-vis the owner (i.e., the state) and try to hide or even falsify the information.

Therefore, it is possible to conclude that the second function of the theory of property rights is the alleviation of informational asymmetries which are the origin of a bad distribution of these rights and the lack of incentive of the agents inside an organization to put in more effort.

The Transaction Cost

The work of Coase (1937) and Williamson (1975, 1986) challenged this assumption and enriched the theory of property rights, which today is closely linked to the theory of transaction costs. According to Carlton et al. (1998), "transaction costs are expenses related to the exchanges carried out by economic

agents between themselves, which are added to the prices of goods, such as the costs of drafting and applying contracts” (p. 335). Coase (1937) advanced a new approach to the firm, which broke with the neoclassical approach; according to Coase, economic activity is exclusively organized by the market (i.e., the notion of the point-and-automaton firm). Coase sees things differently whenever he considers that the company can in turn be an alternative place of economic decision-making to the market. The transactions that are established on the market are neither instantaneous nor instantaneous: Negotiations between traders will take place, contracts will be signed, and lawyers are mobilized. This creates transaction costs and leads the company to decide according to the financial value of these costs.

An example is a farmer who rents warehouses to store his produce; the more the transaction costs carried out with the tenant are high, the more the farmer has an interest in building his own deposits himself. While criticizing the Coase model for its general character in that it can be compatible with any system where there is a firm/market split provided there is an adequate specification of transaction costs, Williamson (1975) started from Coase’s intuitions and carried out an extensive analysis of the economics of transactional costs. Williamson identifies four basic principles:

1. Transactions in a market economy take place either in the market or in the firm. As a result, a company can use the market to source a good or decide to produce it, if the transaction costs seem high.
2. The choice mentioned in (a) is made on the basis of the comparison of two costs: The cost of recourse to the market (transaction cost) and the production cost borne by the company if it produces the good it needs.
3. The transaction cost is variable and depends on the manner in which negotiations take place between the agents concerned, just as it also depends on the characteristics of the market.
4. Transaction costs affect transactions mediated by the market as well as those internal to the company (i.e., the cost spent by one or more shareholders to regulate, supervise or oversee the manager is also a transactional cost).

This approach aims to explain the company and its internal organization as an alternative decision-making place to the market in an environment characterized by a limited rationality of the agents, on the one hand, and the opportunism of the contractual parties, on the other hand. Thus, bounded rationality and opportunism are the two assumptions on which Williamson’s transactional theory is based.

Ownership’s Rights and Transaction Costs

The existence of positive transaction costs does not pose a problem for the company, if they relate to relatively small sums and to “nonstrategic and nonspecific” goods for the company. However, the reality is much more complex. Transactions are, under certain conditions, very expensive. The solution envisaged will be to internalize this transaction in the sense that the good, the subject of the transaction, will be produced by the company itself. The conditions that cause high transaction costs are threefold: (1) The uncertainty of the environment; (2) the frequency of transactions; (3) the specific investment or asset.

The Uncertainty of the Environment

For Williamson (1985), uncertainty is a frequent phenomenon and can be conceived as the consequence of the complexity of the environment and its rapid change. Indeed, the limited rationality of economic agents does not allow them, when signing contracts, to foresee the different states of nature. Consequently, the more the market fluctuates, the more frequent the opportunistic behavior of the agents is and the more the revision of the contract, as requested by the injured party,

becomes imperative. The successive revisions of the contract are costly and generate significant transaction costs.

The Transaction Frequency (for the Buyer)

The frequency of the transaction for the buyer comes into play for the justification or the rejection of a specific investment. In other words, it takes on more importance when the investment is specific. In general, occasional and infrequent transactions are entrusted to the market, recurring ones are internalized (Aouadi, 2002).

Specific Assets

An asset is said to be specific when it is specialized or designed for a particular user. A buyer who signs a contract with a sole supplier for the supply of a specialized product has only one immediate source of supply. Likewise, it is difficult for the supplier to find another buyer for this specialized product. (Carlton et al., 1998, p. 20)

Williamson (1985) emphasized the importance of the specificity of assets insofar as they are the basis of the change in the relational aspect between agents. In other words, the standard neoclassical transactions based on the instantaneous exchange of goods and services between anonymous agents is called into question.

Indeed, the existence of specific assets transforms the previously anonymous relationship into a personalized relationship between economic agents. In this regard, Williamson (1985) wrote that “there is a lasting bond of personal dependence between the parties” (p. 52). This dependency is the origin of the very high transactional costs resulting from an opportunism externalized by the contractual parties who realize that they are in a position of strength.

At this level, the theory of property rights establishes a new basis of legitimacy which consists of its role in the elimination of transactional costs via their internalization. In practice, when the company that remunerates the transactional cost is harmed by the opportunism of the company that provides it with the specific asset, it can produce the transactional cost.

Thus, it seems clear that controlling the ownership of specific assets is an effective way to avoid opportunistic behavior. This theoretical trajectory includes the work of certain authors such as Mastern (1984) who showed, in the case of the aeronautics industry, the existence of a relationship between the specificity of assets and their ownership.

Similarly, Anderson and Schmittlein (1984) tried to see the link between the specificity of the assets and the possession by a company of its own sales network of these assets. Crocker and Reynolds (1993) approached the problem from another perspective, while seeking to elucidate the relationship between asset specificity and U.S. Air Force procurement. At the end of this section, it is clear that the third function of the theory of property rights is none other than the internalization of transactions relating to specific assets.

Thus, after all these definitions and delineation of elements of differentiation between the theory of property rights and its neoclassical rival, a question arises: Why is it important to present this theory? The next section will provide the answer.

Property Rights and Economic Efficiency

To well situate the relationship between property rights and economic and organizational efficiency, the authors conducted a review of some of the more important and recent studies into this area, from 2024 back to 2022, and drew out the main themes of concern represented in these studies.

Zoorob (2024) attempted to determine the impact of privatization on the quality of services in a new context by applying it to American prison health care. To achieve his objective, the author used difference analyses of mortality trends in a panel of more than 500 prisons in the United States while covering a time horizon ranging from 2008 to 2019. The results did not make it possible to provide strong findings that switching from publicly provided prison health care to private health care

increases inmate mortality in the short or long term. This conducts further on the path of neutrality. In the same line of ideas, Brogaard and Petersen (2022) tried to know how the quality of services is influenced by modes of ownership. They converged on the neutrality of ownership as long as there is no evidence of the superiority of private providers in the quality of the services they offer. On the contrary, evaluation data suggest that public providers tend to offer slightly higher quality of service.

According to Fattoruso (2022), the question of ownership does not take precedence because everything depends on the complexity of the decision-making problems and the competitiveness in which companies find themselves in carrying out their activities. Thus, given the occurrence of private organizations that focus on corporate and social work and public organizations that focus more on privatizing their capital, it turns out that the decision-making process is complicated because a new mixed rationality (private and public) requires a more complex decision-making architecture based on multicriteria decision-making (MCDM) supposed to be capable of simplifying the process of choice, classification or sorting of the alternatives which characterize the problem at hand both in public or private organization. The results show that MCDM is widely used in different application areas of the domain of interest, both in the private and public sectors. Everything plays out at the level of the decision-maker who should be involved in several phases of constructing MCDM methods.

Nevertheless, how can the public organization reduce the performance gap relatively to the private sector? The answer to this question leads a large number of researchers (Reina et al., 2021; Moser-Plautz & Schmidhuber, 2023) to assume that this cannot occur only in the case of external shocks (e.g., the COVID-19 pandemic). These shocks reinforce the public organizations and make them more efficient. According to the authors, public organizations and companies have always had problems of adaptation to qualitative changes, in relation to private companies. However, the only possibility offered to them lies in the digital transformations which can accompany certain shocks. By applying their study on the COVID-19 pandemic, the authors noticed that this has affected different organizational aspects following the digital transformations that the pandemic has required. By taking a sample of 10 Austrian public organizations, the authors were able to conclude that the pandemic has not only led to an increased use of technological means, but has also influenced various organizational aspects, such as employee attitude towards technology and organizational culture towards innovation. In particular, organizations heavily impacted by the pandemic have benefited from a higher degree of digital transformation. Therefore, the pandemic has influenced the spirit of innovation and accelerated the speed of digital transformation.

It is always appropriate to recall the theoretical results of the standard neoclassical model which serve as a reference situation for comparison. In this model, property is assumed to be entirely allocated to private agents who exercise property rights that are well defined by the system of rules in force. This property is exchanged at zero transaction costs and without information costs. The market is assumed to be the exclusive mechanism through which property is exchanged.

However, the new organization theory claims a new hypothetical and analytical corpus. Ownership is multidimensional insofar, as in a given organization one can have many forms of ownership that coexist simultaneously, private property rights are often mitigated by forms of state regulations and by the functional logic of certain productive organizations (e.g., joint-stock companies and communal and public property), transaction costs, inherent in certain forms of property, are not zero and the information is imperfect. Therefore, in a system where ownership is not unique and where some rights are attenuated, property rights theory works to give the best form of distribution of those rights to maximize the efficiency of any organization.

To understand in what sense the new organization theory allows this maximization, it is better to start by defining the form of property for which the owner can best manage their resources. A property is deemed to be of good quality if it is simultaneously exclusive and transferable. Exclusivity means that the owner exercises an exclusive and absolute right over their property. In other words, the owner has the right to do whatever they want (within the limits of the legal provisions) on their

property: They can use it, change its shape, and change its size. This exclusivity allows the owner to exercise the right of control over their property. This is very important in the theory of organizations, since control is effective to the extent that exclusivity is respected. The partial or total alteration of this right reduces the incentive for control and multiplies the distances and informational distortions between the owner(s) and the other agents who emerge in the organization.

Transferability means that the owner can, if they wish, partially or totally get rid of their property. The major interest of this characteristic is that it allows the individual the possibility of making arbitrations between different alternatives which are open to them. For example, a person who owns a house can either live in it, rent it or sell it; however, in other cases, such as in ex-planned economies, individuals did not have the possibility of this sort of arbitration since the ownership of housing was public.

Three factors significantly impact exclusivity: (1) the legal constraints which, in certain circumstances, limit the enjoyment of certain rights; (2) transaction costs, which are costs borne by the owner in order to enforce their own rights against others; (3) the externalities, which mean variations in utility not taken into account by the organization and which govern the transactions between individuals. As for transferability, it is intended to be attenuated following provisions of a legal nature (example.g., in the case of public ownership there is no longer any transferability).

EMPIRICAL ANALYSIS

In this section, the authors will address the main question of their research: What is the effect of Tunisian privatization on the performance of privatized and postprivatization human resources? To do so, they used the technique of nonparametric tests and econometric regression to estimate these effects. In the first instance, the authors focused on the tests applied individually to each of the companies included in the sample, then they observed the results of applying the same tests to all the companies collectively. The efficiency indicators they used focused on several aspects: Productivity (employee performance in terms of turnover and net result: turnover/workforce, net income/workforce), performance (net margin ratio which is equal to the net profit/turnover ratio), profitability (net income/equity), debt (total debt/total balance sheet), debt capacity (medium and long-term debt/equity), and gross cash flow (amortization and provisions + net income). Table 1 shows the Tunisian companies which have been privatized and which are the subject of the authors' empirical analysis.

Nonparametric Tests

Table 2 presents the summary of different applied tests to different effectiveness indicators.

In general, privatization had positive effects on efficiency indicators (Table 2). When the companies where the indicators were not significant (neutrality of privatization) were not considered, privatization generated efficiency gains during the postprivatization period on most of the indicators except the profitability ratio of services (for the two banks UIB and BS) and the net margin ratio. This shows that, in general, the efficiency indicators (i.e., productivity and profitability) have evolved in accordance with theoretical assumptions.

However, it should be noted that, alongside these efficiency gains, privatization has a positive and significant effect on corporate debt. The companies' share of debt, which has been negatively and significantly affected in terms of their profitability and productivity indicators, is very low or even zero, which means that privatization often generates positive effects on efficiency or, at least, it is rarely generating efficiency loss. These results seem to converge with the empirical results of Charreaux and Alexandre (2001), who found that privatization in France had positive postprivatization effects on net margin ratio as well as on productivity indicators (Sales turnover/workforce or NI/Workforce). They also found that these efficiency improvements were accompanied by significant increases in debt ratios. Internationally, the work and analyses of Megginson and D'Souza (1999)

Table 1. List of sample companies

Company	Year of privatization
SITEX	1988
STAR	1988
SCG	2000
SOTRAPIL	2001
SIPHAT	2001
SOTUMAG	2000
SOCOTU	1996
AMS	1995
HOTEL DAR EZZAHRA	1995
SOTUMETA	1999
SOTUVER	1999
MAKLADA	1999
BS	1997
UIB	2002
SOTETEL	1998
SIAME	1998
ALKIMIA	1996
STIP	2002
MAGASIN GÉNÉRAL	2002
LE MOTEUR	2000
SFBT	1995
SIMPAR	1996

Source: MPDR

Table 2. Summary of the various tests applied to the various efficiency indicators

	T/w	NI/W	NI/T	GCF	TD/TBS	NI/ Equity	MLTD/ Equity	Equity/ NBI *	Overheads/ NBI *
Positive and significant effects (in %)**	13 62	8 36,66	6 28,57	7 58,33	8 50	6 37,5	7 46,46	0 0	2 100
Negative and significant effects (in %)	0 0	4 18,33	7 33,33	0 0	3 18,75	1 6,25	2 13,33	0 0	0 0
Insignificant effects ***	8	10	8	5	5	9	6	2	0
Number of companies ****	21	22	21	12	16	16	15	2	2

Source: Authors' calculations

Note. * These indicators are specific to the two banks selected in the sample (BS and UIB).

** The percentage between the number of companies (for which the indicator in question is positive and significant) and the total number of companies.

*** The percentage between the number of companies (for which the indicator in question is negative and significant) and the total number of companies.

**** Companies' number is sometimes less than 22 since the ratios list was not exhaustive for some companies.

and Megginson et al. (1994) produced similar results; net margin and productivity ratios revealed a significant privatization effect. However, the authors concluded that there was a decrease in relative indebtedness after privatization.

Static Tests of the Effect of Privatization on the Effectiveness of all Privatizations

After seeing the statistical effects of privatization on the different companies included in the authors' sample, they examined the effect of privatization on all the companies collectively. To achieve this objective, the authors chose a time period covering seven years (three years before privatization and three years after privatization), then they made the sum of the variables they had studied for all the companies and, finally, they applied the equality medians tests. For example, for the year (-3) (i.e., the third year preceding privatization), the researchers took all the values of the variable (e.g., profitability ratio) from all companies, then they calculated the corresponding average; they did the same work for the years (-2), (-1), (1), (2), and (3). Finally, the authors applied the tests to the two obtained series.

As expected, the results clearly show that the Tunisian privatization led to an increase in the performance of human resources (Figure 2). This is explained by the capacity of the new private owners to manage best the ex-public company. In addition, it is acknowledged that, in the private sphere of business, the workers are more vigilant and their managers are more able to incentivize them. Also, it is generally noted that the private manager or management is better able to reduce the informational gap or imbalance of the employees.

Econometric Estimates of Privatization Effect on Human Resources

Based on the theoretical background on the relationship between privatization and human resources, in this section the authors will test three fundamental hypotheses:

Hypothesis One: Privatization generates a reduction in the workforce (model 1).

Table 3. Static effect of nonparametric tests of privatization on all companies

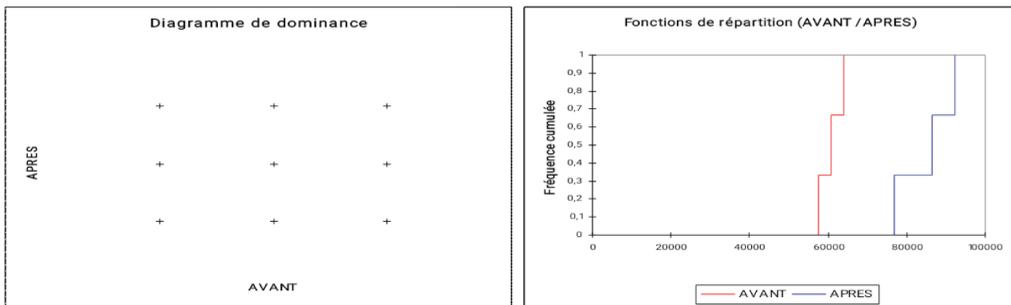
Indicators	Me (Mo) before	Me (Mo) after	M W test	Sign test	Signed wilcoxon test	K W test	F test	Kolmogorov Smirnov test
ST/w Left-tailed test Right-tailed test	60719,286 60769,873	86419,190 85144,619	0.0809 <0.05**	0.250	0.250	0.0495**	0.083	<0.1* <0.05**
NI/W	82082,000 85591,000	118769,000 130586,000	0.4	1.0	0.50	0.275	0.564	0.6
*NI/EQUITY (%) Left-tailed test Right-tailed test	15,991 15,894	13,180 11,404	0,11 < 0,05**	0.25	0.25	0.127	0.083*	0,6
TD/TBS (%) Left-tailed test Right-tailed test	44,148 44,133	48,549 49,325	< 0,1* < 0,05**	0.25	0.25	0.0495**	0.083*	<0.1* <0.05**
MLTDE/EQUITY(%)	45,637 50,051	51,113 51,619	0.7	1.00	0.75	0.513	0.546	0.6
NI/ST (%) Left-tailed test Right-tailed test	10,914 11,100	9,753 9,374	< 0,0001 < 0,0001	0.25	0.25	0.0495**	0.083*	<0.1* <0.05**
A to D&P +NI Left-tailed test Right-tailed test	6090389,2 5973417,8	4226853,7 4316733,66	< 0,0001 < 0,0001	0.25	0.25	0.0495**	0.083*	<0.1* <0.05**

Source: Authors' calculations.

Note. * Productivity indicators.

-ST/W (Turnover/Workforce).

Figure 1. Dominance diagram and average turnover distribution function of all companies

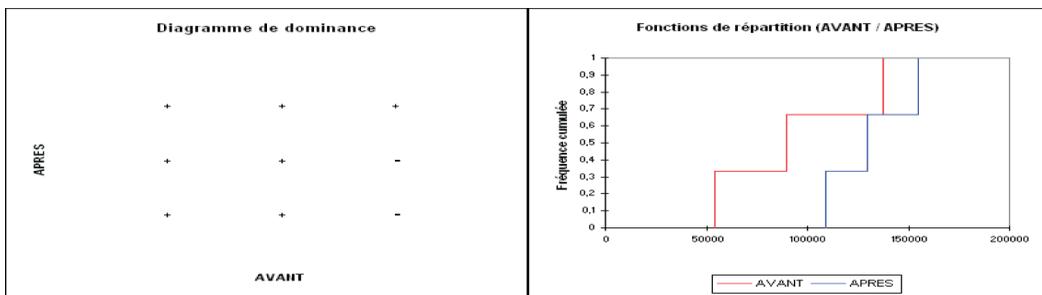


Source: Authors' calculations.

Figure 1 shows that privatization led to a positive significant effect at 5% threshold on the value of sales turnover. This can support the hypothesis that the change in the propriety rights of companies created a new incentive scheme on the vector of human resources.

-NI/W (Net Income/Workforce)

Figure 2. Dominance diagram and average net profit distribution function of all companies



Source: Authors' calculations.

Note. For all companies, privatization had a positive and significant effect at 5% threshold on average turnover, while no significant effect was recorded for average net income.

*NI/ST (net margin ratio) (Net Income/Sales Turnover)

Hypothesis Two: The effect of privatization on Human resources is dependent on organizational and governance factors (internal to the firm) and on macroeconomic and contextual factors (model 2).

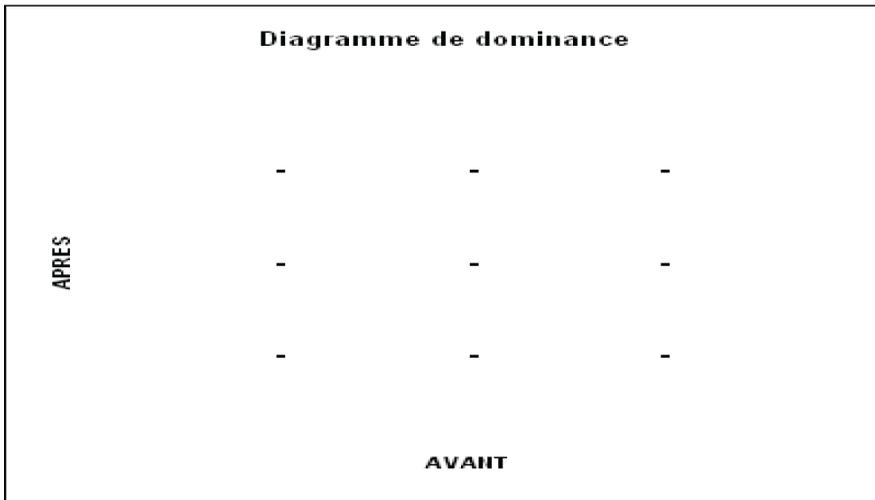
Hypothesis Three: The effect of privatization on human resources is dependent on the periods of time travelled by the privatized company (preprivatization period, year of privatization and the post-privatization period) (model 3).

To understand the dynamic effect of privatization, the authors used Villalonga's (2000) procedure, which allowed to describe more explicitly the temporal dynamics of privatization. However, while Villalonga's model leaned on the estimation of the effect of privatization on the efficiency, the authors used it in this study to estimate the effect of privatization on both human resources and efficiency. Indeed, the logic inherent in the model did not prevent the authors from using it in this study.

The procedure consisted of three steps:

1. To test the first hypothesis, the authors introduced model 1, in which we tried to measure the dynamic gain or loss of human resources applied to the entire sample (panel data).

Figure 3. Dominance diagram and net margin ratio distribution function of all companies

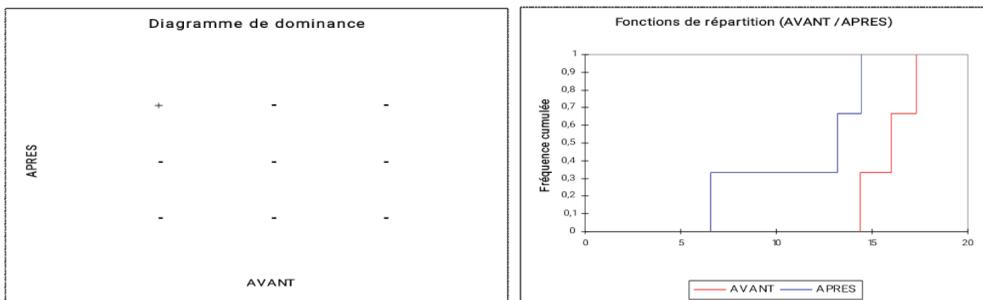


Source: Authors' calculations.

Inversely to the other ratios, the authors observed that privatization led to negative and significant effect on the net margin ratio, meaning the companies recorded less of a profit ratio postprivatization. This is explained by the investment cost established to restructure these companies, which can lead to an increase in returns in the medium and long terms.

*NI/EQUITY (financial profitability ratio) (Net Income/Equity)

Figure 4. Dominance diagram and financial ratio distribution function of the profitability of all companies



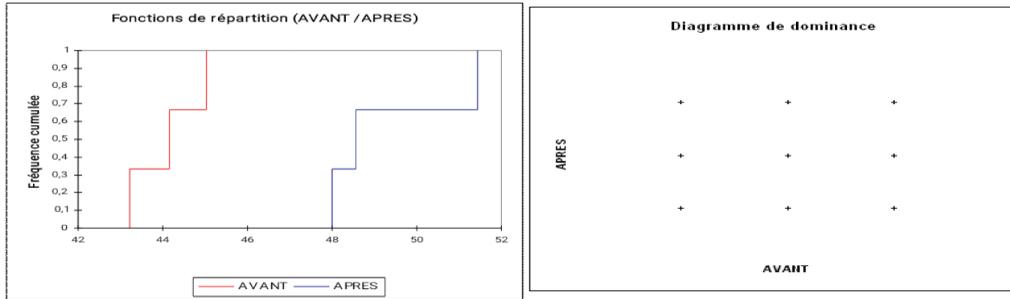
Source: Authors' calculations.

Contrary to theoretical hypotheses, privatization had a negative and significant effect at 1% threshold on the financial profitability ratio. This can be explained to allow for other possible factors, even if this seems to be the most obvious. In the future, this spent sum will generate a positive return and participate in the increase of efficiency.

*TD/TBS (rate of debt) (Total Debt/Total sheet balance)

2. To test the second hypothesis, the authors introduced a model in which they identified the main variables that explain the dynamic effect of privatization on human resources (model 2).
3. To test the third hypothesis, the authors adopted a model where they tried to observe the effect of time in the dynamics of human resources (model 3).

Figure 5. Dominance diagram and debt ratio's distribution function of all companies

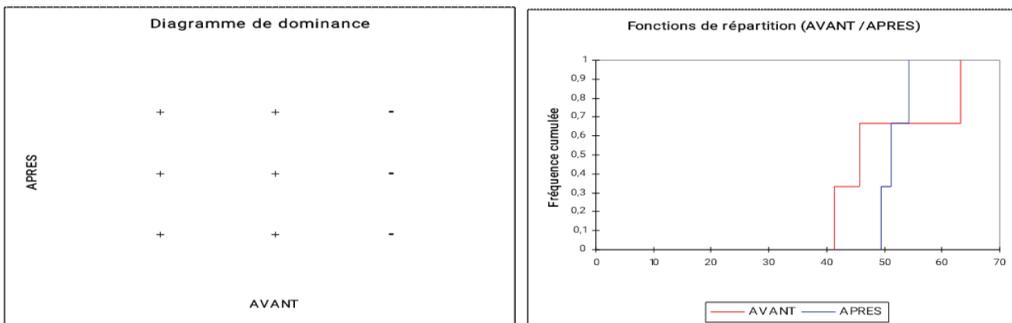


Source: Authors' calculations.

In addition to its negative effects on productivity and profitability indicators, privatization had a positive and significant effect at 5% threshold on debt ratio. This supports the hypothesis, that once privatized, the company will have more potentialities to accede to financial markets and to extend their financial sources.

*MLTD / EQUITY (financial autonomy ratio) (Medium Long-Term Debt/Equity)

Figure 6. Dominance diagram and financial autonomy ratio's distribution function of all enterprises



Source: Authors' calculations.

No significant effect is recorded on financial autonomy ratio. It seems that companies have pursued the same financial autonomy policies.

* Allocation to depreciation and provisions + net income (gross cash flow)

Model One: The Effect of Privatization on Human Resources (Evaluation of Human Resources' Dynamics)

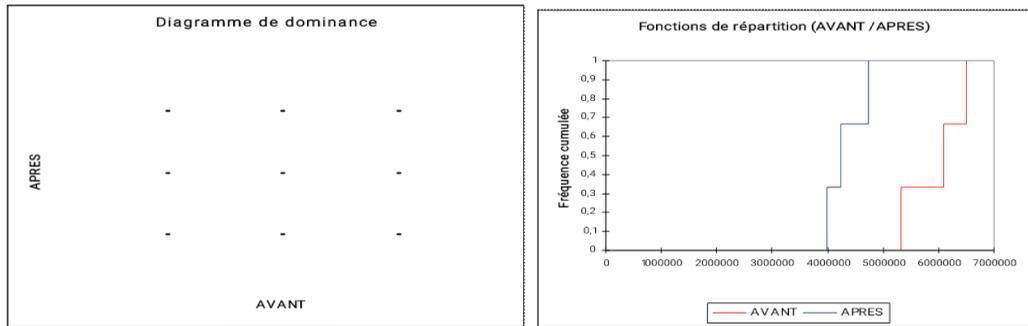
In this model, the authors used a panel with fixed individual effects. The researchers drew on their previous works (Issaoui, 2009a, 2009b; Issaoui & St-Hilaire, 2010) to explore to what extent the change in rights ownership could influence human resources. The result is the following Equation:

$$Work_{it} = \alpha_{it} + \beta_{1i} Time_{it} + \beta_{2i} Pri_{it} + \beta_{3i} Time_{it}.Pri_{it} + \beta_4 Turn_{it} + \beta_5 GDP_{it} + \varepsilon_{it} \quad (1)$$

where:

- $Work_{it}$ measures the workforce of company (i) in year (t).
- $Time_{it}$ is a dummy variable of time for firm i (value ranging from 1 to 7).

Figure 7. Dominance diagram and financial autonomy ratio distribution function of all companies



Source: Authors' calculations.

In line with the other indicators, privatization had a negative and significant effect at 1% threshold on the gross cash flow.

- Pri_{it} is a privatization dummy variable which takes the value 1 when firm (i) become private and 0 if not.
- $Time_{it} \cdot Pri_{it}$ is a composite variable that take into account the dynamics between the two dummy variables cited above (T and P).
- $Turn_{it}$ is the firm size (measured by turnover) of the firm (i) in year (t).
- GDP_{it} is the GDP growth rate, year t for firm i.

It would be important to note that, in this model, the authors adopted two hypotheses. The first is that there is a neutral effects exerted by the variables size and economic cycle on human resources on the firm, regardless of the firm. The second, and drawing on Villalonga (2000), Charreaux and Alexandre (2001), and Issaoui (2009), is that two common factors (i.e., the size and the cycle) are beyond the control of firms and impact all enterprises in the same manner.

The effects of the variables T, P, and TP are, on the other hand, specific to each company. As a first step, it is important to test if the data structure contains individual effects. Testing this on STATA software gave a fisher statistic $F(20, 61) = 78.78$, which let the authors conclude the rejection of the null hypothesis, meaning that it was necessary to include individual effects in the model. Nevertheless, while they should have tested if these individual effects were fixed or random, this was not possible with their specific data structure.

To resolve this problem, the authors considered a priori that the effects are fixed based on two reasons (Villalonga, 2000). First, the privatization process in Tunisia was not selected with a coherent logic leading the researchers to well specify the parameters of privatised companies by the simple return to the whole sample of public enterprises. Secondly, in the case of random effects model, the authors assumed that there was no unobservable individual characteristics that can have significant effects on explanatory variables. This was not validated in this study because in the privatization process the companies have their own self-culture and specific characteristics, allowing them to affect the explanatory variables of the model.

Concerning the specificity of error terms, the different tests showed that these errors are characterized by their heteroscedasticities, but not by their interindividual correlations nor by their intraindividual autocorrelations. Thus, the feasible generalized least squares allows to give blue estimators and to correct the problem of heteroscedasticity.

In terms of results, the cycle variable had a positive and significant effect at 5% on the workforce employed in privatized companies. This means that companies privatized in good economic conditions

Table 4. Effects of time, privatization, and postprivatisation period in the dynamic of human resources

	Size -2.7e-07 -5.37***		Cycle effect (GDP) .3903447 2.07**	Wald chi square = 2.204.072 (Pr > Chi saugre) = 0.0
	Constant	Time	Pri	Time.Pri
ALKIMIA	190 24***	5.7 1.51	-31 -4.42***	-89 -2.31**
AMS	1227.43 33***	-21.1 -1.22	95 1.99**	-39 -2.38**
BS	1446 161.28***	22.8 6.17***	181 11.75***	-40 -9.23***
LE MOTEUR	380 24.69***	37.5 5.39***	151 5.24***	-30 -2.83***
MAGASIN GENERAL	1254 17.92***	52 1.61	-177 -1.32	43 1.13
MAKLADA	157 34.43***	10.72 5.59***	28 3.57***	-6 -2.64***
SCG	555 153.90***	-3.32 -2.76***	36.38 7.27 ***	-14 -9.39***
SIAME	492 25.65***	-8.7 -0.99	104 2.82***	-31 -2.94***
SIPHAT	705 60.12***	20.9 3.93***	8.7 0.39	-13 -1.99**
SITEX	1901 22.12***	-8.7 -0.22	-190.5 -1.15	33 0.70
SOCOTU	461 23.10***	-50.1 -5.43***	-237.7 -5.36***	61 5.61***
SOTETEL	795 9.12***	154.7 3.84***	533.03 2.26**	-108 -2.26**
SOTRAPIL	80.7 36.29***	.6 0.86	233.4 5.24***	.9 1.04
SOTUMAG	167.3 68.60***	6.1 7.76***	4.4 1.34	-1.9 -2.06**
SOTUMETA	225.3 26.58***	-29.34 -7.81***	-131 -8.43***	37 8.35***
SOTUVER	250.6 25.82***	9 3.04***	-20.1 -1.47	-8.9 -2.21**
STAR	870 30.56***	19 2.60***	201.5 6.66***	-43.17 -5.49***
STIP	1117 55.72***	59.9 6.57***	98.8 2.59***	-43.1 -3.99***
UIB	1489	-2.28 -0.19	167.5 3.38***	-37 -2.62 ***
SFBT	1039 33.43***	21.30251 1.49	85.38011 1.44	-27.6 -1.63
SIMPAR	22 4.90***	.97 0.49	-16 -2.34**	.9 0.45

Source: Authors' calculations.

Note. The figure in the first line is the coefficient and that of the second line the Student's t;

* indicates coefficient significantly different from zero at 10%, ** indicates coefficient significantly different from zero at 5%, and *** indicates coefficient significantly different from zero at 1%.

are better able to increase their workforce in the postprivatization period. However, the size variable had a negative and significant effect at the 1% level; this result does not seem to be in line with preliminary expectations, because the authors expected that the size of the company would have a positive influence on the number of employees. The analysis of the coefficients corresponding to the variables T, P, and TP brings back to Table 4.

Table 4 evidences that the effect exerted by time (T) on human resources was significantly positive for nine companies, while it was only significantly negative for three companies. A priori, it seems that, as time goes by, the company adapts better to its environment, accumulates experience, and manages to organize itself better, which allows it to invest more and employ more. Privatization had a positive and significant effect for 11 companies, while it only negatively affected human resources for four companies. This result does not lead to invalidate the hypothesis which stipulates that privatization is antisocial, since the coefficients associated with the variable P only tell about the threshold effect of privatization. To find out the dynamic effect of privatization, the authors noted that the coefficients associated with the variable TP are negative and significant for 14 companies, which means that, during the postprivatization period, the number of employees suffered a reduction for at least 67% of the companies. However, two companies experienced an improvement in their workforce in the postprivatization period, namely SOCOTU and SOTUMETA. Nevertheless, in the case of SCG, the authors remarked that both coefficients associated with the variables T and TP are negative, which means that the downsizing in this company, during the postprivatization period, took place less quickly compared to the preprivatization period.

Model Two: Explanation of the Dynamic Effects of Privatization on Human Resources

Drawing on Issaoui (2009) and Issaoui and St-Hilaire (2010), in this paragraph the authors will explain how the privatization process can generate dynamic effects on the human resources policy post privatization. Thus, based on their literature review, the authors adopted a second model in which they select a set of explanatory variables relating to three fundamental aspects:

1. Governance variables (i.e., nature of the investors who acquired the company, the nature of the ownership from which the privatization resulted, the nature of the postprivatization control, and the membership of the privatized in the stock market).
2. Contextual aspects of privatization (i.e., cycle, nature of the sector, budget deficit, privatization methods, and waves of privatization).
3. Initial conditions of privatized firms (i.e., profitability at the time of privatization, initial performance, and initial size of the company).

After having selected 19 explanatory variables deemed to be theoretically and causally linked to the dynamic effects of privatization on human resources, the authors tried to make multiple regressions for two main reasons: Firstly because the number of observations was low (21 companies), and secondly because certain variables presented serious problems of multicollinearity between them. Formally, the second model takes the following written form:

$$\text{Employment}_i = \alpha + \sum_{k=1}^K \beta_k V_{ik} + \varepsilon_i \quad (2)$$

where Employment_i is the vector of different coefficients values estimated of the variable PT in model 1 of firm i , and V_{ik} is the value of the k th explanatory variable for firm i .

Theoretically, in this type of model the errors are supposed to be heteroscedastic for two main reasons. First, the problem of heteroscedasticity is very common in snap-cut samples where companies have such disparate and heterogeneous characteristics. Second, when the explained variable is itself

estimated (which is the case in this model), the errors are likely to be heteroscedastic, since their measurements vary according to their observations.

Version 1 is as follows:

$$\text{Employment}_i = \alpha + \beta_1 \text{Profitability}_{i0} + \beta_2 \text{GDP } i_0 + \beta_3 \text{stock exchange }_{i0} + \beta_4 \text{foreign control}_{i0} + \beta_5 \text{Foreign}_{i0} + \varepsilon_i \quad (3)$$

where:

- Foreign_{i0} is a binary variable that takes the value 1 when the company is acquired by foreign investor and 0 if not.
- GDP _{i0} represents the economic cycle and measures the GDP growth rate in the moment of privatization of public enterprise (i.)
- $\text{Profitability}_{i0}$ is represented by the monetary value of the net result of company (i) in the moment of privatization.
- $\text{Foreign control}_{i0}$ is a binary variable which takes the value 1 when the control of the public enterprise is transferred to foreign investors and 0 if not.
- $\text{Stock exchange }_{i0}$ is a binary variable which is equal to 1 if the privatized enterprise is listed on the stock exchange (in the postprivatization period) and 0 if not.

To test the problem of heteroscedasticity, the authors used the Breusch Pagan test, which gave the Fischer statistic $F(5, 15) = 0.6$, since the p-value (0.7) was greater than alpha (10%); thus, they could conclude that the null hypothesis of homoscedasticity was accepted, which led them to use the ordinary least squares method. Table 5 shows all the results of the estimation of the model.

Based on the the authors' estimates, it is possible to note that, contrary to their assumption, the economic cycle had no significant effects on human resources during the postprivatization period. This does not seem strange given that the privatized company is a changing company and has little interest in the economic situation in terms of its human resources policy, at least in the short term. What matters most after privatization is to manage the bloated workforce and adjust the quantity and quality of human resources to its efficient level.

Table 5. Estimation of the effects of governance variables on the dynamic effects of privatization on human resources (Version 1)

Total number of privatized enterprises 21	F(5,15) = 4.6*** Prob > F = 0.01	R ² = 0.6 R ² adjusted = 0.48
C	-5.1	-0.14
Variables describing the privatization context		
GDP	5.3	1.46
Foreign	-26.0	-1.76*
Variables describing the Governance dimension of privatized enterprise		
Foreign control	15.5	0.82
Stock exchange	-47.2	-3.1 ***
Initial conditions of the firm		
Profitability	-4.e-06	-1.8 *

Source: Authors' calculations.

The postprivatization effect of “foreign” on human resources is negative and significant at 10%. This means that part of the capital was held by foreigners, then a reduction in human resources would be implemented. In other words, the active control of (foreign) shareholders encouraged managers to reduce the number of employees in order to get rid of excess staff and, consequently, make the company profitable (Vickers & Yarrow, 1988).

As to the stock exchange variable, the authors concluded that its effect on human resources is negative and significant at the 1% threshold. This is conform to the economic logic. This allows to assume that new managers make more efforts, especially where their financial achievements are reported in any moment to shareholders. Thus, privatized and listed companies reduced their workforce the most during the postprivatization period. The coefficient of the foreign control variable is positive but not significant on postprivatization human resources; this means that, with regard to human resources, the type of control (foreign or national) is secondary. Regarding profitability, it had a negative and significant effect at 10%; this means that, as much as the company is profitable at the time of privatization, it reduces its postprivatization workforce. This seems logical, given that companies which generate financial surpluses are more able to decide on layoffs and bear their costs.

Version 2 is as follows:

$$\text{Employment}_i = \alpha + \beta_1 \text{GDP}_{i_0} + \beta_2 \text{WP1}_{i_0} + \beta_3 \text{WP2}_{i_0} + \beta_4 \text{Private}_{i_0} + \beta_5 \text{Restructuration}_{i_0} + \beta_6 \text{Competition}_{i_0} + \varepsilon_i \quad (4)$$

where:

- GDP_{i_0} measures the economic cycle represented by GDP growth rate in the moment of privatization of company i .
- WP1_{i_0} indicates that the wave of privatisation is a binary variable taking the value (1) if privatization is lunched during the period 1987—1995 and 0 if not.
- WP2_{i_0} indicates that the wave of privatisation is a binary variable which takes the value (1) if the privatization is lunched during the period 1996—1999 and 0 if not.
- Private_{i_0} is a binary variable taking the value (1) if the control of the company is held by private shareholders and 0 if not.
- $\text{Restructuration}_{i_0}$ is a binary variable which takes the value (1) if company i resorted to layoffs during the preprivatization period 0/-3 and 0 if not.
- Competition_{i_0} is a binary variable taking the value (1) if the privatized enterprise is evolving in a competitive sector and 0 if not.

To determine the nature of the market in which the privatized company operates, the authors drew on Jelili’s (2005) study and on the United Nations Conference on Trade and Development’s (2006) report. Table 6 provides the main results of the above model.

Table 6 evidences that, as assumed by the economic logic, the variable cycle has a positive and significant effect at the 1% threshold on human resources’ recruitment in the postprivatization period. The privatization waves WP1 and WP2 exerted negative and significant effects at the 1% threshold, which means that companies privatized during the period 1987—1999 had recorded job losses during the postprivatization period. The restructuring variable had a positive and significant effect at the 1% threshold, which means that companies which experienced reductions in their workforce during the -3/0 period were better able to increase their workforce during the postprivatization period. The private variable had a negative and significant effect at the 10% threshold on human resources, which means that the private property to which privatization resulted generated job losses. The competition variable had a positive and significant effect at the 1% threshold on postprivatization human resources, which means that the more the company operates in a competitive market, the more it manages to employ more after its privatization.

Table 6. Estimation of the effects of contextual variables on the dynamic effects of privatization on human resources (Version 2)

Number of privatised enterprises 21	F(6,14) = 4.9* Prob > F = 0.07	R² = 0.7 R² adjusted = 0.5
C	-131	-3.9***
Contextual variables		
GDP	14.8	3.5***
WP1	-40.1	-1.9*
WP2	-57.4	-3.1***
Competition	52.6	3.6***
Variables describing Governance		
Private	-32.45	-2.09*
The principle conditions of the privatized firm		
Restructuration	44.3	3.28***

Source: 'Authors' calculations.

Version 3 is as follows:

$$\text{Employment}_i = \alpha + \beta_1 \text{Profitability}_{i0} + \beta_2 \text{GDP } i_0 + \beta_3 \text{tSize}_{i0} + \beta_4 \text{Stock exchange}_{i0} + \beta_5 \text{Dbudg}_{i0} + \varepsilon_i \quad (5)$$

where:

- Size_{i0} is revealed by the turnover of the privatized enterprise in the moment of property transfer.
- Dbudg_{i0} is the amount of the excedent or deficit of the budget deficit recorded in the year of the privatization.

Since the Breusch Pagan test allowed the authors to determine the absence of heteroscedasticity, they could use the ordinary least squares method. Table 7 summarizes the results.

Once again, the cycle variable impacted positively (but without statistical signification) human resources' dynamics. The impact of profitability and stock market variables was negative and statistically significant at the 1% and 5% thresholds, respectively. The effect of budget deficit was positive, but without statistical significance. This means that the privatization decision was not taken instantly in order to fill the budget deficit. When privatization is decided suddenly and the budget is in deficit, there will be a strong chance that the buyers will be confronted with companies that are completely inefficient and suffering from overstaffing; however, this was not the case, given that the ex-ante planning of the privatization program allowed the government to restructure and consolidate its assets independently of the budget balance.

The size variable had a positive and nonsignificant effect, which allowed the authors to establish that the size of the company cannot influence the action of managers in terms of the management of existing human resources. In other words, the existence of overstaffing can occur both in large and small EPs.

The authors chose to produce only these three versions given that the other variables did not give relevant results; the variables inherent to the sectoral affiliation of the privatized or to the privatization methods were in most cases insignificant.

Table 7. Estimation of the effects of initial conditions of the firm on the dynamic effects of privatization on human resources (Version 3)

N= 21 public privatized enterprises	F(5, 15) = 4.0* Prob > F = 0.03	R ² = 0.5 R ² adjusted = 0.4
C	-21	-0.5
Variables describing the context of privatized firm		
Dbudg	3e-06	0.10
GDPi0	6.0	1.6
Conditions of the privatized firm in the moment of privatization		
Size	2 e-07	0.9
Profitability	-7e-06	-2.0**
Governance variables		
Stock exchange	-50.0	-3**

Source: Authors' calculations.

Model Three: Explanation of Dynamic Human Resources Growth Over Time

In this section, the authors will answer the following question: How does the number of employees change over time and the different phases of privatization? Thus, drawing on Villalonga (2000), the authors estimated the following Equation:

$$\text{Employment growth}_{it} = \alpha + \beta_{1i} N32_{it} + \beta_{2i} N21_{it} + \beta_{3i} N10_{it} + \beta_{4i} N01_{it} + \beta_{5i} N12_{it} + \beta_{6i} N23_{it} + \epsilon_{it}$$

$$\text{Employment growth: } (\text{Employment}_{it} - \text{Employment}_{i(t-1)}) / \text{Employment}_{i(t-1)} \tag{6}$$

where $N_{t, t+1}$ is a biannual binary variable where the indices t and $t+1$ measure the temporal distance that separates these years from the reference year of privatization (year 0). To understand the notations of the indices, the authors used the following example: Index 32 stipulates that the years considered are year -3 (i.e., three years before privatization) and -2 (i.e., two years before privatization), while index 23 corresponds to the second and third year after privatization.

By application of all statistical tests on the error terms structure, the researchers noted that errors are heteroscedastic, and correlated interindividuals but not intraindividuals. Thus, it seems that the feasible generalized least squares method is the most efficient.

Table 8 highlights that the overall significance of the model is called into question, as the chi2 test demonstrated. Thus, to improve the overall significance of the model, the authors had to discard the least significant variable for the intermediate years (i.e., the YEAR12 variable) while keeping the extreme years and the periods including the year of privatization. Table 9 shows the new regression.

Roughly we can say that the effect of the year of privatization is negative and significant at the 10% threshold on human resources growth within privatized companies. In the postprivatization period, we notice significant increases which continue to grow as we move away from date 0, corresponding to privatization, as proven by the coefficient of the variable N23, which is more important and more significant than the coefficient linked to the N01 variable. (Issaoui & St-Hilaire, 2010, p.)

Table 8. Regression of human resources growth on biannual dummies

Number of observations = 126	Wald chi ² (6) = 7.4 Prob > chi square = 0.3	Log likelihood = 1271
N32	-1.07	-0.3
N21	4.18	1.3
N10	-5.3	-1.68*
N01	-2.7	-0.86
N12	4	1.26
N23	1.9	0.62

Source: Authors' calculations.

Table 9. Regression of human resources growth on biannual dummies

Observations = 126	Wald chi square (5) = 15.0** Prob > chi2 = 0.01	Heading here
N32	3	1.3
N 21	1.5	0.7
N10 (year of privatization)	-4	-1.8*
N01	4.15	1.8*
N23	5.6	2.4**

Source: Authors' calculations.

CONCLUSION

The main purpose of this study was to investigate the effect of the property change from public toward private ownership. The authors chose two techniques, namely, the nonparametric tests and the econometric technique. By using the nonparametric tests, they noted that, from a holistic point of view, all the selected companies in the sample failed to prove that there exists a determinant positive effect of privatization on efficiency indicators.

Nevertheless, privatization led to an improvement on productivity indicators at the level of 1% threshold and a positive and significant effect on average sales turnover. On the other side, privatization seemed to have a negative and significant effect at 1% threshold on the net margin ratio. It also worsened the financial situation of all companies whose debt ratios were inflated. These results deserve special attention since they do not converge with those of other studies. The difference in results can be simply explained by the fact that, when the average of a given value from all companies is considered, the problems of company size and its productive capacity can influence calculations.

The big financial loss of one company can neutralize the positive financial results of several other companies, and the calculation of averages can lead to an overall insignificant effect. Moreover, and as Charreaux and Alexandre (2001) pointed out, applied to a fictitious median firm, the results only give a rough and unrealistic view, which leads to state that the first method which tested the specific firm-by-firm effect remains more consistent.

The application of the econometric technique evidenced a whole restructuring policy on human resources allocation, in the postperiod privatization. This is logic because the incentive scheme of new privatized enterprise tried to be more efficient. In addition, the second model showed that the

human resources' dynamics post privatization depend of economic cycle and the nature of investors. The third model confirmed the idea that privatization leads to an improvement in work force and its productivity in the long run.

COMPETING INTERESTS

There is no interests conflict between authors.

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