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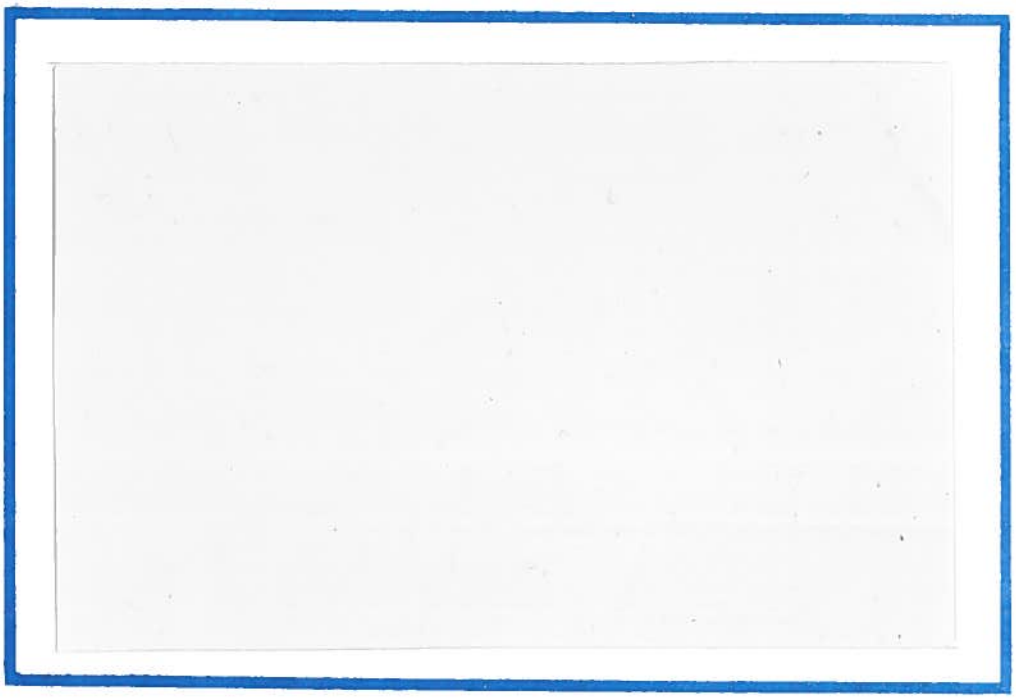

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MACROECONOMIC EFFECTS OF PRICE CONTROLS: THE ROLE OF MARKET STRUCTURE

by

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MACROECONOMIC EFFECTS OF PRICE CONTROLS: THE ROLE OF MARKET STRUCTURE

by

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1. Introduction

The impetus for the current study comes from an attempt to understand the results of Israel's stabilization program of July 1985. The program consisted of a sharp reduction in aggregate spending via an increase in net taxes and a moderate reduction in government spending, a devaluation followed by a fixed exchange rate, and price and wage controls. The results of the program are reported in Table 1. In the first quarter that followed the implementation of the program, i.e., the third quarter of 1985, aggregate spending declined, exports increased, imports declined, the real wage rate declined, and employment declined. These results can be explained by a conventional competitive macroeconomic model, as I will explain in Section 3.

During the next six months all the variables reversed their course. This would be easy to explain with a conventional competitive model if the price controls had been removed. However, they were not, and it is difficult to

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[1]I would like to thank Allan Drazen and Leo Leiderman for comments.

reconcile the comovement of the reported variables in their presence. Especially intriguing is the simultaneous increase in the real wage rate and employment. This is so, because in a competitive model price controls lead to excess demand. In this case increased spending has no price or employment effects, while a wage increase reduces employment The difficulty is further aggravated by the fact that contrary to the model's prediction, almost no shortages have been observed. In addition, as shown in Section 3, partial relaxation of price controls is also incapable of explaining the data with this type of a model. This lead me to study a macroeconomic model with oligopolistic markets.

It turns out that both the competitive and the noncompetitive models generate similar predictions in the absence of price controls, but that in their presence the models' predictions differ substantially. The details of these differences are interesting, because they show how macroeconomic performance may depend on market structure. This issue is the main theme of the paper.

The next section is devoted to a study of the effects of price controls on a single competitive and noncompetitive industry. This partial equilibrium analysis clarifies a major effect of market structure. In the following section (Section 3) I construct a simple, competitive, multisector economy, and study its implications for the comovement of variables in the presence of price controls. In Section 4 I construct a model with oligopolistic competition and study the same set of questions. The reader can see in Table 2 some of the resulting differences. An application of these theoretical

findings to the Israeli case is illustrated in Section 5. It is argued that the implications of the competitive model are inconsistent with the data, while the implications of the noncompetitive model are consistent with them.

2. Partial Equilibrium

An important insight into the effects of price controls under different market structures can be obtained from a partial equilibrium analysis. Consider Figure 1. Panel (a) describes a competitive industry. Without price controls the equilibrium price is p, which is determined by the intersection of the marginal cost curve MC and the demand curve D. Now, if price controls reduce the price to p^c, then there is an excess demand $\overline{AB}$. In this case the actually transacted quantity is determined by point A, which represents the short side of the market. Hence, output is supply determined, and price controls bring about a contraction of output.

Now consider panel (b), which describes a firm with some degree of monopoly power. Curve D describes the demand curve faced by the firm, with the associated marginal revenue curve MR. Its marginal cost curve is MC. Without price controls the equilibrium quantity of output and sales is determined by the intersection of MR with MC, and the equilibrium price is found on the demand curve at the point that corresponds to this quantity. Hence, p is the equilibrium price. Now suppose that price controls are imposed, with p_1^c being the price ceiling. Than the firm's marginal revenue curve becomes the horizontal line at the level of p_1^c up to point C, then it drops to F, and coincides with MR for larger output levels. In this case

profit maximization makes the firm supply the entire demand at the controlled price. This is true for every price ceiling above point E. Hence, as long as the price ceiling is above E, there is no excess demand, output is demand determined, and price controls bring about an expansion of output. These results are radically different from those derived for the competitive case. Only when price controls are severe enough to reduce the price below E, will shortages appear. Take, for example, p_2^c to be the price ceiling. Then the relevant marginal revenue curve becoms the horizontal line up to B, then dropping to G, and coinciding with MR for higher output levels. In this case point A represents the intersection of the marginal revenue with the marginal cost curve, while point B represents the demanded quantity at the controlled price. Hence, there is an excess demand equal to $\overline{AB}$. Observe, however, that in this case too output is higher than in the uncontrolled case, despite there being shortages. Only when the price ceiling falls below the intersection of MR with MC do price controls bring about shortages with a lower level of output.

This analysis shows that in a competitive market price controls lead to shortages and a decline of output, with the output level supply determined. On the other hand, in a market with oligopolistic firms, moderate price controls do not lead to shortages, and output--which is demand determined--increases. We have, therefore, a potential explanation of the lack of shortages in the Israeli economy, that was discussed in the introduction. In order to see that this explanation is also consistent with the data reported in Table 1, we need to develop a more elaborate model, taking into account some general

equilibrium interactions. However, since it is not the purpose of this paper to study in detail the Israeli economy, but rather to point out the importance of market structure for macroeconomic performance in the presence of price controls, I first discuss in some detail the perfectly competitive case.

3. Perfect Competition

Consider a competitive economy that produces two commodities: a traded product that is exported but not consumed domestically, and a nontraded product. Their production functions are $f_i(\ell_i)$, $i=X,N$, respectively, where ℓ_i is labor use of a representative firm in sector i. The functions $f_i(\cdot)$ are strictly concave, which can be justified by the existence of firm specific inputs. Sector i is composed of n_i firms and aggregate labor supply is L.[2]

Domestic consumers have homothetic preferences over the nontraded product and the imported product. These preferences imply that the share of spending on product i, $i=N,I$ (where I stands for imports) is an homogeneos function of degree zero of consumer prices p_i, $i=N,I$. The share functions are represented by $s_i(p_N,p_I)$. In what follows prices and aggregate demand are measured in terms of foreign currency. Hence, if E represents aggregate demand, then the foreign currency value of spending on good i is $s_i(p_N,p_I)E$.

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[2]The number of firms plays no essencial role in this section. It is, however, introduced here in order to facilitate the comparison with the next section.

Foreign demand for domestic exports is $X(p_X)$. The price elasticity of export demand is assumed to be larger than one (in absolute value). The foreign supply price of domestic imports is p_I^*.

A competitive equilibrium is represented by the following conditions:

$$(1) \qquad p_I = p_I^*$$

$$(2) \qquad p_i f_i'(\ell_i) = w \,, \qquad i = X,N$$

$$(3) \qquad n_X \ell_X + n_N \ell_N = L$$

$$(4) \qquad X(p_X) = n_X f_X(\ell_X)$$

$$(5) \qquad s_N(p_N, p_I)E/p_N = n_N f_N(\ell_N)$$

$$(6) \qquad T = p_X X(p_X) - p_I^* s_I(p_N, p_I)E/p_I$$

where w is the wage rate and T is the trade balance surplus, both measured in terms of foreign currency. Equations (1)-(2) represent the competitive pricing conditions, while (3)-(5) represent clearing conditions in the labor market, the export market, and the market for nontraded goods, respectively. Equation (6) defines the surplus in the trade account. Given the level of spending E, this system provides a solution for the equilibrium values of prices (p_X, p_N, p_I), the wage rate w, labor allocations (ℓ_X, ℓ_N), and the surplus in the trade account T.

Naturally, we are interested in the effects of changes in aggregate spending. These may result from policies directed to affect it (such as taxes), or from feedbacks from price controls. However, for the purpose of this paper there is no need to model the determinants of spending. I will, therefore, treat it as exogeneous. In the unrestricted competitive equilibrium described by (1)-(6), an increase in aggregate spending brings about an expansion of the nontraded goods sector and a contraction of the exportables sector (labor shifts from the latter to the former); the price of exports and the price of nontradeables increase, with the former rising proportionately less than the latter. Imports increase and exports decline, bringing about a decline in the trade account surplus. These are the standard responses. However, in anticipation of the analysis of price controls, it is convenient to use a reduced form system, which I develop in what follows.

Let $\Pi(p_X, p_N; L)$ be the domestic product function for this economy.[3] This function embodies conditions (2)-(3), it is positively linear homogeneous in prices, concave in labor input, its partial derivative with respect to a price equals the output level of the corresponding commodity, and its partial derivative with respect to labor input equals the competitive wage rate. Now the commodity market clearing conditions (4)-(5) can be represented by:

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[3]The domestic product function is defined by:

$$\Pi(p_X, p_N; L) = \max_{\ell_X, \ell_N} \{p_X n_X f(\ell_X) + p_N n_N f(\ell_N) \mid \text{s.t. } n_X \ell_X + n_N \ell_N \leq L\}$$

$$X(p_X) = \Pi_X(p_X, p_N; L) \tag{7}$$

$$s_N(p_N, p_I)E/p_N = \Pi_N(p_X, p_N; L) \tag{8}$$

where $\Pi_i(\cdot)$ is the partial derivative of $\Pi(\cdot)$ with respect to p_i and p_I satisfies (1). Given the price of imports and aggregate spending, conditions (7)-(8) determine the price of exports and the price of nontradeables. This solution is depicted in Figure 2. The curve XX describes (7) while the curve NN describes (8). Both curves are upwards sloping; p_X/p_N declines along XX and rises along NN (see Mundell (1971, chp. 9) for a similar diagram). Point A is the equilibrium point.

Now suppose that aggregate spending increases. Then the NN curve shifts to the right and the new equilibrium point is B. At B both prices are higher, but the relative price of exports is lower. Hence, the price of exports increases proportionately less than the price of nontradeables. It is now clear from (7)-(8) that at B exports are lower and output of nontradeables is higher than at A. The increase in the price of nontradeables relative to imports increases the share of spending on imports. Together with the initial increase in aggregate spending this increases the value of imports. Since the higher price of exports reduces export earnings (under the assumption that the price elasticity of export demand is larger than one); the trade account surplus declines. Finally, since both prices of domestic output increase, the wage rate -- given by $w = \Pi_L(p_X, p_N; L)$ -- also increases.

The next step is to consider price controls. As explained in the introduction, the motivation for this analysis comes from the use of price controls in stabilization programs. This takes typically the following form. There is a currency devaluation, while domestic currency prices are not allowed to be raised by the full extent of the devaluation. The exchange rate is frozen and price controls are maintained. In this case prices of controlled products decline in terms of foreign currency. If, for example, domestic import prices and prices of nontradeables are frozen following the devaluation, then p_I and p_N decline by the same proportion, which equals the rate of devaluation. If only nontraded goods are under price controls, p_I does not change while p_N declines. The price of exportables is assumed to be uncontrolled.

If import prices are controlled, then importers cease importing, because the domestic price does not cover unit costs.[4] This generates an excess demand for imports and disequilibrium in the import market. The forced reduction in the price of nontradeables generates also disequilibrium in the

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[4]The result that under competition price controls lead to the ceasation of imports depends on the way the importing activity is modelled. I use in the text the standard modelling procedure. If, however, one assumes that importables have to be combined with domestic inputs in order to supply domestic demand (as, for example, in Sanyal and Jones (1982)), then price controls only reduce imports. This can be modelled, for example, by assuming that there are inputs specific to the import industry, so that final output of importables is given by $f_I(m)$, where m is the quantity imported and $f_I(\cdot)$ is strictly concave. Then importers maximize $p_I f_I(m) - p_I^* m$, and a reduction in p_I does not lead to $m = 0$. The model in the text assumes $f_I(m) = m$. Observe, however, that our main results do not depend on the way imports are being modelled.

market for nontraded goods, which moves into a state of excess demand. If there is no decline in desired aggregate spending, the economy experiences forced savings. In this case one expects to observe shortages of the type that appeared in Brazil after the implementation of its stabilization program in 1986. In terms of Figure 2 (in which point A describes the equilibrium without price controls), if price controls lead to the decline of the price of nontradeables to p_N^c, then the economy ends up at point C, at which there is clearing of the export market (which is not controlled) and there is excess demand for nontraded goods. Hence, price controls lead to a decline in the price of exportables, but proportionately less than the price of nontradeables. The result is that exports increase and imports decline (to zero), bringing about an improvement in the trade account. Naturally, the expansion of the export industry is associated with a contraction of the nontraded goods sector, thereby aggravating excess demand in that market. Finally, since both prices of domestic output decline, so does the wage rate $w = \Pi_L(p_X, p_N; L)$. If labor resists wage reductions, there is unemployment.

Moreover, since p_N declines proportionately more than p_X, and w declines by a weighted average of the decline in p_N and p_X, then w declines proportionately less than p_N. Therefore, if $Q(p_N, p_I)$ is the consumer price index (where the function $Q(\cdot)$ is homogeneous of degree one), the real wage rate w/Q increases as a result of price controls.

It is now easy to see that the analysis does not change much if import prices are not controlled. Naturally, in this case there is no excess demand in the market for importables, but there is still excess demand for

nontradeables. In terms of Figure 2, point C still describes the new equilibrium point. Hence, the price of exportables declines proportionately less than the price of nontradeables, exports expand and output of nontradeables contracts. The difference arises in the trade accout. Now imports do not drop to zero. In fact, given aggregate demand E, the unsatisfied demand for nontradeables spills over to imports, so that the import bill becomes $E - p_N \Pi_N(p_X, p_N; L)$. However, using the equilibrium conditions (7)-(8), in this case the trade account surplus can be represented as

$$T = \Pi(p_X, p_N; L) - E$$

Hence, since p_X and p_N decline, domestic product declines and there is a deterioration in the trade account. Now w/p_N increases but w/p_I declines, so that w/Q may increase or decline.

Naturally, if the initial situation is one with effective price controls, then partial relaxation of these controls has opposite effects. These are presented in the first row of Table 2 for the case in which import prices are also controlled (which is the relevant case for Israel).

The next issues to be considered concern the effects of shifts in aggregate spending and labor supply in the presence of price controls. First, consider aggregate spending. If both imports and nontradeables are controlled, then given that the price controls are effective, small changes in aggregate spending do not affect prices or sectoral allocations, nor do they affect the trade account. Rather, an increase in aggegate spending brings

about larger forced savings while a decline in aggregate spending brings about smaller forced savings. If import prices are not controlled, however, changes in aggregate spending do not affect prices and resource allocation as well, but this time they do affect the trade account, because all of the change in aggregate spending is reflected in imports. Hence, an increase in aggregate spending increases imports, bringing about a decline in the trade account surplus.

Since (7) is satisfied also in the presence of price controls, an increase in labor input L, which leads to an excess supply of exportables if prices do not change, brings about a decline in the price of exports (in terms of Figure 2, the curve XX shifts downwards, and so does point C) and an expansion of output in the exporting industry. The wage rate $w = \Pi_L(p_X, p_N; L)$ declines as a result of both the increase in L and the decline in p_X. Hence, the real wage rate w/Q also declines. Therefore, output of nontradeables rises (see (2) for i=N), thereby reducing the excess demand for them. Imports do not change if import prices are controlled and they decline if import prices are not controlled (due to the fact that additional supply of nontradeables reduces the spillover of excess demand into importables), while export earnings increase. The result is an improvement in the trade account. Naturally, the same results obtain if the wage rate is reduced and employment is allowed to adjust. These results are summarized in the upper part of Table 2 for the case in which import prices are also controlled.

4. Imperfect Competition

Now consider an identical economy, except for the fact that the nontraded and the importable products are differentiated.[5] Let there be n_I varieties of the importable, each one being imported by a different agent. A typical exporter has the exclusive right to market one variety. The number of importers and producers of nontraded varieties is constant in the short run, which is the relevant time span for the current discussion. Consumer preferences for varieties are symmetrical and of the Spence-Dixit-Stiglitz type (see Spence (1976) and Dixit and Stiglitz (1977)). Hence, the elasticity of demand for a single variety in sector i, $i=N,I$, is constant, say ϵ_i, and marginal revenue is $\alpha_i p_i$, where:

$$\alpha_i = 1 - \frac{1}{\epsilon_i} .$$

Since ϵ_i is larger than one, α_i is positive and smaller than one (see the Appendix for a precise derivation of the demand elasticities and the spending share functions).

The market for importables is oligopolistic, and so is the market for nontraded goods. A typical competitor in one of these markets sets its price, taking as given prices of rivals, total spending on the product, and the wage rate. Hence, prices are set so as to equate marginal revenue to marginal costs. Defining $\alpha_X \equiv 1$, the pricing equations (1)-(2) are now replaced by:

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[5] I could have assumed that the exportable is also a differentiated product, but this would have added no new dimension to the problem at hand.

$$(1') \qquad \alpha_I p_I = p_I^*$$

$$(2') \qquad \alpha_i p_i f_i'(\ell_i) = w, \qquad i = X,N$$

while conditions (3)-(6) remain valid. This describes the equilibrium without price controls.

As before, it is possible to use a reduced form representation of this equilibrium by means of the function $\Pi(\cdot)$, despite the fact that it no longer describes domestic product (see Helpman (1984)). The counterparts of (7)-(8) are:

$$(7') \qquad X(p_X) = \Pi_X(p_X, \alpha_N p_N; L)$$

$$(8') \qquad s_N(p_N, p_I)E/p_N = \Pi_N(p_X, \alpha_N p_N; L)$$

where $\Pi_N(\cdot)$ stands for the partial derivative of $\Pi(\cdot)$ with respect to the second argument (i.e., $\alpha_N p_N$).

Figure 2 can be used again, with XX representing points that satisfy (7') and NN representing points that satisfy (8'), and the intersection point A describing the resulting equilibrium. An increase in aggregate demand shifts the NN curve to the right and the equilibrium point to B. The results are the same as in the competitive economy: exports decline, output of nontraded goods expands, prices of exportables and nontradeables increase, with the former rising proportionately less. The value of exports

declines while the value of imports increases, and there is a decline in the trade account surplus.

Now consider price controls. Suppose that a devaluation and controls on nominal prices lead to an equiproportional decline of p_N and p_I.[6] As long as p_I remains larger than p_I^*, importing remains a profitable activity (remember the discussion in Section 2 and that initially $p_I = p_I^*/\alpha_i > p_I^*$), so that importing does not cease. Moreover, under these circumstances it is profit maximizing to import as much as possible, so that imports are demand determined. Similarly, a cut in the price of nontradeables plus price controls make their producers supply the demanded quantity at the new price. This is profit maximizing for a monopolist. Hence, the output of nontradeables is also demand determined. All this means that conditions (3)-(6) remain valid in the face of price controls. (If $p_I < p_I^*$, imports cease, and (6) is replaced with $T = p_X X(p_X)$). Consequently, (5) implies an expansion of output in the nontraded goods sector, leading (via (3)) to a contraction of the exportables sector. The contraction of exports requires a higher export price (see (4)), leading to lower export revenue. Point C' in Figure 2 describes the resulting price configuration. Since imports increase while export revenue declines, the trade accout worsens. The effect on wages is found by observing that price controls invalidate (2') for nontradeables only, and that it remains valid for exportables. Therefore, a higher price of exportables and lower employment in their production requires a higher wage rate w, and implies a higher real wage rate w/Q.

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[6]The reader is encouraged to also consider the case in which price controls apply only to nontradeables.

The economic story that emerges from this analysis is as follows. An equiproportional reduction of import prices and prices of nontradeables expands demand for imports and for nontradeables. Monopolistic suppliers find it profitable to supply the entire demand. Consequently, producers of nontradeables increase their demand for labor, thereby bidding up the wage rate. The wage hike increases marginal costs in the production of nontradeables and exportables. However, as long as marginal costs of producing the higher demand of nontradeables does not exceed the controlled price, the incentive to supply the entire demand does not change. In the export sector increased marginal costs lead to lower output and a higher price. Naturally, the export surplus declines.

These results of price controls are just the opposite from the results for a competitive economy. The main reason for the difference is that while under price controls in a competitive economy output is supply constrained, in an oligopolistic environment with price setting firms it is demand constrained, as explained in Section 2. Since price reductions increase demand and reduce competitive supply, they are contractionary in a competitive environment and expansionary in an oligopolistic environment. The results for a relaxation of price controls, which are opposite to the results of their imposition, are reported in the fourth row of Table 2.

Now consider the results of an increase in aggregate spending in the presence of price controls. Remember that in a competitive environment this leads to only larger forced savings when import prices are also under control, and to only larger imports if import prices are not under control. In the

current setup things differ substantially. Higher aggregate spending brings about the expansion of the nontraded sector (see (5)) and the contraction of the exporting sector (see (3)). Consequently, the price of exportables rises and import revenue declines. Higher aggregate spending also increases imports, so that the export surplus declines. The wage rate w rises (see (2') for $i=X$), and so does the real wage rate w/Q. The same results obtain when import prices are not controlled.

Next consider an increase in labor use L while the price controls remain effective. It is clear that in this case output of nontradeables does not change, because it is demand determined and demand has not changed (see (5)). Hence, all of the additional labor is absorbed in the exporting sector (see (3) and (4)), bringing about an expansion of exports and a decline of its price. Imports do not change. The wage rate declines, as one can see from (2) for $i=X$, and so does the real wage rate w/Q. Clearly, if the source of the disturbance is shifted from employment to wages, then an exogeneous decline in wages with an endogenous employment adjustment will also produce the above described results. The results for the oligopolistic market structure are summarized in the lower part of Table 2.

It is now clear that in the presence of several industries, some of which are competitive and some of which are oligopolistic, the net effect of price controls will depend on the relative size of the competitive part of the economy. In an economy with high concentration rates and a few small competitive sectors the outcome will be closer to what has been described in this section. On the other hand, in an economy with a few highly concentrated

industries and many large competitive sectors the outcome will be closer to what has been described in the previous section.

5. An Illustration

The usefulness of our theoretical analysis can be demonstrated by applying it to the interpretation of the Israeli data reported in Table 1. Recall that the Israeli program consisted of a sharp reduction in aggregate spending, a devaluation followed by a fixed exchange rate, and price and wage controls. Due to an agreement with the labor unions, real wages were scheduled to increase after a period of several months. One can see in the first column of the table that indeed during the third quarter of 1985 aggregate spending declined substantially, but that it began to increase in the fourth quarter. Real wages also declined sharply in the third quarter, remained approximately at the same level in the fourth quarter, and rose sharply in the first quarter of 1986. On the other hand, employment dropped in the third quarter, and began to rise thereafter. Finally, exports rose initially and declined subsequently, while imports declined initially and increased subsequently.

The competitive as well as the noncompetitive model predict that a reduction in aggregate demand without price-wage rigidities brings about an expansion of exports, contraction of imports, and a decline in the wage rate. If the wage rate is not allowed to decline by the full extent required for full employment, the employment level declines. This is one reason that wage controls were introduced; i.e., to moderate the unemployment effect (another

reason was to reduce aggregate demand via lower wages).[7] Hence, the initial effects of the program can be explained by both models, provided the price controls were not effective or had only a small effect. Indeed, there are some who might argue that the initial sharp reduction of aggregate demand brought about equilibrium prices below the imposed ceilings. It is, however, reasonable to argue on the basis of the intensive activity of the Ministry of Industry and Commerce in the implementation of price controls -- including law suits that were filed against defiant sellers -- that even if the price controls were not binding initially, thay have certainly become binding in face of rising spending in the following months.

Taking the view that price controls were effective starting at least with the fourth quarter of 1985, it is clear that the competitive model discussed in Section 3 does not explain the data in the table. Remember that in the competitive model with price controls an increase in desired aggregate spending does not change sectoral employment levels, prices or wages. All of the additional desired spending translates into either forced savings or higher imports. If, in addition, there is an exogeneous wage increase, employment declines. Hence, the reported increase in aggregate spending, the real wage rate, and employment are inconsistent with this model (see the upper part of Table 2). Moreover, there is no evidence of significant shortages during that period, which is also inconsistent with the competitive model.

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[7] Another important argument for price-wage controls was to eliminate the inertia from the inflationarry process, an issue not addressed in this paper. See Bruno (1986).

Now consider the alternative specification, with price setting sellers operating in oligopolistic markets. Given price controls, a rise in aggregate spending brings about an expansion of the nontraded sector and a contraction of the exporting sector. All demand is satisfied, so that there are no shortages. Exports decline and imports increase. The price of exportables increases and so does the wage rate that maintains a constant level of employment. If the wage rate does not rise by the extent required to secure constant employment, employment increases, thereby moderating the decline of exports. This description is consistent with the data, provided the increase in spending dominates the other effects (see the lower part of Table 2). Naturally, this is also consistent with the lack of shortages. The evidence on the degree of concentration in Israeli manufacturing industries supports the assumption of substantial monopoly power (see Bregman (1986, chp. 3)).

It seems, therefore, that the noncompetitive model better explains this episode. Nevertheless, one cannot be confident that the model constructed in Section 3 is indeed the most approapriate for the Israeli economy. However, my results make the point that an analysis of macroeconomic performance under price controls has to take explicit account of market structure.

APPENDIX

This Appendix is devoted to the specification of preferences, based on Spence (1976) and Dixit and Stiglitz (1977), which justifies a constant elasticity demand function for a representative seller. The current presentation relies heavily on Helpman and Krugman (1985, ch.6).

The utility function is:

$$(A.1) \qquad U = U[u_N(\cdot),\ u_I(\cdot)]$$

where $u_i(\cdot)$ is the subutility of product i. The function $U(\cdot)$ is homothetic. The subutility function $u_i(\cdot)$ takes the form:

$$(A.2) \qquad u_i(D_{i1},\ D_{i2},\ldots,D_{in_i}) = \left(\Sigma_{j=1}^{n_i} D_{ij}^{\beta_i}\right)^{1/\beta_i},\quad 0 < \beta_i < 1$$

where D_{ij} is consumption of variety j. If E_i represents aggregate spending on product i, then the variety specific demand functions are:

$$(A.3) \qquad D_{ij} = \frac{p_{ij}^{-\sigma_i}}{\Sigma_{h=1}^{n_i} p_{ih}^{1-\sigma_i}} E_i,\quad \text{for all } i,\ j,\ \text{where } \sigma_i = \frac{1}{1-\beta_i} > 1.$$

The seller of variety j of product i takes E_i and p_{ih}, $h \neq j$, as given. Therefore, his price elasticity of demand is:

$$\epsilon_i = \sigma_i + (1 - \sigma_i) \frac{p_{ij}^{1-\sigma_i}}{\sum_{h=1}^{n_i} p_{ih}^{1-\sigma_i}}.$$

In a symmetric equilibrium $p_{ij} = p_i$ for all j, and

$$\epsilon_i = \sigma_i - (\sigma_i - 1)/n_i, \quad i = N, I.$$

Hence, the elasticity of demand is constant.

Moreover, in this case (A.3) implies that $D_{ij} = D_i$, which together with (A.2) implies:

$$u_i = n_i^{1/\beta_i} D_i = n_i^{1/\beta_i - 1} E_i/p_i. \tag{A.4}$$

The allocation of aggregate expenditure to products can now be determined from:

$$\max U\left[n_N^{1/\beta_N - 1} E_N/p_N,\ n_I^{1/\beta_I - 1} E_I/p_I\right]$$

$$\text{s.t.} \quad E_N + E_I \leq E.$$

Homotheticity of $U(\cdot)$ implies that there exist share functions $s_i(p_N, p_I)$, $i = N, I$, such that the solution to this problem can be represented by:

$$E_i = s_i(p_N, p_I)E$$

with $s_i(\cdot)$ being a homogeneous function of degree zero. Naturally, the share functions depend on $U(\cdot)$ and on n_i and β_i, $i = N, I$.

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TABLE 1
ISRAEL

	Index of aggregate spending[1]	Exports[2]	Imports[2]	Index of real wage rate[3]	Employed persons[4]
1985-I	356	1335	1591	126	1364
II	359	1397	1623	119	1352
III	320	1432	1497	102	1333
IV	331	1379	1673	101	1350
1986-I	344	1377	1714	115	1354

1 Aggregate spending is calculated as private real consumption plus public real consumption plus real investment. The data is seasonally adjusted.
Source: Table B-1 from **Main Israeli Economic Data**, Research Department, Bank of Israel (September 2, 1986).

2 Millions of dollars in 1980 prices. Exports excluding diamonds. Imports excluding diamonds and fuel.
Source: Table C-5 from **Main Israeli Economic Data**, Research Department, Bank of Israel (September 15, 1986).

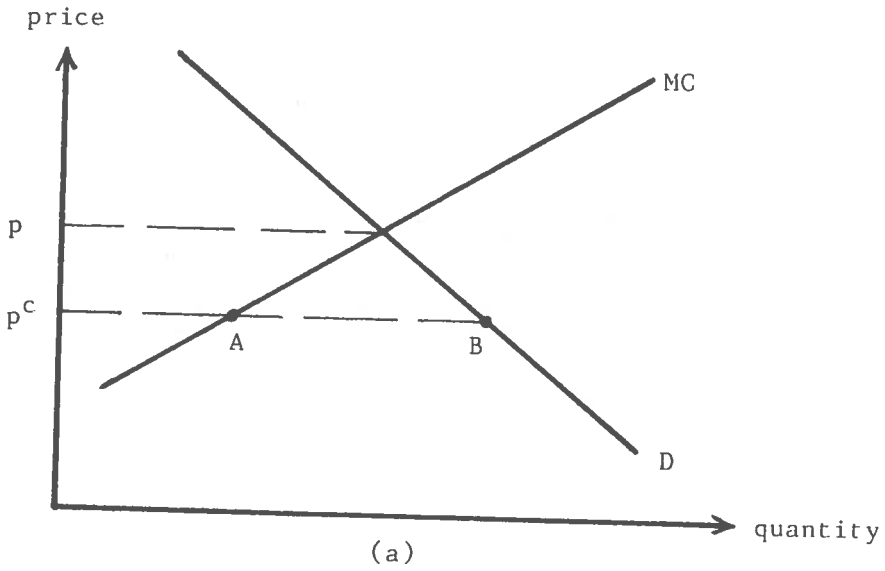
3 Monthly averages.
Source: Table E-4 from **Main Israeli Economic Data**, Research Department, Bank of Israel (September 8, 1986).

4 Thousands, seasonally adjusted.
Source: Table E-5 from **Main Israel Economic Data**, Research Department, Bank of Israel (September 12, 1986).

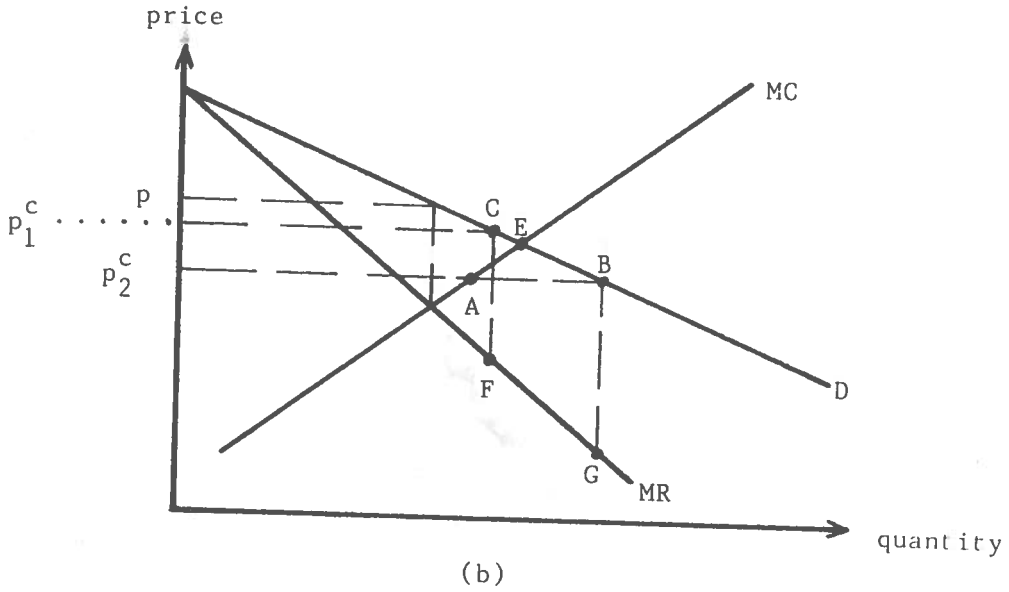
TABLE 2

		exports	imports[1]	real wage rate w/Q
Perfect Competition	Release of Price Controls	-	0	-
	Desired Spending Increase	0	+	0
	Employment Increase	+	-	-
Oligopolistic Cmpetition	Release of Price Controls	+	-	-
	Desired Spending Increase	-	+	+
	Employment Increase	+	0	-

[1]Assuming that import prices are also controlled.


price
MC
p
p^c
A
B
D
quantity

(a)


price
MC
p_1^c
p
p_2^c
C
E
B
A
F
D
G
MR
quantity

(b)

Figure 1

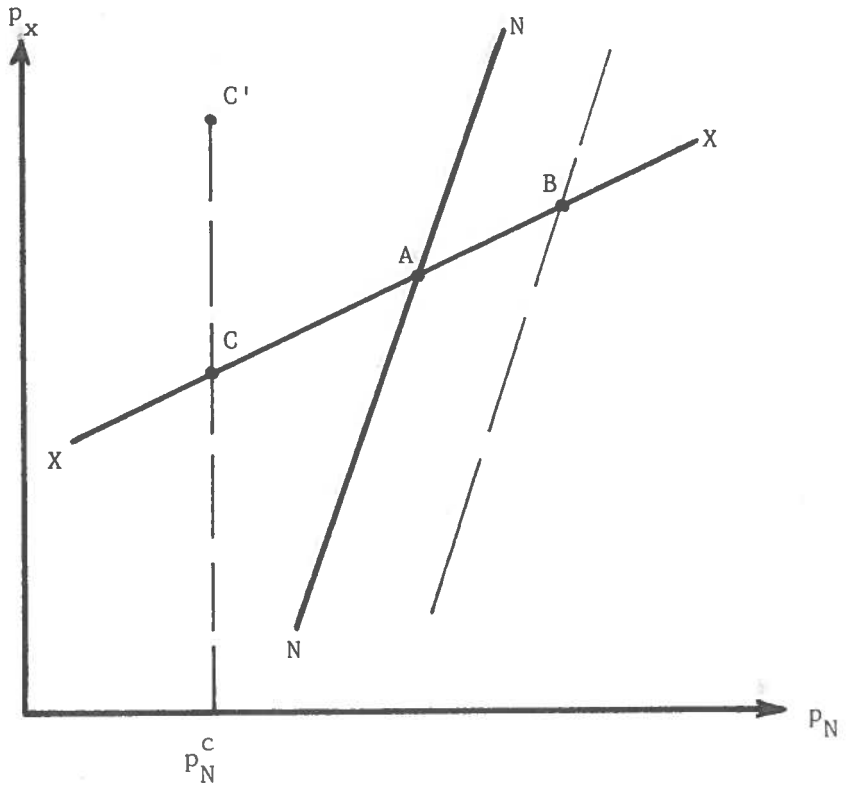


Figure 2