



MASTER RECHERCHE

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LES THÉORIES ÉCONOMIQUES DE  
L'ENTREPRISE

« *La Théorie des contrats incomplets* »

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## Introduction to the incomplete contract theory



O. Hart  
Harvard U.

- *Pathbreaking article: Grossman S.J., and O.D Hart [1986], The Costs and Benefits of Ownership : a Theory of Vertical Integration, **Journal of Political Economy**, 94, 691-719.*
- *One announced goal: To propose a good formalization of the transaction cost theory*
- *One main strategy : The assumption of bounded rationality is not useful in order to build an organization theory*



# Assumptions

- Rationality
- Symmetric information
- Risky environment
- Incomplete contracting
  - **Contractual incompleteness comes from asymmetric information or bounded rationality of third parties**
  - Some specific investments are observable, but not verifiable
    - Mainly human asset specificity

A theoretical framework that is criticized, mainly because of internal inconsistency: Tirole 1999 *Econometrica* and *Journal of Legal Studies* 2000.



# A sketch of the theory

- Property rights and residual rights of control
- Investments are non verifiable (i.e. non contractible)
- Renegotiation occurs
  - It is efficient
  - Nash bargaining

Date 0

Date 1

Date 2

Signature of the contract  
Choice of property rights

Investments are made

Contract is renegotiated



## Example of Nash bargaining

- Nash bargaining example
  - Two contractants A and B
- Surplus generated by investment  $i = 100$ 
  - Outside option of agent A = 60
  - Outside option of agent B = 10
  - Surplus is shared such as :
    - Agent A =  $60 + (100 - 70)/2 = 75$
    - Agent B =  $10 + (100 - 70)/2 = 25$



John Nash  
1928 -



## Incomplete contracting and under-investment

- Agent A invests  $i$  at cost  $i$ ; generating a surplus  $R(i)$  with  $R' > 0$  et  $R'' < 0$ ;
- Agent B does not invest
- Investissement is 100% specific (*i.e.* no outside option)
  - First Best : Maximisation of the realized surplus
    - $\text{Max } R(i) - i \Rightarrow i^* / R'(i^*) = 1$
  - Second best
    - $\text{Max } PO - CO + 1/2 R(i) - i \Rightarrow i^{**} / R'(i^{**}) = 2$
  - Then:  $i^{**} < i^*$



## Main conclusions

- Contractual incompleteness opens room for hold-up behaviors.
- Agents anticipate this. This anticipation distort ex ante investments
- Property rights distribution permits to influence such distortion
  - By changing outside options
- There is no way to reach the first best

## Main Propositions

- **Vertical integration issues:**
  - Integration does not change the level of control or negotiation power!
    - Non contractible investments are still non contractible!
  - Integration gives to the party that own the assets a higher outside option. Incentives to invest are thus influenced by property rights
    - « *It would be too easy to construct a theory of the firm with the assumption that incentives are decreasing in the firm compared to the market* » [Hart 1995]
  - Who integrates is crucial: Party with the more crucial specific investments should integrate the other
    - but : if investments made by parties are equally important then what is optimal is the non-integration situation

## Some quotations

- *"The need, plainly, was to develop formal models of incomplete contract. That got under way with the publication of the path-breaking paper by Sanford Grossman and Oliver Hart [1986]" (WILLIAMSON [1993], page 42).*
- *"It is noteworthy that Grossman and Hart (and related papers of this kind) work from transaction cost economics premises - albeit with terminological differences. Thus Grossman and Hart employ the terms noncontractibility and nonverifiability rather than bounded rationality. And they refer to "relationship-specific investments" rather than asset specificity. Unanticipated state realizations, and the need to adapt thereto, are what pose contractual strains in their model. So uncertainty makes an appearance" (WILLIAMSON [1990], page 16).*

Versus

- *"If some of the central and critical ideas in transaction-cost economics as formulated by Williamson have been captured, others, equally important, have been missed. In particular, mathematics-based theory still lacks the language needed to capture essential ideas of bounded rationality, which are central to Williamson's concepts of transaction costs and contractual forms" David M. KREPS [1996], page 2.*
- Williamson 1999, 2000, 2002, Whinston 2003



## One precise example: Hart-Shleifer-Vishny 1997, Quarterly Journal of Economics



Oliver Hart  
Harvard U.

- ICT is now one of the leading theoretical framework to analyse make or buy issues
- Surprisingly, this is not yet the case when this question is applied to the public services cases (Hart 2003)
- First step: Hart-Shleifer-Vishny 97 - with an application to the prisons in US.
- Model that is similar to study the « proper scope of the firm »



## Theoretical framework

- Property rights and residual rights of control
- Investments are non verifiable (*i.e.* non contractible)
  - e: in order to reduce production costs
    - Positive effect  $c(e)$
    - Negative effect  $b(e)$  on quality
  - i: in order to increase quality
    - Positive effect  $B(i)$
    - Negative effect  $C(i)$  on costs
- Renegotiation occurs
  - It is efficient
  - Nash bargaining

Date 0

Date 1

Date 2

Signature of the contract  
Choice of property rights

Investments are made  
(i,e)

Contract is  
renegotiated



## Application to the US prisons

- The manager of the prison can be
  - A private manager
    - He owns the infrastructure and gets the residual rights of control
  - A civil servant
- The manager may develop two types of investments (*i.e.* effort levels):
  - One type of effort to increase his profitability (e)
    - *Example: Reduce qualification, number of employees*
  - One type of effort to increase quality (i)
    - *Example: electrification of the prison to avoid escape*
- Those investments are not contractible!
  - Why?



## First best as a benchmark

- Let's suppose that all investments are contractible
- A complete contract is then signed in order to maximize global surplus

$$(1) \quad \max_{e,i} \{-b(e) + c(e) + B(i) - C(i) - e - i\}$$

We know that  $e^*$  and  $i^*$  are such that:

$$(2) \quad -b'(e^*) + c'(e^*) = 1$$

$$(3) \quad B'(i^*) - C'(i^*) = \beta'(i^*) = 1$$

## A private manager runs the prison

- The manager owns the assets
- He decides unilaterally to implement or not innovation that reduces costs
- He renegotiates in order to implement innovations that increase quality
  - Why? Because otherwise, he is not paid for the increase of quality
  - What is the objective function of the government?

$$(4) \quad U_{M1} = B_0 - P_0 + 1/2\beta(i) - b(e)$$

$$(5) \quad U_{M2} = P_0 - C_0 + 1/2\beta(i) + c(e) - e - i$$

Manager M2 will choose  $e_{M2}$  and  $i_{M2}$  in order to maximize his utility

$$(6) \quad \max_{i,e} \{1/2\beta(i) + c(e) - e - i\}$$

The unique solution  $e_{M2}$ ,  $i_{M2}$  is such that:

$$(7) \quad c'(\overline{e_{M2}}) = 1$$

$$1/2\beta'(\overline{i_{M2}}) = 1$$

# A civil servant runs the prison

- Let's  $\lambda$  be the ease the civil servant might be replaced

$$(9) \quad U_{M1} = B_0 - P_0 + (1 - \lambda / 2)[-b(e) + c(e) + \beta(i)]$$

$$(10) \quad U_{M2} = P_0 - C_0 + \lambda / 2[-b(e) + c(e) + \beta(i)] - e - i$$

Manager M2 will choose  $e_G$  and  $i_G$  in order to maximize his utility

$$(11) \quad \max_{e,i} \left\{ \lambda / 2[-b(e) + c(e) + \beta(i)] - e - i \right\}$$

The unique solution  $e_{M2}, i_{M2}$  is such that:

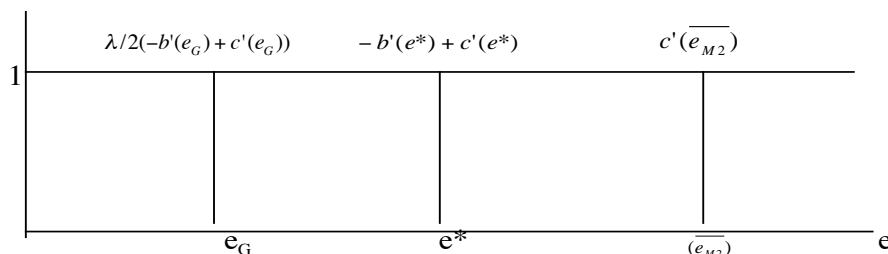
$$(12) \quad \lambda / 2(-b'(e_G) + c'(e_G)) = 1$$

$$\lambda / 2\beta'(i_G) = 1$$



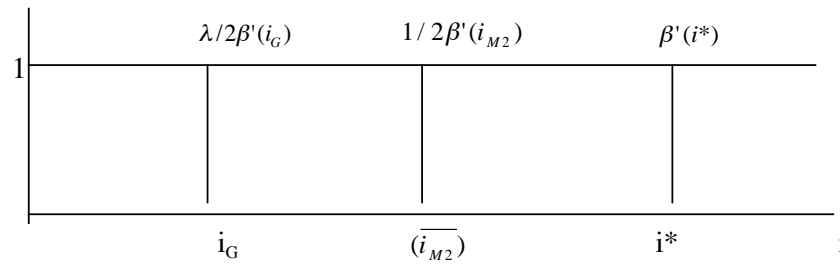
## What is the optimal organizational choice?

Incentives to reduce costs (i.e.  $e$ ) in each governance structure



# What is the optimal organizational choice?

Incentives to increase quality (i.e.  $i$ ) in each governance structure



# What is the optimal organizational choice?

- The public solution is an organizational solution that is characterized by low incentives.
- The public solution is nevertheless efficient when:
  - There exist few opportunities to innovate to increase quality (i.e. technology is mature)
  - Adverse effect of cost reductions on quality are high
  - There is no ex post competition
    - This is not in the model
    - Prisoners cannot choose their prison...

## US Prisons: Facts

- 95 % of them are publicly run / 5% are privately run
- Contracts signed between the State and managers are incomplete
  - Some dimensions are not contractible
    - Use of violence
      - Death, violence stat
    - Capabilities of the guards
      - Average wage compared to public prisons
- What the model would predict?



## US Prisons: Facts

- What the model would predict?
  - When adverse effects are low then private prisons should be chosen
    - Citizens do not care about violence and escapes
  - When adverse effects are high then public prisons should be chosen
    - Citizens do care about violence and escapes
- Why do we observe at the same time public and private prisons?
  - Prisons are specialized by type of prisoners
    - Private prisons are mainly youth correctional facilities
    - Maximum security prisons are publicly run



## Conclusion: what is a firm?

- TCT
  - Subordination / forbearance contracts
- ICT
  - A collection of assets
- IT
  - A nexus of contracts
    - *"incentive theory has nothing to say about such things as the distribution of authority within an organization, the limits of the firm, the separation between the public and the private spheres of the economy, and more generally nothing to say about organizational forms and designs"* (Malin & Martimort 2002)
    - In order for this theory to be able to add something to those issues, incentive models should *"take into account various forms of transaction costs and that those forms of transaction costs lead to various contract incompletenesses which can be easily described"*
- RBV
  - A place that is efficient to develop specific human investments



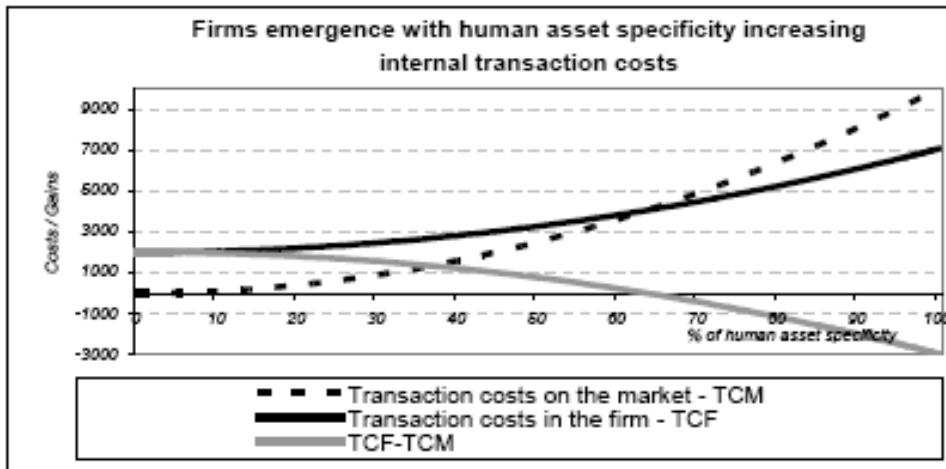
## Why so many theories?

- « Transaction cost is an empirical success story », Williamson 1996
  - That generates imprecise predictions (Whinston 2003)
  - That gave rise to inconclusive empirical tests (Carter-Hodgson 2006; Plunket-Saussier 2003)



# Is 'Resource based view' TCT compatible ?

**Figure 1. Firms emergence with human asset specificity increasing internal transaction costs**

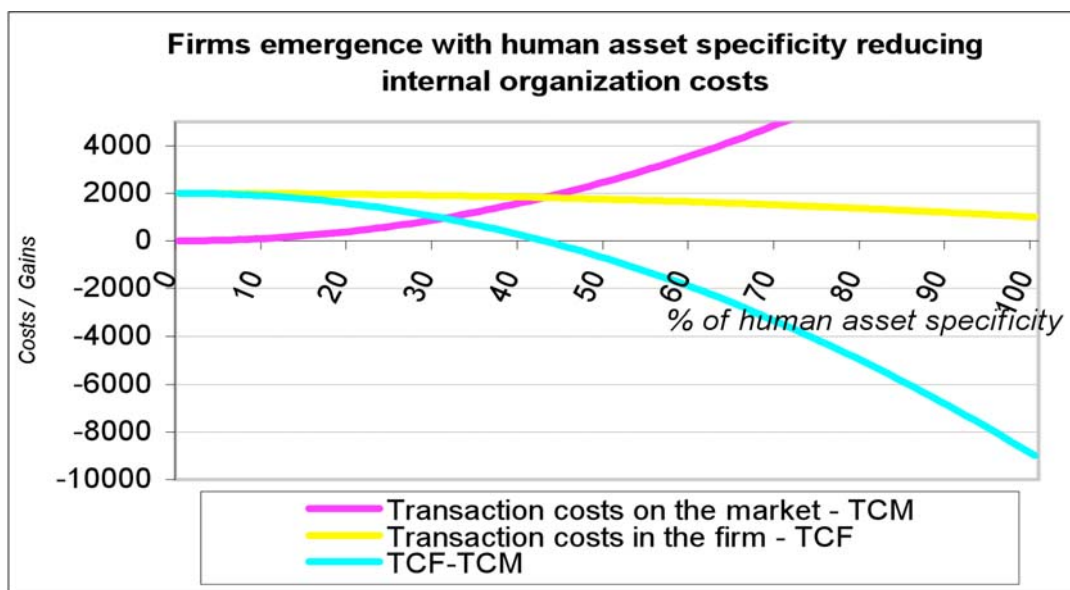


With  $TCM = x^2$ ;  $TCF = 2000 + 0,5 x + 0,5 x^2$ ;  $x$ : % of human asset specificity

TCM: transaction costs on the market ; TCF: transaction costs inside the firm



# Is 'Resource based view' TCT compatible ?



## Coming Back to Coase!



- Is there any modern theory taking Coase seriously?  
TCT?
  - The central role of asset's specificity and opportunistic behavior (Klein-Crawford Alchian 1988)
    - Find in TCE, ICT, RBV and RCT
  - « *Having developed the argument that asset specificity would expose a firm to the risk of opportunistic behavior and therefore lead to vertical integration to avoid it, I finally concluded that it was not an important factor influencing the structure of industry* » Coase 2006, p. 259

