EMPRESAS TRANSNACIONAIS E O DESENVOLVIMENTO TECNOLÓGICO BRASILEIRO: UMA INTRODUÇÃO AO ARTIGO "PRESENT INTERNATIONAL PATTERNS OF FOREIGN DIRECT INVESTMENT: UNDERLYING CAUSES AND SOME POLICY IMPLICATIONS FOR BRASIL"

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O economista francês François Chesnais tem sido um dos mais importantes autores que contribuem para um melhor entendimento do processo de globalização em curso. A partir de sua obra de meados dos anos 1990 (Chesnais, 1996) sobre a mundialização do capital, seu trabalho intelectual é referência fundamental nos debates sobre este processo. Nos seus trabalhos posteriores mais conhecidos, Chesnais enfatiza a mundialização financeira (Chesnais, 1998) que é relacionada, entre outras coisas, a um significativo aumento de fluxos de investimento direto estrangeiro (IDE). Estas reflexões mais recentes de Chesnais foram precedidas e fundamentadas em diversos trabalhos por ele realizados nos anos 1980 e início dos 1990 sobre a crise estrutural do capital da década de 1970 e pelas alterações no processo de internacionalização das grandes empresas transnacionais observados a partir de então, especialmente sob a forma de fusões e aquisições que acentuaram a concentração da produção e da comercialização mundiais (Chesnais, 1996).

Desde então o IDE tem se constituído cada vez mais num componente importante do processo de globalização. Em 1980, o estoque de IDE correspondeu a aproximadamente 6,6% do PIB global; em 2007 ele chegou a 28,4% (UNCTAD, 2011).

As empresas transnacionais (ETN) são as principais propulsoras deste fenômeno. De acordo com a Conferência das Nações Unidas sobre Comércio e Desenvolvimento (UNCTAD), na década de 1990 havia 37.000 ETN com 175.000 subsidiárias no exterior. No final de 2007, elas já eram 79.000 com um total de 790.000 filiais estrangeiras. Sua importância na economia mundial é correspondente. Estima-se que as ETN geraram em todo o mundo, tanto no país sede quanto no exterior, um valor adicionado de aproximadamente US$ 16 trilhões em 2010, representando mais de um quarto do produto interno bruto (PIB) global. As trocas entre matrizes e filiais representavam, no mesmo período aproximadamente 60% do comércio mundial (UNCTAD, 2011).

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Estas empresas também dominam a produção global de tecnologia e são responsáveis pela grande maioria dos gastos privados em pesquisa e desenvolvimento (P&D). De acordo com informações do EUROSTAT da União Europeia, as maiores 1.500 ETN foram responsáveis por aproximadamente 90% dos gastos globais em P&D em 2012 (European Union, 2013). Suas atividades tecnológicas estão fortemente concentradas nos países-sede. Por exemplo, os gastos em P&D das subsidiárias das ETN norte-americanas correspondiam, em 2007, a apenas 17% daquelas das matrizes; a maior parte destes gastos das subsidiárias eram realizados em outras nações desenvolvidas (UNCTAD, 2008).

No âmbito da globalização dominada pelas finanças, a compreensão do papel e estratégias de desenvolvimento tecnológico das ETN adquire maior importância tendo em vista a ênfase dada pelas políticas de desenvolvimento produtivo e de inovação ao papel supostamente virtuoso destas empresas no desenvolvimento dos sistemas nacionais de inovação. Novas articulações entre capital financeiro e capital produtivo têm afetado mais ainda a dinâmica organizacional das grandes ETN, o que sem dúvida traz impactos significativos às suas estratégias.

Embora François Chesnais tenha se constituído um importante analista desses fenômenos, a literatura de origem anglo-saxã que trata das ETN tem se mostrado imune ao tipo de discussão por ele proposto, que evidentemente parte de uma abordagem de economia política.

Stephen Hymer (1960) foi o primeiro autor que tentou compreender as razões pelas quais empresas buscam internacionalizar a produção. A partir de um uso não convencional das teorias neoclássicas de organização industrial – especialmente a discussão sobre barreiras à entrada - e de economia internacional ele sugeriu que as ETN que desejassem produzir em qualquer país deveriam possuir alguns ativos específicos capazes de superar as vantagens naturais de empresas nacionais: poder de mercado, tamanho e economias de escala, capacidade tecnológica e acesso a fontes de financiamento mais barato. A contribuição do Hymer foi seminal na medida em que enfatizava a importância de imperfeições do mercado enquanto estímulo à internacionalização da produção.

Seus trabalhos posteriores contribuíram significativamente para a compreensão das transnacionais, do ponto de vista da economia política (Hymer e Rothworn, 1970). Em particular, ele ressaltou (i) o poder oligopolístico das ETN; (ii) que uma nova estrutura produtiva em nível mundial estava surgindo, sublinhando uma nova divisão internacional do trabalho dominada por algo entre 300 e 500 grandes ETN; (iii) que o poder efetivo de Estados-Nação para controlar suas economias estava sendo corroído dada a flexibilidade das ETN para reagir a regulamentações adversas e políticas fiscais ou monetárias (Presser, 1981). Ele também introduziu na década de 1960 alguns dos

elementos que ainda prevalecem hoje em dia em qualquer avaliação de ETN, ou seja, a crescente interdependência de capitais de diferentes fontes no controle acionário das ETN e o conflito dessas empresas com os Estados-Nação.

A maior parte do esforço acadêmico posterior, infelizmente, deixou de lado a economia política das ETN e o debate sobre estas empresas evoluiu com um entendimento implícito de que elas são, essencialmente, um tipo específico de empresa que poderia ser tratada metodologicamente dentro dos limites tradicionais da teoria neoclássica da firma.

Vernon (1966) e os trabalhos da Escola de Reading foram os expoentes desta visão, marcando significativamente o debate acadêmico e normativo sobre o assunto. Numa tentativa de elucidar como a produção internacional tendia a ocorrer, Vernon (1966), através do conceito de ciclo de vida do produto, introduziu uma dimensão locacional, explicando que com o passar do tempo – e considerando-se a expansão do mercado global – as grandes empresas norte-americanas estabeleciam atividades produtivas no exterior ou para diminuir custos de produção e/ou distribuição, ou tendo em vista uma ameaça à sua posição competitiva. Em particular, Vernon enfatizou o caráter adaptativo dos esforços tecnológicos locais.

Com relação à Escola de Reading, Dunning (1977) tentou integrar vários argumentos para criar sua teoria eclética da produção internacional a partir das teorias neoclássicas da firma, da organização industrial, do comércio internacional e da teoria locacional. Sua abordagem tenta explicar "por que, onde e quando" ocorre a produção internacional através da análise de três grupos de vantagens: as de propriedade (aquelas específicas a uma empresa particular), as locacionais (aquelas específicas a um determinado país que o tornam atrativo aos investidores estrangeiros) e as de internalização (as que derivam da produção interna à firma e que permitem a elas evitar os mercados externos e os custos de transação a eles associados)[2].

A abordagem de Dunning tornou-se dominante nos anos 1980, quase sempre aplicada independentemente das circunstâncias específicas. Esta ampla aplicabilidade de

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[2] Este conjunto de vantagens vincula a conceituação de Dunning a outro e paralelo esforço teórico também da Escola de Reading, a teoria de internalização das ETN de Buckley e Casson (1976) e, portanto, à teoria da firma de Coase (1937). É a partir de tal teoria que tais autores desenvolvem uma abordagem que aponta porque a produção direta no exterior (internalização) é uma modalidade superior da internacionalização das empresas. Apesar de seu sucesso e utilização ampla em alguns círculos acadêmicos sua real validade é disputada na medida em que é intrinsecamente tautológica. Como reconhecida por seus próprios autores, "*internalization is in fact a general theory of why firms exist, and without additional assumptions it is almost tautological*" (Casson, 1982, p. 24) e "*at its most general, the concept of internalisation is tautological; firms internalise imperfect markets until the cost of further internalism outweighs the benefits*" (Buckley, 1983, p. 42).

certa maneira enfraqueceu-a. Como enfatizado por Ietto-Gillies (2007), além de tautológica por também depender da internalização (ver também nota de rodapé 1) uma teoria que é sempre aplicável perde sua utilidade e cientificidade.

Posteriormente, Cantwell (1989), assumindo o ponto de vista de vantagens competitivas de Hymer e de Dunning, considera que tais vantagens são criadas pela empresa. Especificamente, elas podem ser criadas na área de inovação e tecnologia com a empresa tornando-se geradora de suas próprias vantagens.

Todas estas teorias têm sido objeto de outras críticas além daquelas acima apontadas. Ietto-Gillies (2012), por exemplo, enfatiza a necessidade de se incorporar o Estado-Nação na análise, especialmente enquanto determinante das atividades das ETN. Porém, o mais relevante é que todas estas abordagens sobre as ETN desconsideram totalmente as principais tendências observadas nas últimas três décadas com relação à globalização, à externalização de diferentes atividades produtivas para outras firmas (isto é, a formação do que alguns denominam "cadeias globais de valor") e à vinculação das atividades produtivas das ETN à financeirização da economia. A incorporação destas tendências a um quadro de referência analítico sobre as ETN só pode ser realizada se forem incorporados elementos de economia política.

François Chesnais tem se constituído em uma das poucas, e sem dúvida a mais importante, exceções a esta percepção simplista. Partindo das idéias de Charles Albert Michalet sobre a internacionalização do capital (Michalet, 1994; Delapierre e Michalet, 1989), Chesnais, já no início dos anos 1990, contribuiu com pelo menos dois importantes trabalhos – um dos quais é publicado pela primeira vez neste número da Revista de Economia Contemporânea - que enfatizavam as transformações no papel das ETN no processo de globalização que se descortinava, nas mudanças nas suas estratégias e como as questões de natureza tecnológica, em especial aquelas ligadas ao seu controle, se inseriam neste novo papel e estratégia (Chesnais, 1990; Chesnais, 1992). Posteriormente, já na segunda metade dos anos 1990, com o avanço do processo de globalização e o término da rodada Uruguai do *General Agreement on Tariffs and Trade* (GATT) que levou à criação da Organização Mundial do Comércio, ele publica dois outros textos (Chesnais, 1997; Chesnais e Ietto-Gillies, 1997) nos quais se analisa como esta nova institucionalidade contribuiu para aumentar o controle por parte destas empresas sobre os novos desenvolvimentos tecnológicos.

Esta série de artigos representa uma importante contribuição para um melhor entendimento das ETN (particularmente quanto a suas estratégias tecnológicas) no quadro atual do capitalismo. Elas se inserem na concepção de Chesnais do regime de acumulação dominado pelas finanças no qual os mercados financeiros e mais especificamente as bolsas de valores são fundamentais para a criação e implementação de mecanismos econômicos que levam ao crescimento (Chesnais, 1994; Chesnais e Sau-

viat, 2003). Nesta concepção a liberalização econômica e a desregulação têm sido pré-requisitos indispensáveis do regime e as ETN e investidores institucionais têm se constituído em seus beneficiários mais importantes.

As contribuições de Chesnais quanto às novas especificidades das ETN que se estabelecem a partir do surgimento da crise dos anos 1970 vinculam-se ao debate francês sobre as novas formas de regulação do capitalismo mundial. Chesnais é o primeiro intelectual a caracterizar o regime que emerge como sendo "dominado" pelo capital financeiro. Portanto, o papel exercido a partir de então pela empresa transnacional - e suas estratégias - seria decisivamente marcado pelo processo de "financeirização" das decisões econômicas, políticas e produtivas.

Como assinalado por Chesnais e Sauviat (2003), a nova relação entre as finanças e a indústria passa a modelar o padrão de investimento (incluindo-se P&D) das grandes corporações. Com base na total liberdade de entrada e saída no capital de sociedades oferecidas pela "liquidez" do mercado de ações e com a ajuda de refinadas rotinas financeiras do novo estilo de "governança corporativa", as instituições financeiras adquiriram um poder sem precedentes e ganharam o controle de fato sobre as ETN não-financeiras.

Chesnais considera, corretamente, que qualquer discussão sobre as ETN necessariamente deve incluir uma dimensão de poder econômico e político. Por exemplo, a crescente externalização das atividades produtivas das ETN buscando, nos últimos 30 anos, menores custos salariais nas economias do sudeste asiático, particularmente a China, só pode ser explicada se for incorporada uma percepção sobre as reações ao poder do trabalho *vis-à-vis* as grandes corporações. As estratégias de terceirização e externalização em geral foram desenvolvidas a partir da década de 1980 como parte das estratégias corporativas das grandes empresas, levando à fragmentação do trabalho e, portanto, diminuindo seu poder de barganha.

Assim, para Chesnais, de forma consistente com sua interpretação global do capitalismo, em que regimes de acumulação variam de acordo com os diferentes períodos históricos, o papel desempenhado pelas ETN e sua inserção no sistema econômico-social se alteram dependendo do momento histórico em questão. Se na era do regime fordista as ETN passaram por uma "internacionalização", no novo regime elas passam a operar dentro do quadro da globalização (ou mundialização, segundo a escola francesa).

A globalização não surge como o resultado de uma evolução natural das formas anteriores de "internacionalização", características do regime fordista. Enquanto naquele período, a entrada da ETN em um país buscava, majoritariamente, a ampliação do seu mercado consumidor, na era da globalização, a emergência das tecnologias de informação e computação (TIC) abriu a possibilidade de instalação de uma agenda estratégica única e global por parte destas empresas. Com a globalização são alteradas

não somente a intensidade das interdependências internacionais, mas principalmente a sua qualidade e sua estrutura.

As novas características assumidas pelas ETN a partir da globalização dominada pelas finanças estão vinculadas às suas articulações com o mercado financeiro. Estas empresas, como bem coloca Chesnais (2004, p. 10), são a espinha dorsal do gigantesco mercado acionário dos EUA, sendo, portanto, um canal central através do qual se estrutura sua valorização financeira, em escala global.

A financeirização representa, portanto, esse processo de subordinação de suas estratégias às necessidades de valorização do capital financeiro, mediadas pelos mercados financeiros. Grandes empresas transnacionais industriais tornaram-se, na verdade, centros financeiros com atividades industriais. Mais ainda, elas têm como parte principal de sua estratégia uma centralização de ativos financeiros, realizado através de uma empresa *holding*, no mais das vezes localizada em paraísos fiscais e fora, portanto, do alcance da legislação e controle das instituições nacionais de seus países originários (Serfati, 2008). As ETN passam a se caracterizar por um relativo declínio da importância atribuída às atividades de produção, com um aumento associado na importância das atividades financeiras e apropriação de valor dos ativos intangíveis (Serfati, 2008).

Como parte de sua crescente subordinação às finanças, as ETN modificaram substancialmente a organização e a gestão de suas cadeias de valor globais. As novas TIC permitiram a fragmentação dos processos de produção e a crescente internacionalização da aquisição de bens e serviços intermediários. Evidentemente, um objetivo importante destas mudanças foi a redução dos custos do trabalho. Elas também incluíram a terceirização de fases do processo produtivo que pudessem ser realizadas fora do âmbito da corporação por custo mais baixo.

Na maioria dos casos, as novas estratégias tentam preservar atividades estratégicas, como design e inteligência de negócios, e os estágios do processo produtivo, como a integração final do produto, que são produtores de altas margens de lucros. Mas a terceirização tem também atingido etapas de desenvolvimento tecnológico necessários para a inovação.

Chesnais (1992, 2002) explicita como as relações entre o capital financeiro, a empresa transnacional e os diferentes sistemas nacionais de inovação possam ser entendidos enquanto mecanismos de apropriação de valor. Entendendo-se a inovação como um processo sistêmico, sua busca requer insumos de diferentes naturezas e diferentes tipos de capacitação tecnológica. A apropriação destes recursos demanda gastos e esforços significativos. As empresas transnacionais passam a gerir a constelação de recursos específicos à sua disposição e aqueles que possam ser apropriados externamente de forma subordinada aos interesses advindos de sua crescente articulação às finanças.

Assim, a empresa transnacional adentra o regime de acumulação dominado pelas finanças visando se apropriar desses diferentes tipos de insumos ao processo inovativo de forma a minimizar seus custos e, mais importante, a partir de uma subordinação de suas estratégias de longo prazo àquelas de maximização dos ganhos financeiros de curto prazo.

O impacto destas transformações nos sistemas nacionais de inovação de países da periferia do capitalismo já tinha sido objeto de análise de François Chesnais em seu texto de 1992 (Cassiolato *et al*., 2014). Em tal texto Chesnais argumenta que, no bojo da globalização dominada pelas finanças, a inserção da ETN nos sistemas nacionais de inovação passa a se dar de forma distinta do período anterior em particular em função das transformações anteriormente apontadas. Inicialmente, a emergência das TIC permitiu a tais empresas migrar de estratégias nas quais as filiais eram razoavelmente independentes nos diferentes espaços nacionais para um sistema estratégico unificado, no qual estas subsidiárias se organizam em redes tendo em vista um objetivo global (Chesnais, 1992, p. 282). Diferentemente de algumas abordagens simplificadoras do surgimento de cadeias e redes globais de valor (que apontam a existência de estruturas descentralizadas de decisões), a abordagem de Chesnais sugere que as novas tecnologias em torno das TIC não apenas possibilitam que se mantenha uma estrutura decisória bastante hierarquizada no âmbito das ETN, mas permitem a submissão das atividades das filiais à estratégia central de maximização de valor de curto prazo e subordinação aos ditames das finanças. Nas suas palavras, "dentro das 'corporações em rede' ainda mais do que nas 'multinacionais clássicas', as estratégias de P&D e de inovação são funcionalmente relacionadas à gestão corporativa central tanto quanto a estratégia financeira das corporações" (Chesnais, 1992, p. 286).

Assim, de acordo com a abordagem de Chesnais, a idéia da chamada globalização das atividades de P&D adquire uma conotação mais apropriada. As subsidiárias das grandes ETN passam a se integrar mais às matrizes, e as suas agendas de P&D e de inovação vão ser mais subservientes a uma agenda global da organização. A manutenção dos laboratórios nos diferentes espaços nacionais permite que a grande corporação tenha maior acesso às capacitações e às rotas tecnológicas específicas desenvolvidas em cada sistema nacional de inovação. A direção da irradiação do avanço tecnológico é, portanto, inversa àquela que supõe o argumento usual: quando é a ETN que detém as principais capacitações e está organizada mundialmente com posições únicas de barganha, é ela que se encontra em condições de absorver as diferentes matrizes de conhecimentos disponíveis nos diferentes sistemas nacionais de inovação, e não o contrário (Cassiolato *et al*., 2014). Ainda que um determinado sistema nacional de inovação (SNI) não esteja articulado de forma a gerar uma dinâmica inovativa (e, portanto, produtiva), este quase sempre terá capacitações específicas e ativos comple-

mentares úteis à estratégia transnacional global. Seu acesso torna-se facilitado pelas TIC e, de forma mais relevante, por uma série de institucionalidades globais que foram, ao longo das últimas décadas, introduzidas por pressão das próprias ETN, pelo governo de seus países de origem e por organismos internacionais.

Deste modo, em diversos casos, entre os quais o Brasil se destaca, a chamada internacionalização das atividades de P&D se refere, primeiramente, a aquisições de empresas nacionais, cujos laboratórios de P&D são "herdados" pelas empresas que as adquirem, não faltando exemplos nos quais as operações destes laboratórios são depreciadas ou até encerradas[3]. Mais ainda, tais processos de "internacionalização" relegam às unidades descentralizadas, em sua maioria, papeis acessórios e subordinados à lógica das matrizes. Por fim, o que resta deste processo de descentralização tecnológica privilegiaria, primeiramente, os países da tríade entre si; em segundo lugar, países que, através de políticas públicas e da forte atuação do Estado, vem conseguindo superar seu atraso tecnológico e fortalecer empresas nacionais, a exemplo de Coréia do Sul e, mais recentemente, a China. Aos demais países "emergentes" como o Brasil e outras nações latino-americanas, que historicamente foram dominados pelo IDE e nos quais a participação do Estado como propulsor do desenvolvimento tecno-econômico mostrou-se limitada, os supostos benefícios desta atração de investimento tecnológico externo não foram, em nenhuma medida, sentidos.

Esta é uma importante assertiva válida até os dias atuais: a subordinação das estratégias de inovação das subsidiárias à gestão central das corporações e sua vinculação à estratégia central que é a financeira.

Todos estes temas são tratados de forma pioneira no artigo inédito de François Chesnais que é publicado neste número da Revista de Economia Contemporânea e que foi apresentado originalmente em seminário do Instituto de Economia da Universidade Estadual de Campinas (UNICAMP) em março de 1990. Quase 25 anos depois ele se mostra extremamente atualizado. A partir da percepção antecipada das transformações da grande empresa capitalista no quadro da globalização e da subordinação das estratégias de inovação das subsidiárias à gestão central das corporações e sua vinculação à estratégia central que é a financeira, Chesnais apontava que os objetivos de política perseguidos pelos governos de países em desenvolvimento, inclusive e particularmente o do Brasil, de atrair IDE e fazer com que o capital estrangeiro fosse um dos principais pilares da renovação industrial (associada à revolução da microeletrônica) "eram ao mesmo tempo bastante ilusórios e em grande parte equivocados".

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[3] Cassiolato *et al.* (2001) apresentam vários exemplos, inclusive o caso da Metal Leve S/A, empresa brasileira líder mundial na produção e desenvolvimento tecnológico em pistões para motores e que foi adquirida pela empresa alemã Mahler para a qual licenciava a tecnologia.

Seriam ilusórios na medida em que subestimam seriamente

> a natureza e a força dos fatores estruturais que têm ocorrido desde meados dos anos 1970 e que modificou significativamente as estratégias e as prioridades de investimento das empresas transnacionais que empreenderam o peso dos investimentos nos países em desenvolvimento e NICs na "idade dourada" dos anos 1960 e 1970. (Chesnais, 1990)

Seriam também equivocados na medida em que

> deixam de reconhecer que a mudança de paradigma tecnológico modificou os parâmetros de transferências internacionais de tecnologia e fez com que o crescimento industrial local e endógeno se tornasse dependente em um grau muito maior do que no período anterior (1960-1975) de fatores sobre os quais o capital estrangeiro não pode e não irá trazer ou construir nos países recipientes e que devem ser criados e construídos localmente. (Chesnais, 1990)

No que diz respeito à América Latina,

> estes desenvolvimentos significam que os padrões de IDE e de transferência de tecnologia, baseados na deslocalização da réplica de plantas industriais para a produção doméstica por parte de empresas transnacionais que representou de fato o fator condicionante das políticas cepalinas de substituição de importação voltadas ao crescimento industrial pertencem ao passado e simplesmente não podem ser revividas. (Chesnais, 1990)

Chesnais enfatiza no artigo que

> o que é novo é a extensão do oligopólio global e o fato de que agora ele se constitui na forma dominante de estrutura de oferta em atividades mais intensivos em P&D e de produção intensiva. O oligopólio mundial e a "competição global", que o acompanha, são resultados de dois processos relacionados, mas ainda assim distintos, o da internacionalização e o da concentração industrial e centralização financeira. (Chesnais, 1990)

Enquanto Chesnais antecipava já no início dos anos 1990 as novas formas de organização do capital em escala mundial, em especial a subordinação do capital produtivo ao financeiro e a inadequação de se tentar seguir políticas que tentassem cada vez mais atrelar o desenvolvimento brasileiro ao grande capital internacional, a política brasileira atrelada ao Consenso de Washington caminhava em direção contrária.

O insucesso de 25 anos em tornar endógena ao processo de desenvolvimento brasileiro a capacidade de gerar inovações baseado nas atividades tecnológicas de subsidiárias de ETN deveria estimular analistas e *policy-makers* a uma releitura de tão importante trabalho.

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PRESENT INTERNATIONAL PATTERNS OF FOREIGN DIRECT INVESTMENT: UNDERLYING CAUSES AND SOME POLICY IMPLICATIONS FOR BRAZIL(*) (**) (***)

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ABSTRACT: An important feature of the 1980s has been the substantial fall in the flow of foreign direct investment (FDI) to the developing countries and also, with the limited exception of the Asian NIE (Korea, Taiwan, Malaysia, Singapore) and China, to the newly industrialized countries, in particular those in Latin America. FDI has been concentrated more than ever among the advanced industrialized countries of OECD. The same period has witnessed a number of extremely important changes, both in the nature and location of basic or key technologies, the role of technology in industrial competitiveness; the most appropriate industrial management paradigm following the difficulties of the "Fordist" one; the nature of predominant international supply or market structures; and the relationships between productive and financial capital. Today a number of governments in developing countries and in NIC, among them the new government of Brazil, are again engaged in an attempt to attract FDI and to make foreign capital one of the major pillars of industrial revival and future growth. This paper argues that this policy objective is both fairly illusory and largely mistaken. It is fairly illusory in that it seriously underestimates the nature and strength of the structural factors which have been at work since the mid-1970s and seriously modified the strategies and investment priorities of the TNC which under took the brunt of the investment in developing countries and NICs in the earlier "golden age" of the 1960s and 1970s . The objective of luring foreign capital again to Brazil in ways and on a level similar to the 1960s is also largely mistaken in that it fails to recognize that the change in technological paradigms has modified the parameters of international technology transfers (cf. Ernst and O'Connor, 1989) and made indigenous and endogenous indus-

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trial growth dependent to a much higher degree than in the previous period (1960-1975) on factors which foreign capital cannot and will not bring to or build in host countries and which must be created and built indigenously.

KEYWORDS: Foreign direct investment; market structures; industrial policy; Brazil.

JEL CODES: F2; L1; O1.

PADRÕES ATUAIS DE INVESTIMENTO DIRETO EXTERNO: CAUSAS SUBJACENTES E ALGUMAS IMPLICAÇÕES PARA O BRASIL

RESUMO: Uma importante característica da década de 1980 foi a queda substancial no fluxo de investimento direto externo (IDE) para países em desenvolvimento, bem como, com a limitada exceção dos países asiáticos de industrialização recente (República da Coreia, Taiwan, Malásia, Cingapura) e da China, para outros países de industrialização recente, particularmente os situados na América Latina. Mais do que nunca o IDE vem se concentrando entre os países de industrialização mais avançada da OCDE. Esse mesmo período testemunhou um número significativamente grande de importantes mudanças, tanto na natureza quanto na localização das tecnologias básicas ou principais; no papel da tecnologia na competitividade industrial; no mais apropriado paradigma do gerenciamento industrial que sucedeu as dificuldades do paradigma fordista; na natureza das estruturas de mercado e fornecimento predominantes; e nas relações entre o capital produtivo e o financeiro. Hoje vários governos de países em desenvolvimento e de industrialização recente, entre eles o do Brasil, estão novamente engajados na tentativa de atrair IDE e fazer dele um dos principais pilares da revitalização da indústria e do crescimento futuro. Este artigo argumenta que o objetivo de tal política é ao mesmo tempo bastante ilusório e muito equivocado. É bastante ilusório no sentido de que seriamente subestima a natureza e a força dos fatores estruturais que vem atuando desde a metade da década de 1970 e que vem seriamente modificando as estratégias e as prioridades de investimento das corporações transnacionais, as quais assumiram a maioria dos investimentos nos países em desenvolvimento

e de industrialização recente no início da "época de ouro" das décadas de 1960-70. O objetivo de atrair novamente capital estrangeiro para o Brasil de maneiras e em patamar similar ao ocorrido na década de 1960 é também largamente equivocado, uma vez que falha em reconhecer que a mudança nos paradigmas tecnológicos modificou os parâmetros das transferências de tecnologia (cf. Ernst and O'Connor, 1989) e tornou o crescimento industrial endógeno e exógeno dependente, em um nível muito mais alto do que em períodos anteriores (1960-1975), de fatores os quais o capital estrangeiro não pode e não irá trazer para ou construir em países que o recebe e os quais devem ser tratados e criados endogenamente.

PALAVRAS-CHAVE: Investimento direto externo; estruturas de mercado; política industrial; Brasil.

1. THE PRESENT PATTERN OF FOREIGN DIRECT INVESTMENT FLOWS AND A LOOK BACK AT THE EARLIER PERIOD

An important feature of the 1980s has been the substantial fall in the flow of foreign direct investment (FDI) to the developing countries and also, with the limited exception of the Asian NEWLY INDUSTRIALIZED ECONOMIES (or NIE – Korea, Taiwan, Malaysia, Singapore) and China, to the Newly Industrialized Countries, in particular those in Latin America. Despite an increase in absolute value in 1987 and 1988, the share of total FDI flowing to the NIE, NEWLY INDUSTRIALIZED COUNTRIES (NIC) and developing countries continued to fall in the second half of the 1980s. The latest internationally comparable figures available in the UN Centre on Transnational Corporations (see Table 1) give the following results in terms of the percentage of investment going to different regions or countries. The figures show that the fall in Latin America's share was the sharpest of all.

Table 1 – Share of total FDI flowing to the NIE, NIC and developing countries (in percentage of investment)

	1981-83	1984-88
Developed countries	72.8	80.0
United Kingdom	11.0	8.6
United States	36.0	41.0
Developing countries	27.2	20.0
Africa	2.9	2.5
South and Southeast Asia	10.3	8.6
Latin America	13.0	8.3
Oceania	0.3	0.3

Source: UN Centre on Transnational Corporations (1988).

As can also be seen, FDI has been concentrated more than ever among the advanced industrialized countries of Organisation for Economic Cooperation and Development (OECD). It has also been characterised in that context by significant changes in the pattern of investment, in particular the sharp rise in the level of inward investment by the United States and the emergence of Japan as a formidable competitor and exporter and now also the home country of some of the world's largest industrial TRANSNATIONAL companies (TNC).

It is impossible to go on viewing this fall in the share of FDI going to the developing countries and barring a few exceptions to the NIC as representing some kind of cyclical phenomenon, albeit one in which the depressionary phase might be of long duration. Nor is it sufficient to attribute the fall in the new foreign direct investment exclusively to the dramatic debt crisis suffered by a number of countries and to the phenomena which have accompanied it: e. g. low or often negative rates of investment in industrial capacities du-

ring the 1980s and more serious still in the basic infrastructures and public services (including those necessary to industry itself); galloping inflation or even hyperinflation; the acute fiscal and hence political and social crisis of the State; "dolarisation" (Salama, 1989) and the establishment of two parallel and highly unequal monetary systems (one based on the national currency, the other on the dollar); the serious worsening of the already extremely unequal pattern of income distribution and in particular the fall in the real income of the working class, not to speak of the other low or practically "non-income" social groups; the drop in the level of labour productivity resulting from all the previous factors (see Table 2).

Table 2 – Foreign direct investment flows, 1983-1988 (billions of United State dollars)

Country/region	1983	1984	1985	1986	1987	1988	1981-1983	1984-1988
	Foreign direct investment inflows						Annual average	
Developed countries	33.5	38.6	35.7	63.6	94.5	118.8	35.3	70.2
France	1.7	2.4	2.6	3.2	5.1	8.5	1.9	4.4
Germany, Federal Rep. of	1.6	0.6	0.6	1.0	2.0	1.7	0.9	1.2
Japan	0.4	-0.01	0.6	0.2	1.2	-0.5	0.3	0.3
United Kingdom	5.2	-0.3	4.7	7.1	13.3	13.1	5.4	7.6
United States	12.0	25.3	19.2	33.7	46.8	58.5	17.1	36.7
Developing countries	10.4	12.0	13.3	13.9	23.6	25.1	13.2	17.6
Africa	1.2	1.4	2.6	1.8	2.2	2.9	1.4	2.2
South-East Asia	4.7	5.1	4.6	5.7	10.1	12.3	5.0	7.6
Western Asia	0.3	0.7	0.4	0.3	0.2	0.4	3.7	0.4
Latin America	4.0	4.7	5.6	6.1	10.8	9.3	6.3	7.3
Oceania	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Eastern Europe	0.02	0.03	0.02	0.02	0.01	0.01	0.02	0.02
TOTAL	43.9	50.7	49.0	77.5	118.1	143.9	48.6	87.8
	Foreign direct investment outflows						Annual average	
Developed countries	35.8	41.4	56.6	90.6	142.1	144.3	40.3	95.0
France	1.7	2.1	2.2	5.3	9.1	14.5	3.0	6.7
Germany, Federal Rep. of	3.2	4.3	4.9	10.1	9.2	10.4	3.2	7.8
Japan	3.6	5.9	6.4	14.3	19.4	34.3	4.3	16.1
United Kingdom	8.2	8.0	11.2	16.2	30.5	27.2	9.2	18.6
United States	3.6	4.9	13.5	21.4	41.2	14.8	7.5	19.2
Developing countries	0.9	0.6	1.2	1.3	2.3	5.8	0.7	2.2
Africa	0.06	0.06	0.04	0.05	0.1	0.04	0.08	0.06
South-East Asia	0.3	0.3	1.0	0.8	1.9	5.4	0.3	1.9
Western Asia	0.2	0.1	0.07	0.3	0.1	0.3	0.07	0.2
Latin America	0.3	0.08	0.1	0.2	0.2	0.1	0.3	0.1
Oceania	0.001	0.003	0.001	-0.008	-0.02	0.03	0.001	0.002
Eastern Europe	0.001	0.01	0.001	0.02	0.008	0.02	0.003	0.01
TOTAL	36.7	42.0	57.8	92.0	144.4	150.1	41.1	97.3

Note: Data courteously provided by the Secretariat of the UNTC.
Source: International Monetary Fund (1990), and OECD (1986a).

While all such and other phenomena arising from the debt crisis have certainly played a role in turning FDI away from many developing countries as well as from the most hi-

ghly indebted NIC, notably those of Latin America, and will thus explain a part of the difference with the level of FCI experienced by the much less indebted Asian NIC-NIE, the relationship between the debt crisis and the FDI is a considerably more complex one.

On the other hand, there exists an extremely powerful constellation of factors (four of which are examined below in section 2) tending to force advanced capitalist firms to concentrate their strategies, resources and even the day-to-day attention of their management within the OECD area (plus the investment which may now go to Central and Eastern Europe in particular by German firms).

On the other hand, in relation to changes in the pattern of international competition (including the consolidation of tripolar competition along with trading block relationships between the three poles – the United States, Japan and Europe – and the developing countries in their "own" zone of influence), as well as to changes in key technologies and industry-to-industry hierarchies, the only investments that these same firms will seriously contemplate in NIC and developing countries will be:

(i) in free export zones within legal arrangements combining quasi extra-territoriality and sovereignty of TNC (e. g. Northern Mexico) with the right given to them to exploit the local workforce on the basis of the most unfavourable local conditions; or on the contrary;

(ii) in economies such as Taiwan or South-Korea, which have built industries, firms and/or technical infrastructures which can be of interest to advanced country firms, thus allowing these economies to be serious candidates for the type of subcontracting agreements of industrial joint ventures which are required by new techno-industrial paradigms discussed ahead.

With respect to Latin America, these developments mean that the patterns of FDI and technology transfer, based on the delocalization of "replica-of-home-production" industrial plant by TNC – as studied *inter alia* by Caves (1982) and Michalet (1986[1976]) –, which represented in fact the conditioning factor of CEPAL (e. g. Prebitch inspired) "import-substitution" policies of industrial growth, belong to the past and simply cannot be revived.

1.1. THE EARLIER PATTERN OF FDI AND TECHNOLOGY TRANSFER IN RETROSPECT

Today it is clear that the international pattern of FDI and the structure of international technology transfers which prevailed from the late 1960s up into the second half of the 1970s (definitely ending with the 1979 "oil shock" and the subsequent sharp cyclical downturn of 1980-82) were shaped by a few, easily identifiable set of major factors. Several of these were recognized at the time by the most clear sighted authors, but

more rarely combined into a single analysis. With the hindsight of subsequent developments, it is now possible to see the extent to which the level and pattern of FDI and multinationalisation during the 1955-1975 period were historically conditioned and cannot be expected to reoccur on the same level or the same forms. Reference will be made here only to four of the most major factors, one financial and monetary and three related to supply structures, production and technology.

The financial and monetary factor was of the one related to the existence of a set of stable and temporarily effective monetary institutions, coupled with the large capital resources accumulated within US corporations and of the very large official reserves of the United States stored in the Fort Knox gold chambers. On the whole, in retrospect the period was one where in the advanced capitalist countries the banking system remained the auxiliary of industry and the predatory operations of concentrated money capital were rare, and where the largest part of the investment resources made available to the developing countries took the form of loans through multilateral banks, bilateral government development aid and FDI. It is only later, at the end of the period and after 1979, that huge foreign credits were made available by international banks at initially very attractive "easy money" conditions for parasitical State-apparatuses and equally parasitical domestic banking systems and that the buildup of today's crippling debt burden began. During this "golden era", FDI was through multinational enterprises (MNE) or for the financing of well-defined large infrastructures and was generally a factor of industrialization and the extrusion of capitalist relationships of production.

The three main non-directly financial phenomena which contributed to shape FDI and the pattern of multinationalisation or transnationalisation in developing countries between 1980 and the second half of the 1970s, related to:

i) the pattern of industrial power and the nature of prevailing supply or market structures;
ii) the general state of maturity of industrial technology; and
iii) the security, wide diffusion and fairly easy "exportability" of the dominant "Fordist" paradigm of industrial management.

Let us look quickly at each of these three factors. First, it is now even more clear than it was at the time the expansion of MNE or TNC-based foreign direct investment was closely related to the particular conditions of US hegemony during the two and half decades which followed the end of the 2nd World War (up to the collapse of the Bretton Woods system in 1971). Over this period, the process of internationalisation was characterized by the linking of still fairly autonomous national productive systems and domestic oligopolies with in an international setting marked initially by very strong US leadership, characterised simultaneously by US technological advance, US industrial

competitiveness and the large capital resources available to US firms. During this period, the geographical and industry-specific orientation of FDI was shaped by patterns of corporate behavior which could only be understood against the setting of US domestic supply or market structures, and thus basically represented the international extension of US domestic oligopolistic rivalry. Here we wish to quote Caves, who represented at the time one of the few US authors (along with Hymer) with a real insight into the factors shaping US foreign direct investment. In the introduction of his seminal 1971 paper he says:

> Briefly, the argument of this paper is that foreign direct investment occurs mainly in industries characterized by certain market structures in both the "lending" (or home) and "borrowing" (or host) countries. In the parlance of industrial organization, oligopoly with product differentiation normally prevails where corporations make "horizontal" investments to produce abroad the same lines of goods as they produce in the home market. Oligopoly, not necessarily differentiated, in the home market is typical in industries which undertake "vertical" direct investments to produce abroad a raw material or other input to their production process at home. Direct investment tends to involve market conduct that extends the recognition of mutual market dependence - the essence of oligopoly – beyond national boundaries. (Caves, 1971, our stress)

"Recognition of mutual market dependence" gave a premium to acquisition and/or green field investments located in foreign economies which permitted corporate growth in ways that did not disturb significantly the equilibrium of power between oligopolistic rivals at home. When the major European economies along with their "national champions" (e. g. their domestic and regional oligopolists) recovered sufficiently and started expanding again internationally within the world imperialist system in the mid--1960s, they generally adopted the status of docile junior partners within the US-based and US-dominated oligopoly, very rarely challenging the US oligopolies on their domestic market and modeling their overseas investments along the basic US pattern.

The second factor at work concerned the state of technologies and the fairly stereotyped pattern of technology transfer they implied. From the 1960s onwards, in many important industries process technologies were either mature or approaching maturity and were hence fairly readily transferred, both within "replica plant" import substituting FDI as in Latin America or to form the basis for "export-led" growth as in Far East Asia. Similarly, product technologies could be made to follow "product life cycles" on the basis of the international investments patterns which are classically associated at a conceptual level with the names of Hirsch (1976) and Vernon (1966).

Third, over the same period, industrial production was completely dominated by the "Fordist" paradigm, characterised by very high levels of mechanisation, a very ad-

vanced state of the division of labour within firms, labourspecialisation and for very many jobs a drive towards the utmost simplification of functions, thus allowing the employment in many positions of very unskilled workers: indigenous peasants and immigrant workers at the centre of the system and the local often very unskilled labour force at the periphery. The stability of this paradigm – and its success over some time – offered TNC based security in their home economies and an easily exportable pattern of management, one that could combine foreign stays by management and senior engineers and the employment of the local work force all the other functions.

From the mid-1970s onwards, in the context of the world crisis and as particular dimensions of this crisis, all three factors began to undergo very deep and partly inter--related changes which are still far from over today, while in parallel very important and deeply contradiction-ridden changes took place in the international monetary and financial system.

2. MAJOR STRUCTURAL FACTORS SHAPING CORPORATE INVESTMENT PRIORITIES

It is now the time to turn to the factors which are concentrating the attention and resources of firms in the advanced countries. These factors include the new role of technology in competitiveness, the energy devoted by firms to adopting new "post-Fordist" management and work organisation styles, the attention and resources firms have to devote to pairing off the attacks of large, predatory finance capital ventures and the onset of tripolar "global" competition within international of world oligopolistic market structures.

In defining these changes, it is probably best and certainly soundest methodologically to start by the ones which have occurred in connection with the pattern of international competition between the three major financial and industrial poles and the underlying parallel changes in the predominant form of supply or market structures.

2.1. THE EMERGENCE OF INTERNATIONAL OR GLOBAL OLIGOPOLY

One of the most important international developments of the 1970s was the eruption of the major Japanese firms in a number of industrial sectors, not only as major actors in world markets, but also as entrants into the prevailing oligopoly who were not prepared to accept, as the Europeans had done previously, to tow the American line. Japanese oligopolists broke the unwritten conventions of the previous phase of international oligopolistic expansion. They attacked the major US firms in their domestic economy, first through exports and then in the 1980s through direct investment, depriving US firms in many industries (consumer electronics first, later cars and ma-

chine-tools, now semiconductors) of huge market shares, not simply in "neutral" or "third party" markets, but in their own home economy. Japanese firms are of course now poised to do the same in Europe with Thatcher's United Kingdom as a convenient "inside" jumping board (see the UK's share of FDI in Table 1), and have begun to increase their pressure strongly on Europe, in a number of product areas.

This new pattern oligopolistic competition would, by itself, have forced the major US and European firms to rethink their priorities and orient their investment towards strategies aimed at counteracting the Japanese advance. The fact that Japanese expansion has been based on a new paradigm of industrial organization and work management, now far superior to the "Fordist" one, and that the eruption of Japanese firms into the world market also coincided with the start of the radical change in basic technologies, has made this reorientation all the more necessary and urgent.

Before passing on to these important phenomena, it is first necessary to specify a few points regarding the nature of present capitalist supply structures.

The eruption of the Japanese as major world competitors and the strategy they chose *vis-à-vis* their US counter parts has brought about a transition from the pattern of oligopoly analysed in section 1 to the emergence and generalization of supply structures characterisable as world oligopoly or international oligopoly (see Cotta, 1978; Chesnais, 1982; Dosi, 1984).World oligopoly is of course not, in any way, a totally new form of supply structure. In petroleum and in severalnon-ferrous metal mining and processing industries (for instance aluminum), world oligopoly has long been a key feature of supply. What is new is the extension of global oligopoly and the fact that it now constitutes the dominant form of supply structure in most Research & Development (R&D) intensive or "high technology" industries as well as in many scale intensive manufacturing industries in the Pavitt (1984) terminology. In R&D intensive industries, the only exceptions are those industries where supply structures are even more highly concentrated with only two (as for instance in the case of space launchers) or three (as for instance in the case of long range civil air craft) manufacturers competing in the market.

World oligopoly and the "global competition" which goes along with it is the outcome of two related but nonetheless distinct processes, that of internationalisation and that of industrial concentration and financial centralisation. It occurs at the point:

i) when in a given industry industrial and technological development has created extremely strong constraints on firms (notably in the form of large R&D costs which must be recouped) to produce for world markets as distinct from even the largest domestic markets, as well as important opportunities for worldwide sourcing of key inputs to production, notably in the form of scientific and technological advances made in foreign countries (we have argued and documented this point in Chesnais, 1988a);

ii) when patterns of foreign direct investment have followed a path where after an initial phase in which such investment was principally of US origin and followed the pattern discussed above, that have increasingly developed on a tripolar (or "Triad" basis, Ohmae, 1985) and taken the form of "mutual invasion" or "raiding" (Erdilek, 1985) between TNC belonging to the three main poles of the international market economy, and

iii) when concentration, after developing principally on a domestic basis, has evolved as an international process and led to a situation where the number of oligopolistic rivals in the strict sense of the term, e. g. those effectively capable of waging world or global competition, has dropped to levels corresponding *pari passu* at the world level to those previously associated with oligopoly as calculated on the basis of earlier domestic criteria.

Work on concentration at an international level has fallen seriously behind the deep changes in the world economy which have taken place as a result of the overall process of internationalisation (cf. Newfarmer, 1985). Measures of concentration (e. g. market shares by the first four, eight and 20 firms) are still being carried out mostly on a purely domestic basis at a time when the most significant indicator of concentration probably now pertains to global, e. g. world market shares. This has begun to be done in a number of sector studies, notably in some carried out over recent years at OECD, but these scattered efforts now require to be centralised and related to the appropriate theoretical under-pinning in a way which would contribute to establishing international oligopoly as a recognized and academically "irrefutable" concept.

In our perspective, the proper relevant measure of global concentration in an industry is the share of the largest 10, 20, 35 and 50 firms in total world assets or sales. This would provide one meaningful index of the power in the industry considered of a selected group of firms to influence business decisions, build collective entry barriers *inter alia* through the individual and collective protection of their technological advance and, when conditions permit this, to limit price-competition around the world (as has been the case for instance in pharmaceuticals).

Increases in global market concentration associated with transnational investment do not of course necessarily preclude situations of strong almost "cut-throat" oligopolistic rivalry. This, obviously, is the case today between Japanese and US oligopolists in a number of high technology industries. Such rivalry can, however, quite well represent essentially a transitory phase, the outcome of which may be an increase in concentration over the long-run as some firms are driven out of business and the remaining ones prefer to work out arrangements permitting some kind of coexistence with the leaders of the world oligopoly (this has occurred in colour TV for instance).

Oligopoly has generally been studied principally in relation to price theory. A correct appreciation of mutual market dependence and so of mutual recognition as representing the hallmark of oligopoly can help to understand why cooperation, notably today in the area of technology (see Chesnais, 1988b, for an overview of the literature and case study material), can develop alongside rivalry and occur in many areas other than the establishment of prices. Caves was quoted before. A good British textbook on industrial structure and market conduct, Pickering (1974) also points out that:

> The normal starting point in the definition of an oligopoly is to be found in the emphasis of fewness. In fact this alone is an inadequate definition and it is unlikely that a simple count of heads in an industry would be sufficient to identify an oligopoly situation (…) It is more accurate and meaningful to emphasis the pattern of behavior that arises in an oligopoly and to recognize that it is the interdependence between firms which is the key (…)
>
> The consequence of oligopoly is that firms respond not to impersonal market forces but personally and directly to their rivals (…) Competition in this situation trends to take place not only between products, but also between producers and there is a considerable emphasis on entrepreneurial skills in identifying and devising new and effective forms of competition. Product and marketing competition is therefore particularly important. There is, however, not necessarily all out competition in all dimensions and at all times in an oligopoly. Often there will be attempts to generate co-operation between firms; firms will bargain with each other and side payments may often be made.

Interdependence (or to be more exact "mutual market dependence" now occurring in an international as opposed to a national context), mutual recognition and oligopolistic co-operation are not contradictory with intense rivalry and can in many instances develop in parallel with competitive strategies aimed at eliminating rivals from the market. The breakdown of the previous strong domestic oligopolies has led in some instances to clearly recognizable forms of international or world oligopoly with quasi-cartel features. But, in most industries somewhat more complex supply structures involve quite strong forms of competition prevail today. In the case of highly concentrated oligopolies and among large rival firms, these situations comprise oligopolistic recognition and cooperation by rival firms alongside the global competition theoricised by Porter (1986) which concerns the struggle by rivals to gain a strong foothold in all the parts of the multipolar system.

The type of competition being waged today among OECD firms, in which Japanese firms have been particularly successful during the whole of the 1980s, does not exclude the participation of governments. On the contrary, as noted quite early by

Cotta (1978), governments are parties to global oligopolistic competition making world oligopoly "mixt" (e. g. public and private). This point is now fully substantiated for instance by Ernst and O'Connor (1989) and by the main papers for the 1990 OECD Tokyo Colloquium on Technology and the Internationalisation Globalisation Process (see *inter alia* Lanvin, 1989).

Innovation policy involves one of the most presently significant government-corporate interface. The focus is on the promotion and adoption of the new technology, with the aim to maximise international competitiveness. The center stage is occupied by the Japanese policy of targeting strategic sectors or technologies considered essential to the long-run commercial or security interests of the country. While there have been some changes over the past two decades under strong US pressure, Japanese innovation policy remains unique in its blend of cooperation and competition between Japanese industrial groups, and its effective coordination of several policies: trade, R&D, competition policy, and financial market structure.

The influence and impact from the Japanese model has been equally evident in Europe and in the United States, although the forms have been different. The increasing and novel use of antidumping by the European Commission has stemmed from concern about preserving a European base in leading-edge technologies. This concern has also propelled the development of cooperative government-industry research projects, especially in information technology (ESPRIT I and II). In the United States, the debate about developing an innovation policy has been devisive and remains unsettled. But changes in antitrust law (to encourage cooperative research among firms); in the role of the Department of Defense (in supporting "critical" dual-use technologies and products); and in trade policy (the US-Japanese semiconductor agreement and the structural impediments initiatives) all point to the impact of the Japanese model. The most likely outcome of the pressures, in the absence of international policy action, is a move to bilateral managed trade which will not produce a stable international trading system, but rather strengthen the "neo-mercantist" tendencies at work.

2.2.THE NEW TECHNOLOGIES, TECHNOLOGY-BASED COMPETITION AND "INTANGIBLE" INVESTMENT

Independently of the pace which is attributed to current technological change, there can be no doubt that the major current new technologies (by which are meant information technologies, new materials technology and biotechnology) possess a number of fairly novel features, which have created within the OECD area strong constraints for changes in the strategies and day-to-day operations of firms along with correspon-

ding necessary developments at the level of industrial organization and approaches to business management.

At a fairly high level of generalisation the current overall trend in science and technology can be defined as follows:

i) Basic scientific knowledge is playing an increasingly crucial role in opening up new possibilities for major technological advance and has brought competitive industrial technology closer than even before to "pure" and of course to mission-oriented fundamental research. This is obvious in the case of biotechnology, but is also true for computer programming, for instance.
ii) Many recent breakthroughs have occurred as a result of cross-fertilisation between scientific disciplines and more are in the offing (e. g. bio-informatics).
iii) In many areas technology has acquired ever stronger systemic features. These features are the hallmark not only of spectacular developments in space technology, telecommunications or military systems, but also of more mundane, albeit revolutionary, technologies in the areas of DAC/CAM, new materials, etc.
iv) In most areas of manufacturing, engineers are confronted with new criteria for dominant designs and must adapt to new technological and industrial paradigms, some of which are compatible with earlier approaches to design and production management, while others require a complete break with previous procedures and ways of thinking.

The four aspects are in fact linked and represent facets of a single interacting process. Major innovations are based even more strongly on scientific knowledge: synergies and cross fertilization, both between scientific disciplines and between scientific and technological (engineering advances), play an ever more important role, notably through the advances continually occurring in computing technologies. The massive entry of computing into instrumentation has further strengthened the role played by the latter. The extension of the systemic features of technologies to an ever larger number of areas is a necessary and inevitable outcome and expression of these developments.

In parallel, firms have been faced with the imperative of assuming strong increases in R&D costs and outlays: this has been particularly noticeable in computers, electronics and components and pharmaceuticals, but would also be identifiable in areas such as new materials if detailed data were available. Many factors explain the sharp rise in the cost of R&D. We can list a few entry into a phase of scientific and technological development where even and ever larger investments are required to make an advance (the latest generations of semiconductors, "5th generation" computers); shifts to new technological paradigms with the need to make new investments

well ahead of any large scale commercial return (this is the case in biotechnology); strongly diminishing returns to R&D outlays in traditional paradigms (molecular screening in pharmaceuticals); international competition between OECD countries for scarce scientific manpower on account of high government R&D outlays in defense (this is the case in laser technology) or because of the shift to a new technological paradigm (biotechnology).

The rise in the cost of R&D and the need for firms to follow closely current changes in technology represent at the moment absolutely general processes. They account for the rise in the percentage of corporate sales spent by firms on R&D, not only in industries long accepted as R&D intensive, but also in industries affected by inter-industry technology transfers and impacts (for instance automobiles). The simultaneity, inter-connectedness and complexity of current technological developments have created what Fusfeld (1986) has described as a "technological capability squeeze" on firms, marked by:

i) The increase in the number of technical fields relevant to corporate growth:

> Continuing technical progress opens new branches of knowledge and creates new interfaces between existing disciplines. Chemical companies are turning to biotechnology, automotive and process industries use robotics and microprocessors, and medical instrumentation combines optics, mechanics, electronics, and biology. As products and processes become more sophisticated and represent more substantial technical change, they tend to require contributions from a larger number of scientific and engineering specialties.

ii) Totally new requirements for significant technical advances:

> In industries which are characterized by a high degree of technical change, as well as in industries which have experienced minimal technical change, business growth and indeed the survival of firms frequently requires a massive technical step forward (...). Laser devices, photographic imaging, medical instrumentation, biotechnology, catalysis are all areas where the emerging products are based on pushing the technical frontiers of those fields. Wholly new approaches for mining, for treating chemical waste, for continuous casting of all common metals, for reducing friction in mechanical systems are equally complex or massive in their technical requirements (...). The almost continuous technical advances in microelectronics have sharply reduced the life-cycle of products such as small computers, instruments, control devices, toys, medical equipment. These changes bring great opportunities for new comers and fast-moving existing firms. And they put pressure on all companies to expand their technical resources in order to absorb and anticipate external technical change.

Firms must meet these pressures simultaneously through their own R&D and the external acquisition of knowledge, know-how and skills located in other organisations, whether universities (when the knowledge is still close to basic research), government research institutes, or other, more specialised, but also very vulnerable smaller firms. Today interfirm or university-industry technology cooperation agreements represent a major route for this form of external sourcing (see Chesnais, 1988b, for a review and assessment). When they concern firms, these agreements may simply prepare the way to outright acquisitions and mergers. But firms have also sought to face up to the pressures of the "technological capability squeeze" by setting up joint of cooperative R&D arrangement with their direct oligopolistic rivals.

As a result, the increase in the overall knowledge intensity of production has been associated with a significant parallel change in the mix between physical and "intangible" investment. The point which we wish to make here is that although "tangible", e. g. physical investment in machinery, buildings and equipment has always been closely related to intangible investment in new knowledge and its dissemination, this interdependence has now taken on new dimensions with the current wave of new technologies. "Intangible" investment in R&D, education, training, and software maintenance and development is now considered by OECD firms and governments to be an essential complement to most forms of physical investment.

In section 3, we will point to the policy implications of this process for the NIC, the argument we are making here being the attention and the large outlays which firms at the tripolar center of the system within OECD have been forced to devote to the form of investment. In five major OECD countries the share of total investment going to "intangibles" (R&D, marketing and software only) rose sharply by over 40%, from the mid 1970s to the mid-1980s (see Table 3). The only other kind of investment activity which increased as dramatically relative to other forms of investment over the same period was in the financial sphere, due to rapid increase in mergers and acquisitions.

Table 3 – Trends in industrial investment (1) (in percentage of total)

	1974	1984
Expansion investment (industrial plant)	38.1	31.7
Modernisation investment (machinery and equipment)	42.4	41.8
Non-physical investment (R&D, marketing, software)	13.8	19.4
Financial investment (mergers and acquisitions)	2.1	4.8
Foreign investment (outward direct investment)	3.6	2.3
Total Industrial Investment	100.0	100.0

Note: (1) Averages for five major OECD countries: United States, Japan, Germany, France and the United Kingdom.
Source: OECD (1986a).

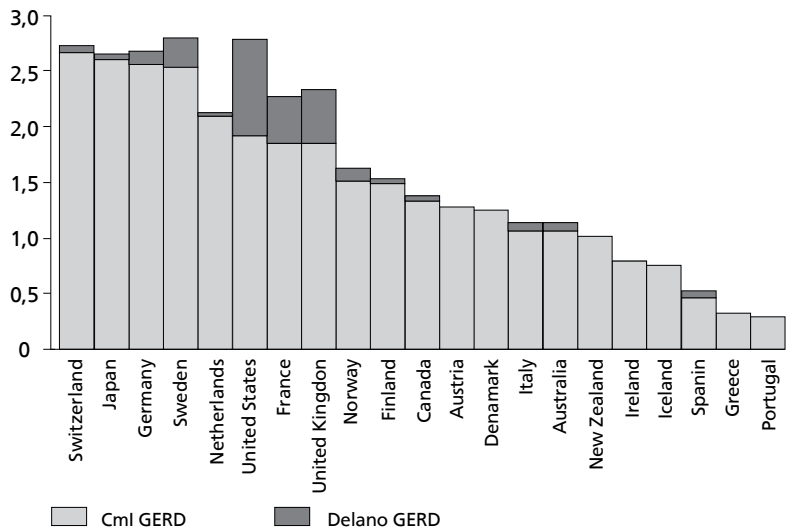
Directly comparing physical investment with intangible investment (R&D, software and marketing only), the share of GDP going to intangible investment rose significantly from the mid-1970s to the mid-1980s, whereas total physical investment in non-residential construction and machinery and equipment declined as a share of GDP (see Table 4). Subsequently, physical investment revived in most OECD countries, but it is still being outstripped by high rates of investments in intangibles.

Table 4 – Industrial investment in tangible and intangible assets (1) (in percentage of GDP)

	Tangible		Intangible (1)	
	1974	1984	1974	1984
United States	14.2	13.2	4.4	6.2
Japan	26.9	22.9	2.4	3.5
Germany	15.0	13.8	2.4	3.6
France	16.8	13.4	2.3	3.1
United Kingdom	16.3	13.5	3.1	3.8
Italy	18.1	14.7	1.0	1.9
Netherlands	16.1	13.5	2.6	3.7
Average	17.6	15.0	2.6	3.7

Note: (1) Intangible investment = expenditures for R&D, marketing and software.
Source: OECD (1986a).

Figure 1 – Civil and total GERD as a percentage of GDP, 1986



Source: OECD (1986a).

Table 5 – Productivity, output and input growth of thebusiness sector (average percentage change at annual rates)

	OECD average	United States	Japan	Germany	France	United Kingdom	Italy	Canada	Austria	Belgium	Denmark
1960s to 1973											
Output	5.2	3.8	9.7	4.6	6.4	3.2	5.6	5.7	4.5	5.4	3.4
Factor input	2.4	2.3	3.5	1.8	2.1	1.2	0.9	3.5	1.7	1.6	1.7
TFP	2.8	1.5	6.1	2.8	4.3	2.0	4.7	2.2	2.8	3.7	1.7
Labour productivity	4.1	2.2	8.6	4.9	5.9	3.3	6.5	2.9	5.3	4.8	3.6
Capital productivity	-0.4	0.3	-2.4	-1.1	0.6	-0.7	0.4	1.1	-2.7	1.0	-1.8
1973-79											
Output	2.9	2.8	3.8	2.4	3.5	1.1	2.9	4.9	3.5	2.0	0.9
Factor input	2.2	2.9	2.0	0.6	1.4	0.9	1.3	3.7	1.7	0.6	0.7
TFP	0.7	-0.1	1.8	1.8	2.1	0.2	1.6	1.1	1.8	1.4	0.1
Labour productivity	1.6	0.3	3.2	3.4	3.5	1.3	2.4	2.0	3.9	2.8	1.8
Capital productivity	-1.4	-0.9	-3.0	-1.1	-1.2	-1.9	-0.4	-0.3	-2.7	-1.8	-3.3
1979-86											
Output	2.3	2.2	3.8	1.6	1.5	1.4	1.9	2.5	1.7	1.6	1.9
Factor input	1.7	2.2	2.1	0.8	0.2	0.3	1.1	2.9	1.1	0.3	1.1
TFP	0.6	0.0	1.7	0.8	1.3	1.1	0.7	-0.3	0.7	1.3	0.8
Labour productivity	1.4	0.6	2.8	2.0	2.5	1.9	1.2	1.1	2.0	2.3	1.7
Capital productivity	-1.3	-1.0	-2.0	-1.3	-1.4	-0.8	-0.7	-2.6	-2.2	-1.2	-0.9
Memorandum:											
1985 capital share	32.2	34.3	22.6	34.8	30.8	32.5	29.9	37.9	32.1	29.2	33.8

Source: Englander, Evenson and Hanazaki (1988).

The measure of intangible investment being used here does not include firm-based training, re-organisation and product introduction, all of which have also been growing strongly over the past decade – but for which internationally comparable data are very difficult to find. This is a drawback since the growth of this form of "intangible" investment is an expression of the third broad process explaining why corporate priorities are centered today within the home countries of TNC and concentrated within the OECD area.

This process relates to the attempts now underway by corporations in the major capitalist countries in North America and Europe to move away from the "Fordist" model of industrial management and work organisation, and to adopt a management "paradigm" (or set of principles) better adapted to the economic and social context as well as to the opportunities offered by the new technologies (see Coriat, 1990): a model which would be

capable of resolving the contradiction of "Fordism" and the blind alley into which it had entered by the mid-1970s, but which is also the only one which can permit the firms from the two other poles of the "Triad" to survive in the face of Japanese competition.

2.3. THE STRUGGLE TO MOVE OUT OF THE "FORDIST" MANAGEMENT PARADIGM

While C. Perez (see her contributions in Dosi *et al*., 1988) and the authors that follow her can argue quite forcefully on the basis of the so-called "mismatch theory" of which she is the main protagonist, that the new industrial management genially known as "Toyotism" represents the first component of the "adequate socio-institutional framework" which would be required to unleash the full potential of the new technologies (in particular information technology), "Toyotism" represents in fact a set of "organizational innovations" developed from the late 1960s onwards, as the specific Japanese response to what was at the time not yet the crisis of Fordism, but already on their part an acute perception of its contradictions and weaknesses.

The new management principles (which are of course hardly "new" anymore for Japan itself where "Toyotism" has many variants) form one of the central pillars of Japanese industrial competitiveness. Understanding, adopting and adapting these principles is now a matter of life and death for US and European firms. The process of course also defines the management standards which any firm aiming at competition in capitalist conditions on world markets is now forced to adopt. Since this point is still often not fully appreciated, or at least seriously under estimated both by development economists and, outside Korea and Taiwan, by most capitalist circles in the NIC, we will dwell on this point fairly longly in this paper. It has obviously implications for "national" Brazilian firms.

A) FORDISM IN ITS PRIME

The "Fordist" model of industrial management and work organization (which builds of course on the principles of "Taylorism" and is called "Taylorist" by some authors, but is really much wider), was based on a few simple building blocks:

i) A highly developed division of tasks within firms, based on the principles of "scientific management" as instituted by A. J. Taylor for industrial labour, but subsequently developed and extended to many areas of corporate activity, thus leading to deep and marked distinctions and strong barriers (e. g. compartimentalisation) between conception and execution, production and maintenance, marketing and finance;

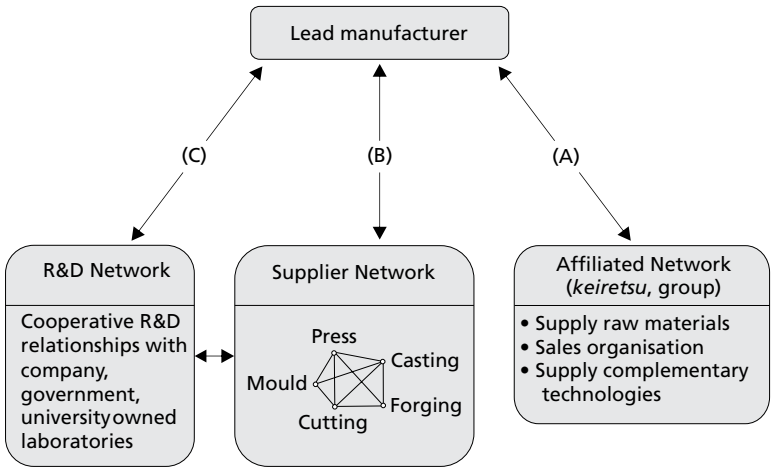
ii) a high degree of mechanisation in the specific form of highly specialised equipment related one to another through the organisational technology of the Fordist assembly line;

iii) the employment on this basis of a very large categories of unskilled or little--skilled workers, only trained to execute the very limited specialised and mechanised tasks to which they were assigned;

iv) productivity maximizing principles, which were highly dependent on returns to scale and could only guarantee the profitability of investment through the mass production and sale of huge quantities of standardised products;

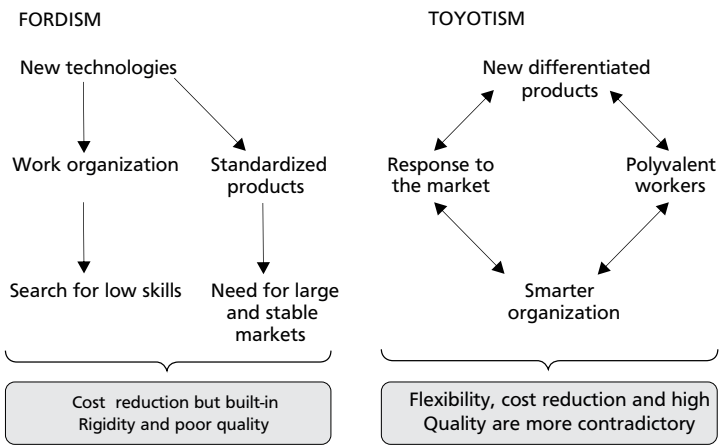
v) a dependence on Iarge, stable and as far as possible growing markets; these markets being assured to firms as a whole by expansionary budgetary and fiscal policies by governments, high or fairly high wages decided through collective wage agreements as well as by large and growing exports resulting from the general expansion of world trade, and to individual oligopolistic rivals by very high outlays on marketing (e. g. large budgets for advertising on media). These are the macroeconomic conditions of Fordism as studied by the French *école de la régulation* (see Boyer, 1986, and his essay in Dosi *et al.*, 1988).

Figure 2 – Inter-organisational networks



Source: adapted from K. I. Imai (1988).

Figure 3 – A Summary: the Fordist and new models in a nutshell



Source: Boyer (1989).

In relation to other parallel developments, in particular the concentration and centralisation of capital, the resulting emergence of very large firms and the onset of stable and very comfortable (because protected) situations of domestic oligopoly, the model progressively incorporated a number of secondary or subsidiary traits, in particular:

vi) a premium on vertical and later horizontal integration through acquisition and mergers and soon huge "hierarchies" (Williamson, 1975);

vii) fairly aggressive and, in the long run, self-defeating policies by the large firms with regards to non-integrated suppliers and sub-contractors (this point is now argued very strongly by the report of the MIT Commission on Industrial Productivity, see Dertouzos *et al*., 1989);

viii) the custom of holding very large inventories (or stocks) or raw materials, components and parts (as a twofold guarantee against strikes and product defects), and also to a lesser extent of finished goods;

ix) a premium on in-house R&D and technology leading subsequently to what the Americans now call the "not-made in Detroit" or "not made in Seattle" syndrome;

x) a growing propensity to favour product innovation, often of a fairly superficial or spurious kind, backed by high advertising expenditure.

From the mid-1960s, starting in the United States and then spreading in the early 1970s to the other major OECD countries, this model began to meet a growing number of serious difficulties.

B) FORDISM'S PARTICULAR "ROADBLOCKS" (SEE ABERNATHY, 1978)

Increased mechanization and corresponding rises in capital/output ratios stopped converting themselves into higher productivity. The decline in the rate of growth of labour productivity, as well as of total factor productivity, sets in from the mid-1960s onwards in the US. Because of the "catching up" process which was still at work, this productivity slowdown only reached Japan (who reacted rapidly), and the main industrialized countries of Western Europe (who did not react, behaving here again like their US counterparts) later. In a non-Marxian analytical approach, three wide sets of factors can be said to account for this slowdown.

The first pertains to the progressive exhaustion of the main clusters of innovation which had represented the technological foundation of the Fordist industrial management paradigms in the "scale intensive" mechanical and electrical engineering and automotive industries and also of "Fordism" (in the wider sense of the *école de la régulation*) more generally.

This phenomenon was first observed in relation to heavy chemical plant engineering and wrongly characterised by authors such as Giarini and Lonbergé (1978) as expressing declining return to R&D, across the whole system while it really represented first and foremost declining returns to the particular technological paradigm of returns to scale (see Chesnais, 1983, for a critique). The pattern of "technological exhaustion" has now been documented by Patel and Soete (1987) and other authors, and confirmed to be a factor principally at work in the industries most closely associated with the "Fordist" paradigm and its period of success.

The second concerns the breakdown of worker-acceptance of the work relationships in the factory which laid at the heart of the Fordist approach to the organisation of production and work organisation. This point is now well documented for Europe and the United States. From the mid-1960s onwards, low skilled blue collar workers working in the car industry started rebelling against the monotonous character of assembly-line tasks, as well as the discrepancy between the deskilling tendency of Taylorist manufacturing techniques and rising social expectations regarding the quality and initiative of work.

Following the start of the period which opens in 1974-75, with the recession triggered off by the change in oil prices, followed by the 1979-81 recession and the onset of permanently turbulent and uncertain macroeconomic conditions at world level in the 1980s, a third major vulnerability of the Fordist paradigm became apparent. This is the one stemming from the priority given to scale economies obtained through mass production, this leading to very high rigidity in the face of uncertain and rapidly changing demand and markets.

This rigidity is not lodged simply in the scale of investment or the organization of the large assembly line, but characterises the whole approach analysed by Galbraith in

the hey-day of Fordism, and believed at that time by him and other observers to be an irreversible phenomenon (e. g. his study of corporate planning in a context of complete supplier domination over consumers in the "The New Industrial State"). The inertia of mass production does not simply concern the quantity of standardised products, but also their quality as well as their complete lack of versatility and flexibility in the face of changes in consumer demand. The traditional very long lag between the perception of and/or decision to shape a new demand, the conception of products aimed at meeting their design and testing – e. g. all the things post-Fordist Japanese management practice has revolutionalised – from part of the overall rigidity of Fordist industrial management.

While the decline and crisis of Fordism could be read from the late 1960s onwards in the sharp drop in the rate of growth of labour and total factor productivity in the US and later in Europe (see Table 4) and in the parallel and related drop in the various indicators of the rate of return to capital (or profit rate), these factors would almost certainly not have been enough to challenge the Fordist paradigm of industrial management and work organization deeply and rapidly, had it not been for Japanese competition and the eruption of the Japanese groups into the Western market, in particular the US domestic market.

Table 6 – Five OECD countries facing the challenge of the new management principles. A very provisional and tentative synthesis

Countries / Principles	France	Japan	Sweden	United States	West Germany
P1: Global optimisation	(-) Recognized, but difficulties in implementing it	(++) Strong. Example: capital and inventories / output ration decline	(+) Present. Examples: low breakeven point	(-) Minded by Fordist inertia, succeeded by Japanese firms	(+) Existing but some conservatism
P2: RD and production integration	(-) Efforts but lagging organization	(++) Leader role. Example: shorter design times	(++) Very dynamic product and process RD	(+) Difficult in spite of success	(+) Follows the old model with minor exceptions
P3: Users-producers interaction and diversification	(-) Fairly low. Example: failure of the equipment goods industry	(+) Important for equipment goods	(+) Limited due to the role of the external markets and the size of the economy	(-) Fairly low. Example: quasi-none for equipment goods	(+) Significant via servicing of equipment goods
P4: High quality at low cost	(-) Recent efforts but still quality problems	(++) A key feature of Japanese style	(+) Quality of servicing but extra cost of customized goods	(--) For quality and relative high costs	(+) High quality but not clear cost advantage
P5: Productive versatility to demand	(-) Traditionally low	(++) Important. Example: short lag in the car industry	(+) Existing, even if not very fast	(-) Sluggish in nature industries, present in high-tech industries	(+) Average, along the previous model

P6: Production decentralization	(-) Typical centralization in large firms	(+) Significant if not general. Example: impact at microelectronics (ME)	(+) Well-known experiments (from Kalmar to Uddevalal but Taylorism still exists	(-) High centralized in spite of Japanese success full experiments	(+) Significant responsibility for skilled workers, but rather centralized management
P7: Horizontal coordination and new working	(-) Emerging, but not very strong	(++) Large. Example: Kanban and now ME	(+) Existing the plant level	(-) Used to be forbidden by anti-trust laws, now reversed	(+) Yes, at the regional level
P8: Long-run, cooperative subcontracting	(-) Emerging, for example in the car industry	(+) Applied to fist tier subcontractors	(+) Not clear	(-) Idem	(+) Role of professional mobility
P9: Recomposition of production maintenance-programming	(-) Not very easy due to hierarchical barriers	(++) Very significant	(+) Active field in some key experiment	(-) Rather difficult	(+) Exists, but not very strong
P10: General education and job training	(+) Average performance of both general education and training	(+) Very significant to large firm, lower in other firms	(++) Active role of public authorities in retraining and upgrading skills	(--) One of the poorest performances for OECD countries	(++) Excellent system combining general education and practical learning
P11: Workers' competence and commitment	(+) Implicit: now major concern, but practice lagging	(++) Usually strong. Example: support to the firm culture	(+) In order to fight against turnover and absenteeism	(-) A tradition of adversarial relations, control and financial incentive	(+) Clear for high and medium skilled workers
P12: Long term compromise over job tenure and/or good wage	(+) Only marginally present in some firms: no more existing in the national level	(+) Implicit, covers only large firms employees	(++) At the national level: compromise over a maintained quasi-full employment	(+) Marginally existing, short run sighted capital-labour relations	(++) Active negotiations about technologies, wages, work duration
General support and closeness to the new model	Fordist and cultural inertia	Japan invented it (Toyotism, Sonyism) "Diversified quality mass-production"	An original variant (Volvism) "Customized quality competitive medium sized production	Fordism nostalgia "The inconvenient of having been successful: a very difficult transition to a new region"	An orginal variant "Quality competitive medium of mass-production"
Synthetic index (1)	-0.375	0.00	0.54	-0.50	0.50

Note: (1) Obtained by algebraically summing up all the "plus" (+) and "minus" (-) and dividing with the maximum score (12x2) in order to get the index, between +1 (complete support) and –1 (at the opposite of the new model).
Source: Boyer (1989).

The evidence for this can be found in particular in the extremely conservative (and indeed protectionist) reactions even today of very many of the major US firms who had lived up to the mid-1970s within very concentrated oligopolistic structures and behind very efficient entry barriers. Much the same can be said for French firms. Similarly, only a very high degree of internationalisation (with 50% to 60% of earnings being made abroad) has stopped UK firms from seeking salvation against the collapse of

Fordism through protectionism. In steel, consumer electronics, automobiles of course, but also in food processing and many other industries, US oligopolists in particular reacted to the drop in the rate of growth of productivity and the fall in profits on the basis of the supposedly purely cyclical character of these factors, and on policies founded on their previous almost total international domination and market power. Price markups, yet more spurious product innovation, larger outlays for advertising and calls on the US government for retaliatory trade policy measures of various sorts against "unfair competitive practices" have been the main response of many of the large US firms to the failure of their management paradigm and to foreign competition.

C) THE MAIN DEPARTURES OF "TOYOTISM" FROM "FORDISM"

"Toyotism" (to use the current and quite convenient "shorthand reference" to the rival Japanese management model) began as the Japanese response to the weakness and contradictions of "Fordism". At the start, as documented *inter alia* by Jones (1988) and now in a very complete way by Coriat (1990), "Toyotism" took the form exclusively of a set of organisational changes or innovations, using essentially the same basic technology as did the Fordist assembly line. CAD/CAM and FMS only came later: today a Japanese author like Watanabe (1989) can still assert without any hesitation that "organization counts more for productivity than micro-electronics *per se*".

Three basic organisational departures from Fordism underlie the Japanese model, namely (i) with the adoption of networking subcontracting and "just-in-time delivery", a fundamental reversal of the move towards ever greater vertical and horizontal integration which has become an important dimension of US and to a large extent also of European Fordism; (ii) a reorganisation of work at the factory and production hall (*atelier* in French) levels; and (iii) a significant reduction in the compartimentalisation and hierarchical organization of R&D, design, production engineering and the organisation of marketing within firms (for authoritative studies of this dimensions, see the studies by Clark and Fujimoto at Harvard, references in Dertouzos *et al.*, 1989). In combination the three changes allow totally new levels of flexibility, while still retaining the main advances and advantages of standardization and totally new standards in relation to quality ("zero defects").

We cannot comment in detail on each of these dimensions in this paper. We must limit ourselves here to a few remarks about "network subcontracting", the partial "disintegration" of manufacturing through increased external sourcing and "just-in-time" delivery. The contrast between the long dominant and still largely prevalent US approach and the Japanese one can be defined as follows.

US business enterprise theory and managerial economic have developed the theory of the "transaction costs" supposedly incurred by firms when resorting to markets for the sourcing of inputs to production. They have done so both as a "theoretical" justification (e. g. ideological disguise) for concentration, integration and the trend towards oligopoly-monopoly, and as an expression of genuine and deep mistrust on their part of "arm's length" market interfirm relationships upstream of final consumer markets, coupled with a fairly radical underestimation of the collective or "social" benefits which can accrue to individual firms through the division of labour they evolved among themselves. In the US the accent has thus been placed for decades on concentration and integration. For decades external sourcing through interfirm cooperation and subcontracting has been treated as a totally ancillary and very subordinate complement to integration, and organized by the larger firms on an extremely unfavourable basis for the smaller ones (for a recent sharp "indigenous" US critique, see the MIT study, Dertouzos *et al.*, 1989).

The Japanese on the contrary have recognized (i) US type corporate structures on the Williamson "hierarchies" model to be the source of extremely high "bureaucratic" costs, and considered (ii) that approaches could be found for organizing an interfirm division of labour which reaps the benefits of specialization, of cost and risk-spreading, in ways which could bring large "collective" sources of productivity to individual firms (notably those at the center of industrial networks of course) without incurring the risks of anarchical and unstable market relationships.

The "organization mode" within the *zaibatsu* or *keiretsu* type of large group structures and stable long term interfirm contractual relationship leading to "network" types of corporate organization have been the reply. The concentration, e. g. centralisation of industrial capital, is without doubt much higher in Japan than in the United States, but vertical and horizontal integration is much lower having been offset both by the *zaibatsu* type of group structure and by the "network firm". This, essentially, is one of the main sources of Japan's present overwhelming industrial competitiveness: the understanding that there exists a "collective" and "social" form of inter-capitalist organization other than oligopolistic or cartel-type price collusion or political lobbying, which can bring very large benefits to each individual profit making center.

D) TWELVE NEW "GOLDEN PRINCIPLES" OF INDUSTRIAL MANAGEMENT: THEIR PRESENT STATE OF ADOPTION AND MAIN CONDITIONING FACTORS

Today the strength and ruthless nature of Japanese industrial and technological competition have made the attempt to cling on at all costs to the Fordist management paradigm suicidal. At the same time the new technologies have eased the way towards the adoption

of new organizational approach for industrial production and marketing, which firms in the United States and Europe have thus progressively begun to recognize.

While in Japan the organization principles of *kan-ban* – e. g. the "just-in-time" management of stocks and organization of delivery from component manufacturers and sub-contractors – were initially managed with the help of pencils and paper, the advent of computer aided "real-time" techniques has brought these principles within the reach of US and European Fordist-trained management hierarchies. Similarly on the shop floor computer aided techniques have made it considerably easier for them to begin moving away from the assembly lines towards the adoption of the group or circle type of decentralised work organisation.

In parallel other important technological development of the 1980s, for instance those which have occurred as a consequence of the fusion of information technology and composite materials technology and resulted in the emergence of the so-called area of "new materials", have simultaneously opened up new *vistas* for "economies of scope", new opportunities for "variety" (Zuscovitch and Willinger, in Dosi *et al.*,1988) and strengthened the need by firms to establish closer relationships with users and customers and to incorporate a highly differentiated and flexible assessment of potential demand into corporate planning.

Taken in conjunction with the developments discussed above in 2.3, the example of the Japanese management principle along with the spread of Japanese direct investment appears now to have led to the emergence of a new management paradigm with some degree of application in all the principal industrialized capitalist countries.

In a synthesis paper based on national studies prepared for an OECD conference, Boyer (1989) has recently listed 12 novel "golden principles" of industrial management towards which OECD firms are now groping. According to Boyer, on the basis of the available evidence, the 12 principles which could allow firms to move to a new "post--Fordist" management paradigm are:

i) The global optimization of production flows, e. g. the generalized adoption of the Japanese *kan-ban*, "just-in-time" and "total quality" system based on qualified sub-contractors and leading to the elimination of raw material and component stocks.

ii) The close integration between R&D, design, engineering and industrial manufacture where Japanese firms also have the lead, but have been followed by German, Swedish and now a few US large corporations.

iii) The establishment of new, closer relationships with users, principally industrial users regarding home evidences available, but perhaps also final consumers (here no hard evidence exists: the principle is at best a wishful thought).

iv) The establishment of a new pattern of production combining lower costs with much higher levels of quality and "zero defects": this again would represent a generalisation of Japanese performance.

v) The incorporation of a correct definition of demand characteristics and evolution into design and production strategies (this principle seems to overlap with (ii) and (iii)).

vi) Higher levels of decentralisation of decisions about production with on-line management and workers responsibility: this again is the particular Japanese pattern, with a few extensions in contexts of co-management by unions and of social-democratic consensus-seeking as in Germany and Sweden (but the Swedish model now appears to be in crisis!).

vii) Decentralisation of supply through networking and joint ventures with component and materials supplier firms upstream and retailers downstream. This is basically a further development of point (i) leading to the emergence of what are now beginning to be called "network corporations", the main examples being found again in Japan and a few in Italy (see Antonelli, 1988).

viii) Long term and co-operative subcontracting (here again this seems an overlap with points (i) and (iv)).

ix) A lower level of division of tasks within firms and the organization of work on a team or "circle" basis. This stems from point (vi) and represents the result of the reexamination by Japanese automobile factory engineers of the Taylorist principles of "scientific management". Boyer however urges some caution on the degree and speed at which it may generalize throughout manufacturing and across countries.

x) Higher priority and private outlays (as well of course as public educational investment) for vocational training. This again stems from and partially overlaps with (vi) and (ix).

xi) The enhancement of workers' and employees' skills as a source of commitment, competence and productivity. (This is hardly different from (x).)

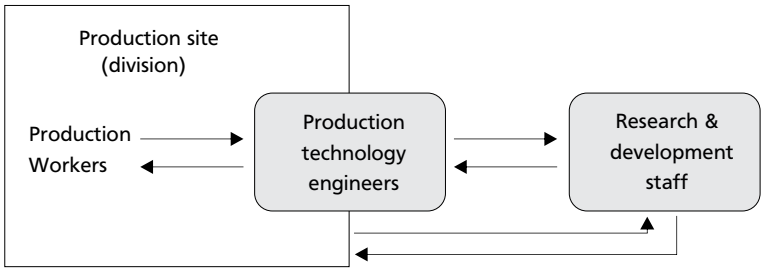
xii) A new approach to employment, long-term contracts and wages: this would be a generalization of Japanese practice to other countries at a time when it appears to becoming under heavy strain in Japan itself.

Table 5 above summarizes these principles and outlines what Boyer calls his own "personal and probably impressionistic reading" of the somewhat patchy case study evidence available. This author's own reading is that the Swedish firms may be presented rather too favourably and that, outside Japan, Germany is at any rate the only large advanced capitalist country where the management style and performance of corporations bears a relation to the overall structural competitiveness of the national economy.

Whatever its limitations Table 5 is an important one in the context of this paper, in that it suggests at what point the firms from different OECD countries are in their struggle to leave Fordism and adopt the new management paradigm. The UK and Belgian firms would probably get a mark similar do the French ones, with Italian and Dutch ones doing better but not as good as the German ones.

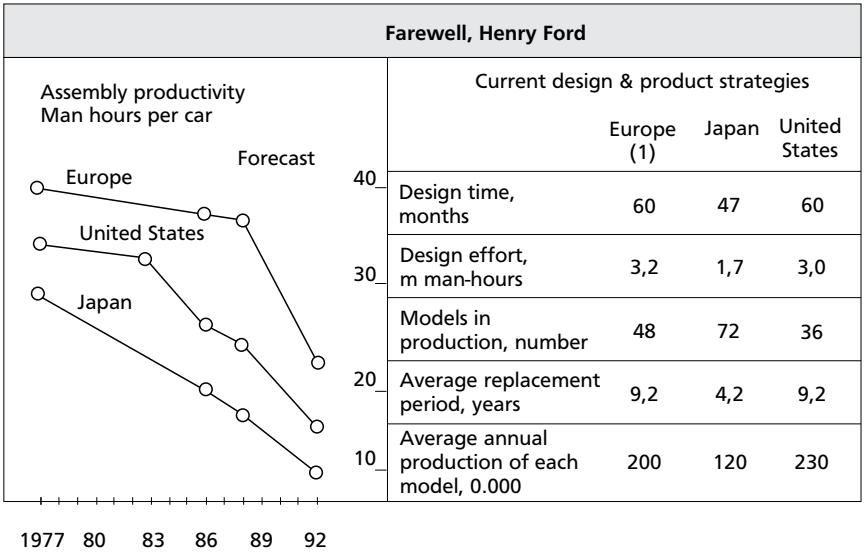
E) INTEGRATION BETWEEN DESIGN AND MANUFACTURING: MORE FLEXIBILITY AND PRODUCTIVITY

Figure 4 – Role of personnel mobility



Source: S. Watanabe (1989, p. 3)

Figure 5 – A new impact upon economic performance



Source: The Economist, Harvard University, June 1989.

Before ending this section, two last points must be made or rather stressed again. The first is that the paradigm attempts to address the problem of the large corporation and comes up with a reply that combines high levels of concentration-centralisation of capital with a much less integrated – and in particular vertically integrated – approach to production. In the major central capitalist economies, the end result after nearly 20 years of experience in Japan and eight to 10 years in other countries, in flexible or differentiated mass production, and as Leborgne (1987), Coriat (1990) and Boyer (1989) now all argue very convincingly not flexible specialization and a "new industrial divide" (Piore and Sabel, 1984) which present a major opening for small firms and leading to a much higher degree of industrial democracy. The model helps the large firms to succeed a reconciliation between the imperatives of variety, flexibility and economies of scope while still benefiting from decentralised forms of scale economies obtained through the standardisation of component and part production (see Watanabe, 1983, and Sciberras and Payne, 1985, for a full documentation of this in the machine-tool industry). When all is said and done, for small and medium firms the main and perhaps sole change may simply be in the nature and quality of cooperation with the large firms and a modification in the status offered to them as subordinated partners within wider "network" corporate structures (see Antonelli, 1988, for the Italian evidence).

The other last general point to be made concerns the nature of the resource intensities of the new approach to the management of production and marketing and the organization of corporations. The approach is somewhat less capital intensive with respect to "tangible" capital, but much more intensive in terms of "intangible" investment and of the human capital requirements. The model is information intensive and calls on much higher levels of skills. It would require, as Boyer puts it, "a big push in education and a 'new deal' between managers and wage earners". The disastrous educational situation of the United States, with its extremely high illiteracy rate, its weak general education and even vocational training represents a formidable challenge and barrier to the adoption of the new paradigm in that country. It is linked to the particular history of the US and the huge "fiscal crisis" of the US State, but it also heralds a trend which can be observed, albeit at a lesser level in a number of OECD countries. As for the new "new deal" with wage earners, available figures on the trend in the distribution of income in the 1980 between wage earners and non wage earners in most OECD countries show, as well as the resurgence of strong strikes in the industrial sector (cf. Peugeot), that in terms of monetary retribution this new deal concerns at the very a very small minority of the industrial working class.

Insufficient educational budgets and the shift in the distribution of income to holders of capital assets (firms, banks and individual renters) are, of course, a simply given

expression of the economic, social and political resurgence of capital, in particular finance capital, and the benefits it has received in most OECD countries in the twofold form of lower taxes on capital and property and high earnings on shares and bonds.

2.4. POSITIVE INTERESTS RATES AND PREDATORY OPERATIONS BY FINANCE CAPITAL

In this paper, this point is simply included *pour mémoire*. However, no account of the factors compelling firms to concentrate their attention and financial resource within the OECD area, would be complete if it did not mention the state of interest rates over the whole of the 1980s and the development of a number of highly aggressive new financial techniques. High interest rates have simultaneously represented for industrial capital a heavy weight (which it has partly shifted onto wage earners, see Fitoussi and Le Cacheux (1989) and a profitable diversion to more a lucrative forms of earning. The new financial techniques, such as public bids and leverage buy outs (LBO) whether or not financed in part by "junk bonds", on the contrary have represented for large firms in the financial environments of the United States, the United Kingdom and to a lesser extent France, a permanent obstacle to strategies built on long term horizons (see again on this point the MIT study, Dertouzos *et al*., 1989), forcing firms to have their eyes rivited on the price of their shares and to build up strictly financial defenses against the threat of "unfriendly" LBO.

3. SOME INDUSTRIAL AND TECHNOLOGICAL POLICY IMPLICATIONS FOR THE NIC

Quite obviously, the structural factors affecting the investment priorities of OECD firms which have just been discussed also have a number of important implications for the domestic industrial and technological policies of the newly industrialised countries, among which Brazil seemed at one time to be one of the most successful.

In the limits of the present paper, obviously, all we can do in this concluding section is to sketch out a few of the most important implications, leaving their detailed analysis and form of application in Brazil to future work, given that this could only be done in cooperation with Brazilian workers.

The central issue can be put as follows:

- on the one hand, both the nature of international supply structures along with the entry barriers they imply, and the complexity of contemporary technological advances along with the constraint they create for a strong degree of external sourcing give an extraordinary high premium on alliances and cooperation,

thus making the capacity of industries and individual firms in NIC to present themselves as reasonably attractive, albeit subordinate partners in international cooperative agreements, one of the essential conditions for their access both to markets in the advanced industrialised countries and to the possibility of acquiring vital technological knowledge not available in any other form;

- on the other hand, the NIC must count mainly on their own forces in this endeavour, since little or no help can be expected from foreign capital for creating the conditions which may permit domestic industries and firms to attain world market levels, both because this capital has other more important priorities, but also, and more important still, because the human and physical investments and institutional developments required can only be made by the countries themselves.

The international context facing NIC and developing countries is in fact the most difficult and indeed hostile one they have had to face for many decades. All NIC are now confronted with the rise of what some authors have named "neo-mercantilist policies" (for a good discussion see Ernst and O'Connor, 1989). With respect to NIC, such policies include trade policies regulating the access to "first world" markets. More significantly still, they now include policies aimed at controlling the access to technology, where governments and firms in many OECD countries have taken, together or separately, steps to impose intellectual property regimes which may be appropriate for these countries and firms in their dealings among themselves, but act as very deterrent barriers for all other countries, including NIC.

In the case of heavily indebted countries like Brazil, the highly unfavourable and hostile international environment is relayed by associated domestic issues: all the issues related to servicing the foreign debt *per se*, but also the numerous, very serious internal issues stemming from the debt, notably the "fiscal crisis of the State", galloping inflation and the privileges for all the indigenous institutions and social groups associated or allied with the foreign banks.

This context strongly affects the size of the "window of opportunity" (Perez, 1989) which the country has for facing the problems, the challenges and possibly the openings offered by the changing technologies.

3.1. DIFFERENT GOVERNMENT, BETTER GOVERNMENT BUT NO LESS GOVERNMENT

The first implication arising out of the discussion above concerns the need to preserve the role of the State. Although the issue was only raised above in passing (see the end

of 2.1), it is important not to be misled by the prevailing talk about the "market", liberalisation and privatisation and so misinterpret the real situation with respect to the role played by government in the advanced capitalist countries. In the 1980s, policy instruments changed and likewise priorities regarding policy objectives, but government support to business in the area of trade, competitiveness and labour and social policies has remained as strong as ever. Some support (for instance in some fields of R&D) has been given further "upstream" than previously, but this has been determined by the generic nature of several of the major new technologies as much as by any other consideration. Trade barriers have now shifted to non-tariff barriers, while governments have devised a wide array of means for backing "national champions" in the context of global oligopolistic competition. "Privatisation" has modified the legal ownership of a number of previously nationalised firms, but the state-industry relationship has been maintained and strengthened in a number of other ways.

State apparatuses in NIC are top heavy, show strong parasitical tendencies and are subject to the strongest possible form of partisan political pressure, manipulation and plundering. Deep, radical political reform which can in fact often only take place as an off shoot of revolutionary situations must change this, but the role of the State in the economy and in international economic relationships is as vital as ever.

In a thoughtful paper, C. Perez (1989) has given a good general characterisation of firms in NIC, in the way they have been shaped by earlier import substitution and/or export promotion policies (which were State supported in both cases):

a) Most firms were not designed to evolve. The majority were meant to operate mature technologies, supposed to be already optimized.
b) Firms were not expected to reach competitiveness on their own. Profitability was to be determined by exogenous factors, such as tariff protection, export subsidies and numerous other forms of government help, rather than by the firm's own capability to increase productivity or quality.
c) Firms are not interconnected. The scarce development of the capital goods industries and other engineering services in the majority of developing countries has made it difficult to generate synergy in industrial networks or complexes.

In a very interesting way, Perez then goes on to discuss three policy options. The first is the neo-liberal recipe to "eliminate state intervention and let the best survive", which Perez rejects because all this can really lead to is the destruction of most firms including "potential winners" and a total dislocation of the "existing platform of development, however faulty". The second is for the State to "provide facilitating resources", in particular in the area of appropriate financial instruments, human re-

source investment, infrastructure (notably telecommunications) and R&D. The third which Perez would favour would be for the State to "steer and promote change", on the basis of "deliberate consensus building" between social actors and with the aim of forging a "national system of innovation" in the sense identified by Freeman (1987) and Lundvall (1988). This third approach is, of course, close to our own starting point.

3.2. NATIONAL PRODUCTION SYSTEMS HAVE TO BE BUILT CONSCIOUSLY AND THEIR TRANSFORMATIONS MONITORED

The "structural adjustment" type of industrial policies which have received strong support during the 1980s from neo-liberal sources and the main international financial institutions and often been the direct instrument of attacks on the public sector and nationalised or semi-state enterprises do not meet the requirements of NIC and developing countries, today even less than before. They build on a totally deficient view of national economies, and in particular of the extent in which cumulative process (or "virtuous circles") of capital accumulation and also the accumulation of knowledge in the form of production technology (see Dosi *et al.*, 1988, on technological cumulativeness) are related to the ways in which national production systems (in particular within the manufacturing sector) hang together. These relationships point to the "tight linkages" analysed by some recent US advocates of industrial policy (cf. Cohen and Zysman, 1986), or again the "external economies to production" on which Alfred Marshall laid so much stress, and which represent one of the foundations of "structural competitiveness" (Chesnais, 1986a). The stress which has recently and rightly placed on producer-user relationships (Lundvall, 1988) is an extension and special aspect of the vital nature of linkages.

Technology is one of the factors which contribute to shape these relationships (which mainstream economies captures <u>partially</u> *inter alia* through input-output relationships between horizontal industries or coefficients in capital/output ratios). Consequently technological change of a radical or paradigmatic type will <u>modify</u> these relationships more or less deeply thus destroying previously established cumulative processes (or virtuous circles) and modifying the parameters of national policies of industrialisation. This process can be defined as a process of forced "structural adjustment" in the strictest sense of the term. In the case of NIC in particular, this process <u>must</u> be viewed as a one which requires <u>monitoring</u> and which <u>cannot</u> be left simply to the interplay of blind "market forces", behind which always lie in reality easily identifiable domestic and foreign "visible hands".

3.3. DOMESTIC MARKETS AND CUMULATIVE LEARNING PROCESSES: THE STRUCTURE OF INCOME DISTRIBUTION AS A MAJOR DEVELOPMENT ISSUE

Analytical and empirical evidence has always pointed extremely strongly to the role of the "internal market" as a basis for "virtuous" cumulative processes of capital accumulation and growth (see *inter alia* Mistral, 1978, 1983, and Chesnais, 1986a, concerning the role of domestic markets in contributing to structural competitiveness).

In her 1989 paper, C. Perez makes a point also made by us (see Chesnais, 1988c) namely that "the new (technological) paradigm and the new technologies provide means to overcome scale constraints and effectively address specific local needs". The issue is of course considerably more complex, since the possibility suggested by Perez implies some degree of indigenous mastery over generic technologies and so the means of attempting to shape the trajectories of technology in such a way that a "social divide" in Piore and Sabel's use of the term (1984), stays (or becomes) open in the context of a given country or set of countries. Should this condition come to be satisfied today in relation to microelectronics and all the technologies which allow for flexibility and small batch production, then a new relationship could be established between the scale of investment and the scope economies of the new technology and the particular level and pattern of demand in NIC and developing countries. The large oligopolistic firms in the advanced countries have shaped the trajectories of these technologies according to their own needs, but other trajectories could probably still be shaped if the will and the means to do so came together.

User-producer interactions within domestic markets have reasserted their importance as a spring board, possibly a *sine qua non* condition for the export of the most highly advanced technologies.

The capacity of innovating firms to dominate a market by understanding and monitoring the systemic dimensions of technology has generated new forms of competitive learning curves. A capacity for efficient production is often not enough to gain leverage in the system. Design capability, systems engineering and marketing networks become increasingly important, and their integration with production depends on management information and control systems.

These aspects have a direct bearing on the "application versus productive debate", since what Ernst and O'Connor call the false dichotomy implies that countries must be knowledgeable, for instance,

> about the interface between the new information technologies and other (e. g. mechanical) technologies to be able to combine them effectively. Learning-by-doing and learning-by-using are to a large extent complementary activities, which means that the interactions among hardware, software and systems suppliers and users are

> an important element in the learning process. Without a supplier sector, not only is one agent of the learning process missing, but the synergies arising from the user-producer interaction are lost as well. (Ernst and O'Connor, 1989)

One of the reasons why the industrial export policies of the 1980s do not have much mileage ahead of them, even the more successful, relates to the ever more highly differentiated and customer specific demand patterns discussed in section 2, which simultaneously require some degree of sophisticated demand for similar products with the export's home market. This process is so notable that it is even affecting export-led economies with a fairly long and reasonably successful experience in selling in foreign markets. This point is stressed by Ernst and O'Connor (1989), who observe that even in Far East Asia in the context of the latest highly "customer tailored" development in information technology.

> [T]he NIE technology suppliers have thus far been unable to forge strong links with foreign users, beyond a few cases involving joint ventures with foreign firms, and thus remain confined to markets for more standardized products where such links are not critical. Even then, products which were once standard commodity items are incorporating more customized elements, largely as a result of advancements in CAD/CAE technologies. For example, computer memory ICs are increasingly customized to the requirements of particular equipment vendors or market niches. Thus, the South Korean chaebol, for example, which entered the mass memory market at the time when memories were still standard "off-the-shelf" items, may have to establish closer user links – as well as stronger design capabilities – in order to remain competitive as the market becomes more highly differentiated. (Ernst and O'Connor, 1989, our highlights)

This in turn raises the issue of income distribution. How can a differentiated domestic demand develop and the internal market more generally play its role as an accelerating factor in the twofold process of capital accumulation and knowledge accumulation, if the structure of income distribution remains what it is in so many NIC and developing countries. The issue of income distribution is a central issue of social justice and effective political democracy. It is also, now more than even, a central issue of sustained development.

3.4. A TOTALLY NEW APPROACH TO INDUSTRIAL EXPORT POLICIES IS REQUIRED

The changes in technologies and demand in the advanced countries along with aggressive trade policies notably by the US (this is of course well-known to Brazilians) leave

little perspective for much further implementation of the type of industrial export policies developed at great social cost by debt-ridden countries during the 1980s. As noted above, even the economies, notably in Far East Asia, which have had considerable success in export-led growth during the late 1970s and the 1980s are coming up against these obstacles.

The central overriding reason is that the mix of cooperation and competition, including "mutual market access" which the advent of international or global oligopoly has brought with it, coupled with the pace of technological investment and the measures taken by the large firms to recoup their R&D costs, have created much stronger entry to industry barriers than before. These also represent *de facto* barriers to market access, which now exist alongside earlier most classical import restrictions and non tariff barriers. When an industry is organised internationally through a series of "gentleman's agreements" between major actors and "neo-mercantilism" has set in as a result of policies by governments and by firms, industrial exports by NIC become difficult unless they are parties to the arrangements and alliances which structure the market.

The "lock-out" effect of dominant standards will work in the same direction because as new technology develops and matures, standards are set either *de facto* by dominant suppliers or *de jure* by national or international standards organizations, or by a combination of the two. Software and telecommunication networks and in another field the patenting of living organisms (biotechnology) are areas where the search for competitive advantage and the building of entry barriers are tending to the establishment of standards which often have unfavourable impacts on all those who are not directly parties to their negotiation. This tendency can be partly offset by battles in the GATT, WIPO or other international organisations, but battles involving standards are fought most effectively by being a party to the standard setting process itself.

3.5. ACCESS TO ADVANCED TECHNOLOGY AND THE CHANNELS OF TECHNOLOGY TRANSFER HAVE CHANGED

Most the available literature and policy prescriptions on technology transfer and the access to foreign technology date back to the 1960s and 1970s, when technologies were well defined, fairly mature and generally fairly strongly equipment-embodied.

In the hey-day of classical CEPAL import substitution industrialisation foreign capital could be called in to build on a joint venture basis or alone plant on the basis of "turn-key" contracts or something approaching. As industrial sectors developed the technology transfer "package" could be "unbundled", and an increasing fraction of

components build domestically within institutional arrangements which increasingly evolved towards domestic-foreign joint venture arrangements, often negotiated by governments (see Oman, 1989).

Today the situation is increasingly different in several respects. First, technology cannot today – and much less than previously – be seen anymore as being exclusively or even principally machine-embodied. Part of it is embodied in machines, but much of it is not: it is increasingly embodied in the brains of people and organisational structures. Second, the complexity of technology as discussed above in 2.2 means increasingly that much knowledge and many processes can only work if complementary technological assets are available (Teece, 1989).

Consequently, technology transfer is now increasingly subordinated to the setting up of interfirm (or on university-industry) technological cooperation agreement. But cooperation, in turn, only occurs between partners or participants who actually have something to offer in exchange. This "something" can still sometimes take the form of an access to a particularly interesting market (a major example is the US defense procurement market, the access to which European firms are willing to pay in the form of key technological knowledge) or again a large and rapidly growing domestic market. Inter-firm cooperation and access to technology is increasingly based on the two-way exchange and/or pooling of scientific and technical knowledge.

Recent research by von Hippel (1987) has studied the informal trading of proprietary know-how between rival firms, notably through informal contacts, co-operation and exchange by engineers or scientists. This type of informal know-how trading also occurs extensively between scientists. Hippel cites research showing that scientists employed by non-profit laboratories (university and governmental) only revealed data do colleagues interested in know-how related to the "TEA laser" on a highly selective basis. He notes that individuals and laboratories made conscious and careful discriminations as to what know--how would be revealed to what recipient and noted also that "nearly every laboratory expressed a preference for giving information only to those who had something in return".

It is against this background that the more formalised forms of technology sharing agreements studied by Chesnais (1988a), Mytelka and Delapierre (1987) and others must be examined. The invariably build on similar types of procedures and calculations with regard to the firms which are parties to the most worthwhile agreements, involving selection mechanisms of those that are invited to become partners in cooperative ventures. These mechanisms can either stem from, or lead to, industrial structures with tier forms (as, for instance, in pharmaceuticals see Burnstall, Dunning and Lake, 1981). They represent *de facto* very efficient technological access barriers for given categories of firms even within the advanced countries and all the more for firms from developing countries.

3.6. INVESTMENT IN EDUCATION, RESEARCH AND TRAINED MANPOWER

Today in order to attain the rank of countries which can be of interest to foreign capital (outside of the economy type free-export zones which may provide a little employment and a little foreign currencies for servicing the external debt, but are not a path to industrialization), a whole set of complex, complementary long-term investments and organizational measures have to be made – and made alone by countries.

The new technologies are now highly science-dependent. Access to basic research has become a crucial prerequisite for the progress of technology, and the race is on to exploit basic research for commercial purposes. Developments in technology are also stimulating new advances in basic research. No NIE or NIC can hope any longer to stay in the race and keep its rank, if it is does not follow in the wake of the advanced countries with respect to the public financing of "intangible investment".

Even in a strictly competitive capitalist perspective and even in the advanced industrialised countries with a long experience and accumulation in education, today the "human resources" question is not a simple one (see item 2.3). In the case of NIC, it is even more difficult and costly. At the very least, providing training in the new organizational techniques and in the use of information technology seems to be an important resource to put at the service of change in the production system. Beyond that, and depending on the level of development of the country, the whole education and training systems might need revision and renewal. Changes both in contents and in pedagogical methods are really required to keep abreast with the new technologies and to move towards interdisciplinarity and continuous learning. Ongoing training and recycling institutions might need to be setup, as well as provisions for on-the-job training.

The process does not only involve the retraining of production workers. Engineering and business administration schools would have to be brought up to date as well as technical and secretarial training. Both information technology and its complementary organizational model are based on flexibility, creativity and adaptability rather than routine.

This involves education of course, but also more fundamentally the dimensions of democracy and of opportunity for the whole population.

We will make this our concluding remark. The "trajectory of the information technologies is tending to be shaped in accordance to the needs of unequal class divided and strongly hierarchical relationships and organizational forms. This, in fact, is reducing their full potential, because fundamentally they are not "social control technologies" despite their present use as such, but technologies whose full potentialities will only bloom on the basis of highly developed economic, political and social democratic

relationships and organisational forms. In the NIC, in particular, as long as present political and social conditions reign, it cannot be expected that the "educational" and "human resource" investments and the "participatory" structures required for their use (see Boyer above) will be set up. These can only come as a result of a process of social transformation and radical reform which is on the future agenda of so many countries, and of course on that of Brazil.

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ANNEX

1. THE AIMS OF THE NEW MODEL IN THE LIGHT OF THE CAPITAL ACCUMULATION PROCESS.

For those interested in a Marxian interpretation, basically the "twelve principles" outlined by Boyer's paper, can be summarized as representing:

i) A response to the overall pervasive world economic crisis reigning since 1974 (latent in the expansionary phases of the business cycle, quite open in the recession any ones), which confront firms with the fact that in present conditions "the conversion of surplus value into profit... is determined as much by the process of circulation as by the process of production" (Marx, *Capital*, Vol. III), implying that the realization problem can no longer betackled solely through the mass production and sale of medium quality standardised products. Increased inequalities in income distribution in most advanced capitalist countries (very notable in the UK, France, etc.) along with relative demand saturation (resulting from the effects of the Keynesian marginal propensity to consume) in high and medium income brackets in the advanced capitalist countries, coupled with the increased technological potential for "variety" and the increase in "customized" or "tailor-made" demand, now force firms to get "closer to users" and in all events to incorporate right from the beginning of the corporate planning process and in new more elaborate ways market analysis and consumer satisfaction in to decisions related to industrial design and manufacturing. Japanese firms appear to have along lead on these points.

ii) The attempt, which has met with a fair degree of success with in Japanese and some other firms, to react against and offset the rise in the organic composition of capital fall in the rate of profit, through the use of "just-in-time" management measures, aimed at strongly reducing the quantity of stocks and inventories, thus simultaneously reducing the amount of "constant capital" immobilised in the form of "working or circulating capital", increasing the rate of rotation of capital (see *Capital*, Vol. II), and lowering the organic (technical) composition of capital by reducing this component of constant (e. g. non-value creating) capital (see *Capital*, Vol. III).

iii) An attempt, only really successful in the case of Japanese firms to reduce inventories also in the form of final goods or output from production (with similar effects on the amount of capital immobilised and the rate of rotation) through short production runs and the maximum use of the flexibility the new technologies permit. This aim coincides of course with the demand situation outlined in (i).

iv) A growing implicit and in some cases explicit understanding by firms that production *lato sensu* is a social process and that, on the express condition that interfirm relationships are based on a long term stable, negotiated basis freed from the caprices of market fluctuations and that they also satisfy the need for smaller firms to be allowed to retain at least a part of the value and surplus value produced within their own walls, then interfirm agreements, joint-ventures, long-term subcontracting, the decentralisation of manufacturing towards the most specialised production units, and hence the trend towards at least one variety of "network firm", can have strong positive effects on the global or collective productivity of capital.

This fairly novel quest for productivity gains which represents (as already forecasted by Marx, *Capital*, Vol. I) an extension of the Smithian division of labour (e. g. division of tasks), out of the single firm or factory to encompass a number of very specialised firms, without falling back into the pitfalls of the anarchy of the market and its undesirable "transactions costs", can of course lean today very heavily on all the technological developments arising out of the industrial applications of microprocessor controlled technology and more generally of IT "real-time" management of these organised inter-firm relationships within "networks".

The approach now appears to be significantly superior to the strongly vertically integrated corporation on the traditional US model and so to Williamson type "hierarchies". As we have stressed in other work (Chesnais, 1990a), the network pattern does not however represent any kind of" return to the market", but an alternative and more efficient, because collective, way of organising "market failure", and of economising (on a negotiated basis) transaction costs. It is a new modality of the "visible hand", superior in present conditions to the earlier one described in Chandler's classical analysis of the US multidivisional corporation (Chandler, 1977).

v) Finally, we have to increase surplus value (relative surplus value) through the attempt to resolve some of the problems of high shop-floor conflictuality, absenteeism and low labour productivity resulting from strong job dissatisfaction associated with Fordism. As suggested by Boyer, this is still the least clear, most highly ideology ridden and in all cases vulnerable (e. g. depending on a hypothetical "New Deal" or "New Alliance") dimension of the "post-Fordist" industrial management model now emerging (Coriat, 1990, seems to think however that it can be partly successful).

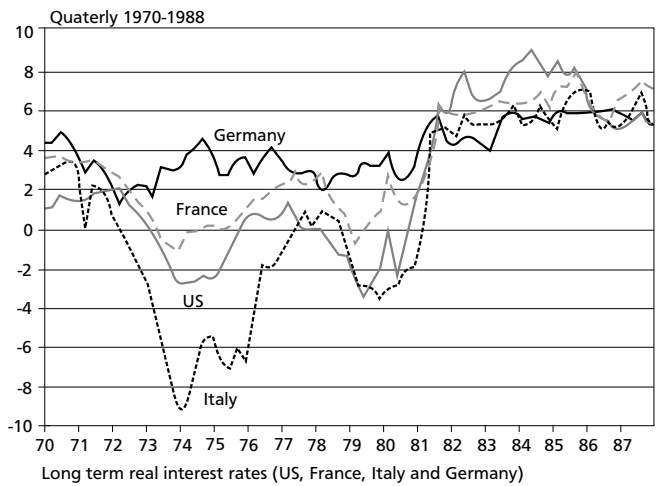
All the developments defined in the points (i) to (iv) imply in themselves and almost by definition changes in the organization of work. All are in themselves sources of important productivity growth at the micro-level or enterprise level. Other organisational innovations, relating directly to the organisation of work at the shop floor level, have now been

experimented over some 15 years, again in Japan and also in a few pilot factories in the European car industry. These organizational innovations involve in particular a new approach to the assembly line a number of parallel "mini-lines" tending to replace the single major one (for a detailed analysis, see Coriat, 1990) along with the organisation of work in teams or circles. The diffusion of these approaches appears at present to have been slower than most of the other developments defined above, because they impinge directly on the physiognomy of relationships of production at the factory and shop floor levels in the specific historical forms in which these have developed previously in given countries.

Our own personal impression, based on the reading of the patchy case study work available on Europe and the US, is that the present evidence is mainly in the area of the productivity gains resulting from a more "network" like, "collective" conduct of capital, combined with the results of reducing employment, as well as significant advances in the extraction of relative surplus value.

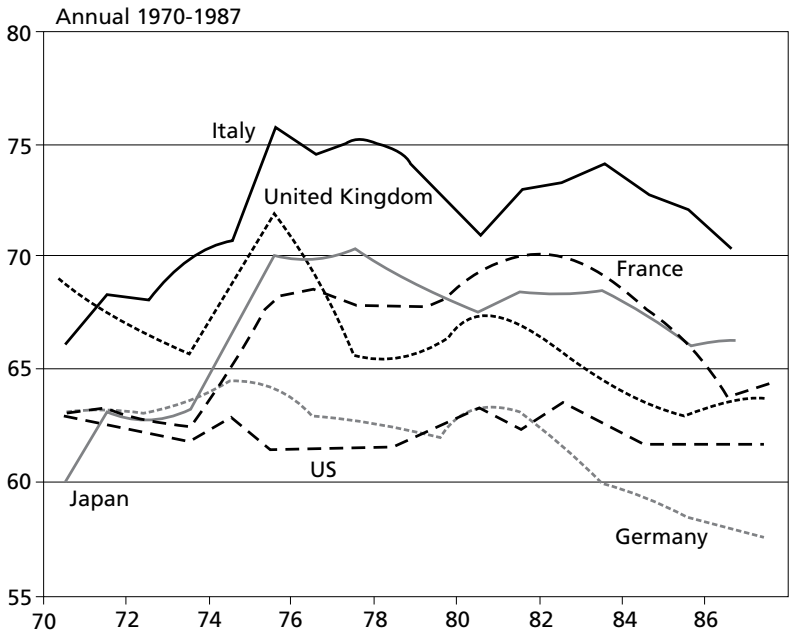
All the potential growth impacts, finally, are offset by the demands of "renter" finance capital and by the dislocation of national production systems, under the combined impacts of the finance system, financed-led internationalisation and "Thatcher" inspired economic policies. Fitoussi and Le Cacheux (1989) attributes the drop in the share of wages in value added mainly to the twofold effect of redundancies and unemployment and the necessity of industrial capital to shift the burden of positive real interest rates on to wage earners through very tough wage bargaining.

Figure A.1 – Real interest rates (1), from the US, France, Italy and Fed. Rep. of Germany (1970-1987)

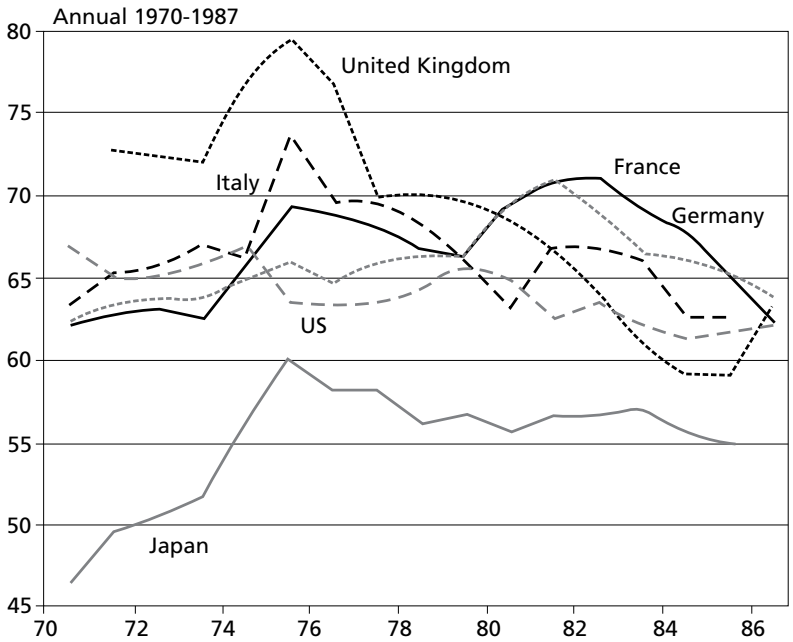


Note: (1) Nominal interest rates over long-term public obligations minus the moving average on nine semesters of consumer price inflation rate.
Source: OECD.

Figure A.2 – Wage share of economic value added (1970-1987)



a. All economic sectors



b. Industry