Macroeconomic Consequences of Outsourcing

An analysis of growth, welfare, and product variety

by Henri L.F. de Groot[*]
Tilburg University and CentER
P.O.Box 90153
5000 LE Tilburg
The Netherlands
Tel: (+31) 13 466 2933
Fax: (+31) 13 466 3042
E-mail: H.L.F.deGroot@kub.nl

Abstract

Outsourcing of non-core activities by firms is nowadays a common business strategy. This paper provides a theoretical framework for analyzing a firms' incentive to follow such a strategy and its consequences for *macro*economic variables like growth and product variety. We divide production activities into core and non-core activities. Non-core activities can be performed within the firm or can be mediated by the market. We will derive conditions under which outsourcing will occur, and under which outsourcing will be socially desirable. These conditions do not necessarily coincide due to two externalities. Outsourcing may hence be a profitable strategy for firms, while it is socially suboptimal. Crucial parameters in the model are the relative scale of core versus non-core activities, traditional management costs, transaction costs and taste for variety of consumers. This paper suggests that declining transaction costs are a crucial factor in explaining the observed increase in outsourcing.

JEL codes: D23, L16, O40

Key-words: outsourcing, endogenous growth, product variety, transaction costs, welfare

This version: March 30, 1998

---

[*] I would like to thank Jan Boone, Richard Nahuis, Anton van Schaik, Sjak Smulders and Thomas Zwick for many useful discussions and insightful comments on earlier versions of this paper.

Macroeconomic Consequences of Outsourcing

An analysis of growth, welfare, and product variety

by Henri L.F. de Groot

Abstract

Outsourcing of non-core activities by firms is nowadays a common business strategy. This paper provides a theoretical framework for analyzing a firms' incentive to follow such a strategy and its consequences for macroeconomic variables like growth and product variety. We divide production activities into core and non-core activities. Non-core activities can be performed within the firm or can be mediated by the market. We will derive conditions under which outsourcing will occur, and under which outsourcing will be socially desirable. These conditions do not necessarily coincide due to two externalities Outsourcing may hence be a profitable strategy for firms, while it is socially suboptimal. The relative scale of core versus non-core activities, traditional management costs, transaction costs and taste for variety of consumers will turn out to be crucial parameters in the model. This paper suggests that declining transaction costs are a crucial factor in explaining the observed increase in outsourcing.

1. Introduction.

Outsourcing of activities to the service sector is nowadays a common business strategy. According to Abraham (1990) and Abraham and Taylor (1993) market mediated work arrangements associated with business service employment increased substantially over the period 1975-1990. For a longer period, Ten Raa and Wolff (1996) find a gradual increase in the share of service inputs in gross manufacturing input between 1947 (11.3 % in constant dollars) and 1977 (14.3 %), a strong rise till 1982 (16.9 %) and a small decline till 1987 (16.1 %). Part of the process of deindustrialization can be associated with this development. Activities previously performed within a manufacturing firm (e.g.,

accounting, maintenance, repair, janitorial and legal services) are currently performed in what is labelled the service sector. To the extent that this development occurs, deindustrialization (defined as a decline in manufacturing employment) should not be seen as a *real* phenomenon but as resulting from measurement problems. In addition, this development puts popular statements that most new employment is generated by small service sector specialists in perspective, to the extent that this employment has simply been transferred from (large) goods-producing firms to the service sector (Postner, 1990). Another reason why outsourcing is an interesting trend that deserves closer attention is that it changes the *internal* organization of the firm and can thereby potentially influence both the firm's performance and the macroeconomic performance of an economy.

So far, there have been several studies, theoretical and empirical, that look at reasons for and consequences of the upward trend in outsourcing in the last 20 years. Abraham and Taylor (1993) distinguish three broad theoretical considerations for outsourcing, namely savings on wage and benefit payments, transfer of demand uncertainty to the outside contractor, and access to specialized skills and inputs that the firm cannot afford itself. Wage and benefit savings can be achieved if activities can be contracted out to firms that offer less generous wages. The payment of high wages relative to outside contractors may be due to the presence of trade unions or efficiency wage considerations that play no role for the outside contractor. This kind of reasoning is especially relevant and interesting for high-wage firms that have good reasons for paying high wages to its core workers and at the same time (e.g., for reasons of rent sharing or fairness/equity) have no opportunity to pursue a different compensation strategy to the other workers.[1] This would suggest outsourcing of peripheral, low skill tasks by high wage firms. Feenstra and Hanson (1995) argue that outsourcing of this type is an important phenomenon that can contribute to the explanation of the widening wage gap in the US and the reduction of employment for unskilled workers. Transferring demand uncertainty as an incentive for contracting out can be relevant given the willingness of firms to smooth the work load of its regular work force. Required for profitability of outsourcing here is that the contractor supplies to firms that are (somewhat) unevenly hit by negative demand shocks. Contracting out in order to acquire specialized equipment or skills is especially relevant when economies of scale are involved in the supply of these production factors.

In an empirical study, based on establishment level data, Abraham and Taylor

---

[1] Empirical evidence has convincingly established that firms that pay high wage to workers in some occupations also pay (relatively) high wages to workers in other occupations (e.g., Blau, 1977, Dickens and Katz, 1987, and Dell'Aringa and Lucifora, 1990).

(1993) provide evidence that a combination of the three reasons discussed before is reflected in the decision to contract out (the analysis was restricted to manufacturing industries). Two specific reasons are advanced for the observed increase in contracting out activities in recent years. The first is the increasing gap between labour costs at contracting firms and the market price of labour available to perform a particular task. Secondly, there may have been an increase in the comparative advantage of specialized service establishments due to (i) increased demand (and greater potential to achieve economies of scale by spreading fixed costs over larger output and reducing the price) and (ii) improvements in communications infrastructure, allowing greater specialization and realization of greater economies of scale. The last two factors will turn out to be crucial elements in our theoretical model in the decision for firms to contract out.

The importance of outsourcing for understanding the recovery of productivity in US manufacturing is stressed by Ten Raa and Wolff (1996). They find that imputing material inputs embodied in services purchased by the manufacturing industry reduces the measured Total Factor Productivity (TFP) growth by one quarter. Furthermore, they show that there is a strong negative correlation between TFP growth in manufacturing on the one hand and TFP growth in those parts of the service sector that supply to manufacturing. One may conclude from this evidence that outsourcing was partly responsible for the recovery of manufacturing productivity and that manufacturing has been successful at externalizing those activities that are characterized by sluggish productivity growth.[2] A similar kind of argument is made by Siegel and Griliches (1992). They argue that the observed increase in TFP in manufacturing in the US between 1979 and 1987 is partly due to mismeasurement resulting from (1) outsourcing, (2) import of materials from foreign establishments, and (3) an increase in the rate of investment in computers. The result is that deflators for capital and materials are overstated and growth of inputs is underestimated leading to an overestimation of measured TFP growth in manufacturing. Krugman (1997, p. 127) states all this as follows: '... much business restructuring does not eliminate jobs; it merely outsources them from large corporations that pay high wages to smaller suppliers that often pay less. From the point of view of the restructured company, it may seem as if the same work is being done with far fewer people; from the point of view of the economy as a whole, output per worker may not have increased much, if at all.'

The study of Abraham and Taylor confines attention to the benefits of outsourcing

---

[2] Postner (1990) gives an interesting account of the problems that are involved when measuring the extent to which contracting out is a real phenomenon. Based on a Canadian survey, he reaches the conclusion that the growth rate of labour input that produces services is probably overestimated by official statistics due to inappropriate measurement of an increasing importance of contracting out.

at the level of the firm. However, costs are involved as well, and it is these costs that are central in the transaction cost literature. In this literature, a microanalytic approach is taken to the study of economic organization with a focus on transactions and the efforts of organizations to economize on these (Williamson, 1985 and 1998). Taking this perspective, outsourcing can be seen as a reorganizational effort aimed at a reduction of transaction costs defined in a broad sense, taking into account the comparative costs of planning, adapting and monitoring task completion under alternative governance structures. Much attention in this literature is paid to vertical integration by firms as a means of economizing on transaction costs (e.g., Williamson, 1985, chapters 4 and 5, Chandler, 1990, and Lazonick, 1991). Stated crudely, vertical integration can be seen as a business strategy opposite to that of outsourcing ('vertical disintegration' in terms of Stigler, 1951). Crucial elements in a firm's decision to vertically integrate are the importance of economies of scale and scope and governance cost differences under the alternative regimes of inhouse provision and market mediation. The principal factor to which appeal is made is that of asset specificity. The argument runs as follows. With low asset specificity, the governance cost of mediation by the market is low relative to that of inhouse provision (as there is a low degree of bilateral dependency when asset specificity is limited and the market restrains bureaucratic distortions more effectively, market mediation is relatively advantageous; see Williamson, 1985, for an extensive justification for this argument). Furthermore, economies of scale to be gained by a single supplier operating on the market are potentially large when asset specificity is low. For these reasons, vertical integration is unlikely to be profitable with low asset specificity. However, as asset specificity increases, the bureaucratic costs of internal governance decrease relative to those of market mediation due to increased bilateral dependency, increased costs of control, and the need of signing detailed contracts which are limited in adaptability respects. In addition, the benefits to be gained from economies of scale decrease as assets become more specific to the firm in question. Still another reason under high asset specificity is that the large market power of the supplier of the specialized asset may result in a relatively high price for the asset.[3] As a consequence, internal governance becomes more and more attractive when asset specificity increases and ultimately becomes the preferred mode of governance resulting in vertical integration (in the terminology of this paper, we can label this as 'insourcing'). A passage from Chandler (1990, p.38) clearly illustrates all the above mentioned aspects: '... as long as such [vertical]

[3] Avoiding the problem of double marginalization is often used as an argument for vertical integration in the literature on Industrial Organization (e.g., Tirole, 1988, and Viscusi, Vernon, and Harrington, 1995). Other vertical restrictions considered in this literature are, for example, resale price maintenance, exclusive dealing and tying. These restrictions are known to be potentially in the interest of society.

integration did not directly increase economies of scale or scope, as long as alternate sources of supply were available at reasonable price, and as long as legal and personal ties and relationships helped to assure the fulfilment of contractual arrangements, manufacturers usually preferred to buy their supplies rather than invest in and manage the production of those supplies. If the investment was not made to reduce the cost of transaction risks, it might be made merely as a profitable portfolio investment. But most manufacturers preferred other routes to growth...' (p. 38).

The elements pointed at in the transaction cost literature will recur in a stylized way in the analysis of the model to be developed in this paper. We will try to interpret some examples discussed in the transaction cost literature in terms of our model (section 4). The main deviation from the transaction cost literature with its focus on partial microeconomic analysis is that we put some of its elements in a general equilibrium model of endogenous growth in order to be able to study the macroeconomic consequences of outsourcing as a business strategy. Although we lose some of the rich descriptive elements present in the transaction cost literature, we think this approach of formalizing some of the ideas in the transaction cost literature within a general equilibrium model yields some interesting new insights in the macroeconomic consequences of outsourcing. We define outsourcing as vertical disintegration of production (i.e., buying indirect inputs on the market instead of producing them internally). The primary motive for outsourcing will be that it can give rise to exploiting economies of scale present in the production of the indirect inputs. We will develop a model that allows us to analyze under what conditions outsourcing will be a profitable strategy, abstracting from strategic considerations in the decision whether or not to engage in outsourcing. The model will be characterized by two equilibria; one in which all firms contract out (market mediation), and one in which all firms engage in self provision (internal governance). Having established if, for what reason, and under what conditions a firm engages in outsourcing, we will analyze the macroeconomic consequences (more specifically for the rate of growth and product diversity) and address the question whether outsourcing, when it occurs, is socially desirable. Due to the presence of two externalities, private profitability and social desirability of outsourcing do not coincide in general. Differences in governance costs and transaction costs in the two respective regimes may drive a wedge between the two.

This paper will proceed as follows. In section 2 we will discuss the complete model and present the two equilibria that characterize the model. The welfare characteristics of the model will be the topic of discussion in section 3. In this section, we will derive which of the two equilibria will prevail and whether the prevailing equilibrium is socially desirable. We will discuss two externalities that can drive a wedge between private profitability and social desirability. Section 4 will present some real world

examples extensively analyzed in the transaction cost literature and discuss and interpret these in the light of the specific model developed in this paper. In section 5, we will briefly deal with some potential extensions of the model. Section 6 concludes.

2. The model

We have an economy with *N* firms. Each firm produces a (unique) differentiated consumption good. These goods form imperfect substitutes so each firm has some monopoly power. Producers compete monopolistically à la Chamberlin. Free entry and/or exit of firms guarantees that, in equilibrium, firms make zero-profits (this assumption determines the number of differentiated products). The only factor of production is labour (*L*). Labour is homogeneous and supplied inelastically. There is no growth in labour supply. The cost of producing the consumption good consist of four parts. There is a direct wage cost resulting from the direct cost of production. This cost results from the primary or core activities of the firm (all those costs related to the manufacturing process itself). Secondly, there are indirect costs. These indirect costs result from the support or non-core activities of the firm (e.g., accounting, cleaning, janitorial, maintenance, and repair services). The firm can employ direct labour to perform these activities or it can engage in ‘outsourcing'. In the latter case, the firm buys the good on the market place from a monopolist with access to a superior fixed cost technology. Thirdly, a fixed cost has to be incurred before being able to produce (management labour). In the spirit of the transaction cost literature, this cost will depend on the adopted mode of governance (i.e., on whether the firm engages in outsourcing or sticks to internal provision of the good or service in question). Finally, firms engage in research by employing R&D labour. Research will result in increased total factor productivity and forms the ‘engine of growth' in the model.

This section will in turn discuss household behaviour, producer behaviour, and the equilibria in which the firm produces the good internally and engages in outsourcing, respectively. Finally, we will determine which equilibrium will prevail. We will compare the growth rates, firm size, and product diversity in the two respective regimes.

2.1 Household behaviour

A representative infinitely lived consumer maximizes his intertemporal utility subject to a

dynamic budget constraint

$$\max\ U = \int_0^{\infty} \frac{C_t^{1-\rho}}{1-\rho} e^{-\theta t} dt \quad \text{s.t.} \quad \dot{A}_t = r_t A_t + w_t L_t + \pi_Y - C_t P_{Ct}, \tag{1}$$

where C is a consumption index, $1/\rho$ is the intertemporal elasticity of substitution, θ the subjective discount rate, A wealth, r the interest rate, w the wage rate, π_Y are profits made in the sector that potentially supplies the producers of the consumption goods with their support activities,[4] and P_C the price index corresponding to the composite of consumption goods. In the remainder of this paper, we assume the intertemporal elasticity of substitution to be smaller than one ($\rho>1$). Optimization yields the Ramsey rule (a dot above a variable represents a derivative with respect to time, so $\dot{C}_t \equiv dC/dt$)

$$\frac{\dot{C}_t}{C_t} = \frac{r_t - \dot{P}_{Ct}/P_{Ct} - \theta}{\rho}, \tag{2}$$

according to which consumers accept a steeper consumption profile the larger the difference between the real rate of interest ($r - \dot{P}_C/P_C$) and the subjective discount rate, and/or the larger the intertemporal elasticity of substitution ($1/\rho$). The composite good C is composed out of varieties of consumption goods. We assume that consumers have a love for variety. In the second step of their optimization consumers maximize the consumption index C subject to a static budget constraint

$$C = N^{\sigma}\left[\frac{1}{N}\sum_{i=1}^{N} c_i^{\frac{\varepsilon-1}{\varepsilon}}\right]^{\frac{\varepsilon}{\varepsilon-1}} \quad \text{s.t.} \quad \sum_{i=1}^{N} c_i p_{ci} \le C_t P_{Ct}. \tag{3}$$

where c_i is the consumed quantity of the consumption good of variety i. Consumption goods of different types are imperfect substitutes ($\varepsilon>1$). The parameter σ captures the preference for diversity which is, contrary to Dixit and Stiglitz (1977), explicitly distinguished from the elasticity of substitution between any pair of consumption goods (in the case considered by Dixit and Stiglitz, the parameter capturing taste for diversity equals $\varepsilon/[\varepsilon-1]$). We assume σ to be larger than one. The consumption index C can then, under symmetry, be written as $C=N^{\sigma-1}(Nc)$. Under the assumption of $\sigma>1$, consumers prefer of

[4] Profits in the consumption goods sector are 'by definition' equal to zero because of the free entry and exit assumption so we may omit these profits in the dynamic budget constraint. In the equilibrium in which the support activities are performed internally, the sector providing these activities is not operating and hence $\pi_Y=0$.

two equally sized bundles, $(Nc)^1=(Nc)^2$, the one with the largest variety (N). We refer to Benassy (1996), Broer and Heijdra (1996), and De Groot and Nahuis (1997) for an extensive discussion of this way of modelling taste for diversity (and its consequences for welfare analysis). Optimization yields a downward sloping demand curve for a consumption good of variety i

$$c_i = \left(\frac{p_{ci} \sum_{i=1}^{N} c_i^{\frac{\varepsilon-1}{\varepsilon}}}{C} \right)^{-\varepsilon} . \tag{4}$$

2.2 Producer behaviour

Each of the N active firms in the economy aims at maximizing its present discounted value by producing and selling a unique brand of a consumption good. Production requires direct labour L_{ci} and support activities y_i. Total factor productivity is h_i. We assume that production takes place with a Leontief production technology (there are no substitution possibilities between the inputs)

$$c_i = h_i \min\left[L_{ci}, \frac{y_i}{a} \right] . \tag{5}$$

The parameter a measures the input of support activities per unit of labour input, L_c. An alternative way of conceiving this production process is to formulate the 'core business' of the firm resulting in the production of the differentiated consumption good as

$$c_i = h_i L_{ci} , \tag{5a}$$

where, in order to produce this output, an additional (indirect) input y is required that equals

$$y_i = a L_{ci} , \tag{5b}$$

according to which this additional input requirement is directly related to the scale of operation of the firm (L_c).

Following Van de Klundert and Smulders (1995), we assume that knowledge (total factor productivity) has important firm specific elements (i.e., knowledge is tacit). Firms

can increase productivity by employing labour for R&D activities. The productivity of R&D labour increases with knowledge accumulated in the past

$$\dot{h}_i = \xi h_i L_{ri} . \tag{6}$$

In this specification, h_i represents total factor productivity, L_r is labour employed in R&D, and ξ is a productivity parameter. Note that knowledge is completely internal to the firm. There are thus no externalities resulting from inter-firm knowledge spill-overs. This is important for our welfare analysis, which is to follow in section 3, since it allows us to focus on the crucial externalities we want to focus on in the context of the decision to engage in outsourcing. Growth in this model is endogenous as the reproducible factor *h* can be accumulated with constant returns to scale with respect to itself.

Finally, in each period, each producer of the consumption good has to employ an amount of management labour (a traditional fixed cost) before being able to produce (equal to L_m). This fixed cost will (potentially) differ between the two modes of governance. An assumption we make in the subsequent analysis is that in deciding which mode of governance to adopt, firms do not take into account the consequence of this choice for the management cost. In other words, firms decide whether or not to engage in outsourcing completely on the basis of cost-considerations related to the potentially outsourced product. We relax this assumption in Appendix C where we solve the model in case producers of the consumption goods do take into account the consequences of their decision to engage in outsourcing for the management cost.[5] The basic results we will derive in the main text are not altered by the relaxation of this assumption.

We are now able to derive the two equilibria that we can distinguish in this model (i.e., the equilibrium with internal provision of the support activities and the equilibrium with outsourcing). Characterization of these equilibria will be the topic of section 2.2.1 and 2.2.2, respectively. In section 2.2.3 we will compare the equilibria and determine which equilibrium will prevail. We will indicate the equilibria by an index *j* which equals *I* when the firm provides the support activity internally, and *O* when it engages in outsourcing.

---

[5] Something similar (though in a completely different context) is done in Dluhosch (1997). In this paper, a partial equilibrium model is developed to study the effects of increased openess on the technological structure of a firm. In this model firms can control the extent to which they use specialized components and the extent to which they buy goods at a low price abroad. In both cases a trade-off is involved. Using more specialized components increases labour productivity but also increases fixed (scale independent) costs. Similarly, outsourcing reduces the costs of the inputs as they are cheaper abroad, but increases fixed costs. Outweighing these costs and benefits determines the equilibrium of the model.

2.2.1 Equilibrium with Internal Provision of the Support Activities

In the equilibrium with internal provision of the support activity, y_i, this activity is produced with labour, L_{yi}, according to a constant returns to scale technology

$$y_i = L_{yi} . \tag{7}$$

Producers aim at maximizing their present discounted value. Their optimization problem is

$$\max_{L_{ci}, L_{ri}} \int_0^\infty \left(c_i p_{ci} - (L_{ci} + L_{yi} + L_{ri} + L_m^I) w \right) e^{-rt} dt , \tag{8}$$

subject to (4), (5), and (6). Standard dynamic optimization of the current value Hamiltonian yields the following first order conditions:

$$\frac{\partial H}{\partial L_{ci}} = p_{ci} h_i \left(1 - \frac{1}{\varepsilon} \right) - w(1 + a) = 0 \quad \Leftrightarrow \quad p_{ci} = \frac{\varepsilon}{\varepsilon - 1} \frac{w(1+a)}{h_i} , \tag{9}$$

according to which firms put a mark-up of $\varepsilon/(\varepsilon\text{-}1)$ over unit wage-costs ($w[1+a]/h$),

$$\frac{\partial H}{\partial L_{ri}} = p_{hi} \xi h_i - w = 0 \quad \Leftrightarrow \quad p_{hi} \xi h_i = w , \tag{10}$$

according to which firms change the number of R&D workers until the marginal benefit of the last worker ($\xi p_h h$) equals its marginal cost (w), where p_h is the shadow price corresponding to knowledge, and

$$\frac{\partial H}{\partial h_i} = p_{ci} L_{ci} \left(1 - \frac{1}{\varepsilon} \right) + p_{hi} \xi L_{ri} = r p_{hi} - \dot{p}_{hi} \quad \Leftrightarrow \quad r = \frac{\dot{p}_{hi}}{p_{hi}} + L_{ci} \frac{p_{ci}}{p_{hi}} \frac{\varepsilon - 1}{\varepsilon} + \xi L_{ri} , \tag{11}$$

which is the no-arbitrage condition. This condition states that investing an amount p_h in the financial market at rate r should yield the same return as investing in knowledge capital which yields a capital gain, an increase in production, and an increase in the knowledge base. The model is closed by imposing a zero profit condition, stating that entry or exit occurs until profits in the consumption goods sector equal zero

$$c_i p_{ci} = (L_{ci} + L_{yi} + L_{ri} + L_m^I) w , \tag{12}$$

and a labour market constraint

$$L = \sum_{i=1}^{N} \left(L_{ci} + L_{yi} + L_{ri} + L_m^I \right). \tag{13}$$

Assuming symmetry between firms, we can drop firm indices, and solve for the steady state of the model taking the wage rate as numéraire (w=1). This yields the steady state rate of growth (see Appendix A)

$$g^I \equiv \frac{\dot{h}^I}{h^I} = \frac{\xi(\varepsilon-1)}{\rho-\varepsilon}\left[L_m^I - \frac{\theta}{\xi(\varepsilon-1)} \right], \tag{14}$$

and the equilibrium number of firms and the number of production workers (see Appendix A)[6]

$$N^I = \frac{L\xi(\rho-\varepsilon)}{\left[\xi(\rho-1)L_m^I - \theta\right]\varepsilon} \quad \text{and} \quad L_c^I = \frac{(\varepsilon-1)\left[\xi(\rho-1)L_m^I - \theta\right]}{\xi(\rho-\varepsilon)(1+a)}. \tag{15}$$

An important notion that will recur in the analysis of the model to follow is that the growth rate positively depends on the traditional management cost, and that the equilibrium number of firms negatively depends on this management cost. As management costs increase, the room for firms with non-negative profits becomes smaller (the equilibrium number of firms declines). As a consequence, each individual firm becomes larger in size and its market share increases. This increased market share increases the incentive for firms to engage in R&D as each firm can now spread its (quasi) fixed R&D cost over a larger output. The rate of growth will consequently increase. Another characteristic of the equilibrium is that the macroeconomic production of non-core activities ($N^I a L_c^I = (\varepsilon-1)aL/[\varepsilon(1+a)]$) is independent of the fixed management cost. An increase in the management cost leads to an increase in firm size and to an equiproportionate decrease in the number of firms. The macroeconomic demand for non-core activities is positively related to the mark-up. This is explained since a low mark-up leaves limited room for firms with non-negative profits. The macroeconomic employment of management labour ($N^I L_m^I$) consequently goes down, leaving more room for productive activities.

---

[6] Stability of the equilibrium with a positive growth rate requires the following restriction on the parameters: $(\rho-1)>(\varepsilon-1)>\theta/\xi L_m^I$.

2.2.2 Equilibrium with Outsourcing of the Support Activities

In the equilibrium with outsourcing, a monopolist has access to a superior fixed cost technology and can produce the support activities, using labour L_Y, according to

$$Y = \delta(L_Y - F) . \tag{16}$$

In a symmetric equilibrium, the output of the monopolist (Y) equals the demand from the producers of the consumption goods (Ny_i). The superiority of the production technology is reflected in the assumption we make that $\delta>1$. The fixed cost (expressed in units of labour) equals F. This fixed cost can in part be seen as a cost that has to be incurred each period by the monopolist to establish and maintain a relation with its customers (the users of the non-core activities),[7] and in part as the cost of acquiring and using the superior technology. For outsourcing to take place, it has to be mutually beneficial. This means that the price of the non-core activity should be sufficiently low for the producer of consumption goods, while it should be sufficiently large for the monopolist to make it possible for him to earn a profit. More specifically, these conditions imply that the monopolist will engage in limit pricing,[8] charging a price of the support activity that will be equal to w (the unit-cost of a support activity when produced internally). Pricing by the monopolist of the non-core activity slightly below this unit cost makes it profitable for the producer of the consumption good to engage in outsourcing, and hence it will take the decision to do so.[9] The optimization problem for the producer of consumption goods now

---

[7] See for example Kelley (1997) for a model in which the monopolist can explicitly invest in establishing a relation with customers and thereby enlarge the market it can supply. Similar considerations could be built in our model, but would significantly complicate the analysis without adding to the basic insights.

[8] We formally show in Appendix A that it is indeed optimal for the monopolist to charge as high a price as possible, and thus to engage in limit pricing. In Appendix C, we will derive the limit price under the (alternative) assumption that the producers of consumption goods do take into account the consequences of their decision to engage in outsourcing for the amount of management labour they need (L_m).

[9] Of course, there are more considerations to this decision not taken into account in this model for reasons of simplicity, like considerations of increased uncertainty or reduced quality of the non-core activities once a firm engages in outsourcing. Such extensions are interesting but beyond the scope of the current paper.

looks like

$$\max_{L_{ci},L_{ri}} \int_0^{\infty} \left(c_i p_{ci} - (L_{ci} + L_{ri} + L_m^O) w - y_i p_Y \right) e^{-rt} dt \,, \tag{17}$$

subject to (4), (5), (6), and (16).

Standard dynamic optimization of the current value Hamiltonian yields the following first order conditions:

$$\frac{\partial H}{\partial L_{ci}} = h_i p_{ci} \left(1 - \frac{1}{\varepsilon} \right) - w - p_Y a = 0 \quad \Leftrightarrow \quad p_{ci} = \frac{\varepsilon}{\varepsilon - 1} \frac{w + a p_Y}{h_i} \,, \tag{18}$$

$$\frac{\partial H}{\partial L_{ri}} = p_{hi} \xi h_i - w = 0 \quad \Leftrightarrow \quad p_{hi} \xi h_i = w \,, \tag{19}$$

$$\frac{\partial H}{\partial h_i} = L_{ci} p_{ci} \left(1 - \frac{1}{\varepsilon} \right) + p_{hi} \xi L_{ri} = r p_{hi} - \dot{p}_{hi} \quad \Leftrightarrow \quad r = \frac{\dot{p}_{hi}}{p_{hi}} + L_{ci} \frac{p_{ci}}{p_{hi}} \frac{\varepsilon - 1}{\varepsilon} + \xi L_{ri} \,. \tag{20}$$

It is important to note here that, given the limit-pricing behaviour of the monopolist, the cost structure in this regime is exactly the same as in the regime with internal provision. The model is closed by imposing a zero profit condition, stating that entry or exit occurs as long as profits are unequal to zero

$$c_i p_{ci} = (L_{ci} + L_{ri} + L_m^O) w + y_i p_Y \,, \tag{21}$$

and a labour market constraint

$$L = \sum_{i=1}^{N} \left(L_{ci} + L_{ri} + L_m^O \right) + L_Y \,. \tag{22}$$

The steady state rate of growth can now be obtained as (see Appendix A)[10]

$$g^O = \frac{\xi(\varepsilon - 1)}{\rho - \varepsilon} \left[L_m^O - \frac{\theta}{\xi(\varepsilon - 1)} \right] . \tag{23}$$

The equilibrium number of firms and the equilibrium number of production workers per

[10] Stability of the equilibrium with a positive growth rate requires the following restriction on the parameters: $(\rho-1)>(\varepsilon-1)>\theta/\xi L_m^O$.

firm equals (see Appendix A)

$$N^O = \frac{(L-F)\,\delta\,\xi\,(\rho-\varepsilon)(1+ap_Y)}{\left[a(\varepsilon-1+\delta p_Y)+\delta\varepsilon\right]\left[\xi(\rho-1)L_m^O-\theta\right]} \quad \text{and} \quad L_c^O = \frac{(\varepsilon-1)\left[\xi(\rho-1)L_m^O-\theta\right]}{\xi(\rho-\varepsilon)(1+ap_Y)}. \quad (24)$$

Again, the macroeconomic demand for non-core activities ($N^O L_C^O$) is not affected by the fixed management cost.

2.2.3 Comparison of the two regimes and equilibrium selection.

In this section, we will compare the macroeconomic characteristics of the two respective equilibria (i.e., we will compare product diversity, firm size, the volume of production and the rate of growth). Then we will derive which equilibrium will prevail (i.e., for which non-core/support activities it is profitable for firms to engage in outsourcing).

The growth rates (equations (14) and (23)) are different to the extent that there are differences in the traditional fixed cost (management cost). If these costs are larger in the regime in which outsourcing occurs, the room for firms with non-negative profits decreases, market shares of remaining firms increase, the incentive to engage in R&D increases, and hence the rate of growth will be larger (and the other way around).

Comparing product diversity (as measured by N; see equations (15) and (24)) in the two equilibria boils down to

$$N^I > N^O \quad \textit{iff} \quad \frac{L}{\left[\xi(\rho-1)L_m^I-\theta\right]} > \frac{(L-F)(1+a)\delta\varepsilon}{[a(\varepsilon-1+\delta)+\delta\varepsilon]\left[\xi(\rho-1)L_m^O-\theta\right]}. \quad (25)$$

The relative number of firms in the two regimes depends on the relative amount of management labour needed and the superiority of the fixed cost technology of the monopolist.[11] The more management labour is needed in the regime with internal provision relative to the regime with outsourcing, the lower will be the relative number of firms in the regime with internal provision. As management costs are larger, there will be less room for firms with non-negative profits. The fixed cost technology will be more superior, the lower the associated fixed cost (F), the larger the superiority of productivity (δ), and the larger the intensity with which non-core activities are used (a) as this allows

[11] Subtracting the solution for the number of firms under outsourcing (equation (24)) from the solution for the number of firms under inhouse provision (equation (15)), and taking derivatives, it can be verified that $d(N^I-N^O)/dL_m^I<0$, $d(N^I-N^O)/dL_m^O>0$, $d(N^I-N^O)/dF>0$, $d(N^I-N^O)/da<0$, and $d(N^I-N^O)/d\delta<0$.

to spread the fixed cost of the superior technology over a larger output. As the fixed cost technology becomes more superior, less labour is required for producing support activities, leaving more labour for the production of consumption goods, resulting in a larger diversity of these goods.

Outsourcing will be a *feasible* strategy if profits for the monopolist supplying the support activities are positive at the limit price ($p_Y=w$). This condition boils down to (using equation (24))

$$\pi_Y = p_Y N^O y^O - wL_Y = w\left[N^O a L_c^O\left(\frac{\delta-1}{\delta}\right) - F\right] \geq 0 \Leftrightarrow La(\varepsilon-1)(\delta-1) \geq F\varepsilon\delta(1+a). \tag{26}$$

Producing $N^O y^O$ internally would require $N^O a L_c^O$ units of labour. Outsourcing is in other words feasible (and will thus occur) if the labour requirement by the monopolist (L_Y) is smaller than the amount of labour required for the same production volume under inhouse provision. Note that in the specific case in which $L_m^O=L_m^I$ the condition for outsourcing to be profitable coincides with the condition for the number of firms to be larger under outsourcing than under internal provision (see the condition derived in equation (25)). In this case, firm size with respect to core activities ($L_c+L_r+L_m$) is equal in the two regimes. We know that outsourcing is profitable if less labour is required for the production of a certain amount of non-core activities by the monopolist than would be required if firms would engage in self-provision. So if outsourcing is profitable, more firms can be sustained in the equilibrium with outsourcing than with internal provision, since more (direct) labour remains for productive purposes. In more general cases in which $L_m^O \neq L_m^I$, we can show that the monopolist will be indifferent about providing the non-core activity (i.e., $\pi_Y=0$) in the specific case in which the macroeconomic demand for non-core activities is equal in the two equilibria, which holds if[12]

$$N^O = \frac{N^I a L_c^I}{a L_c^O} = \frac{\xi L(\rho-\varepsilon)}{\varepsilon\left[\xi(\rho-1)L_m^O - \theta\right]}.$$

We can interpret this condition as the minimum number of firms that has to be sustained in the equilibrium with outsourcing for outsourcing to be a profitable strategy for the monopolist (given the limit-price he can maximally charge). We will recur to this condition for outsourcing to be profitable in section 3.

---

[12] Using the solutions for N^j and L_c^j, we can derive a condition for which macroeconomic demand is equal in the two regimes. This condition boils down to $La(\varepsilon\text{-}1)(\delta\text{-}1)=F\varepsilon\delta(1+a)$. This condition is equal to the condition $\pi_Y=0$.

We can thus conclude that outsourcing is more likely to occur the larger the scale of the economy (L), the smaller the fixed cost of the superior technology (F), the larger the productivity of the superior technology (δ), the larger the demand for the support activity (a), and the larger the elasticity of substitution (ε); see equation (26). In other words, outsourcing will occur if the fixed cost technology is sufficiently superior, if the scale of the economy is large so that the (additional) fixed cost of the superior technology can easily be spread over large output (the degree of specialization is limited by the size of the market), and if consumption goods are close substitutes. This last result can be understood as close substitutability between consumption goods implies strong competition and a relatively small number of firms. There will consequently be much labour left for productive purposes as the amount of labour required for management activities (NL_m) is relatively small. The demand for support activities will consequently be relatively large and the profitability for the monopolist with access to the superior technology increases. Competition thus fosters outsourcing.[13] Note that the management requirement does not enter in the condition for outsourcing to be profitable (see equation (26)). The reason is that an increase in the management cost leads to an equiproportionate decrease in the firm size. The macroeconomic demand for non-core activities is hence left unaffected, which is what the monopolist supplying the non-core activities is interested in.

In this section, we have seen how the two equilibria that we can distinguish in this model look like and we have established which equilibrium will prevail in the market. In the next section, we will look at the welfare characteristics of the equilibria of this model. We will derive whether the prevailing equilibrium in the market economy is desirable from a social point of view.

3. Outsourcing and Welfare; Growth versus Product Diversity

In this section, we will determine the welfare characteristics of the model in order to see whether outsourcing is socially desirable in cases where it is privately profitable. We will show that there are two externalities present in this model that may drive a wedge between private profitability and social desirability.[14] The first is that the monopolist in deciding

[13] A similar result is derived in a trade model by Dluhosch (1997). Trade is argued to enhance competition and thereby increase the scale of firms and increase the incentive to save on production costs. This is shown to result in an increased slicing of the value chain and an increase in outsourcing.

[14] Due to limit-pricing by the monopolist, there is no effect of a firms' decision to start outsourcing on the internal cost structure of the firm (the cost of one unit of indirect input is equal to the wage rate in both regimes). This holds although a firms' decision to engage in outsourcing decreases the average cost of pro-

whether or not to supply the non-core activities does not take into account the effect of its decision on the product diversity. Similarly, the individual firm producing consumption goods does not take into account this effect when deciding whether or not to engage in outsourcing. Secondly, the monopolist does not take into account that its decision to start operating affects the internal organization of the firm producing consumption goods and thereby affects its incentive to engage in R&D. We will show that in one specific case, these two externalities exactly cancel and the market always yields the socially desirable decision. In this case, the market (unintentionally) makes the 'correct' tradeoff between growth and variety. This result can, however, not be generalized. The market may result in outsourcing while it is not socially desirable, and the other way around. This section proceeds by deriving and comparing welfare in the two regimes in section 3.1. In section 3.2 we will compare the conditions for outsourcing to be feasible with the conditions for outsourcing to be socially desirable. The market generally does not make the socially optimal trade-off between growth and product diversity when outsourcing is to be considered by firms. We will proceed by discussing the comparative statics of the model in somewhat more detail, focussing on the effects of gradually declining transaction costs.

3.1 Welfare in the two regimes.

In order to make a welfare evaluation of the social desirability of outsourcing, we need to compare the present discounted utility of the representative household in the two equilibria of the model. We recall from section 2.1 that the present discounted utility equals

$$U_0 = \int_0^{\infty} \frac{C_t^{1-\rho}}{1-\rho} e^{-\theta t} dt. \tag{28}$$

Substituting equation (5a) into equation (3) and using the fact that the allocation of labour and the growth rate are constant over time (in the steady state), we derive

$$C = N^{\sigma} c_i = N^{\sigma} h_0 e^{gt} L_c, \tag{29}$$

where h_0 is the initial productivity level at time t=0 (which subsequently grows at a

---

ducing the indirect input by the monopolist.

constant rate g). We can thus derive the present discounted value of utility as

$$U_0 = \int_0^{\infty} \frac{\left[N^{\sigma} h_0 L_c\right]^{1-\rho}}{1-\rho} e^{[(1-\rho)g-\theta]t} dt, \tag{30}$$

Integrating this expression finally yields

$$U_0 = \frac{-1}{(\rho-1)\left[g(\rho-1)+\theta\right]\left[N^{\sigma-1} h_0 (NL_c)\right]^{\rho-1}}. \tag{31}$$

The present discounted utility of consumers is essentially determined by three factors (independent of the prevailing regime). The rate of growth has a positive effect on utility. Secondly, product diversity positively affects utility (captured by the term $N^{\sigma-1}$). This is due to the diversity effect in consumer preferences ($\sigma>1$). Finally, utility is positively affected by the produced volume of consumption goods (basically captured by NL_c). Given our previous discussion of the characteristics of the model, it will be evident that there are two trade-offs involved here. Research labour goes at the expense of production labour, while product diversity goes at the expense of both growth and the production volume.

To compare welfare in the two distinguished regimes, we look at the difference between utility in the two regimes[15]

$$\text{sgn.}\left(U^O - U^I\right) = \text{sgn.}\left(\left[\frac{\xi(\rho-1)L_m^O - \theta}{\xi(\rho-1)L_m^I - \theta}\right]^{\frac{\rho}{\sigma(\rho-1)}-1} - \left[\frac{L[a(\varepsilon-1+\delta)+\delta\varepsilon]}{(L-F)(1+a)\delta\varepsilon}\right]\right). \tag{32}$$

The desirability of outsourcing increases with the superiority of the fixed cost technology (the fixed cost technology is more superior the larger δ, a, and L, and the smaller F).[16] A larger elasticity of substitution increases the desirability of outsourcing as close substitutability between consumption goods implies strong competition, and a relatively small number of firms. There will consequently be much labour left for productive purposes as the amount of labour required for management activities (NL_m) is relatively

---

[15] Using equation (31), we derive

$$\text{sgn.}\left(U^O - U^I\right) = \text{sgn.}\left(\frac{-1}{\left[g^O(\rho-1)+\theta\right]\left[(N^O)^{\sigma} L_c^O\right]^{\rho-1}} + \frac{1}{\left[g^I(\rho-1)+\theta\right]\left[(N^I)^{\sigma} L_c^I\right]^{\rho-1}}\right)$$

Substituting the expressions for g^j, N^j, and L_c^j from equations (14), (15), (23), and (24) and rewriting yields equation (32).

[16] These results follow from taking first order derivatives of U^O-U^I with respect to the parameters under consideration.

small. The demand for support activities will consequently be relatively large, increasing the desirability of exploiting the economies of scale to be gained by using the superior technology. The effect of the (relative) management cost in the respective modes of governance (L_m^O/L_m^I) on the desirability of outsourcing depends on the strength of the taste for diversity (σ) relative to the intertemporal elasticity of substitution ($1/\rho$). To understand this, we have to keep in mind that our model is characterized by a trade off between growth and product variety. The economy is characterized by either few large firms with high market shares and huge incentives to engage in R&D, or by many small firms with small market shares and limited incentives to perform R&D activities. We have seen in section 2 that large management costs result in small product diversity, large market shares for firms, and an accompanied large incentive to engage in R&D. Now suppose that the regime switch from internal provision to outsourcing is accompanied by a decrease in management costs (see sections 1 and 4 for a discussion on governance costs that depend on the adopted mode of governance). Outsourcing will then be accompanied by an increase in product diversity and a decrease in the rate of growth. The lower the relative management cost (L_m^O/L_m^I) the stronger this effect will be. The desirability of outsourcing will hence be positively affected by a decrease in relative management cost if the taste for diversity is strong relative to the intertemporal elasticity of substitution. If the taste for diversity is weak relative to the intertemporal elasticity of substitution, a decrease in the relative management cost will decrease the likeliness that utility in the regime with outsourcing is larger than with internal provision. In the intermediate case, where $\sigma=\rho/(\rho-1)$, the growth and diversity effect on utility exactly cancel. The increased likeliness that outsourcing is socially desirable due to larger growth is exactly offset by its decreased likeliness due to lower variety. Relative utility is hence not affected by relative management costs in this specific case.[17]

3.2 Profitability vs. desirability of outsourcing: the case of declining transaction costs

In the previous sections we have studied the feasibility of outsourcing (section 2.2.3), and we made a welfare comparison between the two equilibria of the model (section 3.1). Outsourcing is feasible and was argued to occur if it is mutually beneficial for the monopolist with access to the superior production technology to start producing support

[17] Mathematically, these results follow from considering the power in equation (32). If $\sigma>\rho/(\rho-1)$, this power is negative and hence $d(U^O-U^I)/d(L_m^O/L_m^I)<0$. If $\sigma=\rho/(\rho-1)$, this power is equal to zero and hence $d(U^O-U^I)/d(L_m^O/L_m^I)=0$.

activities (i.e., $\pi_Y>0$; see equation (26)), and for the producer of consumption goods to buy non-core activities on the market ($p_Y<w$). Outsourcing is desirable from a social point of view if the present discounted value of utility is higher in the regime with outsourcing than in the regime with inhouse provision (i.e., $U^O>U^I$ or sgn.$(U^O-U^I)>0$; see equation (32)).

In this section, we will analyze whether outsourcing is privately profitable if it is socially desirable (and the other way around). The coincidence of private profitability and social desirability will turn out *not* to hold in general. In order to illustrate this proposition and to gain more insight in the working of the model, we now turn to an example. More specifically, we will look at the effects of a gradual decline in transaction costs for the desirability and profitability of outsourcing. This will be done under various parameter constellations. It will turn out that changing transaction costs are potentially important in explaining shifts from a regime with inhouse provision to outsourcing. In intermediate cases, outsourcing may be socially desirable but not profitable for the monopolist performing the non-core activity with a superior fixed cost technology (and the other way around). In other words, the externalities in the model may result in socially undesirable decisions by individual firms with regard to outsourcing.

We introduce transaction- or transportation costs by splitting the parameter δ into two parts (see equation (16)). One part reflects the *purely* technical productivity advantage of the monopolist (δ' which is larger than one). The other part reflects the fact that only a fraction (1-*t*) of the produced amount of the support activity can effectively be used by the producer of the consumption good (when conceiving *t* as a pure transportation cost of the iceberg-type, one can imagine that a fraction *t* of the shipped production is 'lost' during transportation). The parameter δ then equals $(1-t)\delta'$. Declining transaction- or transportation costs are thus reflected in an increase in the parameter δ.[18]

To look at the effects of declining transaction costs in this model, we will rely on a graphical method. As we are mainly interested in the effect on profitability and social desirability of (i) changing transaction costs and (ii) changes in the management requirements of firms following a regime shift, we construct a δ-L_m^O/L_m^I diagram. In this diagram, we can construct three loci representing combinations of parameters for which $\pi_Y=0$ (the PP-locus), for which $N^I=N^O$ (the NN-locus), and for which $U^O=U^I$ (the DD-

[18] Note that changes in transaction costs are in part already reflected in a difference in the management requirement in the two regimes and in the presence of a fixed cost in the production technology of the monopolist with access to the superior technology. However, the three parameters reflect different factors. The parameter *t* comes closest to a real transportation cost for which location is one of the important considerations. Differences in management requirements L_m reflect organizational consequences of the decision to start outsourcing. The fixed cost requirement *F* should be conceived as the cost of acquiring the superior technology and acquiring relations with potential customers (e.g., Kelley (1997)).

locus), respectively. These loci are derived from the equations (25), (26) and (32). Appendix B gives a mathematical representation and discussion of the position of the loci. They are depicted in Figures 1a-1c. The PP-locus is vertical in the δ-L_m^O/L_m^I diagram. Irrespective of the management cost, there is exactly one value of δ for which the monopolist breaks even. At larger (smaller) values of δ, the monopolist makes profits (losses). This result is casued by the fact that changes in management costs resulting in changing firm sizes, lead to equiproportionate (and opposite) changes in the number of firms. They consequently leave the macroeconomic demand for non-core activities unaffected, which ultimately is the factor determining private profitability of outsourcing. There is hence exactly one value for δ for which the monopolist can exactly break even (which is such that the equilibrium number of firms in the regime with outsourcing (N^O) equals $N^I L_c^I/L_C^O$; see the discussion in section 2.2.3).

< Insert Figures 1a-1c around here >

The NN-locus is upward sloping. An increase in the relative management requirement (L_m^O/L_m^I) decreases, ceteris paribus, the relative number of firms (N^O/N^I). To offset this decrease, the superiority of the fixed cost technology has to increase (i.e., δ has to increase). To the right (left) of the NN-locus, N^O is larger (smaller) than N^I. With respect to the DD-locus, we have to distinguish three cases. For large values of the taste for diversity relative to the intertemporal elasticity of substitution, the DD-locus is upward sloping (Figure 1c).[19] To explain this, we look at a decline in δ. This decline in δ makes consumers, ceteris paribus, worse off in the regime with outsourcing. To compensate them in utility terms, N^O/N^I should increase relative to g^O/g^I. This follows from the fact that consumers have a strong taste for diversity relative to their willingness to substitute intertemporally (and thus to 'accept' a high rate of growth). This change will come about, ceteris paribus, if the relative management cost (L_m^O/L_m^I) decreases (see section 2.2.3). Similarly, the DD-locus is downward sloping when the taste for diversity is small relative to the intertemporal elasticity of substitution (Figure 1b). In the intermediate case where $\sigma=\rho/(\rho-1)$ the DD-locus is vertical (Figure 1a). This results from the fact that, ceteris paribus, a change in relative management cost leaves relative utility unaffected, as explained in section 3.1. To the right of the DD-loci, at relatively large values of δ, outsourcing is the socially preferred mode of governance, while at low values of δ internal

[19] In the specific case considered by Dixit and Stiglitz (i.e., $\sigma=\varepsilon/(\varepsilon-1)$) we only need to consider one case. As stability of the equilibria with positive growth rates requires $\rho>\varepsilon$, it holds that $\varepsilon/(\varepsilon-1)>\rho/(\rho-1)$. We are thus in the situation where the tase for diversity is strong relative to the willingness to smooth the consumption profile. This situation is depicted in Figure 1c.

provision is preferred.

We are now able to see whether private profitability and social desirability coincide. Looking at Figures 1a-1c, it turns out that the market will always yield the socially desirable outcome with respect to outsourcing in the cases where $L_m^O=L_m^I$ and $\sigma=\rho/(\rho-1)$. In the first case, outsourcing leaves the rate of growth unaffected. Outsourcing will hence be desirable if the equilibrium with outsourcing can sustain more firms. This will exactly be the case if outsourcing is a profitable strategy. In the second case, the partial effects on relative utility of a change in the relative management costs exactly cancel. And hence outsourcing will be socially desirable if it is privately profitable. The externalities resulting from changing growth and interest rates due to a shift from inhouse provision to outsourcing exactly cancel in this case.[20] The market hence reflects the socially desirable trade-off to be made in deciding whether or not to engage in outsourcing.

In more general cases, social desirability and private profitability do not necessarily coincide. Let us consider the case where taste for diversity is relatively small and management costs are larger under inhouse provision than with outsourcing (Figure 1b). It then holds that the growth rate is smaller under outsourcing than under internal provision of non-core activities. In the initial situation (point *s*) with a relatively large transaction cost, firms provide their support activities internally, which is also the socially preferred mode of governance. As transaction costs decrease, the profitability of the monopolist with access to the superior technology increases until he can just break even (point *p*). At that point, he will start producing support activities and outsourcing will take place. Due to the lower management costs in the regime with outsourcing, this shift in the mode of governance will be accompanied with a decrease in the rate of growth and an increase in the number of firms. These effects are not taken into account by the monopolist, and from a social point of view there is excess entry. In region IV, the outsourcing that takes place is socially undesirable. The market puts insufficient weight on the negative consequences for consumers utility of the drop in the rate of growth in making its decision to engage in outsourcing. As consumers have a relatively limited taste for diversity, they are insufficiently compensated for the drop in the rate of growth by the increase in product diversity. As the decline in transaction costs declines further and product diversity increases to a sufficiently large extent (in region I), outsourcing ultimately also becomes the socially preferred mode of governance (at point *d*).

---

[20] Note that when $L_m^O<L_m^I$, the number of firms that has to be sustained in equilibrium for outsourcing to be privately profitable is larger than the equilibrium number of firms in the regime with inhouse provision (to guarantee equal macroeconomic demand for non-core activities at $\pi_Y=0$).

Figure 1c describes the mirror image from figure 1b. As transaction costs drop, a region is passed (region III) in which outsourcing does not take place though it would be socially desirable. At point *d*, consumers would prefer the switch to a regime of outsourcing and the accompanied increase in product diversity at the expense of a somewhat lower growth rate (given their relatively strong taste for diversity). At this point, the demand for support activities is however not yet sufficiently large to make the use of the fixed cost technology profitable for the monopolist. To put it differently, in region IV, the monopolist is not sufficiently rewarded from a social point of view for its decision to start producing and selling non-core activities, and thereby, unintentionally, increasing product diversity (which can be summarized as a problem of appropriability) .

4. Some Applications

In this section, we will describe some real world examples of developments that can be understood with the insights derived from the model in this paper. We will describe the examples and show how they can be reconciled with the model. In section 4.1, we will look at the effects of the introduction of computers or more broadly the advent of the Information and Communication Technology. Section 4.2 focuses on differences in reliance on subcontracting between Japanese and US firms. Of course, when discussing these developments, we cannot judge whether they are socially desirable. An evaluation of the externalities involved in these developments is beyond the scope of this paper.

4.1 Introduction of computers: Information and Communication Technology

According to Audretsch (1995) both Germany and the US experienced massive downsizing of companies in the early 1990s. The introduction of computers is argued to be one important factor in this experience for two reasons. It reduces the amount of labour needed to produce a certain amount of goods, but it also reduces firm size because '...information technology allows for closer relations with suppliers and customers, thus making it possible for firms to narrow their focus and spin-off previously integrated activities. Thus, while the trend towards downsizing was initially triggered by the need to reduce costs, it also reflects the administrative impact of information and communication technologies. Increased use of technologies, such as electronic mail, voice mail, and shared databases, has, over time, reduced the need for traditional middle management, whose role was to supervise others and to collect, analyze, evaluate, and transmit information up, down, and

across the organizational hierarchy.' (p.27).

In a somewhat broader context, Freeman and Soete (1994) discuss the advent of the Information and Communication Technology, which they argue to be a new techno-economic paradigm. The pervasiveness of this new paradigm is argued to extend beyond just a few products or industries, and to affect every industry, every service, their interrelationships and indeed the whole way of life of industrial societies. One of their arguments is that 'Because of rapid, easy access to information at all levels both vertically and horizontally, intermediate layers of management were often no longer necessary. The need for rapid response and greater decentralisation of responsibility within the new production and management systems also intensified this pressure towards 'downsizing' by reducing the number of middle managers. ... A similar trend was clearly evident in Europe in 1993-94.' (p.57). Another development described by Freeman and Soete is the increased importance and flourishing of small and medium sized enterprises.

Both examples make clear that declining transaction costs affect the economy in various ways.[21] They tend to increase market mediated exchange of goods and services. This change in the way firms operate leads to internal reorganization, mainly resulting in the lay-off of management labour that has become superfluous due to improved media of exchange of information. Following Williamson (1985), we may add that the market gives high powered incentives and thus requires little management to coordinate decisions. The internal reorganization of firms leads to the advent of many small sized enterprises. In terms of our model, (exogenously) declining transaction costs will ultimately (endogenously) result in outsourcing of support activities. This will affect firm size in two ways. There is a direct effect as goods initially produced internally are now bought on the market. The indirect effect results from internal reorganization of the firm. Throughout the paper we assumed that firms engaging in outsourcing required less management labour than firms engaging in self-provision. So far, our model can 'replicate' the developments described before. A result peculiar to our specific model is that the lay-off of management labour (downsizing) will result in lower incentives to engage in R&D and a subsequent decline in the rate of growth. As to whether this result will hold in reality, there is large debate in the literature. Does it need large firms to grow fast? Some economists (e.g., Eliasson, 1992) have argued that large firms are often unable to cope with the speed of

---

[21] In addition, there is a strong focus on the lay-off of middle management. In our model, this would translate into a decrease in relative management cost in the two regimes (L_m^O/L_m^I). Though in this simple version of the model such a change does not affect the profitability of outsourcing, it does in the more extended version of the model (see Appendix C). There a decrease in L_m^O/L_m^I increases the limit price since firms not only compare the unit wage cost with the price of the product to be outsourced, but also take into account potential benefits related to lower management costs. We show in Appendix C that a decrease in L_m^O/L_m^I increases the likeliness that outsourcing is a profitable strategy.

change that is required in periods of technological and organizational turbulence. Pavitt (1986) on the other hand has argued that even very large firms are capable of learning and changing and that they have great advantages to exploit all kinds of economies of scale, present in for example research and development.[22] The increase in the number of (small) firms as predicted by the model seems to be confirmed by the empirical literature.

4.2 Japanese and US industrial structure compared

Japanese firms rely much more heavily on subcontracting than US firms. An example discussed in Williamson (1985, chapter 6) is Toyota Motor Company, which has succeeded in building a mutually profitable and durable relation with its subcontractors. A central element in the explanation of the difference in the mode of governance between Japanese and US firms is that 'The hazards of trading are less severe in Japan than in the United States because of cultural and institutional checks on opportunism.' (Williamson, 1985, p.122). This is reflected in for example the relatively low number of lawsuits in Japan, explained by the Japanese emphasis on harmony in relations between firms and subcontractors. Another measure that underlines the fundamental difference between the US and Japanese mode of governance is the 'bureaucratic burden' (Gordon, 1996). This bureaucratic burden, measuring the managerial and administrative employed as a percentage of non-farm employment, was more than three times as large in the US than in Japan (data from ILO, Yearbook of Labour Statistics, 1994).

In terms of our model, cross country differences in the 'hazards of trading' can be argued to be reflected in the transaction costs (i.e., in the parameter δ). Large hazards of trading or the absence of trust in bilateral relations results in large transaction costs and a low δ. According to our model, outsourcing would hence be less widespread in the US than in Japan. Our model can hence mimic the case study by Williamson.[23]

---

[22] Some other studies in favour of this line of argument mentioned in Freeman and Soete (1994) are Simonetti (1993) and Lovio (1994).

[23] A similar kind of reasoning could suggest that L_m^O/L_m^I is larger in the US than in Japan. Such a difference would not affect the extent to which outsourcing occurs in our simple version of the model. However, they are important in a more extended version (see Appendix C). There a higher ratio of management costs indeed implies outsourcing to take place at a lower scale.

5. Extensions of the model

So far, we have interpreted the model in terms of outsourcing. We can alternatively label the direct cost of production as assemblage activities. The indirect cost can then be seen as the costs of all kinds of inputs that can be produced internally or bought on the market place. Interpreting the model in this way yields a potential explanation for the increased indirectness in the production process and the increased degree of specialization associated with economic development (see Ciccone and Matsuyama, 1996, for a model on these issues).

An alternative interpretation of the monopolist in the model is to conceive it as a consortium of firms (or a business group) requiring non-core activities for production and deciding about whether or not to exploit the superior technology. This would, however, require explicit modelling of how business groups are formed and how decisions within these groups are made (see e.g. Feenstra, Huang and Hamilton (1997) for a model on the formation of business groups).

One generalization of the model would allow for a separation of the support activity into several activities, each with its own characteristics. An example of such a generalization would be the following modification of the production function:

$$c_i = h_i \min\left[L_{ci}, \left(\frac{y_{i,m} - f_m}{a_m}\right)^{\frac{1}{\gamma_m}}\right]$$

where all M support activities are indexed $m(=1,...,M)$. In this representation, a fixed amount of the support activity f_m is required before the firm is able to produce and we allow for the potential of decreasing or increasing requirements with scale (γ_m smaller or larger than one, respectively). In the model in this paper, we used a specification characterized by $\gamma_m=1$, $M=1$, and $f_m=0$. This generalization would seriously complicate the analysis and, except for some very special cases, we would only be able to solve the model numerically.[24] It is easily imagined, however, that an equilibrium will result in which a fraction of the support activities is outsourced, while another fraction is produced internally. The fixed cost (management labour) could be modelled as a (declining) function of the fraction of support activities that has been outsourced (see Dluhosch (1997) for a similar kind of modelling).

Future research could extend this simple model in various other interesting directions. The basic motivation for outsourcing in this paper was exploiting economies of

[24] Numerical examples are available upon request.

scale. Other reasons have been put forward in descriptive literature and could be built into this model. It is easily imagined how the likeliness of outsourcing increases if the monopolist, in addition to having the potential of exploiting economies of scale, has access to cheap labour (for example because he doesn't have to pay efficiency wages as the producers of consumption goods have to). Furthermore we could make the investment required to build a relation with customers explicit, we could relax the assumption that only a monopolist has access to the superior fixed cost technology, and we could allow for some uncertainty that the relation with the monopolist breaks down or that the quality of the product to be supplied is inferior to the quality when producing the good internally.

6. Conclusions

This paper has developed a model that yields insights in the motives for firms to engage in outsourcing. The private incentives for firms to engage in outsourcing are well understood. Transaction costs, exploitation of economies of scale, savings on wage and benefit payments, and strategic considerations may play an important role. What is less understood are the (potential) macroeconomic consequences of outsourcing. In this paper, we develop a general equilibrium model characterized by endogenous growth. We establish conditions for which outsourcing will be a privately profitable strategy. In addition, we study the macroeconomic consequences of outsourcing for economic growth, product diversity, firm size, and welfare. It is shown that private profitability and social desirability of outsourcing do not coincide in general. This is caused by the fact that firms do not take into account the consequences for product diversity and market shares of their decision to engage in outsourcing.

Some results derived from the model are that declining transaction costs may ultimately result in outsourcing. We discussed the advent of the Information and Communication Technology. This development was shown to be potentially important in explaining the increase in outsourcing and downsizing of firms witnessed in recent years. The model predicts that these trends will be associated with an increase in product variety and a decrease in the macroeconomic rate of growth. The first prediction seems to be confirmed by available evidence. The second prediction crucially relies on the 'Schumpeterian' assumption that it needs large firms to grow fast. In this view, large market shares are an important precondition for firms to engage in costly R&D. Cross country differences in the 'bureaucratic burden' were argued to be an important element in differences in the extent to which Japanese and US firms rely on subcontracting. Finally, increased product market competition was shown to foster the incentive to engage in

outsourcing.

We are ultimately left with the conclusion that the decision to engage in outsourcing by private firms can have important macroeconomic consequences. This conclusion has so far been underestimated in both the theoretical and empirical literature on outsourcing. Acknowledging this conclusion may, at least partly, enhance our understanding of the recent productivity slowdown, deindustrialization, and the advent of many small firms supplying highly specialized inputs.

Appendix A.

In this Appendix, we will solve for the equilibrium rate of growth, number of firms, and the allocation of labour under the alternative modes of governance (*j=I*, *O*) under the assumption of symmetry. In the symmetric steady state, it holds per definition that

$$g^j \equiv \frac{\dot{h}^j}{h^j} = \frac{\dot{c}^j}{c^j} = \frac{\dot{C}^j}{C^j}. \tag{A.1}$$

In addition, using the first order conditions for firm behaviour ((9)-(10), and (18)-(19), for the two regimes, respectively), we can derive (note that $w \equiv 1$)

$$\frac{\dot{p}_h^j}{p_h^j} = -g^j = \frac{\dot{p}_c^j}{p_c^j} = \frac{\dot{P}_C^j}{P_C^j}. \tag{A.2}$$

For the regime with internal provision, we can thus write the no-arbitrage condition (11) as

$$r^I + g^I = \xi(1+a)L_c^I + \xi L_r^I \quad \Leftrightarrow \quad L_c^I = \frac{r^I}{\xi(1+a)}. \tag{A.3}$$

Substituting the equation (5a), (5b), and (9) into the zero profit condition (12), we get

$$\frac{\varepsilon}{\varepsilon-1} = 1 + \frac{L_r^I + L_m^I}{(1+a)L_c^I} \quad \Leftrightarrow \quad (1+a)L_c^I = (\varepsilon-1)\left(\frac{g^I}{\xi} + L_m^I\right). \tag{A.4}$$

Combining (A.3) and (A.4), we derive

$$r^I = (\varepsilon-1)g^I + \xi(\varepsilon-1)L_m^I. \tag{A.5}$$

Using (A.1) and (A.2), we can write the Ramsey rule (equation (2)) as

$$\rho g^j = r^j + g^j - \theta \quad \Leftrightarrow \quad r^j = (\rho-1)g^j + \theta. \tag{A.6}$$

Confronting the planned rate of growth (A.5) with the Ramsey rule (A.6), we solve for the equilibrium interest rate and the rate of growth

$$r^I = \frac{\varepsilon-1}{\rho-\varepsilon}\left[\xi(\rho-1)L_m^I-\theta\right] \quad \text{and} \quad g^I = \frac{\xi(\varepsilon-1)}{\rho-\varepsilon}\left[L_m^I-\frac{\theta}{\xi(\varepsilon-1)}\right], \tag{A.7}$$

where stability of the equilibrium with a positive rate of growth requires $(\rho\text{-}1)>(\varepsilon\text{-}1)>\theta/\xi L_m$. Substituting the solution for the interest rate into (A.3) yields the equilibrium number of production workers per firm in the consumption goods sector

$$L_c^I = \frac{(\varepsilon-1)\left[\xi(\rho-1)L_m^I-\theta\right]}{(\rho-\varepsilon)\xi(1+a)}. \tag{A.8}$$

Finally, substituting the solutions for L_c and $L_r(=g/\xi)$ into the labour market constraint (13), and using (5b) and (7), we can solve for the equilibrium number of firms

$$N^I = \frac{L\xi(\rho-\varepsilon)}{\left[\xi(\rho-1)L_m^I-\theta\right]\varepsilon}. \tag{A.9}$$

The solution procedure for the growth and interest rate and the equilibrium number of firms under the regime with outsourcing is along similar lines as for the regime with internal provision and follows using equations (18)-(22) (instead of equations (9)-(13) in the regime with internal provision). Using equations (A.1) and (A.2), we can write the no-arbitrage condition (20) as

$$r^O + g^O = \xi(1+ap_Y)L_c^O + \xi L_r^O \quad \Leftrightarrow \quad L_c^O = \frac{r^O}{\xi(1+ap_Y)}. \tag{A.10}$$

Substituting the equation (5a), (5b), and (18) into the zero profit condition (21), we get

$$\frac{\varepsilon}{\varepsilon-1} = 1+\frac{L_r^O+L_m^O}{(1+ap_Y)L_c^O} \quad \Leftrightarrow \quad (1+ap_Y)L_c^O = (\varepsilon-1)\left(\frac{g^O}{\xi}+L_m^O\right). \tag{A.11}$$

Combining (A.10) and (A.11) we derive

$$r^O = (\varepsilon-1)g^O + \xi(\varepsilon-1)L_m^O. \tag{A.12}$$

Confronting the planned rate of growth (A.12) with the Ramsey rule (A.6), we solve for the equilibrium interest rate and the rate of growth

$$r^O = \frac{\varepsilon-1}{\rho-\varepsilon}\left[\xi(\rho-1)L_m^O-\theta\right] \quad \text{and} \quad g^O = \frac{\xi(\varepsilon-1)}{\rho-\varepsilon}\left[L_m^O-\frac{\theta}{\xi(\varepsilon-1)}\right], \tag{A.13}$$

where stability of the equilibrium with a positive rate of growth requires the parameter restriction $(\rho\text{-}1)>(\varepsilon\text{-}1)>\theta/\xi L_m$. We can now derive the number of production workers and

the firm size, using (A.10), $L_r=g/\xi$, and (A.13), as

$$L_c^O = \frac{(\varepsilon-1)\left[\xi(\rho-1)L_m^O-\theta\right]}{\xi(\rho-\varepsilon)(1+ap_Y)}\ ,\quad L_c^O + L_r^O + L_m^O = \frac{\left[\xi(\rho-1)L_m^O-\theta\right](\varepsilon+ap_Y)}{\xi(\rho-\varepsilon)(1+ap_Y)}\ . \quad \text{(A.14)}$$

Using (5a), (16), (22), and (A.14), we can solve for the number of firms

$$N^O = \frac{(L-F)\delta\xi(\rho-\varepsilon)(1+ap_Y)}{\left[a(\varepsilon-1+\delta p_Y)+\delta\varepsilon\right]\left[\xi(\rho-1)L_m^O-\theta\right]}\ . \quad \text{(A.15)}$$

We can now determine the optimal price to be set by the monopolist providing the support activities. Substituting the solutions for N and L_c into the profit function for the monopolist, we get

$$\pi_Y = Yp_Y - wL_Y = N^O a L_c^O\left(\frac{\delta p_Y - w}{\delta}\right) - wF = \frac{a(L-F)(\varepsilon-1)(\delta p_Y - w)}{a(\varepsilon-1+\delta p_Y)+\varepsilon\delta} - wF\ . \quad \text{(A.16)}$$

From this expression, it is easily derived that $\partial\pi_Y/\partial p_Y>0$. So the monopolist will set as high a price as possible (i.e., he will engage in limit pricing: $p_Y=w\equiv 1$).

Appendix B

In this Appendix, we will mathematically derive the equations underlying Figures 1a-1c. Using equation (25) (with equality), we derive that the number of firms is equal if

$$L_m^O = \frac{1}{\xi(\rho-1)}\left[\left(\xi(\rho-1)L_m^I-\theta\right)\left[\frac{(L-F)(1+a)\delta\varepsilon}{L[a(\varepsilon-1+\delta)+\varepsilon\delta]}\right]+\theta\right]. \quad \text{(NN-locus)}$$

Using equation (26), it follows that profits for the monopolist equal zero at

$$\delta = \delta^* \equiv \frac{aL(\varepsilon-1)}{aL(\varepsilon-1)-F\varepsilon(1+a)}\ . \quad \text{(PP-locus)}$$

For larger (smaller) values of δ, the use of the superior technology is (un-)profitable.

Similarly, we derive from equation (32), that social indifference occurs at

$$L_m^O = \frac{1}{\xi(\rho-1)}\left[\left(\xi(\rho-1)L_m^I-\theta\right)\left[\frac{(L-F)(1+a)\delta\varepsilon}{L[a(\varepsilon-1+\delta)+\delta\varepsilon]}\right]^{\frac{\sigma(\rho-1)}{\sigma(\rho-1)-\rho}}+\theta\right]. \quad \text{(DD-locus)}$$

Taking the derivative of this expression with respect to δ, it follows that the DD-locus is upward (downward) sloping if $\sigma>(<)\rho/(\rho-1)$, and vertical at $\sigma=\rho/(\rho-1)$.

Now several points with respect to the relative position of the three loci need to be mentioned. First, the three loci will always intersect at the point where $\delta=\delta^*$ and $L_m^O=L_m^I$.

Secondly, the DD-locus will be vertical and coincide with the PP-locus at $\sigma=\rho/(\rho-1)$. Thirdly, the NN-locus and the DD- locus will coincide when $\rho=0$. Since stability with positive growth rates requires ρ to be larger than 1, this coincidence will not occur. Finally, when $\sigma>\rho/(\rho-1)$ and the DD-locus is thus upward sloping, its slope is larger than the slope of the NN-locus (since $\sigma(\rho-1)/[\sigma(\rho-1)-\rho]>1$).

Appendix C

This Appendix solves for the case in which firms also take into account in their decision whether or not to engage in outsourcing what the consequences of this decision are for the internal organization of the firm (i.e., the effect on the fixed management cost). In this case, producers of consumption goods compare the costs of acquiring the non-core activities under the two alternative regimes. This implies that they will engage in outsourcing once

$$a L_{ci} w + w L_m^I \geq a L_{ci} p_Y + w L_m^O \quad \text{so} \quad p_Y \leq 1 + \frac{L_m^I - L_m^O}{a L_c^O}. \tag{C.1}$$

This price is the maximum price the monopolist can charge (the limit-price we saw earlier).[25] In case outsourcing does not affect the internal organization, the limit price equals w and there is no difference with respect to the analysis in the text. When L_m^I is larger (smaller) than L_m^O, the limit price is larger (smaller) than the wage rate. This is intuitively clear since in the former case, the firm is prepared to accept a relatively large price of the non-core activity as outsourcing already saves on management costs. Having established this slight change in the limit price, the analysis just goes through as in the main text; we can again derive two equilibria, one in which outsourcing takes place and one in which firms engage in inhouse provision of the non-core activity. Having established for what (maximum) price single firms are willing to engage in outsourcing, we need to establish for what minimal price the monopolist is willing to supply to non-core activity (which requires $\pi_Y>0$). Following similar procedures as in the text, we can easily establish that none of the conclusions derived in the main text is changed in an essential way.

More specifically, we can derive that the growth and the interest rate are not affected in any of the two regimes. The equilibrium number of firms in the regime with outsourcing changes into

$$N^O = \frac{(L-F)\delta\xi(\rho-\varepsilon)(1+a)}{\left[\xi(\rho-1)L_m^O-\theta\right]\left[a(\varepsilon-1+\delta)+\delta\varepsilon\right]+(\delta+a)(\rho-\varepsilon)\xi(L_m^O-L_m^I)}. \tag{C.2}$$

[25] In deriving this condition, we suppose that the firm makes its decision on the basis of the demand for non-core activities in the situation after outsourcing has taken place.

We derive the size of the production department of producers of consumption goods as

$$L_C^O = \frac{\varepsilon - 1}{\xi(\rho - \varepsilon)(1+a)}\left[\xi(\rho - 1)L_m^O - \theta\right] - \frac{L_m^I - L_m^O}{1+a}. \qquad \text{(C.3)}$$

When there are no differences in management costs, the size of the production department and the number of firms in the regime with outsourcing are equal to what we derived in the text. When the management cost in the regime with outsourcing is smaller than under internal provision (and hence the limit price exceeds the wage rate), the number of firms with outsourcing is larger than in the case considered in the text, whereas the size of the production department is smaller. This is understood since profits of the monopolist and hence demand for final goods is larger, and hence more firms can be sustained.[26]

Profits of the monopolist supplying the non-core activities can now be derived as

$$\pi_Y = \frac{(L-F)\left[a(\delta - 1)(\varepsilon - 1 + Q) - \delta(1+a)Q\right]}{a(\varepsilon - 1 + \delta) + \delta\varepsilon + (\delta + a)Q} - F \text{ where } Q \equiv \frac{\xi(\rho - \varepsilon)(L_m^O - L_m^I)}{\xi(\rho - 1)L_m^O - \theta}. \qquad \text{(C.4)}$$

Taking derivatives of this expression with respect to the management requirements and marginal labour productivity of the monopolist reveals that the PP-line for which profits are zero is upward sloping in a diagram is depicted in Figure 1 (instead of vertical as in the simple version of the model discussed in the main text). The NN-locus is also upward sloping, while the slope of the UU-locus is again ambiguous depending on, among others, the size of the taste for diversity relative to the intertemporal elasticity of substitution (the condition for the UU-locus to be vertical becomes more complicated than in the main text). Furthermore, the PP-locus is steeper than the NN-locus.

References

Abraham K.G. (1990): "Restructuring the Employment Relationship: The Growth of Market Mediated Work Arrangements", in K.G. Abraham and R.B. McKersie (eds.): *New Developments in the Labor Market*, MIT Press, Cambridge, MA.

Abraham K.G., Taylor S.K. (1993): "Firms' Use of Outside Contractors: Theory and Evidence", *NBER Working Paper*, 4468, Cambridge MA.

Audretsch D.B. (1995): "The Innovation, Unemployment and Competitiveness Challenge in Germany", *CEPR Discussion Paper*, 1152.

Benassy J.P. (1996): "Taste for Variety and Optimum Production Patterns in Monopolistic Competition", *Economics Letters*, 52, 41-47.

[26] For the number of firms in the regime with outsourcing to be a positive function of the marginal productivity δ, we have to impose the condition that $L_m^I - L_m^O < [L_m^I(\rho-1) - \theta/\xi](\varepsilon-1)/[\varepsilon(\rho-1)-(\varepsilon-1)]$, where the last term is unambguously positive. Hence, this condition implies that the management cost under the regime of outsourcing may not be too small.

Blau F.D. (1977): *Equal Pay in the Office*, D.C. Heath and Company, Lexington, MA.

Broer D.P., Heijdra B.J. (1996): "The Intergenerational Distribution Effects of the Investment Tax Credit under Monopolistic Competition", *OCfeB Research Memorandum 9603*, Rotterdam.

Chandler A.D. (1990): *Scale and Scope*, Harvard University Press, Cambridge, MA.

Ciccone A., Matsuyama K. (1996): "Start-Up Costs and Pecuniary Externalities as Barriers to Economic Development", *Journal of Development Economics*, 49, 33-59.

Dell'Aringa C., Lucifora Cl. (1990): "Wage Determination and Union Behaviour in Italy: An Efficiency Wage Interpretation", in R.Brunetta and C. Dell'Aringa, *Labour Relations and Economic Performance*, Macmillan Press, London.

Dickens W.T., Katz L.F. (1987): "Inter-Industry Wage Differences and Industry Characteristics", in K. Lang and J.S. Leonard (eds.), *Unemployment and the Structure of Labor Markets*, Basil Blackwell, New York.

Dixit A.K., Stiglitz J.E. (1977): "Monopolistic Competition and Optimum Product Diversity", *American Economic Review*, 67, 297-308.

Dluhosch B. (1997): 'Trade Liberalization, Technological Change, and the Economics of Outsourcing', University of Cologne, *mimeo.*

Feenstra R.C., Hanson (1995): "Foreign Investment, Outsourcing and Relative Wages", *NBER Working Paper*, 5121, Cambridge, MA.

Feenstra R.C., Huang D.S., Hamilton G.G. (1997): "Business Groups and Trade in East Asia: Part 1, Networked Equilibria", *NBER Working Paper*, 5886, Cambridge, MA.

Freeman C., Soete L. (1994): *Work for All or Mass Unemployment? Computerised Technical Change into the Twenty-First Century*, Pinter Publishers, London.

Gordon D.M. (1996): *Fat and Mean*, Free Press, New York.

Groot H.L.F. de, Nahuis R. (1997): "Optimal Product Variety, Scale Effects and Growth", *CentER Discussion Paper*, 9754, Tilburg.

Kelley M. (1997): "The Dynamics of Smithian Growth", *Quarterly Journal of Economics*, 112, 939-964.

Krugman P. (1997): "How Fast Can the U.S. Economy Grow?", *Harvard Business Review*, July-August 1997, 123-129.

Lazonick W. (1991): *Business Organization and the Myth of the Market Economy*, Cambridge University Press, Cambridge.

Matsuyama K. (1995): "Complementarities and Cumulative Processes in Models of Monopolistic Competition", *Journal of Economic Literature*, 33, 701-729.

Postner H.H. (1990): "The Contracting-Out Problem in Service Sector Analysis: Choice of Statistical Unit", *Review of Income and Wealth*, 36, 177-186.

Siegel and Griliches (1992): "Purchased Services, Outsourcing, Computers, and Productivity in Manufacturing", in Z. Griliches (ed.): *Output Measurement in the Service Sectors*, University of Chicago Press, Chicago.

Smulders S., Klundert Th. van de (1995): "Imperfect Competition, Concentration and Growth with Firm Specific Knowledge", *European Economic Review*, 39, 139-160.

Stigler G.J. (1951) “The Division of Labor is Limited by the Extent of the Market”, *Journal of Political Economy*, 59, 185-193.

Ten Raa T., Wolff E.N. (1996): "Outsourcing of Services and the Productivity Recovery in U.S. Manufacturing in the 1980s", *CentER Discussion Paper*, 9689, Tilburg.

Tirole J. (1988): *The Theory of Industrial Organization*, MIT Press, Cambridge, MA.

Viscusi W. Kip, Vernon J.M., Harrington J.E. (1995): *Economics of Regulation and Antitrust*, MIT Press, Cambridge, MA.

Williamson O.E. (1985): *The Economic Institutions of Capitalism*, Free Press, New York.

Williamson O.E. (1998): "Transaction Cost Economics: How it Works; Where it is Headed", *De Economist*, 146, 23-58.

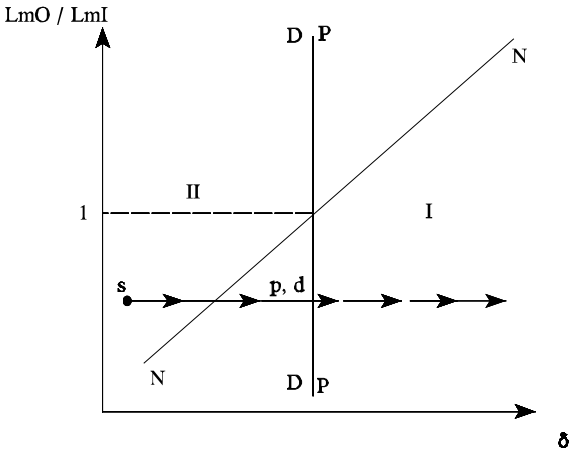

Figure 1a (σ=ρ/(ρ-1)): A benchmark

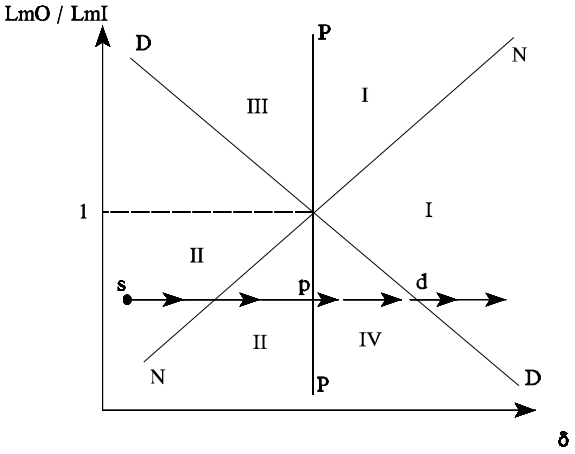

Figure 1b (σ<ρ/(ρ-1))

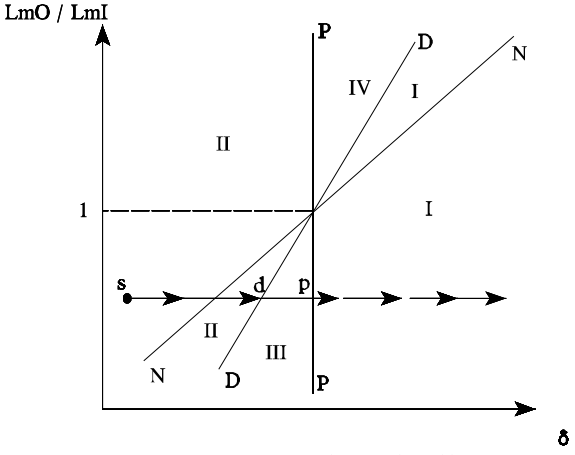

Figure 1c (σ>ρ/(ρ-1))