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THE MARK OF THE PLAGUE

by
DONALD C. WELLINGTON *

I

One of the most tragic events was the Black Death; the fourteenth century scourge that killed an estimated 30 to 50 percent of the people of Western Europe.

Economic historians have paid some attention to the economic implications of the Black Death. There has been a considerable controversy as to whether the economic trends during the century following the Black Death should be characterized as constituting a period of stagnation or a period of continued growth (Postan, 1952; Lopez, 1952; Lopez and Miskimin, 1962; Cipolla, Lopez and Miskimin, 1964; Miskimin, 1964). Neither characterization may be too valid and each may merely reflect the diverse facets of a change in relative factor endowments.

The most likely impact of the Black Death on Western Europe's stock of resources was that suddenly one resource, manpower, was drastically reduced in numbers while little, if anything, occurred to reduce the region's endowment of its non-human resources. If some degree of substitutability of the services of human and non-human resources was possible in the European productive processes, real output should not have fallen as much as the population and per capita incomes can have risen once the disruptive effects on productive processes of the actual epidemic had passed.

A reduction in the stock of human resources relatively to that of non-human resources implies the return to labor services should have risen relatively to other factor prices. Furthermore the structure of wage rates may have changed. If the towns were death traps and a disproportionately larger number of the more skilled lived in towns, wages in the higher paying occupations, such as crafts, may have risen relatively to unskilled wages.

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Such shifts in relative factor prices should have resulted in a sharp rise in the relative prices of those commodities with productive processes that used a high proportion of labor, particularly craft, services and in which other factor services could not be readily substituted for labor services. Many non-agricultural products were probably of this nature.

Any rise in the relative prices of certain goods should have caused consumers to alter their pattern of consumption, thereby causing substantial shifts in the flow of domestic and foreign trade. During the medieval period, a main trading partner of Western Europe was the Muslem world. If little change in the structure of demand occurred in Europe, the decline in European aggregate income would have caused a roughly proportional fall in European imports. In fact, imports may have suffered less because the European price level probably rose. As money was largely in the form of specie coin, its stock and services remained unchanged when real income fell with the result that Europeans would have found themselves holding excess money balances. On spending those excess money balances, the price level would have been driven up thereby encouraging imports and discouraging exports. On the other hand, some exchange rate depreciation

TABLE 1

WAGE RELATIVES: 1351-1400 PERIOD COMPARED TO 1301-1350 PERIOD

Thatcher	135
Thatcher's Help	205
Carpenter	140
Carpenter (highest rate)	130
Mason	148
Tiler	123
Tiler & Help	189
Slater	141
Slater & Help	129
Sawyer	165
Sawing	142
Mowing	124
Threshing	
Wheat	126
Barley	145
Oats	173
Reaping	
Wheat	141
Barley	136
Oats	161

can have occurred as there was a rather broad range of values bounded by the gold export and import points (Ames, 1965, p. 497).

II

In England, the most severe attack of the plague occurred in 1348-49. Subsequent epidemics, which occurred in 1360-61, 1369, and 1375, were characterized by a lower death toll. Russell has estimated that the English population was 3,757,500 in 1348; 3,127,500 in 1348-50; 2,745,000 in 1360; 2,452,500 in 1369; and 2,250,000 in 1374. Thereafter, the population gradually fell to 2.1 million in 1430 and did not reach 2.8 million until 1545 (Russell, 1948, p. 263, 270). These figures indicate that the English population declined about 40 percent during the second half of the fourteenth century. A very similar fall in population is recorded for Catalonia in Spain (Lopez and Miskimin, 1962, p. 417).

To a slight degree, Russell's data bear out assertions that the death toll was higher in the cities. Comparing populations in 1377 with those in the first half of the fourteenth century, Bristol's population fell by 44 percent; Cambridge's by 35 percent; Leicester's by 35 percent; Norwich's by 54 percent and Oxford's by 52 percent (Russell, 1948, p. 284). Similarly, the foreign urban populations experienced a varied record; some of the Spanish, Italian and French cities had population declines in excess of 40 percent and some had less drastic population declines (Lopez and Miskimin, 1962, pp. 417-9). In the case of Pistoia, a town near Florence, the town population fell 45 percent between 1300-10 and 1351 while the population of the neighboring countryside fell 42 percent between 1344 and 1383 (Herlihy, 1967, p. 76).

Whatever were the relative death rates in the towns versus the countryside, wage statistics indicate little change in the wage structure. Table 1 presents relatives of the post-plague English wage rate to the pre-plague wage rate for a variety of labor services (Rogers, 1866, Vol. 1, pp. 303-23). A post-plague wage rate is an average of wage rates during the 1351-1400 period, while a pre-plague wage rate is an average for the 1301-1350 period. All wage rates rose but skilled rates do not seem to have risen relatively to the unskilled rates. In some crafts the craftsman's wage rate rose relatively to that of his helper, while in other crafts the opposite movement of relative wages occurred.

The same result is forthcoming when looking at the wage rates by region and town. Table 2 presents relatives of the post-plague wage rates to

TABLE 2
WAGE RELATIVES: 1351-1400 PERIOD COMPARED TO 1301-1350 PERIOD

	Carpenter	Tiler	Tiler & Help
Oxford	139	122	123
Southhampton	136	159	189
Boxley Grange	200		
Elham	139	150	172
Lullington	133		
Farley	138		
Letherhead	183	150	138
Maldon			167
Clarette	139		
Hoton	159		
Wellow	100	160	
Cuxham	112	157	116
Ibstone	139	200	
Cheddington	155	167	128
Staundon	117		
Gamlinghy	190		
Wolford	153		
Wolrichston	130		

pre-plague wage rates for carpenters, tilers, and tilers and their helpers in a number of English towns and villages (Rogers, 1866, Vol. 2, pp. 286-328). Oxford had an estimated population of about 3500 persons in 1377, Southhampton had a population of about 1700, and each of the remaining places had a population of less than 300 persons (Russell, 1948, pp. 140-3). The wage rate relatives present no consistent pattern of the tiler's or the carpenter's wage rates having risen relatively to that of the tiler and helper. Nor is there any consistent pattern in the record of wage relatives in the two larger towns compared to that of the smaller places.

Although there may not have been any radical change in the distribution in the labor force, the massive decline in the total labor force can have been sufficient to cause substantial changes in relative product prices. If the substitutability of factor services was not easy in all productive processes, the prices of products using a high proportion of labor services in their production can be predicted to have tended to rise relatively to other product prices. This record may have been shared by other product prices if the diminution of the labor force also led a decrease in the stock of some of the other factors; in particular, capital goods with a short life span and

which required much labor in their production. For a variety of products, Table 3 compares the 50 year average of post-plague prices with the 50

TABLE 3

PRICES RELATIVE TO THOSE IN 1301-1350 PERIOD

	1351-1400	1401-1540	1541-1582
Grains			
Wheat	91	98	228
Barley	96	88	200
Drage	105		
Oats	102	87	217
Beans	100	83	136
Peas	94	98	221
Vetches	92		
Rye	90	100	
Malt (1st Qual.)	104		
Average	97		
Livestock			
Oxen	114	157	540
Cart-Horses	115		
Mutton (highest price)	110	118	334
Sows	123		
Hens	121	134	284
Geese	116	131	276
Average	117		
Farm Products			
Hides-Ox	71	93	309
Cheese	98		
Butter	103	127	306
Eggs	110	135	658
Candles	100	67	135
Wax	98	94	136
Cider	116		
Average	98		
Wood & Metals			
Fagots	111	277	488
Charcoal	140	113	185
Iron	225	250	438
Lead	231	119	253
Lime	220	218	517
Tar	110	129	210
Average	173		

	1351-1400	1401-1540	1541-1582
Building Materials			
Laths	150	132	195
Plain Tiles	182	213	394
Lath Nails	185	124	152
Tile Nails	200		
Millstones (Foreign)	175	164	331
Average	178		
Agricultural Implements			
Hurdles	180	154	368
Horseshoes	209		
Horseshoe Nails	211		
Plough Shoes	192		
Plowshares	168		
Clouts	239		
Clout Nails	177		
Wheels (Plain)	226		
Ligatures	236		
Great Nails	305		
Average	214		
Wool	101	73	204
Textiles			
Canvas (Coarse)	179	161	281
Hair Cloth	174		
Linen	212		
Table Linen	136	140	381
Cloth (Best)	107	76	197
Cloth (2nd Qual.)	145	149	251
Average	159		
Foreign Products			
Herring	177		
Wine	154		
Pepper	115	117	223
Oil	122		
Sugar	147	93	100
Almonds	189	195	436
Ginger	112	137	229
Saffron	218	179	247
Average	154		

year average of pre-plague prices (Rogers, 1866, 1882). Non-farm product prices rose markedly compared to farm product prices, many of which even

fell. The price of iron rose relatively to the price of charcoal, which rose relatively to that of fagots. Textile prices rose substantially compared to the price of wool.

A comparison of the average prices in the period from 1401 to 1540 with those in the 1301-1350 period indicates that the post-plague restructuring of relative prices continued to hold sway during the next century when the population, according to Russell's estimates, remained well below the pre-plague level. The population did rise considerably by the mid sixteenth century at which time the pattern of relative prices is much changed.

The relative price changes in Pistoia are not fully consistent with English price changes. The comparison of Pistoia's prices in the pre-plague and post-plague half centuries is, however, based on data from only a very few years, which are not identical for each commodity. Among agricultural goods, the price of wheat rose by 15 percent, that of oil by 72 percent, that of wine by 150 percent, and that of meat by 126 percent. Among non-agricultural products, the price of iron rose by 49 percent and that of bricks by 184 percent (Herlihy, 1967, pp. 123-7, 149-152).

III

As there was a general tendency for both wage rates and product prices to rise during the post-plague period, it is conceivable that no improvement in real wages occurred. Nevertheless, a study indicates that the real wage rate of masons did rise (Phelps Brown and Hopkins, 1956). A rise in real wages, however, does not necessarily imply a rise in per capita real incomes as other factor returns may have fallen. There is some evidence that rents on land and rents on capital goods fell (Postan, 1950, p. 237). The records at Pistoia provide quite concrete evidence that rents in kind on land fell by about 40 percent and that the rate of return on investment in agricultural capital fell by about the same proportion (Herlihy, 1967, p. 238, 243).

Some notion of the change in per capita incomes may be obtained from the following speculative calculations as to the values of factor services. In 1334, the English government levied a tax on moveable property on the basis of assessments that are said to have been fairly accurate (Schofield, 1965, pp. 486-9). The tax was levied on property other than that owned by the Church. The yield on the portion of the tax set at a fifteenth of the value of the property was £ 33,265; while that on the portion set at a tenth of the value of the property was £ 4,164 (Willard, 1915, p. 73). These

tax yields imply that the value of the moveable lay property was about £ 540,000.

The value of the clerical moveable property has been estimated at about 65 percent of the lay property, which implies that the total value of the moveable property was about £ 890,000. That sum was somewhere between being equal or twice the value of the amount of the annual rents on fixed assets, of which the main form was land (Schofield, 1965, p. 504, 498-9). Choosing the latter relationship, the value of the annual rents on land and other fixed assets amounted to about £ 445,000 in 1334. If the moveable property yielded a return of 10 percent as in Pistoia (Herlihy, 1967, p. 240), the total value of the services from non-human factors of production amounted to about £ 534,000. As the price level in 1334 was 99 while it averaged 114 during the 1300-1346 period, the annual rent on non-human factors averaged £ 613,000 during the 1300-1346 period if the stocks and relative prices of those factors were stable. If rents fell by 40 percent in real terms, the post-plague annual rents were about £ 368,000 in terms of the average price level during the 1300-1346 years.

The estimated population in England in 1348 was 3,757,500, which is thought to be little different from the population level at other years in the 1300-1348 period. By 1374, the population had almost reached its lowest level. The children and the indigent made up 36.5 percent of the population in 1377. If the rest of the population can be assumed to have been in the labor force, the labor force averaged 2,386,000 in the pre-plague half century and reached 1,429,000 by the middle of the next half century. No distinction is made between aged and young, women and men, etc. If women are entirely excluded, the estimates of the labor force become halved as the sex ratio of men to women remained steady at one during the fourteenth century (Russell, 1948, pp. 14, 146, 259-60).

The lowest wage rate quoted by Rogers is for help and the highest is for carpenters (Rogers, 1866, Vol. 1, pp. 310-9). Taking the mean for each year during the 1300-1346 period and calculating each mean in terms of the average price level during the 1300-1346 period, the average comes to about 3 pence, which is probably an overestimate of the weighted average of the value of labor services as the vast bulk of the working population probably possessed labor services of less value than those of the carpenters.

According to Rogers, workmen took few holidays. If Sundays were their only holidays, their work year was 313 days, which means that a 3 pence daily wage amounted to a yearly wage income of about £ 4 per worker. If the average value of the female labor services was approximately the same as that of men, such an average annual wage income means that the

value of labor services amounted to £ 9,544,000. The real wage of masons in the post-plague half century was 1.26 times that in the previous half century (Phelps Brown and Hopkins, 1956, p. 311). If the real wage rate experience of the masons is indicative of what happened to other wage rates, real wages rose by 26 percent. This implies that the value of labor services in 1374 amounted to 7,202,000 in terms of pre-plague prices.

These figures mean that the sum of annual income from human and non-human services fell from 10,157,000 to £ 7,570,000. Both figures are expressed in pre-plague prices. They imply that per capita real incomes rose from £ 2.7 to £ 3.4, which is a rise of about 25 percent. Roughly the same rise occurs if women are entirely excluded from the labor force. It is an overestimate if there was much decrease in the amount of land in use. It is an underestimate if non-human factor services were underestimated. The latter is a distinct possibility. Even if the tax assessments were accurate, the estimations probably do not cover much more than the value of land services.

IV

Although the effects of the Black Death on foreign trade would be expected to be less significant to European welfare than effects on real income, the varied record of European foreign trade is consistent with the postulated restructuring of relative factor and product prices in Europe. The foreign trade of southern and northern Europe has been vividly contrasted; with the southern trade having been renowned for its great emphasis on the trading of luxury products with the Middle East (Lopez 1952, pp. 289-338), while the northern trade having been more concerned with the shipment of bulky products, timber, grain, fish, salt and textiles between the European countries (Postan, 1952, pp. 119-133). If this characterization of European foreign trade is accurate, the southern trade should have been more adversely affected by any rise in the European price level and any change in the European price structure towards a rise in the relative prices of labor intensive products. In contrast, the northern trade should not have suffered unduely if most of it was an intra-European trade that would have been unaffected by any general rise in the European price levels.

A considerable decline in population is reported to have occurred in the cities of northern Italy, southern France and Catalonia, which were the main entrepot centers for the European trade with the Middle East. Cloth output in Florence fell to about a third of its pre-plague level, while the

number of cloth seals sold at Ypres in Flanders fell about one-half. For Marseille, there exists a record of the price of the tax farm on cloth exports and a record of the tax farm collecting the levy on ships entering and leaving the port. For each tax farm, the price of the farm during the second half of the fourteenth century averaged about one half that in the first half of the century. The tax farm on the foreign trade of Genoa encountered a similar experience (Lopez and Miskimin, 1962, pp. 418-21).

In contrast, the trade of northern Europe shows little decline. Wine imports into England fell from an annual rate of about 20,000 tons in the early fourteenth century to a rate of about 14,000 tons at the end of the century (James, 1951, p. 176, 190). Not all of this decline in wine imports, however, can be assigned to the economic effects of the Black Death. Part of the decline may have been due to the Hundred Years War between France and England, which began in 1337. The trade in other commodities, salt, metals other than the precious metals, and fish showed no apparent upward or downward movement. In yet other areas, an increase in trade is reported. The exports of grain from the Baltic countries to the Low Countries increased (Postan, 1952, pp. 196, 200-2). Although the exports of English wool somewhat declined, England's exports of finished textiles increased immensely during the fifty year period commencing in the mid fourteenth century (Carus-Wilson, 1963, p. 122, 138).

Another aspect of foreign trade, specie flows, can also be readily explained. The output of the precious metals declined sharply, particularly in Europe's principal mining area in Central Europe (Postan, 1952, p. 201-2). So did the output of the English mint. At the same time, the existence of a specie outflow from Europe is indicated by the flood of prohibitions of the English government against the export of specie. These facts are consistent with the existence of excess money balances causing a rise in European price levels, which would have reduced the return from the mining and minting of the precious metals while making the European balance of payments tend towards a deficit financed by specie exports. It is believed that such balance of payments difficulties existed in England (Miskimin, 1964, pp. 472-5, 476-82, 489).

V

Many of the economic developments in fourteenth century Europe can be interpreted as arising from the drastic restructuring of its resource endowment when very many in its labor force died within a few years. The

restructuring can have raised wages relatively to other factor prices, changed the structure of relative wages, lowered aggregate income but increased per capita real income, raised European price levels, shifted Europe's trade balance towards an import surplus and brought a specie outflow.

English wage and price statistics clearly indicate that the relative prices of labor and labor intensive commodities rose substantially for a prolonged time. On the other hand, little alteration in the wage structure seems to have occurred.

The record of real wages and some conjectural calculations of per capita real incomes in England lend a degree of support to the argument that economic welfare improved for the survivors. Although the record on foreign trade is more varied, it tends to be consistent with Europe's trade with at least one important geographic region, the Middle East, moving towards an import surplus and a specie outflow.

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LE CONSEGUENZE DELLA PESTE

Nel periodo successivo alla peste i prezzi relativi, i livelli del reddito reale e i flussi commerciali possono essere spiegati come conseguenze di un significativo cambiamento nell'Europa Occidentale delle scorte dei fattori umani di produzione relativamente a quelle dei fattori non umani. I dati indicano che le conseguenze si estesero oltre il quattordicesimo e quindicesimo secolo.

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LA TEORIA DEL VALORE DOPO SRAFFA: UNA NOTA

di
ANDREA SALANTI *

1. *Introduzione*

In uno degli ultimi scritti, completato poco prima della sua scomparsa e recentemente pubblicato, il compianto professor Napoleoni si è riproposto di mostrare come l'importanza del lavoro di Sraffa (1960) sul piano strettamente metodologico consista nel fatto "che Sraffa (realizzando peraltro una tendenza già presente nella storia del pensiero economico) dà una teoria del valore e della distribuzione del tutto *staccata da qualsiasi presupposto non empirico*" [1]. Ne conseguirebbe, secondo l'autore, che la proposta teorica di Sraffa – rappresentando una rottura rispetto ad *entrambe* le tradizioni teoriche in tema di teoria del valore (quella classico-marxiana e quella "neoclassica") – non può essere situata in un rapporto di continuità con la prima e/o di rottura con la seconda cosí come suggerito dall'interpretazione prevalente.

Una delle argomentazioni addotte a sostegno di tale tesi consiste nell'osservazione secondo la quale

"se (...) ci si riferisce specificamente a Marx, si vede che il carattere proprio della teoria classica non sta affatto nella presenza in essa di un concetto di sovrappiú, ma sta nella presenza in essa di un concetto assai piú determinato, quello cioè di *plusvalore*, come espressione sul mercato di un *pluslavoro* (...). Ma il pluslavoro è impensabile al di fuori della teoria del valore-lavoro. Infatti il concetto di pluslavoro presuppone la possibilità di operare una differenza *significativa* tra due quantità di lavoro; e tale differenza è significativa soltanto se, come la quantità di lavoro che sta al minuendo è rappresentativa di ciò che il lavoratore dà, cosí la quantità di lavoro che sta al sottraendo è rappresentativa di ciò che il lavoratore riceve; ma

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[1] NAPOLEONI (1989, p. 35, corsivi nell'originale).

il sottraendo ha questa caratteristica, appunto, *solo quando i rapporti di scambio sono eguali ai rapporti tra le quantità di lavoro contenute nelle merci e quindi il valore ricevuto come salario è riconducibile a lavoro senza residui*" [2].

Scopo di questa nota è, innanzitutto, di mostrare come quest'ultima affermazione (se presa alla lettera) risulti falsa; nel senso che appare perfettamente possibile, purché lo si voglia, definire una tale differenza partendo dallo schema sraffiano di determinazione dei prezzi di produzione. Piú in generale, si intende inoltre mettere in evidenza come la peculiarità metodologica dell'approccio sraffiano non consista in una (piú apparente che reale) "mancanza di presupposti non empirici", ma risieda soprattutto in una ridefinizione del "campo teorico" (nel senso, se si vuole, di Althusser) oggetto di studio da parte dell'economista interessato alla problematica del "valore": campo teorico che in Sraffa risulta indubbiamente piú ristretto che non nelle impostazioni con cui si è solitamente portati ad istituire raffronti.

Tutto questo, ovviamente, è ben lungi dal costituire una completa ed esauriente "ricostruzione razionale" di ciò che il lavoro di Sraffa rappresenta sul piano squisitamente metodologico, né risulta sufficiente a dirimere l'annosa questione della continuità di Sraffa nei confronti di una tradizione, quella – appunto – classico-marxiana, che pone a propria volta piú di un problema di carattere epistemologico. Piuttosto, le considerazioni che seguono sono sottoposte al giudizio del lettore nella convinzione che possano riuscire, se non altro, a fornire qualche utile chiarimento preliminare.

2. *Sulla presunta indefinibilità del "plusvalore" in Sraffa*

Sul piano strettamente formale la relazione esistente fra "prezzi di produzione" e "valori" nonché quella, a questa strettamente connessa, fra saggio di profitto e saggio di plusvalore sono note da tempo. È dimostrato, ad esempio, che il saggio di plusvalore per il sistema nel suo complesso può essere direttamente derivato dal valore del salario unitario quale questo risulta dalla soluzione di un sistema di prezzi di produzione espressi in termini di un particolare numerario (il valore del prodotto per lavoratore avente la stessa composizione del salario reale) secondo la semplice relazione [3] $s = \frac{1}{w} - 1$.

[2] Napoleoni (1989, pp. 39-40, l'ultima sottolineatura non compare nel testo originale). La medesima posizione emergeva già da alcuni passi in Napoleoni (1985): si vedano, a tale proposito, le osservazioni in De Vivo (1989, pp. 182-185).

[3] Cfr. Pasinetti (1977, l'appendice al cap. V ed. in particolare pp. 142-144).

D'altro canto è anche possibile, come indicato nel seguito, misurare direttamente – per ogni singolo settore – il corrispondente ammontare di "pluslavoro" partendo da un usuale sistema di determinazione dei prezzi alla Sraffa.

Dalla relazione che ci dà la soluzione per il vettore dei prezzi sappiamo infatti che [4]

$$\mathbf{p} = \mathbf{a}_n [\mathbf{I} - (1 + r) \mathbf{A}]^{-1} w$$

e quindi, per quanto riguarda il bene i-esimo, che

$$p_i = \mathbf{a}_n [\mathbf{I} - (1 + r) \mathbf{A}]^{-1} w \mathbf{e}_i \qquad (1)$$

Ponendo come numerario $wa_i = 1$, possiamo anche scrivere

$$p_i = \frac{1}{a_i} \mathbf{a}_n [\mathbf{I} - (1 + r) \mathbf{A}]^{-1} \mathbf{e}_i \qquad (1')$$

Un modo immediato per misurare il "pluslavoro" può ottenersi identificando qual è il lavoro "comandato" corrispondente alla grandezza che abbiamo assunto come numerario, ovvero quanto lavoro è direttamente ed indirettamente "incorporato" nella quantità del bene i-esimo acquistabile per mezzo di un salario pari a 1 $\left(\text{ovvero } q_i = \frac{1}{p_i}\right)$, salario che, data la definizione del numerario, corrisponde a una quantità di lavoro "astratto" pari ad a_i. La cosa è piuttosto immediata poiché, indicando con v_{q_i} ("valore" della quantità q_i) la grandezza cercata, si ha

$$v_{q_i} = q_i \mathbf{a}_n (\mathbf{I} - \mathbf{A})^{-1} \mathbf{e}_i = \frac{1}{p_i} \mathbf{a}_n (\mathbf{I} - \mathbf{A})^{-1} \mathbf{e}_i \qquad (2)$$

da cui, tenendo conto della (1'), si ottiene

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[4] I simboli non esplicitamente definiti nel testo vanno intesi, secondo l'uso corrente, come segue:

$\mathbf{p}$ = vettore dei prezzi (di produzione);
$\mathbf{a}_n$ = vettore dei coefficienti di lavoro;
$\mathbf{I}$ = matrice identità;
$\mathbf{A}$ = matrice (quadrata di ordine $n - 1$) dei coefficienti di produzione;
$\mathbf{e}_i$ = vettore unitario ($e_i = 1$ ed $e_j = 0$ per $j \neq i$);
w = salario unitario;
r = saggio (uniforme) di profitto.

Per quanto concerne, piú in generale, il quadro analitico da cui le relazioni qui utilizzate derivano, si veda PASINETTI (1977, cap. V).

$$v_{qi} = a_i \frac{\mathbf{a}_n (\mathbf{I} - \mathbf{A})^{-1} \mathbf{e}_i}{\mathbf{a}_n [\mathbf{I} - (1 + r) \mathbf{A}]^{-1} \mathbf{e}_i} \qquad (3)$$

Quest'ultima relazione permette di constatare immediatamente che:

1. se $r = 0$ si ha $v_{q_i} = a_i$, il che coincide perfettamente con il ben noto risultato secondo il quale per $r = 0$ i "prezzi" di Sraffa coincidono con i "valori" di Marx [5];

2. se $r > 0$ si avrà [6] $v_{q_i} < a_i$. In tal caso la differenza tra ciò che il lavoratore dà e ciò che egli riceve, che Napoleoni sostiene essere definibile solo "quando i rapporti di scambio sono uguali ai rapporti tra le quantità di lavoro contenute nelle merci", risulta – al contrario – semplicemente pari ad $a_i - v_{q_i}$ dove entrambi i termini sono definiti, si badi, in termini di *quantità di lavoro*.

Ovviamente si avrà anche, in generale, $\frac{a_i}{v_{q_i}} \neq \frac{a_j}{v_{q_j}}$ (dove $i \neq j$; con $i, j = 1, 2, \ldots, n - 1$), ma questo è il risultato ben noto, dal dibattito sulla "trasformazione", secondo il quale un sistema di prezzi che soddisfi il requisito della uniformità del saggio di profitto nei vari settori è in generale incompatibile con il requisito di un "saggio di sfruttamento" ugualmente uniforme.

Volendo esplicitare il "saggio di sfruttamento" s_i, si può infine riscrivere la (3) come

$$\frac{a_i}{v_{qi}} = \frac{\mathbf{a}_n [\mathbf{I} - (1 + r) \mathbf{A}]^{-1} \mathbf{e}_i}{\mathbf{a}_n (\mathbf{I} - \mathbf{A})^{-1} \mathbf{e}_i} = 1 + s_i \qquad (3')\ [7]$$

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[5] A tale conclusione si può anche pervenire direttamente osservando che se $p_i = v_{q_i} w$ si ha $p_i = v_{q_i} \frac{1}{a_i}$ e quindi $q_i = \frac{1}{p_i} = \frac{a_i}{v_{q_i}} = \frac{a_i}{q_i \mathbf{a}_n (\mathbf{I} - \mathbf{A})^{-1} \mathbf{e}_i}$, per cui la (2) si riduce immediatamente all'uguaglianza $v_{q_i} = a_i$.

[6] Si tenga conto che, per uno dei noti teoremi di Perron-Frobenius, vale la seguente relazione: $[\mathbf{I} - (1 + r) \mathbf{A})]^{-1} > (\mathbf{I} - \mathbf{A})^{-1}$.

[7] Sulla base di tale relazione è quindi possibile osservare come anche l'enunciazione del noto "teorema marxiano fondamentale" da parte di MORISHIMA (1974, p. 17) susciti qualche perplessità. Egli sostiene infatti che

> "Il teorema di Morishima-Seton-Okishio *dimostra* che il saggio di profitto di equilibrio è positivo *se e solo se* è positivo il saggio di sfruttamento. Questo è uno dei teoremi che Marx voleva enunciare nel *Capitale*. Esso può essere considerato il problema centrale della filosofia marxiana, perché implica che *lo sfruttamento è necessario per la sopravvivenza di un'economia capitalistica*, dal momento che essa non può sopravvivere se il saggio del profitto di equilibrio non è positivo" (sottolineature aggiunte),

3. *Qualche ulteriore osservazione sulla peculiarità dell'approccio sraffiano*

Posto, dunque, che il problema di definire il pluslavoro (e quindi il plusvalore) nell'ambito dello schema sraffiano di determinazione dei prezzi di produzione non appare insormontabile, resta da chiarire il motivo per cui tale approccio continui ad apparire piuttosto singolare e conseguentemente non manchi di suscitare, per i piú diversi motivi, ricorrenti discussioni.

Tale singolarità, come accennato all'inizio, viene individuata da Napoleoni (1989) nella presunta assenza di "qualsiasi presupposto non empirico" all'interno del disegno teorico di Sraffa. A parte l'obiezione, sin troppo facile alla luce di (ormai nemmeno piú tanto) recenti indirizzi epistemologici, che non è possibile parlare di totale assenza di elementi non empirici all'interno di un discorso teorico poiché, se mai, si deve al contrario dare per scontato che qualsiasi "osservazione" risulta in qualche modo "imbevuta di teoria", non è nemmeno troppo difficile individuare esplicitamente la presenza di tali elementi all'interno dell'approccio sraffiano.

Che dire, infatti, dell'assunzione di un saggio *uniforme* di profitto, oppure della decisione (non saprei dire quanto consapevolmente metodologica) di circoscrivere l'analisi ai soli beni "riproducibili" e conseguentemente di rappresentare il processo produttivo come un processo perfettamente "circolare", oppure, ancora, della decisione (questa sí senza dubbio esplicita e consapevole) di nulla dire circa la distribuzione del reddito e di porre quindi al centro dell'analisi l'intera relazione salario-profitto? Come si vede non è difficile individuare elementi "non empirici" nell'analisi sraffiana; e non potrebbe essere altrimenti poiché elementi di questo tipo sono presenti, come è ormai ampiamente riconosciuto, in *ogni* teoria e (sia pur in misura diversa) in *ogni* disciplina scientifica. Se cosí è, dunque, le ragioni della "singolarità" (peraltro innegabile) del progetto sraffiano devono essere ricercate in altre direzioni.

In effetti, a mio parere, ciò che contraddistingue Sraffa (1960) da un punto di vista strettamente metodologico è semplicemente l'aver voluto circoscrivere il proprio campo d'indagine in modo tale da dimostrare la possibilità di risolvere *un* determinato problema (ovvero la ricerca del piú possibile ristretto insieme di ipotesi *sufficienti* a giustificare – sul piano

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col che si istituisce una priorità nella successione di connessioni logiche che la (3') mostra essere in certo qual modo gratuita. Ciò che potrebbe essere detto, molto piú semplicemente, è che il saggio di profitto risulta essere positivo solo se il saggio di sfruttamento è positivo e viceversa. Questo è tutto quanto è possibile affermare sulla base della sola algebra (a meno che non si voglia ricominciare a discutere se un'identità vada letta da sinistra verso destra o viceversa).

strettamente teorico – la nozione di "prezzi di produzione"). Questa rigorosa applicazione del "rasoio di Occam" al problema in oggetto, spinta alle estreme conseguenze, ha finito per determinare una delimitazione del campo teorico oggetto di indagine [8] cosí ristretta da rendere poi estremamente difficile, per non dire praticamente impossibile, qualsiasi tentativo di identificare il dominio sul piano empirico di tale costruzione teorica.

Non a caso, quindi, il tentativo indubbiamente piú compiuto e rigoroso di sostenere la rilevanza empirica dell'analisi sraffiana – e mi riferisco all'interpretazione di Sraffa che da diverso tempo va proponendo Garegnani – ha sempre incontrato diverse obiezioni e suscita tuttora una certa perplessità. Secondo Garegnani, come noto, i prezzi di produzione alla Sraffa devono essere interpretati come rapporti di scambio appropriati ad un equilibrio (o "posizione") di lungo periodo che rappresenterebbe una sorta di "centro di gravitazione" cui il sistema dei prezzi "tenderebbe" comunque, pur potendosi trovare, nel breve periodo, in posizioni di non equilibrio [9]. Ma una tale interpretazione, per quanto ingegnosa e per certi aspetti affascinante, come ho avuto modo di sottolineare in precedenti lavori [10], risulta tuttora priva di sufficienti "prove" a sostegno della sua validità sul piano fattuale ed appare comunque basata su premesse metodologiche piuttosto fragili e per certi aspetti contraddittorie.

Va infine osservato, a proposito dell'apparente peculiarità metodologica dell'approccio sraffiano, che quanto osservato in precedenza non giustifica comunque la conclusione secondo la quale in qualsiasi formulazione teorica all'interno della scienza economica ci si imbatte necessariamente in un irrisolvibile contrasto fra requisiti di rigore formale ed esigenze di rilevanza interpretativa. L'esistenza di un simile trade-off, già adombrata in alcune tesi sostenute da Lunghini (1975 e 1986), è stata recentemente riaffermata con forza su questa stessa rivista da Covi (1989), il quale giunge ad affermare che:

"Il significato dell'esperimento intellettuale di Sraffa va colto allora nella dimostrazione per assurdo che esso sottende: il costo-opportunità della conformità al rigore matematico applicato all'economia è l'annullamento del significato economico associato alle proposizioni in essa contenute. (Analogamente all'operazione compiuta dall'amico Wittgenstein nel *Tractatus*, anche qui la definizione rigorosa di un universo economicamente dicibile *mostra* ciò su cui occorre tacere perché impossibile dire scientificamente)" (p. 351, corsivi nell'originale).

[8] Per una interessante discussione della nozione di "campo teorico", basata sull'approccio originariamente proposto in ALTHUSSER (1971), si rinvia a TURCHETTO (1988).

[9] Si veda, ad esempio, GAREGNANI (1976, 1979 e 1981).

[10] Cfr. SALANTI (1985 e 1989).

Ebbene, di fronte a una formulazione così decisa mi sembra necessario da un lato sottolineare l'anacronismo insito nell'implicita adozione di un criterio di demarcazione dell'attività scientifica tutto fondato sul rispetto del rigore formale, e dall'altro ribadire che il caso di Sraffa (1960), per quanto importante debba essere considerato, proprio in quanto singolo caso non è in grado di sostenere una conclusione cosí generale.

Pur ammettendo che si possa percepire una difficoltà di questo tipo, per affermarla come principio di portata generale occorrerebbe infatti individuare con precisione le particolari ragioni che darebbero origine, all'interno delle scienze sociali e della scienza economica in particolare, all'impossibilità di conciliare "coerenza logica" e "realismo empirico" (o, come sarebbe forse piú appropriato dire, "razionalità analitica" e "intellegibilità"). Ma una tale "dimostrazione", a quanto mi risulta, non è stata ancora fornita.

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THE THEORY OF VALUE AFTER SRAFFA: AN APPRAISAL

The scope of this note is to show that, contrary to some opinions recently stated in one of the latest writings by the late professor Napoleoni: *i*) a "measure" of surplus-value can be conceived even within a Sraffa price-system, and *ii*) Sraffa's 1960 theoretical construction cannot be characterized as being devoid of any non-empirical premise. Finally, it is suggested that the peculiar methodological feature of the price of production theory lies in a drastic restriction of the "theoretical field" which is the object of analysis. It is often believed that such a restriction strengthens the analytical rigour to the detriment of empirical relevance as is always the case in social sciences. The universal validity of this conclusion, however, is far from being satisfactorily proved.

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TOBIN'S *Q*, FLEXIBLE ACCELERATOR AND ERROR CORRECTION MECHANISMS: A DUALITY THEOREM IN A GENERAL FRAMEWORK

by
GIUSEPPE COLANGELO *

In investment literature, the three schemes that have been most successful in recent times are the neoclassical model (Jorgenson, 1963), the flexible accelerator (Lucas, 1967; Gould, 1968; Treadway, 1971) and Tobin's q model (1969). It is interesting to ascertain the theoretical links between them, even though in the surveys on investment theory they are treated as independent (Clark, 1979).

This task has frequently been the subject of study: Hall (1977) and Lovell (1977), for example, investigated whether the q model could be related to the neoclassical one.

On the one hand, the two approaches show common features – mainly the relevance attributed to price effects and the idea that a single variable could determine the level of investment –, and on the other, they suggest common difficulties.

In particular, their intrinsic inability to determine the dynamic structure of investment endogenously has been the most striking drawback. This defect is particularly relevant if applied to investment behaviour, that tends to smooth over time and to react slowly to an exogenous stimulus.

The setup of models with costs of adjustment on capital's change – from the seminal paper by Eisner-Strotz (1963) – has solved the problem; a dynamic version of investment was built up, in which both the desired factor demands and the adjustment process stem from an optimization

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framework. The higher adjustment costs, the slower the optimal adjustment process to the demand for capital.

By means of this scheme, the flexible accelerator model comes to be rationalized; it can incorporate the Jorgensonian optimal demand for capital. In the same way, Tobin's q is rationalized too; the existence of convex adjustment costs explains why q structurally diverges from unit value (e.g. Yoshikawa, 1980).

On these grounds, it is clear that a logical relationship between Tobin's q and the flexible accelerator exists; we wonder whether an exact analytical link, i.e. a dual relationship, exists as well. Galeotti (1987) has given an answer to the question, by proving a dual relationship between them within a dynamic optimization problem where static expectations and constant returns to scale are imposed.

This paper extends the result of duality to a more general framework, in which both the aforementioned hypotheses are not imposed. Particular concern is devoted to the theoretical implications of relaxing them.

In line with what Nickell (1978) showed, static expectations – by entailing a fixed targed stock – represent a necessary condition for rationalizing the usual flexible accelerator model; in general, error correction mechanisms [1] (ECM) – Davidson et al. (1978), Nickell (1985) – are theoretically superior to it, precisely because of their ability to account for moving target stock. Unlike the flexible accelerator, Tobin's q can be rationalized even outside static expectations; in this more acceptable case, q is a forward-looking time dependent variable. As for Jorgenson's approach, it holds only in the stationary state, $(K = K^*)$ [2].

In section I, the conventional deterministic model of investment decisions is described; in section II, the flexible accelerator and q are derived from the optimality conditions; in section III, the duality theorem is shown; in section IV, concluding remarks are included.

I. *The Model*

We refer to a representative firm, operating in competitive markets and maximizing the present value of net cash flows, given the entire future time horizon. Convex adjustment costs on capital's change are explicitly

[1] An error correction type model à la Davidson was rationalized by NICKELL (1985) within a problem of minimizing a quadratic loss function in which the target stock variable moves over time.

[2] Where K = effective quantity of capital; K^* = desired quantity of capital.

accounted for; the rate of interest, r, is considered as constant over time.

Analytically, the problem is as follows:

$$(1) \quad V = \max \int_0^{\infty} e^{-rt} \{ \pi (K(t), w(t)) - v(t) I(t) - \theta (I(t)) \} dt \qquad r > 0$$

where $\pi (\cdot) = f(K(t), L(t)) - w(t) L(t)$ represents the restricted profit function such that $\pi_K = f_K > 0$; $\pi_w = -L < 0$ being $f_L = w$[3].

$f(\cdot)$ describes technology: $f_K, f_L > 0$; $f_{KK}, f_{LL} < 0$, $f_{KL} = f_{LK} > 0$; $\theta (\cdot)$ relates to adjustment costs working according to known characteristics: $\theta_I > 0$, $\theta_{II} > 0$, $\theta (0) = 0$.

They are charged on gross investment, that is to say on the sum of net investment and the substitution component of depreciated machines; in formula, $I(t) = \dot{K}(t) + \delta K(t)$ [4], where $0 < \delta < 1$. Moreover, $w(t)$ is the real wage rate, $v(t)$ the price of capital goods in real terms.

The optimal path chosen by the firm is described by the following first order conditions, in which (t) is the Hamiltonian function multiplier:

$$(2a) \qquad \lambda (t) = v(t) + \theta_I (I(t))$$

$$(2b) \qquad \dot{\lambda} (t) = (r + \delta) \lambda (t) - \pi_K (K(t), w(t))$$

$$(2c) \qquad \lim_{t \to \infty} e^{-rt} \lambda (t) K(t) = 0$$

II. *Tobin's* Q *and the Flexible Accelerator as Optimal Solutions*

From the above problem, we can derive as optimal responses the two specifications in question.

As it is well known, Tobin's q is obtained by simple inversion of (2a)

$$(3) \quad I(t) = g(v(t) \cdot (q(t) - 1)) \qquad q(t) = \frac{\lambda (t)}{v(t)}$$

$$g' = \frac{1}{\theta_{II}}, \quad \theta_{II} \neq 0$$

By Legendre second-order condition, the objective function given by (1)

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[3] $\pi_K = \frac{\delta \pi}{\delta K}$; $\pi_w = \frac{\delta \pi}{\delta w}$ and similarly, for the other derivatives.

[4] Dot indicates time derivative.

must be quasi-concave; that is, it must be $\theta_{II} \geq 0$. Hence, equation (3) accounts for an optimal path if and only if $\theta_{II} > 0$.

The economic significance of $\lambda(t)$ is easily derived by integrating (2b)

$$(4) \qquad \lambda(t) = \int_t^{\infty} e^{-(r+\delta)(s-t)} \pi_K(K(s), w(s))\, ds \qquad s \geq t$$

The shadow value of capital – $\lambda(t)$ – is the expected present value of marginal profitability of capital on an infinite time horizon.

Obviously, q is time-dependent and related to future quantities of capital reacting on its own to expected paths followed by v and w.

Under static expectations, – $K(s) = K(t)$, $v(s) = v(t)$, $w(s) = w(t)$ for each $s > t$ –, (4) becomes

$$(4a) \qquad \lambda = \frac{\pi_K(K, w)}{r + \delta}$$

Under these conditions, q is time-invariant and equal to the ratio of marginal profitability of capital and its user cost ($v(r + \delta)$). Conceivably, the same result is obtainable from (2b) under the condition $\dot{\lambda}(t) = 0$.

Let us notice that we have not supposed constant returns to scale; we will show that we do not strictly need this assumption in order to analytically integrate the three popular models of investment into one.

To get the flexible accelerator scheme, let us differentiate (2a) with respect to time and substitute it into (2b); then substitute (2a) in (2b). Finally, we get

$$(5) \qquad \dot{v}(t) + \theta_{II}(I(t))\,\dot{I}(t) = (r + \delta)((v(t) + \theta_I(I(t))) + \\ - \pi_K(K(t), w(t))$$

Expanding (5) linearly around the stationary equilibrium (K^*, v^*, w^*; $\dot{K}^* = \dot{v}^* = \dot{w}^* = 0$) and supposing that adjustment cost function is quadratic, we get [5]:

$$(5a) \qquad \dot{v}(t) + \theta_{II}\,\dot{I}(t) = (r + \delta)\, dv(t) + (r + \delta)\,\theta_{II}\, dI(t) + \\ - \pi_{KK}\, dK(t) - \pi_{Kw}\, dw(t)$$

Incorporating the definition for $I(t)$ and its time derivative, it follows

[5] In the left hand term of equation (5a), $d(\dot{v}(t) + \theta_{II}\dot{I}(t)) = \dot{v}(t) + \theta_{II}\dot{I}(t)$ because $d\dot{v}(t) = \dot{v}(t) - \dot{v}^* = \dot{v}(t)$ and similarly for $I(t)$.

$$(6) \qquad \dot{v}(t) + \theta_{II}\dddot{K}(t) + \delta\ddot{K}(t)) = (r+\delta)\,dv(t) + \\ + (r+\delta)\,\theta_{II}(\ddot{K}(t) + \delta dK(t)) - \pi_{KK}\,dK(t) - \pi_{Kw}\,dw(t)$$

After some manipulations,

$$(7) \qquad \dddot{K}(t) - r\ddot{K}(t) - B\dot{K}(t) = -B K^{*}(t)\frac{-1}{\theta_{II}}\left\{\dot{v}(t) + \right. \\ \left. + \pi_{Kw}\,dw(t) - (r+\delta)\,dv(t)\right\}$$

where $B = \delta(r+\delta) - \frac{\pi_{KK}}{\theta_{II}} > 0$. (7) is a second-order linear differential equation with constant coefficients and a variable particular term. Its characteristic equation $\mu^2 - r\mu + B = 0$ has two solutions, but only one of them is consistent with (2c) [6].

Let us discard the inconsistent solution by setting its constant as zero.

As for the particular solution, we follow the Morrison's guesswork (1986, Appendix); by differentiating the general solution for (7), it yields

$$(8) \qquad \dot{H}(t) = \mu K(t) + \int_{t}^{\infty} e^{(\mu-r)(s-t)}\left\{BK^{*}(s) + \frac{1}{\theta_{II}}(\dot{v}(s) + \right. \\ \left. + \pi_{Kw}(dw(s) - (r+\delta)\,dv(s))\right\} ds$$

where μ is the stable root. Being $\int_{t}^{\infty} K(s)^{*}\,ds = \int_{t}^{\infty} K(t)^{*}\,ds + \\ + \int_{t}^{\infty}(K(s)^{*} - K(t)^{*})\,ds$, in which $K(t)^{*}$ is time-invariant, (8) can be rewritten as

$$(9) \qquad \dot{K}(t) = \mu(K(t)^{*} - K(t)) + \int_{t}^{\infty} e^{(\mu-r)(s-t)}\{B(K(s)^{*} - \\ - K(t)^{*}) + \frac{1}{\theta_{II}}(\dot{v}(s) + \pi_{Kw}\,dw(s) - (r+\delta)\,dv(s))\}\,ds \\ (0 < \mu < 1)$$

We get a more general solution which generates the usual flexible ac-

[6] We deduce this by the violation of Routh's theorem.

celerator scheme as a special case; the second right-hand term reacts to expected changes in prices and in target stock [7]. Following Nickell (1985), we would interpret it as a forward-looking example of an error correction mechanism. In fact agents decide how much to invest not only in relation to the divergence between current and desired capital stock but also to future expected changes in target stock and in factor prices, precisely because of their non static expectations.

Only under static expectations, it holds $\dot{v}(s) = dw(s) = 0$, $K(s)^* = K(t)^*$, for any $s > t$, so (9) coincides exactly with the flexible accelerator.

Indeed, the error correction mechanism is able to pick up the effect of expected changes in target stock on the firm's decisions.

III. *Duality between Q, Flexible Accelerator and Error Correction Mechanisms*

Substituting (3) into the definitory equation of $I(t)$, it yields

$$g(v(t) \cdot (q(t) - 1)) = \dot{K}(t) + \delta K(t) \tag{10}$$

In equilibrium, ($\dot{K}(t) = 0$, $K(t) = K(t)^*$), it gives the following demand for capital

$$K^* = \frac{1}{\delta} g(v(q-1)) \tag{10a}$$

By this means, we are able to link analytically Tobin's q to the other two schemes. Substituting (10a) into (9), we get

$$\dot{K}(t) = \mu\left(\frac{1}{\delta} g(v(t) \cdot (q(t) - 1)) - K(t)\right) + \tag{11}$$

$$+ \int_t^{\infty} e^{(\mu - r)(s-t)} \left\{ \frac{B}{\delta} (g(v(s) \cdot (q(s) - 1)) - g(v(t) \cdot (q(t) - 1))) + \right.$$

$$\left. + \frac{1}{\theta_{II}} (\dot{v}(s) + \pi_{Kw}\, dw(s) - (r + \delta)\, dv(s)) \right\} ds$$

We have expressed the error correction/flexible accelerator scheme in terms of Tobin's q; at whichever point in time, investors choose the desired

[7] Even though a similar exercise was first led by NICKELL (1978, pp. 257-59), we are here applying it for a different scope.

quantity of capital by observing q's behaviour; being so, a duality between the specifications in question always holds true; they are a mirror image of each other and not simply linked by some logical resemblance.

In the case of static expectations, $(q(s) = q(t);\ \dot{q}(s) = \dot{v}(s) = \dot{w}(s) = 0)$ the above relationship becomes simpler

$$\dot{K}(t) = \mu\left[\frac{1}{\delta} g(v(t) \cdot (q(t) - 1)) - K(t)\right] \tag{11a}$$

Equation (11a) corresponds to equation (13) in Galeotti's paper (1987, pag. 775); the dual relationship holds even in a more general class of models than in the static expectations-constant returns to scale one.

IV. *Concluding Remarks*

We have investigated the existence of a duality theorem between q theory and flexible accelerator/error correction schemes in a fairly general framework; that is, where static expectations and constant returns to scale are not imposed. A focus was placed on studying the implications due to relaxing the two aforementioned hypotheses.

The main conclusions reached are:

(i) A dual relationship between q, on the one hand, and flexible accelerator/error correction schemes on the other, exists in this model;

(ii) Tobin's q can be derived only if adjustment costs are strictly convex; in general, q is time-dependent and reacts to expected changes in exogenous variables. Under static expectations, it is time-invariant;

(iii) The usual flexible accelerator scheme is rationalized if, besides the convexity of adjustment costs, static expectations are assumed. Outside this hypothesis, error correction mechanisms are more apt to approximate the optimal behaviour of the firm, because they account more satisfactorily for a moving target stock.

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Q DI TOBIN, ACCELERATORE FLESSIBILE E SCHEMI DI CORREZIONE DELL'ERRORE: UN TEOREMA DI DUALITÀ IN UN MODELLO GENERALE

Nel presente lavoro alcune ben note teorie dell'investimento vengono ricondotte ad un unico schema generale in cui né l'ipotesi di aspettative statiche né quella di rendimenti costanti di scala vengono imposte aprioristicamente.

Anche in questo caso, – piú generale di quelli usuali in letteratura – vale una relazione di dualità tra il *q* di Tobin e una forma di correzione dell'errore che, sotto ipotesi restrittive, coincide con l'acceleratore flessibile.

In particolare, per ottenere quest'ultimo modello si rende necessario non abbandonare l'ipotesi di aspettative statiche.

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STALINISM AS AN EXAMPLE OF A REGIME OF TERROR RESULTING FROM RATIONAL CHOICES

by
GUIDO ORTONA *

1. Current explanations of the establishment of a regime of terror in the USSR in the thirties are unsatisfactory. A first body of theory, on which it is not worth spending time, makes reference to Stalin's madness, a theory which goes against empirical evidence – Stalin was not mad – and against good sense (why should a madman have commanded so much consensus?); or to class struggle (the terror was directed against counter-revolutionaries), which again goes against empirical evidence; or to ideology (Bolshevik ideology fosters terror), as above; or finally to the repression of the just aspirations of the people, which is the same explanation as that of class-struggle with an ideological variance and falls down against the empirical evidence of the arbitrariness of Stalinist terror [1]. A more dignified theory ascribes the unleashing of terror to Stalin's desire to rid himself of internal opposition [2]. But even this theory comes up against serious obstacles. Firstly, the evidence that internal opposition was so strong as to require recourse to such drastic repressive measures is lacking. Secondly, and above all, it is not possible to deduce from this hypothesis the need for such widespread and, above all, indiscriminate terror. The problem, therefore, is moved forward, but remains unresolved: accepting that Stalin intended to free himself of his opponents, this in no way explains the establishment of a regime of mass terror.

In general, therefore, the theories available on the nature of Stalinism do not help very much to explain why a regime of terror was established. In particular, they do not provide a satisfactory explanation for the behaviour

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[1] For a rapid review of these theories see f.i. BOFFA (1982).

[2] See, for example (but the literature is obviously enormous), LEWIN (1977), TUCKER (1977a) and the recent, excellent study by BENVENUTI and PONS (1988).

of those involved, which led to the advent of the terror, unless, as is typical of those pseudo-theories quoted earlier, one accepts as satisfactory the hypothesis that it was due to irrational behaviour, typically on the part of Stalin [3]. But this would raise a methodological problem of enormous proportions for the social scientist. If the presence of behaviour of this kind is necessary to explain the advent of Stalinist terror, it would seem inevitable to conclude that similar behaviour must be attributed to the whole family, however it is defined, of situations similar to Stalinism. But one must then conclude that this family remains inexplicable if one stays with the hypothesis that those implicated in situations which belong to the family maintain their normal characteristics as homines oeconomici, usually assumed to explain their normal behaviour. We would have, therefore, a normal Dr. Jekyll who consumes, produces, has preferences etc., like all others in his daily life, but suddenly turns into a monstrous Mr. Hyde in periods of historical crisis. This could be possible; but before surrendering to this conclusion, tragic for the social sciences from the standpoint of their ability to provide explanations, it would be useful to look for an explanation of the advent of Stalinist terror (and similar phenomena) in line with current assumptions as regards rationality. These pages present a first attempt in that direction. An extremely simple model, perhaps the simplest possible, of the behaviour of a typical subject operating in the Stalinist regime will be illustrated. The subject is presumed to be rational [4], normally selfish and, overall, normal. From this model one finds that if particular initial parameters take on particular values, the behaviour of the typical subject may be such as to produce the essential features of Stalinist terror, as will be defined later. Finally, the initial conditions needed so that the parameters have certain values are illustrated, and the coherence of these conditions with historical evidence is discussed.

2. The main reason which has always made it difficult to explain the advent of Stalinism under the hypothesis of rational beings is probably its apparent "irrationality": the situation is horrible for all. And this does not seem to make sense: we must find out who gains from it, whether a man or a monster. (The same holds for other phenomena similar from the point of view of the existence of a regime of terror, like the Robespierrian terror). But, as is well-known, there is in reality no reason to exclude a priori the

[3] To name just one classic: "The nature of the whole purge depends, in the end, on Stalin's personal and political tendencies" (CONQUEST, 1970, p. 97).

[4] For the definition of rationality accepted here, see, for example, GRAVELLE and REES (1988, ch. 1).

possibility of a situation of stable equilibrium which is sub-optimal for all concerned. The problem is not, therefore, that of the theoretical possibility of such an equilibrium, but that of the dynamics which leads to it. Once the problem has been set in these terms, the path which leads to its solution is clearly mapped: it must be set in terms of a non-cooperative game, given that this is the conceptual structure which allows us to establish a dynamic which leads to an unsatisfactory equilibrium. Before modelling our game, however, I must list some simplifying hypotheses which are assumed in line, I feel, with historical evidence.

a) The economy in which the game is played is a command economy with a pyramid structure in which the power structure officials receive orders from above and pass them on to those below, and are held responsible for everything that happens below them.

b) At every level, officials are interested in reaching the objectives set for them efficiently. This implies that officials must expect severe punishment if the objective is not reached. This feature, of crucial importance in the theory of command economies, is in fact a necessary condition for efficiency, as has been well argued by Osband (1987), Keren (1988) and others [5].

c) Every official has imperfect knowledge of what happens at lower levels.

3. Let us consider two typical officials on immediately successive hierarchical levels. The one on the lower level could equally well be on the bottom-most level of the hierarchy, and be a simple citizen. As I go on, to avoid confusion and also because by 'terror' one usually intends that exercised against the "common citizen", we shall call him 'citizen' and we shall call 'official' the one on the level immediately above. The latter has

[5] The original model is MIRRLEES (1974), although used in a different context. In Mirrlees' model there is no limit to the punishment for not reaching given objectives. Keren observes that this is "intriguing (because) it is reminiscent of the Stalinist approach", and, therefore, not easy to apply in the post-Stalinist situation (but does not, however, cause us problems here). But Osband's solution to this problem is interesting: "After Stalin's death Soviet managers and other bureaucrats gained much more personal security, with restrictions on penalties". In our model this would also permit the end of the regime of terror. As a proof of the validity of the Mirrlees-Osband-Keren model, Osband quotes Smith (1976), according to whom (in the words of Osband) "many Russian workers continue to praise Stalin and Stalinist methods for having kept the *apparatchiki* in line". The model would seem to offer an immediate explanation of the period of terror, in line with that outlined by LEWIN (1977): the terror is the application of the punishment expected on the basis of the model itself. But this interpretation goes once again against the evidence of the arbitrariness of the regime of terror.

the power to arrest the citizen who can, however, appeal against the official to the hierarchical level immediately in turn above him. The official can therefore hurt the citizen by arresting him, and the citizen can hurt the official by complaining to a higher office. This formulation is very general; the features of the political system under examination must be introduced as values of the parameters. Let

- $-A$ = cost of the arrest of the citizen for the official
- $-B$ = cost of the complaint (if accepted) for the official
- $-D$ = cost of the arrest for the citizen
- $-E$ = cost of the complaint for the complainant
- F = payoff of the complaint for the non-arrested complainant
- α = probability of being arrested
- β = probability of a complaint being made
- Γ = probability that the complaint of a non-arrested citizen be accepted
- δ = probability that the complaint of an arrested citizen be accepted.

Let us accept for the moment, and for simplicity, that the values of all parameters are equal for all citizens and for all officials. This hypothesis, whose implications are unimportant, will be relaxed later on.

The situation can be described therefore as follows:

		The citizen	
		complains (R)	does not complain (NR)
The official	arrests (A)	$-(A + B\delta), -(D + E)$	$-A, \quad -D$
	does not arrest (NA)	$-B\Gamma, \quad -E + F\Gamma$	$0, \quad 0$

where the first figure indicates the official's payoff and the second that of the citizen.

The game is not necessarily played instantaneously: first, let's say, the citizen plays; he can complain or not. Then the official plays, and he can decide to arrest or not. If the citizen is arrested the game finishes, and the same if an appeal is accepted. The effects of the moves are not instantaneous, and the moves themselves are not known to the opponent: this means that the moves can be held to be simultaneous. If there are neither arrests nor appeals the game continues with successive rounds. It should be

noted that, on the level of the whole economy, the game continues whether the individual citizen is arrested or not and whether a complaint is accepted or not, in that it is played by many citizens and many officials, all with identical parameters. If the official arrests a citizen who has not protested, he incurs a cost equal to $-A$, and the citizen a cost of $-D$ (top right-hand box). If an official arrests a citizen who has appealed he incurs the same cost as before plus the effect of the appeal weighted with the possibility that the appeal be upheld [6]. The citizen incurs the cost of appeal, but gains the positive effect of the appeal being upheld (bottom left-hand box). If there are neither arrests nor appeals, the situation remains as it was (bottom right-hand box). When we talk of arrests, we mean arbitrary arrests, apart from any presumably written into a normal criminal law.

4. Indicating respectively with EGF and EGC the expected payoffs for the official and for the citizen, we have:

$$EGF/A = -(A + B\delta)\beta - A(1 - \beta)$$

$$EGF/NA = -B\Gamma\beta$$

The official should then arrest the citizen if

$$-(A + B\delta)\beta - A(1 - \beta) > -B\Gamma\beta \tag{1}$$

In the same way, the citizen should complain if

$$-(D + E)\alpha + (F\Gamma - E)(1 - \alpha) > -D\alpha \tag{2}$$

Let us consider (1). With simple transformations, we can write it as follows: it is worth arresting if

$$\beta > A/[B(\Gamma - \delta)] \tag{3}$$

There are, therefore, three cases:

1) The second term is comprised between 0 and 1. It is worth arresting according to whether (3) is respected or not (scenario 1).

2) The second term is > 1. It is never worth arresting (scenario 2).

3) $A \leq 0$, the official will incur no costs or will actually be rewarded for arresting a citizen. It is always worth arresting (scenario 3).

Turning to (2), simple transformations give that it is worth complaining if

$$\alpha < 1 - E/(F\Gamma) \tag{4}$$

[6] This implies that we admit a von Neumann-Morgenstern utility function.

There are two possible scenarios (for $E, F > 0$):

a) The second term is negative. It is never worth complaining (scenario A).

b) The second term is comprised between 0 and 1. It is worth complaining, depending on whether the condition is fulfilled or not (scenario B).

5. Before going on, we should stop a moment to consider the meaning of α and β. These are obviously subjective probabilities: those concerned will estimate the value of such probabilities through observation of the surrounding environment. More precisely, let us accept that these values change through learning: if arrests increase, the estimate that citizens have of α increases; if complaints increase, the officials' estimate of β increases [7].

By pooling the scenarios we find six "composite" scenarios.

Scenario 1a. There will never be any complaints. β will always remain, therefore, below the threshold at which it is worth arresting. There will not be, therefore, either complaints or arrests, and all will live happily.

Scenario 1b. Initially it will be worth complaining or arresting according to the parameter values, but the situation will change with time because of the change of the values of α and β. Given the complexity of the situation, let us leave aside this discussion for a moment.

Scenario 2a. It is never worth either complaining or arresting. See above.

Scenario 2b. It is never worth arresting. As a result, it is always worth complaining. It is a wonderful situation for the citizen but not for the official.

Scenarios 3a and 3b. It is always worth arresting. This is an extreme case which we shall consider further on as such.

It is obvious that if we exclude (for the moment) the last two scenarios, only scenario 1b could qualify as a Stalinist situation. We should therefore examine this scenario in greater depth, while we can ignore the others.

6. Two problems are posed: what happens in this scenario, and what values the parameters must have for this to take place. Let us start with the first. We shall indicate as α^* and β^* the critical probability values. Excluding the case in which $\alpha = \alpha^*$ and $\beta = \beta^*$, there are four possible situations, according to whether α and β are greater or smaller than α^* and β^*. Let us suppose, initially, that $\alpha > \alpha^*$ and $\beta > \beta^*$. It is not worth for

[7] SUGDEN (1986) explains how this type of learning can lead to the establishment of conventions.

the citizen to complain. This lowers β, until $\beta < \beta^*$. At this point it is not worth arresting. This lowers α, until $\alpha < \alpha^*$. At this point it is worth complaining. This increases β, until $\beta > \beta^*$. And so on. The probabilities of a complaint or of being arrested will *oscillate around the equilibrium values.* It is easy to check that the same result is obtained whatever the combination of initial values. We can define α^* the *degree of Stalinism*, and this leads us to a third problem: what determines this degree. This problem will be discussed immediately after the one posed previously, what leads to the relevant scenario. Let us start with the relevant condition on α. As $0 < \alpha < 1$ E must be $< F\Gamma$. As Γ has a maximum value of 1 E must be $< F$ and Γ must be sufficiently high for this condition to be fulfilled. We can thus fix some conditions.

Condition 1. In order that a regime of terror be established it is necessary that the absolute value of E (the cost of complaint for the citizen) be lower than that of F (the payoff from the complaint).

Condition 2. In order that a regime of terror be established it is necessary that the probability of complaints against an official being accepted be high, if made by a free citizen.

We now come to the values of β. For β to be comprised between 0 and 1, A must be lower than B $(\Gamma - \delta)$. Therefore:

Condition 3. In order that a regime of terror be established it is necessary that A (the cost of the arrest of a citizen for an official) be lower than B (the cost for the official of a complaint upheld) in absolute values.

Condition 4. In order that a regime of terror be established it is necessary that Γ, the probability that the complaint of a free citizen be upheld, be greater than $A/B + \delta$, i.e. than the ratio between the cost for an official of the arrest and that of a complaint upheld plus the probability that an arrested citizen's complaint be upheld.

7. It should be noted that the equilibrium values can be very low: there can, thus, be a very slight trend towards complaints or towards arrests. In this case, using our terminology, the degree of Stalinism would be very low, and the system could not be defined one of terror if we accept, as seems reasonable, that this definition can be applied only above the minimum threshold for Stalinism. The preceding conditions are, therefore, *necessary* but *not sufficient* for a Stalinist system to be defined as one of terror. A sufficient condition must fix a value to α^*. The search for such a condition means answering the third of the questions posed earlier. For the level of Stalinism to be high, the value of α^* must be high. We can say that the system is Stalinist if α^*, the equilibrium value of the probability of

being arrested, is higher than a threshold value α°. As the equilibrium value of α is that in which the two strategies are equivalent, we can find this value by resolving the equation:

$$-(D + E)\alpha^{*} + (F\Gamma - E)(1 - \alpha^{*}) = -D\alpha^{*}$$

which, naturally, gives $\alpha^{*} = 1 - E/(F\Gamma)$.

This value will be higher the lower that of E (the cost of the complaint) and the higher that of $F\Gamma$ (the payoff of the complaint weighted with the possibility of it being upheld). The more these conditions are satisfied, the higher the probability that one is in a regime of terror, that is with a high degree of arbitrary arrest. (This implies, in effect, a condition on β^{*} too: for α^{*} to be high, F and Γ need to be high and E low. But a high value of Γ implies a low value of β^{*}). We have, therefore, a *sufficient* condition for a regime of terror to be established.

Condition 5: if conditions 1-4 are valid, a sufficient condition for the establishment of a regime of terror is that the ratio $E/(F\Gamma)$ be low enough that $\alpha^{*} > \alpha^{\circ}$, where α° is an arbitrary equilibrium value, such that for respectively higher and lower values the definition "regime of terror" can be accepted or rejected. More precisely, it is necessary that $E/(F\Gamma) \leq (1 - \alpha^{\circ})$.

8. We now have to discuss in detail the possibility of the parameters taking the values required. We can start with Γ: as we have seen, the higher Γ is, the easier it is for a system of terror to exist. What determines Γ? Let us recall two characteristics that we may consider "stylized facts" of the Soviet system of the period: the existence of a mechanism of punishment for officials who did not reach planned objectives and the lack of information about the work of subordinates. We can, thus, presume that there is for every official a subjective probability $P = \Sigma Pi$ that a punishment be applied, where Pi is the probability that the punishment be applied to official i. Every official j will, therefore, be interested in increasing the value of Pi $(i \neq j)$. Pi, in turn, will rise with the quantity and seriousness of the charges made against i. The historical evidence speaks, in fact, of a climate of suspicion and denouncement within the hierarchy. (This situation could be formalised in a game between officials of the same level, but the matter is simple enough to be debated without this formalisation). Let us consider then a situation in which a complaint against a subordinate is received. If the complaint is accepted, there will be a drop in efficiency due to the need to replace the official who was object of the complaint (accepting that the minimum punishment is transfer);

there will be a gain or a loss according to the ability of the substitute (given the presumed scarcity of information, we can presume the expected value of this element to be zero); and there will be a fall in terms of *Pi* if an innocent is punished and this fact is used against the relevant official by a colleague. If, on the other hand, the complaint is not accepted there will be a drop in terms of *Pi* if this omission can be used against him. We then have that the probability that the complaint be accepted (i.e. the value of *Γ*), will be higher the more:

a) the officials can be substituted without a loss in efficiency;

b) the expected punishment for the punishment of an innocent is low;

c) the expected punishment for non-punishment is high;

d) the co-operation between officials of the same level is low, that is, Akerlof's "loyalty filters" [8] do not work;

e) the power of an official over officials of a lower level is high;

f) the charges are plausible.

The assessment of the existence of these conditions in the Soviet Union of the 1920s is research for historians but, at a first glance, it would seem that all six conditions were, generally, true. As regards points (a) and (d), this derives from the rapid creation of a gigantic administrative apparatus in very little time, starting virtually from zero. We can make the following observations about points (b) and (c). At a given moment there is a given distribution of probabilities *Pi*. Each *Pi* value is, however, a value of unstable equilibrium: it is, in fact, in the interests of all (but *i*) to increase this value. At the point in which the official does not follow up a complaint against a subordinate, it is in the interest of the other officials of the same level to make this subordinate appear guilty in the (ignorant) eyes of their immediate superiors. Therefore the probability that the subordinate *appears* guilty (not that he actually *is* guilty) is presumably very high. And as the punishment expected at point (c) is the product of this probability for the value of the punishment, it will in turn have a very high value, even if we do not hold the Mirrlees-Osband-Keren model to be valid. The situation is, naturally, different if the complaint is upheld: malicious colleagues could accuse an official of having punished an innocent, but this charge is presumably much weaker: it is not difficult for an official with full powers to find proof of guilt for a subordinate subject to punishment. This is all the more true the more condition (e) is true, which certainly is valid to a large degree (as is typical in situations of martial law) in the

[8] Cf. AKERLOF (1983): an élite may find it convenient to work in a co-operative fashion towards the outside world and with dedication to the tasks assigned to it by society.

conditions of semi-civil war of the period [9]. This also explains condition (f).

9. So much for the possibility of a high value of Γ (condition 2), and also for the possibility of a high value of B with respect to A (conditions 3 and 4). We are left with conditions 1 and 5. In discussing these, we should note that in order for the model to make sense it is not necessary that the payoff for the citizen refer to the same citizen: there could be gains and losses which affect a third party who, depending on these, has to decide whether to raise or not the case of the citizen in question with the official. If we presume that the citizen in question has, in the meantime, been arrested, then the complaint loses value and this permits us to leave the structure of the game unaltered. In other terms, the payoff of the complaint goes to official j as an increase in Pi ($i \neq j$); and the cost of the complaint is sustained by the official himself. If we accept, as seems obvious, the possibility of anonimous accusations, the cost of the complaint is very low, and therefore however low dPi is, condition 1 is very easily respected. But if E is low and F and Γ are high, condition 5 is also very likely to be respected. The considerations made in this paragraph do not require further historical references in addition to those made in points (a)-(f) in the previous one, if one excludes as trivial the need to include anonimous accusations.

10. Various problems remain: that of the stability of the parameters between those involved, that of the stability of parameters in time, and that of the possibility of generalising the game described to the whole hierarchical pyramid. The first problem presents no difficulties: the hypothesis of the parameters between subjects being constant can be dismissed with ease, substituting it with the weaker one in which parametrical terms be valid for all officials in the game. The other two points do, on the contrary, raise extremely important questions for the validity of the proposed model. The problem of the generalisation of the model to the whole hierarchical pyramid would require the theoretical assessment of the presence of "islands" where the game is not valid (for example, because of the presence of loyalty filters), and on the historical level, it should be verified if these "islands" existed or not. As for the question of the stability of the parameters, the problem can be formulated in these terms: are the conditions a-f of paragraph 9 stable by their very nature or do they tend to evolve? As I

[9] This situation of semi-civil war is exogenous to the model considered here. Cf. ORTONA (1988).

have argued above, in order for these conditions to be valid it is essential that there be little information, poor skills on the part of the officials (making them replaceable), high levels of punishment for omissions (presumably a function of the damage produced by the omission) and little loyalty between officials. All these four pre-conditions could be reduced in time; and this could mean the creation of non-Stalinist "islands" in continual expansion and, in general, that the system evolves in a less Stalinist way (the same effect could be produced, as suggested by Osband, by the strengthening of the corporation of officials; cfr. note 5). The effect of the variation of the values of the parameters on the dynamics of behaviour with reference to the threshold values of the game is still to be explored [10].

In all these cases, the questions are wide enough to justify their exclusion from this study, just a preliminary one from many points of view. For the moment, we can content ourselves by saying that the validity of results reached up to now rests on the hypothesis that the parameters are stable and that the game has an overall validity. Finally, this study has deliberately ignored the problem of generalising the model (or similar models) to other cases of *indiscriminate terror* [11], as in France at the end of the 18th century or the Pol Pot regime in Cambodia (perhaps there are no other examples). However, among the three situations there do exist structural analogies which would make an in-depth study interesting.

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[10] One possible evolution is that an official (perhaps to reduce the cost of information) decides to maximise arrests in the area for which he is responsible. In our model, this means that A takes on a negative value, and one is, therefore, in a scenario of the third type. (It is easy to check that in the obvious hypothesis that $d < \Gamma$ if $A < 0$, strategy A becomes dominant). This possibility perhaps occurred, at least locally (cf. for example, CONQUEST, 1970, ch. 8). In this case the model explodes, at least locally: this could help to explain some cases of the fall in disgrace of officials of the highest levels.

[11] By indiscriminate terror we mean a situation of *bellum omnium contra omnes*: other cases, such as Nazism, Indonesia, the extermination of the Armenians etc., do not come into this category, and could be more properly labelled *discriminate terror*.

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LO STALINISMO COME ESEMPIO DI REGIME DI TERRORE DERIVANTE DA SCELTE RAZIONALI

Le teorie disponibili sui motivi dell'instaurarsi di un regime di terrore in URSS, e piú in generale sull'avvento del terrore, non sono soddisfacenti, in quanto generalmente richiedono il ricorso ad assunzioni troppo forti sulla funzione di utilità dei soggetti implicati. Attraverso un semplice modello di comportamento di soggetti razionali si verifica che viceversa l'avvento del terrore può essere spiegato accettando funzioni di utilità convenzionali e in presenza di condizioni storiche non eccessivamente astruse.

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RECENT MODELS OF INTERNATIONAL TRADE AND DISTRIBUTIONAL GAINS FROM INTEGRATION
(with reference to the case of the EEC internal market)

by
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1. *Introduction*

Recent empirical work (see the research on "The Costs of the Non-Europe", summarized in EC Commission, 1988) as well as simulation exercises (e.g. Smith and Venables, 1988) have highlighted the extensive gains that the European economy is likely to enjoy from the completion of the internal market in 1992. The removal of the non-tariff barriers that currently fragment the EEC market should actually increase the efficiency of European firms, thanks to larger scale operations and stronger competition. This should also have a beneficial negative pressure on costs and prices, as well as a beneficial effect through a specialization process.

The above studies, however, have made some calculations of the gains for the EEC as a whole, but have overlooked the problem of the distribution of these gains. Yet this is a relevant issue, both *per se* and from the viewpoint of the success of the 1992 program. If some regions or countries were negatively affected by the completion of the internal market, they would have an interest in opposing the course of the program.

History provides several cases of unequal distribution of the gains deriving from economic integration. A well-known example is that of Italy's unification, which had a main role in strengthening the economic gap between the North and the South of the peninsula. Economic integra-

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tion resulted in *inter*-sectoral specialization, with the North producing manufactures and the South producing agricultural goods, which certainly affected the process of development of the *Mezzogiorno*.

On the other hand, recent history provides an argument for a more optimistic view. The creation of the European Common Market seems to have been beneficial to all Six original members. Several commentators and scholars have emphasized in this case the positive effect of *intra*-sectoral pattern of specialization, which would have smoother effects than an inter-sectoral one, and would result in a more equitable distribution of gains.

The purpose of this paper is to identify the possible sources of unequal distribution of the gains from integration, looking at recent international trade theories for suggestions. Their predictions on the pattern of trade are studied, and their implications as to the distribution of the gains from trade among the countries involved in a commercial integration are drawn. This discussion will be held with reference to the case of the completion of the European internal market.

The plan of the paper is as follows.

Section 2 deals with traditional theories, based on comparative cost considerations. Section 3 analyzes the implications of the models based on a monopolistic competition framework, now dominant in the international trade literature, while section 4 looks at the most recent models of oligopolistic competition. Section 5 analyzes the implications of the models of international trade in which countries differ in size and there exist scale economies, both internal and external to the firm. Finally, section 6 will close the paper with some summarizing notes and some tentative conclusions.

2. *The Traditional Theories of International Trade*

The traditional theory of trade, based upon the comparative advantage theorem, offers some initial considerations about the effects of economic integration.

Both the Ricardian approach (based upon differences in production technologies) and the Heckscher-Ohlin one (based upon differences in factor endowments) suggest that the opening of international trade will result in inter-sectoral specialization, each country producing the good in which it has a comparative advantage.

Specialization of production accounts for the gains from trade that occur in the passage from an autarkic to a trade equilibrium. However, it

may also entail an unequal distribution of these gains from trade. If (say) country A specialized in a high value-added and rapid demand growth good, while country B abandoned production of this good to specialize in a low value-added and low income-elasticity good, it would be evident that the latter country may not reap the benefits of the integration. It is in the light of this model that the process of specialization of Italy's unification (cited above) can be understood.

Likewise, this theory indicates some possible drawbacks of the 1992 programme. The successive enlargements of the European Community, with the entry of such (relatively) backward countries as Greece, Portugal and Spain, increase the technological and resource endowment differences within the members of the EEC. Unlike the case of the formation of the EEC, where the six original countries were relatively homogeneous in the level of economic development (apart from South Italy), it may seem possible to apply the propositions of the traditional theories of international trade to analyze the effects of 1992.

The abatement of national borders might then be followed by an inter-sectoral specialization of the member countries, with possible large distributive effects. The less developed regions (Portugal, Greece, Spain, Ireland and Southern Italy) may be led to concentrate their resources in agricultural and in less "dynamic" manufacturing activities, while the more developed regions may benefit from an enlarged market and specialize in "richer" manufacturing and services activities.

The outcome of the integration process would then be the polarization of the European economic system, and the strengthening of the existing gaps. It is worth pointing out that inter-sectoral specialization may also give rise to some (short-run) problems even for Northern countries. Competition from low-wage EEC member countries would probably make central countries shrink production in traditional manufacturing industries. Given the labour-intensity of processes that characterize these sectors, this may create adjustment problems and temporary unemployment.

However, it is far from sure that the across countries differences among the EEC members are such that the Ricardian or the Heckscher-Ohlin models can be applied. The recent "booming" expansion of the Spanish economy and the development of Ireland's high technology industries are only two indicators that the less industrialized EEC countries will not be so easily relegated in the backward productions.

Attention should then be turned to the more recent theories of international trade, in which we identify two broad groups: monopolistic competi-

tion models and oligopolistic models. We analyze these models in section 3 and 4 respectively.

3. *Monopolistic Competition Models of International Trade*

The seminal works by Lancaster (1980) and Krugman (1979, 1980) rely on the assumption of monopolistically competitive industries, with scale economies and product differentiation (while traditional theories assumed constant returns to scale and homogeneous goods).

According to these models, increasing returns to scale oblige a given country's firms to produce a finite number of potentially infinite varieties of the differentiated good. In a world in which differentiated good industries bear a relevant role, the abatement of commercial barriers will result above all in a reallocation of resources *within* sectors, rather than among sectors. After the integration, the member countries will specialize in one or more varieties of the same differentiated good.

This would allow a quite optimistic prediction about the equal distribution of the gains from trade arising both from an increased variety available to consumers in the enlarged market and a reduction in prices due to the impact of scale economies (the latter effect is considered in Krugman, 1979, and in Lancaster's model, but not in Krugman, 1980).

These theories are the main theoretical reference to explain the success of the creation of the European Common Market: the Six member countries had more or less the same degree of economic development and their demand was therefore addressed to somewhat different varieties of the same differentiated goods. The specialization that occurred after the integration was of intra-industrial nature, so that each country could reap the benefits of it.

Reliance on such – now well established – theories of international trade have led some authors to underestimate the possible conflicts of interest arising among partner countries because of the completion of the European internal market (see e.g. EC Commission, 1988, p. 149).

However, some criticisms should be raised about the possibility of applying these theories to the problem of the distribution of the gains from trade.

(*a*) The comparative advantage theory is not substituted for, but rather integrated by the new theories of monopolistic competition. The traditional theory may still maintain some explicative power in cases like 1992's, where

the countries involved in the process of economic integration show differences in technological abilities and factor endowments.

(*b*) The Lancaster and Krugman models explain the volume of intra-industry trade (IIT) and state how many varieties of the differentiated good will be produced in the integrated economy, but do not account for the pattern of trade (which country produces which variety).

In Lancaster's model, for instance, if country A produces in autarky n_1 varieties of the differentiated good X, and country B produces in autarky n_2 varieties of the same good X, the advent of free trade will result in an integrated equilibrium in which N varieties of X will be produced, where $N < (n_1 + n_2)$. In the adjustment process some varieties "disappear", and the firms that produced them shut down. But Lancaster does not say which varieties survive, nor what countries the surviving firms originate from. Yet this is a crucial problem, if we wish to understand the implications of market integration from the viewpoint of the distribution of its gains.

In Krugman (1980) there are no problems of transition from autarky to the integrated equilibrium. Thanks to the very special assumptions of the model (large number of firms and constant elasticity of substitution in utility functions, that excludes any interdependence among firms), when trade opens, consumers of the two symmetrical countries buy all the available goods $(n_1 + n_2)$. As each firm produces a different variety of the differentiated good (each firm has an interest in modifying even slightly its specification, to make it different from all the others), there will be no overlapping in products. As a consequence, in the enlarged economy there will be exactly the same firms as in the autarky situation, and each firm will produce exactly the same level of output as in the pre-trade equilibrium.

Indeed, the story told by Krugman's model is too simple: nothing changes from autarky to the integrated equilibrium, except for the consumer surplus which benefits from the enlarged variety of goods among which they can choose. Therefore, there is no reason to bother about distributional effects of integration.

Like Lancaster, Krugman does not say which is the direction of trade. What country produces what variety? This is a barely relevant question in the context of the Krugman's framework of analysis, where each variety is perfectly symmetrical to the others. But to have a model able to account for the pattern of trade is crucial in the study of the effects of an economic integration.

The lack of prediction as to the pattern of IIT is then a relevant shortcoming of these monopolistic competition theories of trade.

Two possible approaches could be followed to overcome this indetermination.

The first approach is based on the demand side. It hinges on the contribution by Linder (1961) and on the biological models of IIT (Bhagwati, 1982; Feenstra, 1982; and Dinopoulos, 1988, apply the biological approach in a monopolistically competitive and oligopolistic framework respectively).

According to these theories, a country specializes in the production of those varieties of the differentiated good that meet the national consumers' tastes. The idea is that cultural, historical, climatic reasons affect national demand in a strong way, leading to quite different tastes even among countries that share a similar level of development. In the language of biological theories, we can say that some countries share the same "genetic" characteristics (e.g. the level of income and of R & D in manufacturing) but which "phenotype" (i.e. the variety of the differentiated good) is selected in the market will depend on the interaction of this common set of genetic traits with the specific environment of these countries.

These theories can then explain the pattern of trade, at least when final goods are under consideration (if intermediate goods are considered, the role of national tastes becomes less relevant). National firms tend to specialize in varieties that are preferred by the majority of domestic consumers, while the "marginal" domestic consumers will satisfy their needs by addressing their demand to foreign firms (which produce the varieties meeting the national tastes of the foreign country).

What are the consequences of this pattern of specialization from the point of view of the distribution of the gains from trade?

Imagine that, according to national tastes, a country specializes on low value-added or low income-elasticity varieties of the spectrum of differentiated products. Its opportunities of growth may then be weakened, relative to a possible autarky situation in which even goods belonging to a higher segment of the spectrum were produced to satisfy "marginal" demand.

However, the adverse distributional consequences of an economic integration are more likely to exist when vertical differentiation rather than horizontal differentiation [1] is at stake. In this case, there is a higher

[1] Under the assumption of vertically differentiated industries, consumers have the same tastes, but different income levels. They agree in ranking the degree of quality of the different varieties (e.g. Mini Morris and Ferrari), but only the high-income consumers can afford to buy the best varieties. In the case of horizontally differentiated industries, varieties of the differentiated good are of the same qualitative level (e.g. FIAT Uno and Renault 5), but consumers have different tastes.

probability that lower income countries specialize in the goods belonging to the less interesting segments of the market demand, while the opposite is true for higher income countries. This situation is better analyzed by vertical differentiation models (see below), and not by models (like those of Lancaster, Krugman, and of the biological approach) which rely on the assumption of horizontally differentiated industries.

The second approach that may possibly overcome the indetermination of the pattern of intra-industrial trade is based upon the supply side.

The idea is to "combine" the theories of IIT with the comparative advantage principle. Let us assume that each variety of the spectrum of the differentiated good is produced by a different combination of some given inputs, where these inputs are classified according to a finer partition than the traditional one. Instead of considering only capital and labor, we take into account several "inputs", ranging from physical and human capital, energy, land, to design, technological research, managerial capacity, distributional know-how, marketing, and so on.

Following the comparative advantage theorem, the idea would then be that each country will specialize in the production of the varieties in which it is relatively well endowed. For instance, if we consider a possible pattern of specialization following the completion of the European internal market in the differentiated footwear industry, we may have the following: Spain and Portugal might specialize in the production of "normal" shoes, owing to their relatively rich endowment in unskilled labour; Italy might concentrate on shoes having a high content of design and fashion; Germany on sporting shoes, relatively intensive in technological research.

According to this (not rigorous but somewhat intuitive and realistic) picture, intra-industrial specialization will not exclude the dangers of "polarization" suggested by the more traditional Ricardian and Heckscher-Ohlin theories. Countries specializing in lower segments of the market might be at a disadvantage due to lower profitability of production, stagnation of demand, and by competition coming from less developed countries outside the EEC [2].

(*c*) One main source of gains from the completion of the internal market is certainly the harsher competition that will take place among the European sellers, so far protected by the non-tariff barriers which segment the European market. It is worth noting that neither the Lancaster, nor the

[2] Even if appealing, this second approach is not as attractive as the first one from a theoretical standpoint. As a matter of fact, it denies the theoretical nature of intra-industry trade, which would result only from an insufficient sectoral disaggregation: as their input intensities are different, varieties of a given good are in reality *different* goods.

Krugman models can account for this effect. Actually, they assume a perfect monopolistic competition industry even in autarky: in such a world characterized by a large number of firms and free entry, there is no room for welfare gains from increased competition.

This remark, along with the previous arguments, indicates the need to resort to another type of models. In the following section, we study the models of international trade relying on an oligopolistic setting.

4. *Oligopolistic Models of International Trade*

As we have just seen, the existence of different levels of income among the member countries of the EEC suggests to look at the models of international trade in the context of vertically differentiated industries (Shaked and Sutton, 1984, and Gabszewicz et al., 1981).

In these models, consumers unanimously rank the products available in the differentiated industry. Among the main assumptions, we have that: consumers are identical in tastes but with differing incomes distributed uniformly; purchases are indivisible and mutually exclusive; firms maximize their profits. Non-cooperative price equilibria are considered.

Shaked and Sutton (1984) consider two different cases.

(1) Unit variable costs rise steeply with quality. In this case, the authors prove that the main effect of trade is that it increases the number of product varieties available to consumers at equilibrium. Intuitively, what happens here is that the market is extremely segmented, so that any firm may locate on the spectrum and have a "natural market". Competition is relaxed by a one-to-one relationship between quality, costs, and position of consumers along the spectrum of varieties. As to trade implications, this case is similar to the monopolistic competition one seen in Krugman and Lancaster.

(2) Unit variable costs do not rise steeply with quality (this case encompasses the particular one in which costs are zero, analyzed by Gabszewicz et al., 1981). This is not an unrealistic assumption, because it describes situations in which the improvement of quality is linked to fixed costs such as R & D activities, rather than to variable costs such as labour or other input costs.

Under this assumption, it is possible to prove that there is an upper bound to the number of goods that can survive in an economy ("finiteness property"), which basically depends on the range of income distribution (and not on scale economies). The rationale of this result is that when more

goods enter the market, price competition arises and forces the prices of the higher quality goods down to a level at which some lower quality goods will not be bought by consumers, even if they were offered at a zero price.

Then, when trade opens between countries characterized by autarky, it may imply the reduction of the number of goods produced. This outcome crucially depends on the degree of overlapping of the income distribution range of the countries involved. If they overlap completely, then the same number of goods as in autarky can survive in the enlarged economy, which implies that half the firms should exit the market. Conversely, if the two national economies are so different that the range of income distributions does not overlap at all, then trade will arise without any firm being driven out of the industry.

In general, the integration of two separate countries entails that some varieties will disappear: as costs do not rise steeply with quality, there is strong competition within the industry, and lower quality goods are forced to exit. The exit of a number of firms implies that the remaining firms enjoy enhanced economies of scale: there will be a welfare gain due to the fact that consumers buy higher quality goods at a lower price.

In the following, we try to extend the analysis of Shaked and Sutton in an intuitive way, to deal with the problem of the distribution of gains from trade.

Let us assume that income dispersion and size of the market are such that in country "South", at the autarkic equilibrium, there are, say, four firms in the vertically differentiated industry. These firms are numbered from 1 to 4 in increasing order of the quality of the variety they produce ($S1$ to $S4$ in Fig. 1). Likewise, in the "North" four firms are established in the market in autarky. They produce varieties from $N1$ to $N4$, according to Fig. 1.

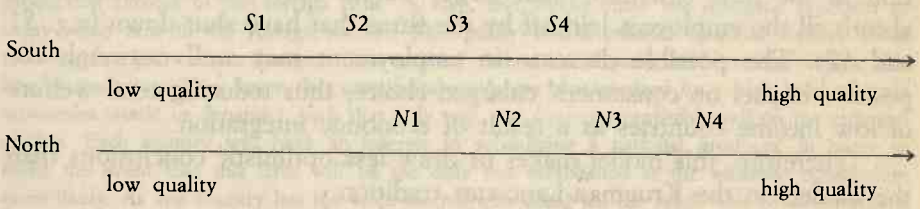

FIG. 1 - Vertically differentiated industries. Possible pattern of specialization between low and high income countries.

The scenario we assume here is one in which the level of quality produced in autarky depends on the national income: as income is lower in the South than in the North, the choice of varieties reflects this situation, with the average quality being lower in the South.

Once integration occurs between the two economies, there will be a partial overlapping in the income dispersion range. If the conditions (about the cost function and the range of income) identified by Shaked and Sutton still hold, some varieties at a lower qualitative level will disappear at the new integrated economy equilibrium.

The exact number of firms surviving will depend on a number of parameters, the most relevant being the degree of overlapping of the income distribution ranges. However, it is evident that the first firms that have to shut down will be the Southern firms producing varieties $S1$ and $S2$.

The reason is quite intuitive. When trade opens between the two countries, harsh competition among the existing firms will reduce the price in the industry. Due to this decrease in price even poorer consumers can afford higher quality varieties: they will shift from the qualities purchased in autarky to some "right-hand side" varieties corresponding to higher qualities. In this adjustment process some "Southern" firms producing lower quality goods are likely to disappear.

To conclude, we can say that even though consumers located in the South will benefit from integration, through the purchase of higher quality varieties, it is far from sure that welfare in this region will improve, because some of its firms will be forced to exit the industry. The vertical differentiation models described here are not general equilibrium models, and do not specify full-employment constraints. It is possible that in the integrated economy equilibrium there will not be the same number of workers employed as in the autarky equilibrium. Even if the surviving firms (e.g. those producing $S3$ and $S4$ in our example) expand their production in the new situation, their larger output may not be sufficient to absorb all the employees laid off by the firms that have shut down (e.g. $S1$ and $S2$). The possible decrease in employment may well outweigh the positive impact on consumers' enlarged choice, thus reducing total welfare of low income countries as a result of economic integration.

Therefore, this model makes us draw less optimistic conclusions than the models in the Krugman-Lancaster tradition.

Apart from the vertical differentiation models, two other categories of oligopolistic models of international trade can be identified.

Firstly, there are the *reciprocal dumping* models (Brander, 1981; Brander and Krugman, 1983). In a homogeneous good industry, they

assume the existence of a domestic monopolistic firm in each of the two (perfectly symmetrical) countries considered. International trade arises because of the different demand elasticities perceived by each firm in the two markets. While there is no profit in selling additional units beyond the level at which marginal revenue equals marginal costs in the domestic market, the same is not true for the foreign market. Each monopolist becomes a discriminating price maker, and sells abroad at a lower price than at home.

This mechanism accounts for the presence of "cross-hauling". It is interesting to note that the existence of gains from trade in this case is not ensured. Actually, with positive transportation costs, this form of international trade in identical goods may entail a welfare reduction. If the waste of resources due to transportation costs is not outweighed by the beneficial effects of increased competition between the two national monopolists, economic integration will result in a loss for both countries [3].

Secondly, there are oligopolistic models which emphasize the role of *sunk costs* and barriers to entry (unlike the models of Lancaster and Krugman, where the monopolistic competition structure of industry allows free entry and exit).

Sunk costs in the specification of the variety produced let the incumbent firms build some entry barriers through an accurate choice of their varieties of the differentiated good. These assumptions may modify in a substantial way the welfare implications of international trade. A technical description of these models is beyond the scope of this paper. It would suffice to note that Eaton and Kierzkowski (1984) and Lyons (1984) present models with the characteristics briefly outlined above and that

[3] Relying upon a model having the charateristic just described, BRANDER and SPENCER (1983) support the idea of interventionist policies in favour of "national champions". By subsidizing R & D activities of the domestic monopolist, national authorities may affect production choices of the foreign firm. In turn, this would allow the domestic producer to enjoy some rent in the foreign market. This policy would enhance national welfare while reducing foreign welfare. Imagine that national authorities of each EEC country follow this line of reasoning. They know that certain industries are characterized by a high level of scale economies (static or dynamic), such that only, say, one firm can profitably sell on the enlarged market. Each country will have an interest in subsidizing a national producer, in order to make the event that this firm will be the only one established at the enlarged equilibrium more likely. As any country has the same incentive in doing so, the result will be an enormous waste of resources.

This situation is however not very likely to occur in the period preceding the completion of the European internal market and it probably describes only a theoretical possibility. However, this emphasizes the conflict of interests that can arise in the course of an economic integration according to oligopolistic theories of international trade (see also KRUGMAN, 1987).

do not ensure that an economic integration will have a Pareto superior outcome. International trade might even have a Pareto inferior outcome. The basic idea hinges on the fact that firms can choose a product specification such that at the post-trade equilibrium new potential entrants are kept out. This can lead to some adverse effects: not only may existing varieties be eliminated and new potential firms find too high barriers to entry, but also the profits of surviving firms may not be as high as in the pre-trade equilibrium (Eaton and Kierzkowski, 1984, p. 79).

Even overlooking the quite exceptional cases in which all the partners involved in an economic integration may turn out to be worse off than in autarky, these oligopolistic models apparently allow skeptical views about the gains from trade.

5. *International Trade Theories with Scale Economies*

So far, we have dealt with models in which countries are supposed to be of the same size. An interesting question is then to analyze what happens when trade occurs in a world characterized by scale economies and countries differing in size (for a survey on this topic see Helpman, 1984).

The most intuitive answer to this question, which dates back to Ohlin (1933) is that, ceteris paribus, countries with the larger population will have a comparative advantage in the production and export of those goods whose production is subject to increasing returns to scale.

Despite the appeal of this argument, which is almost a commonplace in international trade discussions, we shall see that it crucially depends on the nature of scale economies assumptions.

A first distinction to make is between scale economies *internal* or *external* to the firms.

(I) Economies of scale internal to the firms depend on economies of internal organization and specialization, on indivisibilities, and on the existence of fixes costs.

(II) Economies of scale external to the firms are such that production at the firm level displays constant returns to scale, but production at the industry level benefits from some specialization. The larger the industry, the greater the opportunity to enjoy the advantages of within-industry specialization, of conglomerations, indivisibilities, and public intermediate inputs such as roads (Helpman, 1984, pp. 328-29).

But the preceding definition is not precise enough, because it does not specify at what geographical level the industry must be considered. In other

words, will the relevant scale economies for the industry occur at a national (II.*i*), international (II.*ii*) or urban (II.*iii*) level? As we shall see, the pattern of trade prediction hinges on this assumption about the "geographical" level of "external" scale economies.

5.1. Pattern of trade under different country sizes and internal scale economies. – Krugman (1980) devotes a section to the case of trade between two countries differing in size (see also Helpman and Krugman, 1985, for a slightly different model).

Let a world economy be composed of two goods: "alpha", a differentiated good whose production is characterized by internal scale economies, and "beta", characterized by constant returns to scale and perfect competition, and that can be shipped without any cost.

Owing to the assumptions about the beta industry, international trade in beta goods will ensure that wage rates (labour is the only input in this model) will be equal in the two countries. Then, the equality of production costs will let the country with the larger market for the increasing returns to scale industry, alpha, specialize in its production. Scale economies and transportation costs actually create an incentive to concentrate production in the market displaying the larger demand for the good alpha.

In particular: "if two countries have the same composition of demand, the larger country will be a net exporter of the products whose production involves economies of scale" (Krugman, 1980, p. 958).

In Lancaster (1980) the pattern of specialization is less dramatic.

Assume that there are two sectors in the economy: a differentiated good sector (manufactures), whose production displays increasing returns to scale, and a homogeneous good sector characterized by constant returns to scale (agriculture).

In autarky, due to scale economies in manufacturing, the larger country will have greater product variety and a lower equilibrium price for manufactures relative to agriculture than the smaller country. As a consequence, the larger country's citizens are better off than the smaller country's citizens.

At the post-trade equilibrium, local demand for agricultural goods is satisfied by domestic production, but trade in manufactures occurs. In particular, the larger country will produce and export more than a half of the varieties of the differentiated group industry.

As in the pre-trade situation welfare (as measured by per-capita income) was lower in the smaller country, while in the integrated economy welfare levels of the two countries will be the same, Lancaster (1980, p.

168) concludes that "the smaller country will reap the greatest per-capita gains from trade" [4].

Further, from the point of view of the implications of the pattern of specialization, Lancaster's model suggests less dramatic changes from the establishment of an enlarged market: the smaller country continues to produce both the differentiated and the homogeneous good. Thus, unlike Krugman, it does not specialize in the production of the constant returns to scale good only.

To compare the implications of these two models on smaller countries welfare, we had better consider two different cases.

1) From a *static* point of view, the source of the gains from trade lies in the enlarged variety available to consumers.

In Krugman's formalization, consumers are indifferent among the potentially infinite varieties of the differentiated good: all they want is variety per se ("love for variety" approach).

In Lancaster's formalization, on the contrary, consumers have a "most preferred variety", and their utility depends on the distance between this ideal variety and the actual ones available on the market ("ideal variety" approach). Therefore, as Stewart (1984) correctly emphasizes: "International trade in these [differentiated] products permits Southern consumers a wide choice of products produced in the North, but these tend all to have high-income characteristics since it is among high-income consumers that the main market lies" (p. 94).

As a consequence of the different preferences between smaller (less developed) countries and larger (most developed) countries' consumers, which apply both to consumer and producer goods, the gains from trade will not be as high for the former as for the latter.

While these considerations apply to the case of an economic integration between a "Southern" and a "Northern" country, they will cease to hold if trade between two Southern economies occurs. Actually, in this case there would be full benefit from specialization in the differentiated good, because the consumers located in smaller countries will enjoy more choice among varieties designed for markets having the same characteristics as the domestic one.

The point made by Stewart is very important. As for its implications on the completion of the European internal market, it recalls that 1992 involves integration not only between a richer North and a less developed South, but also within countries belonging to these two different groups.

[4] A check of this proposition is not allowed because of the lack of a complete formal treatment of the model.

While trade of a North-South type may entail some adverse effects whose nature we are analyzing in this paper, trade of the North-North or South-South types is considerably more beneficial in its effects.

2) From a "*dynamic*" point of view, Krugman's model leads to less optimistic predictions about the distribution of the gains from trade. It identifies quite a strong effect of specialization, with smaller countries that may be confined to the production of homogeneous constant returns to scale goods. The following process of adjustment may have adverse consequences on the growth opportunities of these smaller countries. Actually, "this is liable to mean poor terms of trade for the non-differentiated producers, since some rent is normally associated with brand-name differentiated good production, as shown by the high price that companies can charge for permission to use their brand-name" (Stewart, 1984, p. 98).

However, this pessimistic view about the growth opportunity of the South, due to a negative evolution of its terms of trade, might be weakened by the arguments put forward by Dixit (1984).

The world (already integrated) economy is made out of two countries, North and South, and of three kinds of sectors. There are non-traded goods, produced in either country under constant returns to scale; an intermediate good, produced in the South under constant returns to scale; a final differentiated good, produced in the North by using the intermediate good, under increasing returns to scale and monopolistic competition [5].

The preferences of Southern and Northern consumers are similar: the level of their utility increases with the number of varieties of the differentiated final good.

The traditional argument by which less developed countries will lose from specialization in raw materials and other intermediate goods is then challenged. Losses and gains from trade do not depend only on the evolution of the terms of trade, but also on the evolution of the range of varieties of the final good available for consumption in the two countries.

Growth in the less developed countries, given in Dixit's model by the expansion of the unique factor of production, labour, worsens the terms of trade of the intermediate good exported by the South. However, this tends to expand the production of the final good in the North, which entails a positive welfare effect for Southern consumers. The net effect of these two opposing forces on the South's welfare is not necessarily negative.

The idea supported by Dixit is interesting, because it emphasizes the gains from trade which accrue, in the form of enlarged product diversity, to

[5] Instead of taking these assumptions about the pattern of specialization as exogenous, one can interpret them as the outcome of the Krugman model referred to above.

the citizens of the country specializing in the production of the homogeneous goods. However, as for the possibility of applying this analysis to the case of 1992, we notice that the scenario hypothesized by Dixit, with Southern countries producing only intermediate goods, does not fit the EEC case. Even though Portugal, Greece, Spain and South Italy are less developed than the EEC average, they have already acquired know-how and technological capabilities in several manufacturing areas. It would be unrealistic to think that the completion of the European internal market would make them abandon these industries.

5.2. Pattern of trade under different country sizes and external scale economies. – As we have just seen, imperfect competition models with increasing returns to scale at the firm level seem to confirm the intuitive idea that the larger countries will tend to specialize in the goods whose production displays scale economies. In this paragraph, we will pay some attention to the pattern of trade and specialization with external economies, dealing with three different cases.

5.2.1 External economies at a national level. – A number of authors (see Helpman, 1984, for references) have considered the case in which firms benefit from the size of the *national* industry. The larger it is, the more important the cost savings that derive from specialization in the industry's activities (e.g. in the provision of intermediate goods).

Under this hypothesis, the pattern of specialization met in the preceding paragraph is found again. If two industries are considered, one displaying country-specific increasing returns to scale, and the other constant returns to scale, the larger country will tend, other things being equal, to specialize in the former good, exporting it to the smaller country (see Helpman, 1984; Panagariya, 1986).

The reason is straightforward. Under the assumptions of free entry or perfect competition in the sector enjoying scale economies, the autarky price of this good will be lower in the country for which the output is larger. When trade occurs, this good will be sold to the smaller country [6].

5.2.2 External economies at an international level. – Ethier (1979) argues that external increasing returns are more relevant on an international,

[6] This result may be complicated by the existence of multiple equilibria, due to different market structures in the two countries (for instance, there is a domestic monopolistic firm in the smaller countries and a perfectly competitive industry in the larger one), or by "historical accidents".

rather than on a national, basis. If the main reason of these industry-specific economies lies in the specialization in intermediate inputs, and these inputs are tradeable, then the positive externalities in the industry's production increase with the world, rather than the country output of the industry.

This assumption of international scale economies leads to a denial of the commonplace conclusion about the pattern of trade. Ethier (1979) shows that in a world in which there is a good produced under international increasing returns to scale and another good produced under constant returns to scale, country size does not affect the pattern of trade, which depends on the more traditional comparative cost considerations [7].

It is worth noting that Ethier's argument may also be applied to counter the result found in the case of scale economies internal to the firm. Suppose that these economies arise from the ability of a vertically differentiated monopolistic firm to save costs in the production of its intermediate inputs when its size increases, then this would result in an incentive for the firm to expand its operations outside the home country (see section 3 below for a discussion of foreign investments in integration processes). Hence, "the Helpman and Krugman's restriction on the monopolist to only employ factors of production located in its own country is then seen as *artificially* creating a way for country size to influence the trade patterns" (Rauch, 1989, p. 360-1).

5.2.3 External economies at a urban level. – As we have seen, the pattern of trade between economies of different sizes depends on the assumptions about the geographical basis of external economies of scale. Helpman (1984, p. 330) reveals a preference for the national over the international assumption: "... economies of scale which arise from conglomeration or public intermediate inputs (such as roads) seem to be country specific, and due to transportation costs within-industry specialization in some stages of production may also be country specific. It seems, therefore, that the size of a domestic industry plays a role in the determination of external economies".

However, the argument made by Helpman, hinging upon economies

[7] The idea underlying this result is that, because of international increasing returns, in the integrated equilibrium the real reward given to the input factors in a given sector is the same across countries. Even though in autarky the relative price of the good showing economies of scale is lower in the larger country, this does not predict the pattern of trade: in the enlarged economy equalization of factor prices does not create an incentive to specialize according to country size.

from conglomeration and public intermediate inputs, may even strongly support the idea that the optimal external scale economies within a given industry lie at a more geographically concentrated level. Positive externalities deriving from specialized infrastructure and concentration of production are more likely to be fully realized in "urban" areas rather than in the country as a whole [8].

Further, as geographic concentration of workers is likely to cause congestion effects (diseconomies of scale arising from the increasing number of workers, because of greater than proportional increases in real resources wasted in commuting) that may outweigh the economies of scale, there may be an optimal city size for each given industry (Rauch, 1989).

Therefore, Rauch (1989, p. 361) shows [9] that "any country large enough to sustain an optimally sized city for a particular industry can compete in that industry on an equal footing with countries many times its size".

This result denies any role to differential size (except for the very unusual case of countries so small that they can not afford an "optimum factory town") in determining patterns of trade. Instead, Rauch finds that a comparative advantage in the production of the increasing return good may accrue to the country that possesses the more efficient way to organize life in the town (e.g. the country able to minimize the time and resources devoted to commuting).

In other words, it is not the smaller country, but rather the country having the less advanced technologies, that will give up the production in the industry displaying economies of scale. The comparative advantage in this production is due to a Ricardian argument. As such, this conclusion is not reassuring about the possible conflicts of interests that may arise from an integration. The pattern of specialization is that predicted by the more traditional theories based on the comparative cost principle: the EEC countries that are technologically backward may be obliged from integration to specialize in the constant returns to scale productions.

6. *Some Conclusive Considerations*

In the preceding sections, we have reviewed the main theories of

[8] The most striking examples of this kind of centers are Silicon Valley in California and Route 128 in Massachusetts. In the Italian case, some geographical districts specialized in textile production (Biella, Prato) may suit the description.

[9] The model proposed by RAUCH (1989) has a structure similar to the others described in this section. In particular, it slightly modifies the example of HELPMAN and KRUGMAN (1985),

international trade, looking for their implications on the distribution of the gains from the EEC enlarged market of 1992.

The value of the suggestions that may come from such an exercise is certainly limited [10]. First of all, the models analyzed are often based on very different assumptions, which makes it difficult to make a correct comparison of their results. Moreover, their theoretical nature and the simplicity (and often abstractness) of their assumptions do not allow an immediate application to the case at issue here. Finally, these international trade theories lack a dynamic view. They are substantially static in nature, while the dynamic aspect is relevant for the issues dealt with in this paper: if a certain country is relegated to the production of homogeneous goods (agriculture, raw materials, low value-added intermediate products) or of lower quality varieties in the range of differentiated goods, what is the implication on its growth capacity?

Despite these necessary qualifications, some general conclusions can be drawn.

1) From a static point of view, most of the theories agree in attributing a welfare-improving role to international trade, both for the integrated economy as a whole and for each partner country. This may come from a better division of labour, from increased competition, or from an enlarged number of varieties available for consumption, according to the different theories.

However, some oligopolistic theories give room to losses from trade for one of the trading partners or even to Pareto-inferior outcomes. While these theories often rely on very special assumptions, their results should not be forgotten, especially when considering that oligopolistic models describe more realistic features of the real world (interdependencies among few sellers, existence of sunk costs, "strategic" behaviour like the voluntary creation of barriers to entry, and so on) relative to perfectly competitive or monopolistically competitive models.

2) From a "dynamic" point of view, the scenario is more variegated.

The traditional models of trade suggest that the most advanced countries would specialize in the most advanced manufacturing or service industries, while the more peripheral (or southern) regions would be relegated to lower value-added agricultural and manufacturing production. Instead, the

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assuming there exists a constant returns to scale good (whose production "does not take place in cities because there are no economies of scale to offset the diseconomies of agglomeration") and an increasing returns to scale good, characterized by the contestable market assumption.

[10] More precise indications will probably come from the empirical research recently promoted by the EC Commission, hinging on the contribution of Buigues and Ilzkovitz (1988b).

monopolistic competition models of trade predict an *intra*-industrial, rather than *inter*-industrial specialization, thus supporting the idea of smoother processes of adjustment, with less dramatic implications for the distribution of the gains from trade.

However, as far as trade between "Northern" and "Southern" regions is concerned, models of vertical differentiation should be taken into consideration. As we have seen, these models enlight the possible problems of adjustment: the openness of trade may entail the shut-down of firms producing low-quality varieties, probably located in Southern countries.

Fortunately, the completion of the internal market of 1992 will also mean an expansion of the trade flows *within* the peripheral regions of the EEC. This South-South aspect of European integration will certainly display positive effects, both from the point of view of technical efficiency and of consumers' choice. It would be interesting to forecast the quantitative relevance of this kind of trade flows relative to that of the North-South type, to see whether possible negative effects of the latter may be outweighed by positive effects of the former.

Theories of trade based on scale economies have also been analyzed, to see whether country size can have an influence in determining the pattern of trade.

In the case of increasing returns to scale "internal" to the firm or external to the firm but internal to the industry on a country basis, theory tends to predict that the larger country will specialize in production and exports of the good produced with scale economies. As for its implications on European integration, this may be detrimental to the smaller and less developed countries like Greece, Portugal and Ireland.

If positive externalities in the production of a given industry act at a more concentrated (geographically speaking) level, so that production of goods displaying economies of scale tend to take place in "specialized" towns or districts, country size loses any role in determining patterns of trade. Instead, comparative advantage may be due to Ricardian considerations, so that technologically advanced countries will specialize in the production of increasing returns to scale goods. Once again, the EEC less developed member countries may lose from integration.

However, the theories that assume scale economies at a national or urban level rely strongly on the assumption of the existence of non-tradeable inputs. It is worth noting that, when two or more countries move toward integration, the degree of tradeability of some inputs tends to increase (while such inputs as roads and infrastructure are not tradeable by their nature, other intermediate inputs can move). This fact, which does not

reduce the value of the theories cited above, somewhat smooths the relevance of the possible polarization effects coming from positive externalities due to geographical concentration.

Another qualification is needed. The theories reviewed analyze the pattern, volume and gains from trade by comparing an initial pre-trade equilibrium in which each economy is totally autarkic, with a post-trade equilibrium in which the economies considered are perfectly integrated. No transition or intermediate cases are taken into account. As a consequence, the changes in the pattern of specialization predicted from these theories are certainly overestimated relative to a situation, like the European Common Market, where a considerable degree of commercial integration has already occurred. In a recent study conducted at a quite disaggregated level, Buigues and Ilzkovitz (1988a) find that only 40 manufacturing sectors will be sensitively affected by the dismantling of the non-tariff barriers that still segment the European market. These "sensitive" sectors represent 49% of European industrial value-added, and the largest part of them belongs to the group in which the impact of 1992 will be felt less.

These figures should be borne in mind when interpreting the results of the theoretical analysis carried out in this paper. The pessimistic views about the possible polarization effects of 1992 have a well founded theoretical basis and should be regarded as a reason to strengthen EEC regional policies, but they should not be exaggerated.

In addition, we should remember that the completion of the European internal market will probably have a strong impact on the flows of foreign direct investments. In particular:

(a) The process of European integration may increase both internal and inward EEC foreign direct investment flows. (b) This rise in FDI flows may be beneficial to the new EEC member countries, whose lower cost of labour will probably attract a high share of inward and internal FDIs. This fact may represent an important opposing force to possible polarization effects (see Dunning and Robson, 1988).

In a recent paper looking at the distributional impact of 1992 measures from a different perspective than that followed here, Begg (1989) concludes that the completion of the European integrated market will probably occur at the expense of the less competitive regions. Even though the analysis carried out in the present work does not justify such a pessimistic view, it certainly supports Begg's recommendation for a more incisive and extensive structural regional policy (possibly administered by the European Commission directly).

Although free market forces may give rise to "winners" and "losers"

from the completion of the internal market, EEC policies should smooth these possible adverse effects, through regional and structural policies able to make the EEC countries share the benefits of the enlargement of the market.

The remarkable increase in structural funds available to the EC Commission may be an interesting signal that the European Community is moving along in the right way. The "accompanying policies" of the 1992 programme must give a priority role to regional measures. Only the strengthening of the industrial environment, the infrastructure and the level of human capital of the less developed regions can give them the maximum opportunity to share the gains deriving from the completion of the European internal market.

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RECENTI MODELLI DEL COMMERCIO INTERNAZIONALE E DISTRIBUZIONE DEI GUADAGNI DELL'INTEGRAZIONE

Questo articolo analizza i piú recenti modelli di commercio internazionale, basati su ipotesi di concorrenza imperfetta, e cerca di derivarne le implicazioni quanto alla distribuzione dei guadagni di un'integrazione commerciale fra i paesi partner.

In particolare, alcuni modelli sembrano evidenziare possibili perdite di benessere per i paesi piú arretrati partecipanti all'integrazione.

La discussione svolta può dare delle intuizioni rispetto al caso del completamento del Mercato Unico Europeo.

La possibile ineguale distribuzione dei guadagni dell'ulteriore integrazione all'interno della CEE rappresenta un forte argomento per le "politiche di accompagnamento" al programma del 1993.

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INCOME ELASTICITY OF DEMAND FOR PUBLIC EXPENDITURES IN CANADA

by
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I. *Introduction*

In the late 19th century, Adolph Wagner formulated his famous Law of increasing state activity for industrializing nations. Wagner stated that the share of public expenditures in national output grow more rapidly than community output [1]. Since then, the "Law" has been tested directly or indirectly in several studies [2].

Past empirical studies of Wagner's hypothesis have mostly looked for a relationship between the government expenditure share (*GR*) and real per capita income [3]. For the law to hold *GR* must rise with real per capita income [4]. Research using this approach has led to inconclusive results; some studies confirm the "Law" while others either refute or do not confirm it. For instance studies by Hook (1962), Peacock and Wiseman (1967), Johansen (1968), Bird (1971) and Kelly (1976) confirm the "Law". Additionally, Gupta (1967), Henning and Tussing (1974), Ganti and Kolluri (1979), and Beck (1979) find a significant and at the same time positive relationship between the government share of *GNP* and per capita income. However,

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[1] BIRD (1970, pp. 69-88) presents an excellent evaluation and review of the "Law". Note that the objective of this paper is not to confirm or reject Wagner's law. Thus, as discussed later, we will be using only federal exhaustive expenditures in our analysis.

[2] See SAHNI (1961) for a comprehensive list of readings on Wagner's Law. For most recent studies see ABIZADEH and GRAY (1985), BORCHERDING (1985), and RAM (1987).

[3] Few studies have included more than one independent variable. For example, MANN (1980) and GANTI and KOLLURI (1979).

[4] For example, see BIRD (1971, p. 4) for more on this assumption.

studies by Wagner and Weber (1977), Lall (1969), Mann (1980) do not find such a relationship to generally hold in case of the samples used.

There are four reasons for obtaining these contradictory results that are rather obvious. First, one cannot refute or accept a hypothesis by merely testing one of the many assumptions inherent in the hypothesis [5]. Second, the majority of past studies suffer from misspecification of the models and thus there are general problems with the nature of the statistical techniques used. As Goffman (1968), and Michas (1975) point out, the inconsistency of the "Law" stems from the discrepancy between the verbal and quantitative formulation of the "Law". Michas (1975) contends that the issue of mixed results can only be resolved when researchers utilize an appropriate and uniform formulation. Third, there is a simultaneous equation problem in many of the tests performed. As Henning and Tussing (1974) and Sahni and Singh (1984) point out, public finance literature treats national product and government expenditures as being exogenous for testing Wagner's Law, while both variables are endogenous factors in the models used. Fourth, and perhaps most important, reason for obtaining those contradictory results, is that the "Law" only applies to the stage of industrialization and thus involves many more variables (social and political as well as economic), as shown by Abizadeh and Gray (1985).

Given Wagner's original formulation of the "Law" and one of the assumptions inherent in the "Law", it is expected that the income elasticity of demand for government can be greater than unity only for those countries which are experiencing industrialization [6]. There is merit in estimating the income elasticity of demand for government expenditure, using a more appropriate quantitative model than those used in the past studies. The information about this elasticity can not only be used to see the relevance of Wagner's Law, or at least the validity of one of its assumptions and its relevance to a particular country (in our case Canada) but it will also provide us with information regarding the desired level of government expenditures both in the short run as well as the long run (including present and future).

The main objective of this paper is to estimate the short-run and long-run income elasticity of demand for government expenditures in Canada using time series data spanning the period 1949-1984 [7]. This tasks is

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[5] See ABIZADEH (1987) for more on the empirical analysis of this assumption.

[6] See ABIZADEH (1987), for more on the income elasticity of demand for government expenditure and the level of economic development achieved by a country.

[7] Sources of data: *National Accounts Income and Expenditure*, Government of Canada,

performed by (a) using a more appropriate model and (b) including a list of properly justifiable variables in addition to real per capita income.

II. *The Model and the Variables*

The income elasticity of demand for exhaustive government expenditures (*GE*) is a measure of responsiveness of *GE* to changes in income (*GNP*) and is defined as the ratio of the percentage change in *GE* to the percentage change in income (*GNP*) [8].

The major difficulty in estimating the income elasticity of demand for *GE*, via least squares method, lies in the fact that *GNP* and *GE* are both endogenous. In as much as *GE* is a component of *GNP*, a least squares regression of *GE* on *GNP* entails regressing *G* at least partly on itself [9]. Indeed, most past studies with the exception of Henning and Tussing (1974) and Ganti and Kolluri (1979) have ignored this point and have estimated the elasticities regardless of the presence of simultaneous bias in their models [10]. To avoid this difficulty, and in order to minimize the bias the desired elasticities should be estimated indirectly.

The general form of a model for estimating the income elasticity of demand for government expenditure is as follows:

$$\Delta\ GE_t = f(X_{it}, \ldots, X_{nt}) \qquad (1)$$

where

$\Delta\ GE$ = change in government expenditure
$X_t, \ldots, X_n$ = variables that can affect the government expenditure including real *GNP*
$t = 1, 2, \ldots n$ (in years)

The next stage is the development of an empirical model along with the identification of those factors which can affect *GE*. The model and the

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Statistics Canada, various issues. *Canadian Statistical Review*, Statistics Canada, various issues. *Historical Statistics of Canada*, Statistics Canada, various issues. *Consolidated Government Finance*, Statistics Canada, various issues. *Federal Government Finance*, Statistics Canada.

[8] Exhaustive expenditures are those expenditures on goods and services which affect resource allocation, whereas non-exhaustive expenditures include transfer payments only (see BIRD, 1970, p. 19 for more on this).

[9] This is discussed in SAHNI and SINGH (1984) in much detail.

[10] Even most recent studies (RAM, 1987) continue to use the conventional model of estimating elasticities and ignore the simultaneous bias therein.

variables then will be used for empirical estimation of income elasticity of demand for government expenditure.

Government expenditure (*GE*) is normally divided into two broad components: exhaustive and non-exhaustive. Exhaustive expenditures are those expenditures on goods and services which affect the allocation of resources in the economy, while non-exhaustive expenditures include items such as transfer payments which do not directly change the allocation of resources [11]. Given the main objective of our study, that of estimating the income elasticity of demand for government expenditures, we only use the exhaustive portion of the *GE* in our dependent variable. The independent variables used as well as their justification are discussed below.

In order to allow for the public policy response to a particular economic problem and the degree of public support for such a policy, an index of perceived economic problems is added as an independent variable. *GNP* gap is used as a proxy for this variable which is defined as the ratio of potential or full employment output to the level of actual output.

Public finance literature provides definite reasons to believe that political factors have a role to play in the determination of the level and growth of government expenditure [12]. To allow for this political factor, a dummy variable is used in the model in order to reflect the preferences of the party in power at the national level. This preference is revealed via the type and level of expenditures undertaken by the government, particularly during and around the election periods. As Cameron (1978) and Lewis-Beck and Rice (1985) argue, the "quest for reelection" is likely to lead to spending increases. The inclusion of this dummy variable provides a test for the impact of the political party in power and its ideology on government expenditures.

Previous studies have ignored the impact of the size of federal debt on the level of government expenditure. As the level of debt in the Canadian economy has been relatively high in the past decade, it is postulated that the level of *GE* is significantly affected by the federal debt accumulation. This variable is lagged one period to allow for possible delays and reaction of federal government to the level of debt.

One of the key assumptions in Wagner's hypothesis, and the one we are most interested in, is related to the effect of economic growth and change on government expenditures. By including *GNP* in the model, a modified version of the Wagner's hypothesis can be tested for the Canadian

[11] For an empirical analysis of the relevance of this distinction as well as the question of whether one should include or exclude transfer payments from total government expenditure, when analyzing the growth of government, see ABIZADEH and YOUSEFI (1988).

[12] This point has been discussed extensively in TULLOCK (1974) and BIRD (1979, p. 86-89).

data. This would be done by using a more comprehensive model with the objective of obtaining the income elasticity of demand for *GE* [13]. However, as it was pointed out earlier, government expenditures and *GNP* are both considered as endogenous variables and government expenditures is a component of *GNP*. Therefore, a least-square regression of *GE* on *GNP* involves simultaneous equation bias. To avoid this problem, indirect least squares method which is analogous to that adopted by Henning and Tussing (1974) is used in this study. In this analysis, *GNP* is replaced by private expenditure (*Y*) and then the percentage change in the private expenditure with respect to *GE* is estimated directly. Thus desired elasticity (income elasticity of demand for *GE*) will be calculated indirectly [14].

Based on the foregoing discussion, regarding the justification of dependent and independent variables, an empirical model which is the modified version of Henning and Tussing (1974) can be employed as follows:

$$\frac{GE_t}{GE_{t-1}} = \left(\frac{G^eE_t}{GE_{t-1}}\right)^{\varkappa} \cdot \left(\frac{D_{t-1}}{GNP_{t-1}}\right)^{\tau} \cdot \left(\frac{YF_t}{Y_t}\right)^{\delta} \cdot DM_t^{\gamma} \qquad (2)$$

where

GE_t = real exhaustive government expenditure, in period t;
G_eE_t = desired (or equilibrium) level of *GE*, in period t;
D_t = real federal government debt, in period t;
Y_t = private expenditure ($GNP - GE$), in period t;
YF_t = the full employment level of Y_t; estimated as Y_t/1.00-unemployment rate;
DM = dummy variable for the type of federal government in power (to assume a value of zero for the Conservatives and one for the Liberals);
t = year 1949-1984 [15].
$\varkappa$, τ, δ, γ are the parameters to be estimated.

The above relationship in logarithmic form is:

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[13] Since the analysis involves the measurement of the effect of relative change in the public sector's share of the economy's real rate of production, the real value of the dependent and independent variables are used here. For an analysis and opposing views on whether real or nominal values should be used in the analysis of government expenditures see LEWIS-BECK and RICE (1985, p. 6), BIRD (1979, p. 18) and BECK (1985, p. 30). Also see BECK (1979).

[14] The detailed derivation of this relationship is given in the Appendix.

[15] This period is chosen in order to avoid the possible effects of displacement hypothesis. See PEACOCK and WISEMAN (1967).

$$\ln GE_t - \ln GE_{t-1} = \varkappa (\ln G^e E_t - \ln GE_{t-1}) + \tau (\ln d_{t-1}) + \delta \, lnYR_t + \gamma lnDM \qquad (3)$$

where:

$d_{t-1} = D_{t-1}/GNP_{t-1}$ and $YR_t = YF_t/Y_t$

The level of desired government expenditure in each period can be postulated as follows:

$$G^e E_t = \alpha \, Y_t^{\beta} \, \nu_t$$

where ν_t is the random error term.

The logarithmic version of (4) is:

$$\ln G^e E_t = \ln\alpha + \beta \ln Y_t + \ln\nu_t \qquad (5)$$

If we substitute (5) in (3), the statistical model for estimating the elasticities is:

$$\ln GE_t = m + \varkappa_\beta \ln Y_t + (1 - \varkappa) \ln GE_{t-1} + \tau \ln d_{t-1} + \delta \ln YR_t + \gamma\delta DM_t + \varepsilon_t \qquad (6)$$

where $m = \varkappa \ln\alpha$ and $\varepsilon = \varkappa \ln\nu$ (6)

The statistical model, equation (6), is a revised version of Henning and Tussing (1974) model. They assume that political factors, and the level of government debt do not have any impact on the level of *GE*. Thus leaving a lot to be explained by the residual. However, it was argued earlier that these variables have a significant effect on the government expenditure in the Canadian context. Accordingly, the modified model will include these independent variables to examine their contribution to the fitted statistical model.

GE is not assumed to adjust immediately, but rather in each period by some fraction, $\varkappa$, of the desired change. Thus the parameter $\varkappa$ measures the speed of response. This type of model is known in econometric literature as "partial adjustment model" (Henning and Tussing, 1974). In equation 6 the coefficient of *Y*, $\varkappa\beta$, is a measure of short-run elasticity, whereas β is an estimate of the long-run elasticity of demand for *GE* with respect to the private expenditure (*Y*).

III. *Empirical Results*

The desired elasticities were estimated using an indirect ordinary least square estimation method [16]. The results are summarized in Tables 1 and 2.

TABLE 1

SUMMARY OF REGRESSION ANALYSIS OF ESTIMATED ELASTICITIES

m	$\beta\varkappa$	$l - \varkappa$	$\varkappa$	β	τ	δ	γ
Constant term	Short-term elasticity (private expenditure)	Lagged dependent variable elasticity	Speed of response	Long-term elasticity (private expenditure)	Debt ratio elasticity	Business cycle elasticity	Dummy variable elasticity
−.09898 (1.340)	.34768 * (.265)	.52067 ** (.255)	.47933	.72534	−.31714 *	2.073 *	.0645 *

* Significant at the 90 percent level
** Significant at the 95 percent level
$R^2 = .97$
Estimated Coefficient of autocorrelation = .23

TABLE 2

SHORT-TERM AND LONG-TERM INCOME ELASTICITIES FOR GOVERNMENT EXPENDITURE (1949-84)

	Short Term	Long Term
1949	.363	.739
1955	.374	.747
1960	.378	.750
1965	.374	.748
1970	.378	.751
1975	.381	.753
1980	.380	.752
1984	.389	.759
Average	.37	.75

[16] Durbin-Watson statistic loses its meaning when a lagged dependent variable is used as an independent variable. Subsequently a Durbin-h test is performed for detection of possible autocorrelation. Based on the Durbin-h statistics obtained it was not possible to accept the

The majority of coefficients are statistically significant and carry the hypothesized signs. Income elasticity for *GE* was calculated indirectly using equation (4*A*) and the results are reported in Table 2.

Our results are consistent with the a priori hypotheses. The ratio of debt to *GNP* carries the expected negative sign. It follows that *GE* in each period reacted negatively to the ratio of debt to *GNP* in the previous period.

The business cycle variable, $YR = \frac{YF}{Y}$ carries a positive sign. Since this index is a proxy for unemployment rate, the positive relationship shows that federal government has relied significantly on the discretionary fiscal policy during the period under study. This result is in contrast with the U.S. federal and local policy during 1919-71 period reported by Henning and Tussing (1974).

The coefficient of the dummy variable, used to examine the role of political parties in power, although small in size, is statistically significant. The value of coefficient contributes to the intercept magnitude and is in favour of the liberal party. The same model was estimated without the dummy variable, but the value of R^2 and the degree of significance of the estimated coefficients deteriorated significantly, indicating that the party in power does play a significant role in affecting the size of government expenditures.

Finally, the short-run and long-run income elasticities for *GE*, as reported in Table 2, are on the average .37 and .75 for the period under study. Although the relationship between *GE* and *GNP* is positive, both elasticities are less than unity [17]. This result contradicts some of the results obtained using unmodified models. For instance Beck (1979) reports an elasticity of 1.96 for Canada over the period from 1950-77. However, these results confirm the stages of growth hypothesis introduced by Herber (1983). Since Canada is a developed country, the rate of change in *GE* is smaller than the rate of change in the real *GNP* in each period. Abizadeh and Gray (1985), Abizadeh and Yousefi (1988) and Abizadeh (1987) have arrived at the same conclusion in a different context and with different models [18].

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hypothesis that autocorrelation was absent. An autoregressive model was conducted for the data and elasticities were estimated using Maximum Likelihood (*ML*) procedure.

[17] It is interesting to note that both the short-run as well as the long-run elasticities have been increasing during the period under study (see, Table 2).

[18] Note that less than unity income elasticity of demand for government expenditure rejects the relevance of Wagner's law of rising government expenditure share of *GDP*. However, in a federal system, it is quite possible to obtain elasticities greater than unity when data from other levels of governments are used.

It can be concluded that in the case of a developed country, such as Canada, the growth of demand for government expenditures has leveled off. This is due to the fact that, once highly developed, the country is already enjoying a sufficient supply of publicly provided goods and services. Further increases in real income will then be more and more allocated to the consumption of other goods which may be luxurious in nature. It follows that government provided goods and services do not have the characteristics of luxury products any more. This claim is supported by the less than unit ratio for the income elasticity of demand for government expenditure reported here.

IV. *Summary and Conclusions*

Wagner's Law of the continually rising government share of total output has been tested by many researchers. The models used for estimating the income elasticity of demand for *GE* have two major shortcomings. First, the models are incomplete, second, there is a simultaneous equations bias in the estimation technique used.

This study attempts to estimate both short-run and long-run income elasticities using (i) a more comprehensive model, and (ii) a more efficient econometric technique. Two new variables have been added to those already used in past studies; the debt/*GNP* ratio, and a political dummy variable to reflect the party in power. In addition, elasticities were estimated via indirect least squares in order to minimize the simultaneous equations bias.

Based on the empirical findings, the following conclusions seem applicable to the period under study for Canada. First, the Federal Government has responded positively to the unemployment rate and *GNP* gap. This variable has the highest elasticity (2.07) in the model. Second, government expenditure in each period was affected by the ratio of federal debt to *GNP* in the previous period. However, the degree of responsiveness has not been very high (elasticity $= -.317$). Third, government expenditure in each period was directly related to *GE* in the previous period. The coefficient of adjustment (speed of response) was .48. Fourth, the Liberal Government tend to spend more than Conservatives (the period that conservatives were in power was short). Finally, the growth in real income was accompanied by higher *GE* (positive income elasticity of demand for *GE*). However, elasticities for both short run and long run were less than unity. While this result refutes Wagner's Law, it confirms the stages of growth hypothesis for Canada.

APPENDIX

GE can be fitted to the private expenditure ($Y = GNP - GE$) in order to estimate the elasticity of GE with respect to private expenditure. According to the definition, the estimated elasticity will be

$$\eta_Y = \frac{dGE}{dY} \cdot \frac{Y}{GE} \tag{1A}$$

And the desired elasticity is:

$$\eta_{GNP} = \frac{dGE}{dGNP} \cdot \frac{GNP}{GE} \tag{2A}$$

The desired income elasticity of demand for GE can be calculated via the following relationship:

$$GNP = Y + GE \quad \text{or} \quad dGNP = dY + dGE$$

Divide both sides by dGE

$$\frac{dGNP}{dGE} = \frac{dY}{dGE} + 1 \quad \text{or} \quad \frac{dGE}{dGNP} = \frac{1}{\frac{dY}{dGE}} + 1 \tag{3A}$$

Rearranging (1A) and (2A) and substituting them in (3A), we get the following relationship between the elasticities:

$$\eta_{GNP} = 1 + \left(\eta_Y - 1/\frac{GE}{Y} \eta_Y + 1 \right) \tag{4A}$$

Where η_Y is the GE elasticity with respect to private expenditure and η_{GNP} is the income elasticity of demand for GE. GE/Y is the ratio of government expenditure to private expenditure in each period. Using 4A we can estimate the desired elasticities (η_{GNP}) once η_Y is estimated.

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ELASTICITÀ RISPETTO AL REDDITO DELLA DOMANDA DI SPESE PUBBLICHE IN CANADA

Vi sono molti e tuttavia non univoci studi empirici sulla relazione fra la spesa pubblica e il reddito reale pro-capite. Questo saggio tratta i problemi teorici ed empirici che conducono a questi risultati non conclusivi. Si suggerisce che una versione riveduta del modello di Henning-Tussing possa produrre una tecnica migliore per l'analisi della relazione in oggetto. L'uso di questo modello riveduto permette di stimare l'elasticità rispetto al reddito della domanda di spese pubbliche per il Canada. Mentre i risultati complessivi respingono la rilevanza della "legge" di Wagner, essi confermano l'ipotesi della crescita a stadi per il Canada.

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LDC LABOR MARKETS, MULTINATIONALS AND GOVERNMENT POLICIES

by
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I. *Introduction*

Multinational enterprises (MNEs) are seldom totally banned from less developed countries (LDCs); nor are they often given free reign. LDC governments are usually involved in determining, instead, under what conditions MNEs should be allowed to operate – LDCs are busy trying to devise constraints on the MNEs that will maximize LDC rewards from their activities. In brief, LDC governments want to keep MNE behavior in line with LDC desires.

Recently, several papers have employed the sector specific capital model of international trade in modelling MNEs, assuming that the MNE invests capital in the LDC and employs LDC labor to produce the output. MNE capital is thus considered internationally mobile but within the LDC it is immobile. Datta-Chaudhuri and Khan (1984), for example, examine the consequences of various policies when the MNE is involved in extractive industries (they assume the MNE is vertically integrated) and the LDC has surplus labor. Batra and Ramachandran (1980) and Jones and Dei (1983) suggest various tax policies as a way of increasing national income assuming a horizontally linked MNE and full employment in the LDC. Gang and Gangopadhyay (1985) have extended the analysis of the MNE to a dual economy framework with open unemployment (as per Harris and Todaro, 1970) and introduced a government budget constraint (as per McCool, 1982) in order to analyze a particular tax cum subsidy policy.

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In this paper we explore the "costs and benefits" of alternative policies for the LDC toward the MNE. Arrangements for taxing corporations' net incomes are major factors in the LDC's ability to capture the gains the MNE makes in the LDC (Caves, 1982). Moreover, use of the tax revenues is an important element in aiding the LDC to obtain its development goals. As such, we will examine the consequences of various tax cum subsidy policies on the LDC. Specifically, we look at two tax policies: a tax on the return on MNE capital in the LDC and an excise tax on MNE output. If the government taxes it makes sense to consider how the government spends the revenue. To capture this we introduce a government budget constraint and consider the use of the tax revenue to alternatively subsidize the MNE's wages and traditional sector wages. Furthermore, we will examine the effects of these tax cum subsidies on various development goals and under alternative assumptions concerning the functioning of labor markets.

The evaluation of policies should be influenced by the structure of the labor market. We may expect that the achievement of the LDC's goals will be influenced by whether wages are sticky or whether at the initial equilibrium the wage is at the subsistence level. Several models of LDC labor markets are in use in the development literature in general and in the multinational literature in particular. For example, Datta-Chaudhuri and Khan (1984) assume wages are fixed at a subsistence level (i.e., there is surplus labor); Batra and Ramachandran (1980) and Jones and Dei (1983) assume complete wage flexibility (i.e., full employment); while Gang and Gangopadhyay (1985) explore a dual economy with Harris-Todaro open unemployment. Here we explore the robustness of our results by examining them across these alternative labor market assumptions. Moreover, the flexible wage assumption allows us to link the analysis with traditional work on the two-sector model. The fixed wage-surplus labor model captures what happens if adjustments are all employment adjustments, while the dual economy model allows us to capture the unemployment effects of policy.

In the next three sections we describe the model. Section V discusses the results, while Section VI draws together the results of the alternative models.

II. *The Production Model*

The model we develop here is a variant of the standard sector-specific models of international trade as developed in Batra and Ramachandran (1980), Jones and Dei (1983), Datta-Chaudhuri and Khan (1984) and Gang

and Gangopadhyay (1985). There are two price taking countries – the home country where the MNE is located, and the host country, which allows the inflow of MNE capital. The host country produces two goods: the MNE output, X, and a domestic output, Y. These are produced with sector-specific capital and homogeneous labor under constant returns to scale technology. The production functions are written as:

$$X = X(K_X, L_X),\ X_i > 0,\ X_{ii} < 0,\ i = K_X, L_X \tag{1}$$

$$Y = Y(K_Y, L_Y),\ Y_i > 0,\ Y_{ii} < 0,\ i = K_Y, L_Y \tag{2}$$

where K_X represents capital in X, etc. The home country produces only one output, denoted X^*, which is physically identical to X. X^* is produced at home by the MNE using capital and home country labor. Denoting home country variables by an asterisk, we have,

$$X^* = X^*(K^*_X, L^*_X),\ X^*_h > 0, X^*_{hh} < 0, h = K^*_X, L^*_X \tag{3}$$

X^* is also produced through a constant returns to scale technology. While the technology for X and X^* may differ, the capital used is the same. The MNE thus divides up a fixed stock of capital $\bar{K}_X$, for the production of X and X^*. Thus

$$K_X + K^*_X = \bar{K} \tag{4}$$

There is no host country owned X-capital. Furthermore, there is a fixed stock of Y-specific capital, $\bar{K}_Y$, in the host country which is completely used up in the production of Y. Thus

$$K_Y = \bar{K}_Y. \tag{5}$$

Given (5), producers of Y actually choose only labor to maximize profits.

If W_Y is the wage rate in the Y-sector, we have

$$Y_L(\bar{K}_Y, L_Y) = W_Y. \tag{6}$$

The MNE is also a profit maximizer. It chooses two things: (*i*) the division of capital between its home and host units of production and (*ii*) the amount of labor to be used in the host country. Note, we are assuming there is always full employment in the home country and that

$$L^*_X = \bar{L}^*_X \tag{7}$$

This assumption greatly simplifies the analysis; a relaxation of this assumption does not change the qualitative results. For MNE profit maximization, we have

$$X^*_K(K^*_X, L^*_X) = X_K(K_X, L_X) \tag{8}$$

and

$$X_L(K_X, L_X) = W_X, \tag{9}$$

where W_X is the wage paid out to MNE labor in the host country. Prices are fixed and we have normalized them to unity.

III. *The Labor Market*

Recent contributions on the behavior of MNEs have usually assumed a full employment economy for the host country. Most of the development economics literature, on the other hand, has emphasized the various institutional rigidities in the labor markets of LDCs. The latter have resulted in unemployment equilibria of various types. (See, e.g., Sen, 1966; Harris-Todaro, 1970). In this paper, we allow for three different types of labor markets for the host country. They are:

(*i*) perfectly flexible wages in both sectors allowing for *full employment* to prevail; this results in equating wages in both sectors and we have

$$W_X = W_Y = W_e \tag{10}$$

where W_e is the (Walrasian) equilibrium wage;
(*ii*) wages in both sectors fixed at a level above the market clearing wage level, W_e, so that

$$W_X = W_Y = \bar{W} > W_e; \tag{11}$$

this has been characterized in the literature as a situation of *surplus labor* (see, e.g., Lewis, 1954; Ranis and Fei, 1961);
(*iii*) wage in the MNE sector fixed above the market clearing level, W_e, and wage in the Y-sector, W_Y, perfectly flexible; workers are risk-neutral income maximizers and allocate themselves between the two sectors so that the expected wage in the MNE sector is equal to the certain wage in the Y-sector (see Harris and Todaro, 1970) so that we have

$$W_X = \bar{W} > W_e \tag{12}$$

and

$$W_X L_X/(\bar{L} - L_Y) = W_Y \tag{13'}$$

where $\bar{L}$ is the total labor force in the host economy. If we normalize $\bar{L}$ to unity, and denote by L_U the number of unemployed laborers then we can write (13') as

$$W_X L_X/(1 - L_Y) = W_X L_X/(L_X + L_U) = W_Y. \tag{13}$$

This situation has been characterized in the literature as *Harris-Todaro* unemployment.

Also, we have,

$$L_X + L_Y \leq 1. \tag{14}$$

Note, in the full employment situation $L_U = 0$, while in the surplus labor and Harris-Todaro cases, $L_U > 0$.

IV. *Government Policy and Its Budget Constraint*

We will consider, in particular, two types of government tax policies on the MNE: (*i*) a tax on MNE returns to capital and (*ii*) an excise tax on the MNE output. There are various other forms of taxes that may be considered but these two appear to be the most natural. Other taxes may be considered within the same general framework outlined in this paper, but we refrain from doing so to keep the analysis simple.

It is important for us to consider what the government does with the tax revenue. Rather then assuming the government redistributes a tax revenue lump sum, we postulate two types of government expenditures (or subsidies) out of these taxes. They are (*i*) subsidy to MNE wages and (*ii*) subsidy to domestic sector wages. Traditionally, economic analysis has focused attention on national income as a measure of potential welfare. In addition, work on basic needs and absolute poverty has led to more attention being paid to wages and employment as LDC development goals. The concern with these goals is captured by these two subsidy policies. The LDC interested in rapid modernization, but also concerned with general employment, may choose to tax and subsidize the MNE. On the other hand, the LDC's traditional sector may produce necessities such as food, and, while the LDC may want to modernize, it may subsidize the domestic sector to encourage more food production.

If the government wants to subsidize the MNE wages then the necessary budget constraint of the government is given by

$$tX_K K_X = W_X s_X L_X \tag{15}$$

or,

$$tX = W_X s_X L_X \tag{16}$$

if revenue is collected through a tax on MNE output. On the other hand, if the government wants to subsidize domestic sector wages through revenue collected by taxing the MNE sector, we will have, corresponding to (15) and (16), respectively, the following equations:

$$tX_K K_X = W_Y s_Y L_Y, \tag{17}$$

or,

$$tX = W_Y s_Y L_Y. \tag{18}$$

Thus we consider four sets of government policies: (*i*) tax MNE capital, subsidize MNE labor; (*ii*) tax MNE capital, subsidize domestic sector wages; (*iii*) tax MNE output, subsidize MNE labor; (*iv*) tax MNE output, subsidize domestic sector wages. Moreover, we consider each of these sets of government policies under our three alternative labor market assumptions: full employment, surplus labor and Harris-Todaro. There are thus twelve versions of the model we need to consider. The reduced-form equations for each different scenario are summarized in Table 1. Each of the reduced-form systems consists of a capital market equation, an equation stating that wage equals marginal product (sometimes corrected for the

TABLE 1

REDUCED FORM EQUATIONS

Case (i): Full Employment

Subsidy Policy	Tax on MNE Capital	Tax on MNE Output
Subsidy to MNE Wages	$(1-t)X_K - X\bar{\bar{K}} = 0$	$(1-t)X_K - X\bar{\bar{K}} = 0$
	$X_L + tX_K \dfrac{K_K}{L_X} - Y_L = 0$	$(1-t)X_L - Y_L + \dfrac{tX}{L_X} = 0$
Subsidy to Domestic Sector Wages	$(1-t)X_K - X\bar{\bar{K}} = 0$	$(1-t)X_K - X\bar{\bar{K}} = 0$
	$X_L - \dfrac{tX_K K_X}{1-L_X} - Y_L = 0$	$(1-t)X_L - Y_L - \dfrac{tX}{1-L_X} = 0$

Case (ii): Surplus Labor

Subsidy Policy	Tax on MNE Capital	Tax on MNE Output
Subsidy to MNE Wages	$\bar{W} - Y_L = 0$	$\bar{W} - Y_L = 0$
	$(1-t)X_K - X\bar{K} = 0$	$(1-t)X_K - X\bar{K} = 0$
	$X_L - \bar{W} + tX_K K_X / L_X = 0$	$(1-t)X_L - \bar{W} + \frac{tX}{L_X} = 0$
Subsidy to Domestic Sector Wages	$\bar{w} - Y_L - \frac{tX_K K_X}{L_X} = 0$	$\bar{W} - Y_L - \frac{tX}{L_Y} = 0$
	$(1-t)X_K - X\bar{K} = 0$	$(1-t)X_K - X\bar{K} = 0$
	$X_L - \bar{W} = 0$	$X_L - \bar{W} = 0$

Case (iii): Harris-Todaro

Subsidy Policy	Tax on MNE Capital	Tax on MNE Output
Subsidy to MNE Wages	$\frac{\bar{W}L_X}{1-L_Y} - Y_L = 0$	$\frac{\bar{W}L_X}{1-L_Y} - Y_L = 0$
	$(1-t)X_K - X\bar{K} = 0$	$(1-t)X_K - X\bar{K} = 0$
	$X_L - \bar{W} + \frac{tX_K K_X}{L_X} = 0$	$(1-t)X_L - \bar{W} + \frac{tX}{L_X} = 0$
Subsidy to Domestic Sector Wages	$\frac{\bar{W}L_X}{1-L_Y} - Y_L - \frac{tX_K K_X}{L_Y} = 0$	$\frac{\bar{W}L_X}{1-L_Y} - Y_L - \frac{tX}{L_Y} = 0$
	$(1-t)X_K - X\bar{K} = 0$	$(1-t)X_K - X\bar{K} = 0$
	$X_L - \bar{W} = 0$	$(1-t)X_L - \bar{W} = 0$

subsidy) in the modern sector, and a labor market equilibrium condition. In the full employment case the latter two equations collapse into one.

V. *Results*

In this section we will consider what happens in the four categories of taxes and subsidies, under the assumption of linearly homogeneous technology in the production of X, the multinational good. The comparative static results are summarized in Table 2. (The derivation of these results are in the

TABLE 2

QUALITATIVE RESULTS

	Subsidy to MNE Wages						Subsidy to Domestic Sector Wages					
	L_X	K_X	L_Y	X	I	L_U	L_X	K_X	L_Y	X	I	L_U
(*i*) *Full Employment*												
1. Tax MNE Capital												
small tax	+	−	−	?	+		−	−	+	−	?	
large tax	−	−	+	−	−		+	−	−	?	−	
2. Tax MNE Output												
small tax	+	−	−	?	+		−	−	+	−	−	
large tax	−	−	+	−	−		?	−	?	−	−	
(*ii*) *Surplus Labour*												
1. Tax MNE Capital												
small tax	+	−	0	+	+	−	−	−	+	−	?	?
large tax	−	−	0	−	−	+	−	−	−	−	?	+
2. Tax MNE Output												
small tax	+	−	0	+	+	−	−	−	+	−	?	?
large tax	−	−	0	−	−	+	−	−	−	−	−	?
(*iii*) *Harris-Todaro*												
1. Tax MNE Capital												
small tax	+	−	−	+	+	−	−	−	+	−	?	?
large tax	−	−	+	−	−	+	−	−	+	−	?	?
2. Tax MNE Output												
small tax	+	−	−	+	+	−	−	−	+	−	?	−
large tax	−	−	+	−	−	+	−	−	?	−	−	+

Notes: The Table shows the effect of raising the tax on each of the variables under our alternative scenarios. The assumptions necessary to arrive at the particular signs are given in the text. I stands for income. A large tax is one that from the initial equilibrium lowers revenues. A small tax is one that from the initial equilibrium raises revenues.

Appendix). Note that we consider two cases which clearly have different implications for the effects of our tax-subsidy policies: (*i*) our initial situation is one of low taxes and subsidies so that an increase in taxes raises revenues and hence the subsidy; (*ii*) our initial situation is one of high taxes and subsidies so that we are actually beyond the revenue maximizing tax rate. Here, raising taxes will lower revenues and hence the subsidy.

1. *Taxing MNE capital, subsidizing MNE labor.* – Consider what happens when we tax MNE capital and subsidize MNE wages under our three labor

market assumptions. Note that two policies are being employed. First, the tax raises the price of capital, r, to the MNE. Second, the subsidy lowers the wage the MNE pays labor. For the MNE, the two policies reinforce the substitution effect, i.e., for given output they push the MNE towards more labor intensive production. The output (scale) effects, however, work in opposite directions. The international investment tax leads to a decline in MNE capital in the LDC for all t. The MNE equates its after-tax rate of return in the LDC to its untaxed rate of return in its home country and allocates its capital stock accordingly. Thus as the tax rate rises capital leaves the MNE sector in the LDC. The subsidy to wages, on the other hand, has an output effect that works in exactly the opposite direction. The wage subsidy lowers the price of labor to the MNE and it hires more labor. The effect on output can be divided into the substitution effect (the relative price of labor has fallen) and the output (scale) effect since the cost of production has fallen.

Note that with two prices changing it is possible to get cross effects so that the final change in output is ambiguous. Moreover the relative size of the effects, and hence whether X and L_X increase or decrease, will depend on the revenue (and hence subsidy) raised from the tax. If we start from a low tax revenues are likely to rise as we increase taxes, while if we are beyond the revenue maximizing tax, of course, any further increase in tax will lower revenues. What happens to X and L_X will be appropriately affected.

In the full employment case we see that MNE employment, L_X, decreases for small taxes and increases for large taxes. Quite clearly what is happening is that for small taxes the substitution effect dominates but for large taxes the output effect due to the tax on capital dominates both the substitution effect and the output effects because of the subsidy to labor. Recall that if the tax is below the revenue maximizing tax, an increase in taxes raises the revenue. The revenue is then used to subsidize labor and, hence, L_X, rises. For large taxes, however, an increased tax lowers revenues so that, although taxes increase, the subsidy to labor falls and, hence, L_X falls. Moreover, while initially the subsidy will increase MNE employment, as the tax rate increases more capital leaves so that eventually L_X falls.

For large taxes with both L_X and K_X falling, output by the MNE in the LDC, X, naturally falls. With small taxes, however, what happens to X is ambiguous – the optimum output can rise or fall.

National income also rises for small taxes. Note that with full employment, if L_X increases, L_Y must fall and hence W_Y rises. But $W_Y = W_X$, so that total labor income, which in this model is equivalent to national

income, rises. We note that *MNE employment moves procyclically with national income.*

Under the assumption of surplus labor, i.e., a fixed wage across both sectors, we find the results parallel to the full employment case with two exceptions. First, employment in the domestic sector, L_Y, is not affected by the tax cum subsidy policy on the MNE. The increase in L_X for small taxes is drawn from the pool of unemployed-surplus labor, while those who lose their jobs with large taxes (since revenues decrease, and hence subsidies fall, with large taxes) become unemployed. Second, the ambiguity in MNE output is eliminated here. This is because (*i*) under this policy X increases; (*ii*) W_Y and thus L_Y remain unchanged, Y is constant; (*iii*) thus with fixed prices $X + Y$ goes up. In addition, the surplus labor case allows us to say something about unemployment, i.e., with a small initial tax it falls while with a large initial tax it rises.

Another type of unemployment is explored in the Harris-Todaro model. The results presented here replicate Gang and Gangopadhyay (1985). The Harris-Todaro version reintroduces the links between the two sectors that exist in the full employment model and were severed in the surplus labor model. Again, the results parallel the other two cases. MNE employment increases for small t and L_Y falls, as in the full employment case. Unemployment decreases if the elasticity of labor demand is less than $[L_U/(L_X + L_U)][L_Y/L_X]$ (Gang and Gangopadhyay, 1985). Moreover, as in the full employment and surplus labor cases national income moves procyclically with MNE employment.

2. *Taxing MNE output, subsidizing MNE labor.* – We can contrast the tax on capital (cum subsidy to MNE wages) with a tax on MNE output, i.e., an excise tax. While the tax on capital increases the price of capital (with its subsequent substitution and output effects), a tax on output directly affects output by decreasing capital *and* labor usage. Thus again, regardless of the subsidies we employ or the labor markets we examine, capital declines in usage.

A glance at Table 2 indicates that the qualitative results are the same as in the case of a tax on capital and subsidy to MNE labor. The reasoning in this tax cum subsidy world parallels that considered above.

3. *Taxing MNE capital, subsidizing domestic sector labor.* – For an alternative policy we assume that instead of taking the tax revenue (either derived from taxing capital or output) the LDC uses it to subsidize domestic sector wages. The LDC may follow this policy in order to encourage production

of the domestic good, or in hope of achieving some basic needs goal. The analysis of the MNE sector should be somewhat simpler since we now have only a tax to deal with, while in the domestic sector we now have to deal with a wage subsidy.

For small initial taxes the effects are as we would expect under all three labor market assumptions. MNE employment of capital and labor falls, as does MNE output in the LDC, while domestic sector employment increases. The effect on national income is ambiguous, though it seems unlikely that it would increase. What happens to income will depend on the elasticity of demand for labor in the domestic sector. If infinitely elastic, national income increases; if perfectly inelastic, decreases.

The unexpected results occur if taxes are initially large. If taxes are initially large, MNE employment *increases* when the MNE sector is taxed. The shift of the demand for the MNE labor curve because of decreased capital may be offset by the substitution effect towards labor. Note that with large taxes the cost of capital to the MNE is high and the subsidy to wages (domestic sector) is also high so that the cost of labor is low. In both the full employment and surplus labor models L_Y falls with large taxes, indicating the decreased total revenue from additional taxation lowers the subsidy and hence lowers L_Y. In the Harris-Todaro model this is not so because of the expected wage equilibrium.

4. *Tax on MNE output, subsidy to domestic sector wages.* – If instead we tax MNE output and use the revenue to subsidize domestic sector wages we find similar results as under the tax on MNE capital. The few exceptions are obvious.

VI. *Comments and Conclusions*

In this paper we have examined the consequences for an LDC of imposing various tax cum subsidy policies towards MNEs under varying assumptions about the labor market structure. We have, alternatively, assumed the LDC was characterized by full employment, surplus labor and Harris-Todaro open unemployment. The LDC either taxes MNE capital or output and subsidizes either MNE or domestic sector wages.

We have found quite a variety of results and some ambiguity. It is possible to draw several general conclusions.

First, as is readily apparent and quite intuitive, a tax on MNE capital or output causes a reduction in the amount of capital in the MNE sector of

the LDC – it goes home. While this does not necessarily mean a reduction in the MNE sector – employment and output *may* increase – it does mean less of the input the MNE is bringing in. For an LDC interested in long term growth and developing the "modern manufacturing" sector, less MNE capital will certainly have a slowing effect on this development.

On the other hand, this sort of reigning in of the MNE is just what many LDCs want to do, and we therefore offer a variety of circumstances which the LDC may find itself in. LDCs, while they might be interested in MNE technology and goods, often want the MNEs in on their own terms. We have explored alternative policy options the LDC might choose from and their consequences.

It is quite clear that the LDC must be very careful, regardless of its own labor market structure, about the size of the tax it is imposing (whether it is below or above the revenue maximizing tax), where the subsidy is going, and the type of MNE it is dealing with. For the most part the LDC can only gain in terms of national income *and* income distribution if the tax, whether on capital or output, is small. Moreover, while not necessary, we can only say that a small tax will benefit the LDC if the subsidy goes to MNE wages.

However, the beneficial effects in terms of national income and unemployment reduction disappear if the MNE does *not* have a fixed capital stock which it must use (monopoly power over capital). That is, if the MNE is a competitor in the world capital market (so that the marginal product of capital is equal to the market rate of interest) the LDC loses if it imposes any sort of tax.

Finally, the striking result is that the effects of the various tax cum subsidy policies are robust across labor market assumptions. This should not be that surprising as what the assumption of wage fixity in the Harris-Todaro and surplus labor models do is "slow down" the adjustment process, not alter qualitatively macroeconomic variables. The advantage of the alternative labor market models is what they allow us to say about unemployment.

APPENDIX

Table A1 contains our comparative static terms, found by totally differentiating the reduced form equations from Table 1 and using Cramer's rule to see how our endogenous variables (L_X, K_X, and L_Y) change when the tax rate changes. To derive the results in Table 2 we employ the assumption of linearly homogeneous technology in the production of X, the multinational good. That is we assume $X_L L_X + X_{LK} K_X = X_{KK} K_X + X_{LK} L_X = 0$, $X_K K_X + X_L L_X = X$ and $X_L - (X/L_X) = (1/L_X)(-X_K K_X)$. Also note that the determinant of the matrix of coefficients is, in all cases, negative.

TABLE A1

DETERMINANTS ARISING FROM TOTAL DIFFERENTIATION OF THE REDUCED FORM EQUATION OF TABLE 1

Case (i): Full Employment

	Tax on MNE Capital				Tax on MNE Output			
	dL_X	dK_X	dL_Y	dt	dL_X	dK_X	dL_Y	dt
MNE Wage Subsidy	$(1-t)X_{KL}$	$(1-t)X_{KK}+X^*_{KK}$		X_K	$(1-t)X_{LK}$	$(1-t)X_{KK}+X^*_{KK}$		X_K
	$X_{LL}+\frac{tX_{KL}K_X}{L_X}$ $-\frac{tX_KK_X}{L_X^2}+Y_{LL}$	$X_{KL}+\frac{t}{L_X}K_XX_{KK}$ $+\frac{t}{L_X}X_K$		$-\frac{X_KK_X}{L_X}$	$(1-t)X_{LL}+Y_{LL}$ $+\frac{tX_L}{L_X}-\frac{tX}{L_X^2}$	$(1-t)X_{LK}+\frac{tX_K}{L_X}$		$X_L-\frac{X}{L_X}$
Domestic Sector Wage Subsidy	$(1-t)X_{KL}$	$(1-t)X_{KK}+X^*_{KK}$		X_K	$(1-t)X_{LK}$	$(1-t)X_{LK}+X^*_{KK}$		X_K
	$Y_{LL}-\frac{tX_{KL}K_X}{1-L_X}$ $+Y_{LL}-\frac{tX_KK_X}{(1-L_X)^2}$	$Y_{LK}-\frac{tX_{KK}K_X}{1-L_X}$ $-\frac{tX_K}{1-L_X}$		$\frac{X_KK_X}{1-L_X}$	$(1-t)X_{LL}+Y_{LL}$ $-\frac{tX_L}{1-L_X}-\frac{tX}{(1-L_X^2)}$	$(1-t)X_{LK}$ $-\frac{tX_K}{1-L_X}$		$X_L-\frac{X}{L_Y}$

Case (ii): Surplus Labor

	Tax on MNE Capital				Tax on MNE Output			
	dL_X	dK_X	dL_Y	dt	dL_X	dK_X	dL_Y	dt
MNE Wage Subsidy	0	0	$-Y_{LL}$	0	0	0	$-Y_{LL}$	0
	$(1-t)X_{KL}$	$(1-t)X^*_{KK}$	0	X_K	$(1-t)X_{LK}$	$(1-t)X_{LK}+X^*_{KK}$	0	X_K
	$X_{LL}+tX_{KL}\frac{K_X}{L_X}$ $-\frac{tX_KK_X}{L_X^2}$	$X_{KL}+\frac{t}{L_X}X_{KK}K_X$ $+\frac{t}{L_X}X_K$	0	$-\frac{X_KK_X}{L_Y}$	$(1-t)X_{LL}+\frac{tX_L}{L_X}$ $-\frac{tX_L}{L_X^2}$	$(1-t)X_{LK}+\frac{tX_K}{L_X}$	0	$X_L-\frac{X}{L_X}$
Domesti Sector Wage Subsidy	$-\frac{tX_KK_X}{L_Y}$	$-\frac{t}{L_Y}(X_{KK}K_X+X_K)$	$\frac{tX_KK_X}{L_Y^2}-Y_{LL}$	$\frac{X_KK_X}{L_Y}$	$-\frac{tX_L}{L_Y}$	$-t\frac{X_K}{L_Y}$	$-Y_{LL}+\frac{tX}{L_Y^2}$	$\frac{X}{L_Y}$
	$(1-t)X_{KL}$	$(1-t)X_{KK}+X^*_{KK}$	0	X_K	$(1-t)X_{LK}$	$(1-t)X_{LK}+X_{KK}$	0	X_K
	X_{LL}	X_{LK}	0	0	$(1-t)X_{LL}$	$(1-t)X_{LK}+X^*_{KK}$	0	X_L

Case (iii): Harris-Todaro

	Tax on MNE Capital				Tax on MNE Output			
	dL_X	dK_X	dL_Y	dt	dL_X	dK_X	dL_Y	dt
MNE Wage Subsidy	$\frac{\bar{W}}{1-L_Y}$	0	$\frac{\bar{W}L_X}{(1-L_Y)^2}-Y_{LL}$	0	$\frac{\bar{W}}{1-L_Y}$	0	$\frac{\bar{W}L_X}{(1-L_Y)^2}-Y_{LL}$	0
	$(1-t)X_{LK}$	$(1-t)X_{KK}+X^*_{KK}$	0	X_K	$(1-t)X_{LK}$	$(1-t)X_{KK}+X^*_{KK}$	0	X_K
	$X_{LL}+\frac{tK_XX_{LK}}{L_X}$ $-\frac{tK_XX_K}{L_X^2}$	$X_{LK}+\frac{t}{L_X}X_K$ $+\frac{t}{L_X}K_XX_{KK}$	0	$-\frac{X_KK_X}{L_X}$	$(1-t)X_{LL}+\frac{tX_L}{L_X}$ $-\frac{tX}{L_X^2}$	$(1-t)X_{LK}+\frac{tX_K}{L_X}$	0	$\dot{X}_L-\frac{X}{L_X}$
Domestic Sector Wage Subsidy	$\frac{\bar{W}}{1-L_Y}-\frac{t}{L_Y}X_{KL}K_X$	$-\frac{t}{L_Y}(X_{KK}K_X+X_K)$	$\frac{\bar{W}L_X}{(1-L_Y)^2}-Y_{LL}$ $+\frac{tX_KK_X}{L_Y^2}$	$\frac{X_KK_X}{L_Y}$	$\frac{\bar{W}}{1-L_Y}-\frac{tX_L}{L_Y}$	$-\frac{tX_K}{L_Y}$	$\frac{\bar{W}L_X}{(1-L_Y)^2}-Y_{LL}$ $+\frac{tX}{L_Y^2}$	$\frac{X}{L_Y}$
	$(1-t)X_{LK}$	$(1-t)X_{KK}+X^*_{KK}$	0	X_K	$(1-t)X_{KL}$	$(1-t)X_{KK}+X^*_{KK}$	0	X_K
	X_{LL}	X_{LK}	0	0	$(1-t)X_{LL}$	$(1-t)X_{LK}$	0	X_L

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MERCATO DEL LAVORO DEI PAESI IN VIA DI SVILUPPO, MULTINAZIONALI E POLITICHE GOVERNATIVE

Questo articolo esamina le conseguenze sui paesi in via di sviluppo di varie politiche verso le imprese multinazionali. Questi paesi tassano i redditi del capitale delle multinazionali o elevano una imposta di consumo sui loro prodotti e usano questi proventi per sussidiare i salari dei settori tradizionali. L'articolo esamina inoltre ognuna di queste politiche dal punto di vista di tre ipotesi alternative. I mercati del lavoro possono avere salari flessibili (il che implica piena occupazione), salari fissi a un livello di sussistenza (eccedenza di lavoro), o un salario minimo fisso nel settore dove opera la multinazionale e salari flessibili nel settore tradizionale (disoccupazione aperta del tipo Harris-Todaro). Meraviglia che il risultato degli effetti delle politiche tassa-e-sussidio sia robusto rispetto ai diversi tipi di mercato del lavoro. Gli effetti sul reddito nazionale e sull'allocazione del lavoro dipendono dalla forma della tassa-e-sussidio. Ciò che gli schemi alternativi ci permettono di cogliere sono gli effetti sulla disoccupazione. Inoltre, risulta che gli effetti dipendono grandemente dall'ipotesi che l'impresa multinazionale operi come monopolista o in concorrenza nel mercato dei capitali.

Assemblea dei Soci

L'assemblea straordinaria e ordinaria dei Soci della Banca Popolare di Milano, riunita il 28 aprile 1990 (presenti n. 1.476 azionisti) sotto la presidenza dei prof. avv. Piero Schlesinger, in sede straordinaria ha deliberato alcune modifiche statutarie e, in sede ordinaria, ha approvato a grandissima maggioranza (9 voti contrari) il bilancio dell'esercizio 1989 (124° dalla fondazione).

I positivi risultati esaminati, per quanto riguarda l'intermediazione creditizia, evidenziano :

Raccolta da clientela	**L. 12.040,1 miliardi**	**+ 17,6%**
Raccolta fiduciaria	**L. 20.425,2 miliardi**	**+ 20,4%**
Mezzi amministrati (raccolta fiduciaria + raccolta indiretta da clientela e da banche)	**L. 35.598,3 miliardi**	**+ 18,4%**
Impieghi per cassa	**L. 8.084,5 miliardi**	**+ 12,4%**

Il notevole incremento operativo dell'Istituto è proseguito nel 1989 parallelamente ad un'ampia espansione territoriale caratterizzata dall'incorporazione della consorella "Popolare di Apricena" (25 sportelli prevalentemente in Puglia), dopo che nell'esercizio '88 era stata attuata analoga operazione con la "Popolare di Bologna e Ferrara".
La Banca si è pure rafforzata a livello internazionale, sia con l'apertura della filiale di Londra, ubicata nel cuore della City, che con il trasferimento in una nuova e più prestigiosa sede della filiale di New York.
Con un brillante esito si è chiusa la prima parte dell'aumento di capitale che ha procurato un introito pari a L. 134 miliardi. A questi vanno aggiunti L. 66 miliardi incassati nel presente esercizio a seguito della conversione di warrants emessi nel 1989.
Per effetto dell'aumento di capitale e degli accantonamenti a riserve patrimoniali deliberati dall'assemblea, il patrimonio della Banca sale a L. 1.247,5 miliardi (+ 20,5%).
La positiva dinamica dei ricavi, associata agli utili derivanti dalla cessione di partecipazioni (in particolare la dismissione della quota detenuta nel Nuovo Banco Ambrosiano), ha consentito un'espansione della capacità di autofinanziamento della Banca.
Infatti, dopo aver provveduto alla copertura delle perdite straordinarie (di cui L. 90,9 miliardi relativi alla Bipiemme Leasing), si è determinato un utile lordo prima degli accantonamenti tassati di L. 283,5 miliardi, mentre l'utile netto dopo le imposte sul reddito è balzato a L. 168 miliardi (+ 32,1%).
L'assemblea, oltre ad approvare accantonamenti a riserve patrimoniali per L. 77 miliardi, ha destinato a monte utili da distribuire L. 66,5 miliardi che ha consentito l'assegnazione di un dividendo unitario di L. 460 ai 144,6 milioni di azioni in circolazione (nel 1988 L. 525 distribuite a 104,3 milioni di azioni).
Il Consiglio di Amministrazione è stato inoltre autorizzato a prevedere in via sperimentale la nomina di un Consigliere Delegato, da scegliere tra i suoi membri e a cui delegare parte dei propri poteri. L'assemblea ha provveduto altresì a confermare l'intero Comitato dei Probiviri composto dai Sigg. notaio dott. Agostino Avanzini, rag. Aldo Bortone, rag. Giuseppe Rolandi (probiviri effettivi) e dai Sigg. dott. prof. Enrico Ballerini, dott. Angelo Cinti (probiviri supplenti).
L'assemblea ha infine ratificato la delibera assunta dal Consiglio di Amministrazione di revocare l'incarico conferito alla KPMG Peat Marwick Fides snc per la certificazione del bilancio della Banca per gli anni 1990 e 1991, prendendo anche atto che per il triennio 1990/92 tale incarico è stato conferito alla società Arthur Andersen e Co. sas.
Unitamente al fascicolo contenente le relazioni del Consiglio di Amministrazione all'assemblea straordinaria e ordinaria, è stato distribuito per la prima volta il bilancio consolidato del Gruppo Bipiemme.

Banca Popolare di Milano