IMPACT OF DEMOGRAPHIC CHANGE ON INDUSTRY STRUCTURE IN AUSTRALIA

A joint study by the Australian Bureau of Statistics, the Department of Employment and Industrial Relations, the Department of Environment, Housing and Community Development, the Department of Industry and Commerce and the Industries Assistance Commission

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A DISAGGREGATED MEASURE OF PRESSURE OF DEMAND : ITS USE IN IMPORT DEMAND ESTIMATION

by

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Preliminary Working Paper No. OP-16 Melbourne October 1977

The views expressed in this paper do not necessarily reflect the opinions of the participating agencies, nor of the Australian government.

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by

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1. INTRODUCTION

It is widely recognized that the level of imports is affected by the pressure of demand in the economy. This activity related effect on imports is due to changes in factors (in the domestic economy) such as waiting times, trade credit availability, bonuses and other non-price inducements which are dependent upon the level of orders relative to the capacity of firms to produce. The effect most commonly tested for in import-demand estimation is associated with high levels of activity : when the level of orders approaches or exceeds the productive capacity of the economy, firms increase their waiting times inducing users of the domestic good to switch to imports. This phenomenon is often termed the 'spillover effect.' We shall consider the spillover effect and another pressure of demand effect associated with low levels of activity in Section 2.

In order to test for the spillover effect, economists have devised various measures of domestic pressure of demand which have been included in their estimating equations. However, the estimation of demand functions for Australian imports has been hampered by a lack of industry specific measures of pressure of demand for use in disaggregated studies. Gregory and Martin [12, p. 13] have commented as follows :

"In principle, a separate measure of the variations in the scarcity of local supplies is needed for each tariff category. In practice, the lack of statistics which prevent the matching of import flows with quarterly variations in the equivalent local production also effectively prevent the calculation of such measures. Consequently it has been necessary to employ an economy-wide statistic, the level of unfilled vacancies divided by the number of unemployed."

In addition, the fact that the measures of pressure of demand most commonly used in Australian import demand estimation (at the aggregate and industry level) are based on aggregate employment statistics (which are readily available) indicates that there is a general paucity of alternatives. For example : Talbot [26] and Higgins and Fitzgerald [13] used the number of vacancies registered with the Commonwealth Employment Service (CES) less one per cent of the workforce; Norton, Jackson and Sweeney [20] and Norton and Henderson [19] used the number of persons registered as unemployed with the CES; Kumar and Ironmonger [16] used the difference between registered vacancies and the number of persons registered as unemployed as a proportion of the former; and Cameron [8] used the ratio of the value of current demand to the value of full employment production where the value of full employment production is calculated by multiplying the value of actual production by an estimate of the ratio of the size of the workforce to the actual level of employment.

These types of statistics are subject to serious measurement error. The number of unfilled vacancies is an unreliable estimate of job availability because no information relating to unnotified vacancies is available. The level of unemployment is unreliable because not all unemployment is recorded, there being little incentive for those not entitled to unemployment benefits to register. There are other difficulties in using the level of unemployment as a measure of pressure of demand : employed labour is often underutilized during recessions - employers may temporarily introduce short-time working, and in addition they may hoard labour in anticipation of an upturn in demand, so that registered unemployment is an incomplete index of the underutilization of labour. It would, however, be valid to use registered unemployment as an index of the underutilization of labour if there were a constant relationship between registered unemployment and other types of unemployment (mentioned above) over time. Taylor and McKendrick [27] present evidence that the relationship is not constant. Furthermore, although the scarcity of labour (if it could be accurately measured) may be a reasonable measure of economy-wide pressure of demand, it may not perform as well in disaggregated import demand studies (say at the industry level) because production bottlenecks may be caused by other factors such as capital constraints or scarcities of intermediate or raw material inputs.

The principal aim of this paper is to provide disaggregated quarterly measures of Australian pressure of demand which can be used in import-demand estimation. These are derived from a question in the Survey of Industrial Trends which is conducted jointly by the Associated Chambers of Manufactures of Australian and the Bank of New South Wales (ACMA-BNSW). The secondary aims of the paper are to consider in some detail the question of what is being measured when a pressure of demand proxy is used in the econometric estimation of import-demand functions and to provide an empirical framework for testing associated hypotheses.

2. THE EFFECT OF PRESSURE OF DEMAND ON IMPORTS

Pressure of demand in an economy can be measured by the difference between the potential supply of goods and services (determined by factors such as the stock of capital equipment, the state of technical knowledge, the skill and availability of labour and the supply of raw materials) and the actual demand for goods and services (Taylor and McKendrick [27]).[1] When the level of demand approaches and exceeds the productive capacity of the economy, import demand increases independently of prices. The usual explanation provided for this phenomenon is that under conditions of excess demand, producers have difficulty in meeting their orders at ruling prices. However, recognizing the short-term nature of this increased demand, producers are reluctant to increase prices and prefer to ration output by increasing delivery lags, with the direct effect of increasing queue lengths. Thus the user pays two prices for the goods : the quoted price and the cost of queuing. In an attempt to minimize total cost, the customer may turn to imports. When this occurs, import demand is no longer fully explained by nominal prices and activity. This is the effect most commonly tested for in import-demand estimation, and shall be referred to as the "positive" pressure of demand effect. For a detailed discussion, see Leamer and Stern [17, pp. 13-14] and Gregory [11].

Numbered footnotes commence on page 38.

It has also been suggested that when domestic output is less than normal, import demand is retarded because domestic producers offer favourable credit terms, rebates, prompt delivery bonuses and other non-price inducements which tend to reduce import demand. This shall be referred to as the "negative" pressure of demand effect. For a detailed discussion, see Parrish and Dillulo [21] and Ahluwalia and Hernandez-Cata [1].

It is clear from the preceding discussion that the positive and negative pressure of demand effects are short-term, mutually exclusive phenomena. Assuming that the measure of pressure of demand increases as the pressure of demand increases, we would expect the positive pressure of demand effect on imports to manifest itself when the pressure of demand measure exceeds a critical value (which reflects the "normal" level of domestic output) and to be zero below this value. Observations which are below this threshold represent a below "normal" level of operation on the part of domestic producers, and would therefore represent values of the measure for which the negative effect could be operating.

Thus, if the threshold value is known, the pressure of demand measure could be partitioned to give two pressure of demand series, one which could be used to test for the positive effect, and the other, the negative effect.[2] If the pressure of demand proxy is not partitioned, the estimated parameter does not a priori represent the positive effect (or spillover effect) as is commonly believed, but some composite of the two effects. Apart from the work of Alaouze, Marsden and Zeitsch [3], and Alaouze [4], the author is not aware of any other import demand studies in which the two effects are estimated separately.

3. AN EMPIRICAL FRAMEWORK

The preceding discussion may be illustrated algebraically. Consider the import-demand function :

$$M = f(\underline{X}) + \Theta Q \quad , \tag{1}$$

where:

- M is the level of imports ;
- $f(\ )$ is a linear function ;
- Q is the pressure of demand proxy ;
- $\underline{X}$ is a vector representing other explanatory variables. Typically, these include the ratio of domestic to import prices, a measure of activity and seasonal dummies ;
- Θ is the coefficient of the pressure of demand proxy. By hypothesis, $\frac{\partial M}{\partial Q} \gtrless 0$, which implies that $\Theta \gtrless 0$. (Some or all of the variables listed may also be in logarithm form.)

Consider the following orthogonal partitioning of Q , based on Q^* (the threshold value of Q above which the positive effect is hypothesised to operate), which can be used to produce proxies for the positive and negative pressure of demand effects :

$$QP = \begin{cases} 0 & Q \leqslant Q^* \\ Q & Q > Q^* \end{cases} , \tag{2}$$

where QP is the positive pressure of demand proxy, and

$$QN = \begin{cases} Q & Q \leqslant Q^* \\ 0 & Q > Q^* \end{cases} , \tag{3}$$

where QN is the negative pressure of demand proxy. From the method of partitioning,

$$Q = QP + QN \quad . \tag{4}$$

Substituting for Q from (4) into (1) :

$$M = f(\underline{X}) + \Theta(QP + QN) \quad . \tag{5}$$

From (5) it is evident that estimating the level of imports using an unpartitioned pressure of demand proxy imposes the restriction that the positive and negative pressure of demand effects on imports are equal. Equation (5) is easily modified to permit the independent estimation of the positive and negative pressure of demand effects :

$$M = f(\underline{X}) + \Theta_1 QP + \Theta_2 QN \quad , \tag{6}$$

where Θ_1 and Θ_2 are the coefficients of the positive and negative pressure of demand proxies respectively. Since $\frac{\partial M}{\partial QP} \gtrless 0$ and $\frac{\partial M}{\partial QN} \gtrless 0$, $\Theta_1 \gtrless 0$ and $\Theta_2 \gtrless 0$.

Specification (6) permits the detection of a significant positive pressure of demand effect in the absence of a negative pressure of demand effect and vice versa. In the event that the estimates of both Θ_1 and Θ_2 are significantly different from zero, this formulation permits the testing of the hypothesis that the difference between the coefficients is significant (this test requires the estimated variances and the covariances of the two parameters).

Two approaches could be used to select a plausible value of Q^* which could be used to produce the partitioned series. First, the nature of the pressure of demand proxy should suggest a plausible value for Q^* . The alternative approach is to use a grid-search procedure to estimate Q^* .

4. THE PRESSURE OF DEMAND MEASURE

In this section we shall construct a disaggregated measure of the pressure of demand which is based on all the important factors which affect the ability of domestic producers to expand output. This information is available from the ACMA-BNSW Survey of Industrial Trends. The survey is distributed in the first two weeks of the last month of each quarter and the questions are designed to obtain an assessment of current economic conditions, and to obtain information about current and anticipated changes in key economic indicators.[3]

The survey results were originally classified into eight industry groups; however the classification was expanded into twelve industry groups based on the ASIC classification in the June quarter of 1974. This does not constitute a break in the series because the additional classifications are based on industry groups contained in the original classification. In addition, the industry coverage has remained the same and the number of respondents for each question is listed. Therefore, series based on the original eight-way classifications can be calculated for the period after March, 1974.[4]

In the survey, producers are asked to identify which single factor is most limiting their ability to increase production. The respondents have a choice of six categories : (i) orders, (ii) materials, (iii) finance, (iv) labour, (v) capacity, (vi) other. The survey is available in a form which gives the proportions of replies for each category classified by industry groupings and in total. The replies to this question given by manufacturers in an industry should be related to the ability of the industry to meet its orders and hence waiting times and other non-price factors quoted to the users of its output.

Let us denote the proportion of replies which indicate that orders are limiting production as P and the proportion of all others as Q , $(P + Q = 1)$. The proportion of firms indicating that orders are not limiting their ability to expand production, Q , is an estimate of the proportion of firms in an industry operating at full capacity.[5] We would therefore expect Q to be a reasonable measure of the ability of an industry to satisfy the demands for its output, hence Q can be used as a measure of pressure of demand in an industry.

When more than half the respondents indicate that factors other than orders are limiting their ability to increase production, we would expect the effects of production bottlenecks to be felt by the users of the industry's output. Therefore we shall use Q when $Q > P$ (that is $Q > 0.5$) as a measure of the positive pressure of demand. Similarly, we can use Q , when $Q \leqq P$ (that is $Q \leqq 0.5$) as a measure of the negative pressure of demand. The method outlined in Section III can be used to partition the Q series into a positive pressure of demand series (QP) and a negative pressure of demand series (QN) , using the threshold value $Q^* = 0.5$.

The values of Q for the responses to the Survey disaggregated into the eight industry classifications and for total responses for the period March 1966 to March 1977 are listed in Appendix 1. The disaggregated series are plotted in Figure 1. Some confidence in the choice of $Q > 0.5$ for the operation of the

FIGURE 1 THE DISAGGREGATED PRESSURE OF DEMAND MEASURES

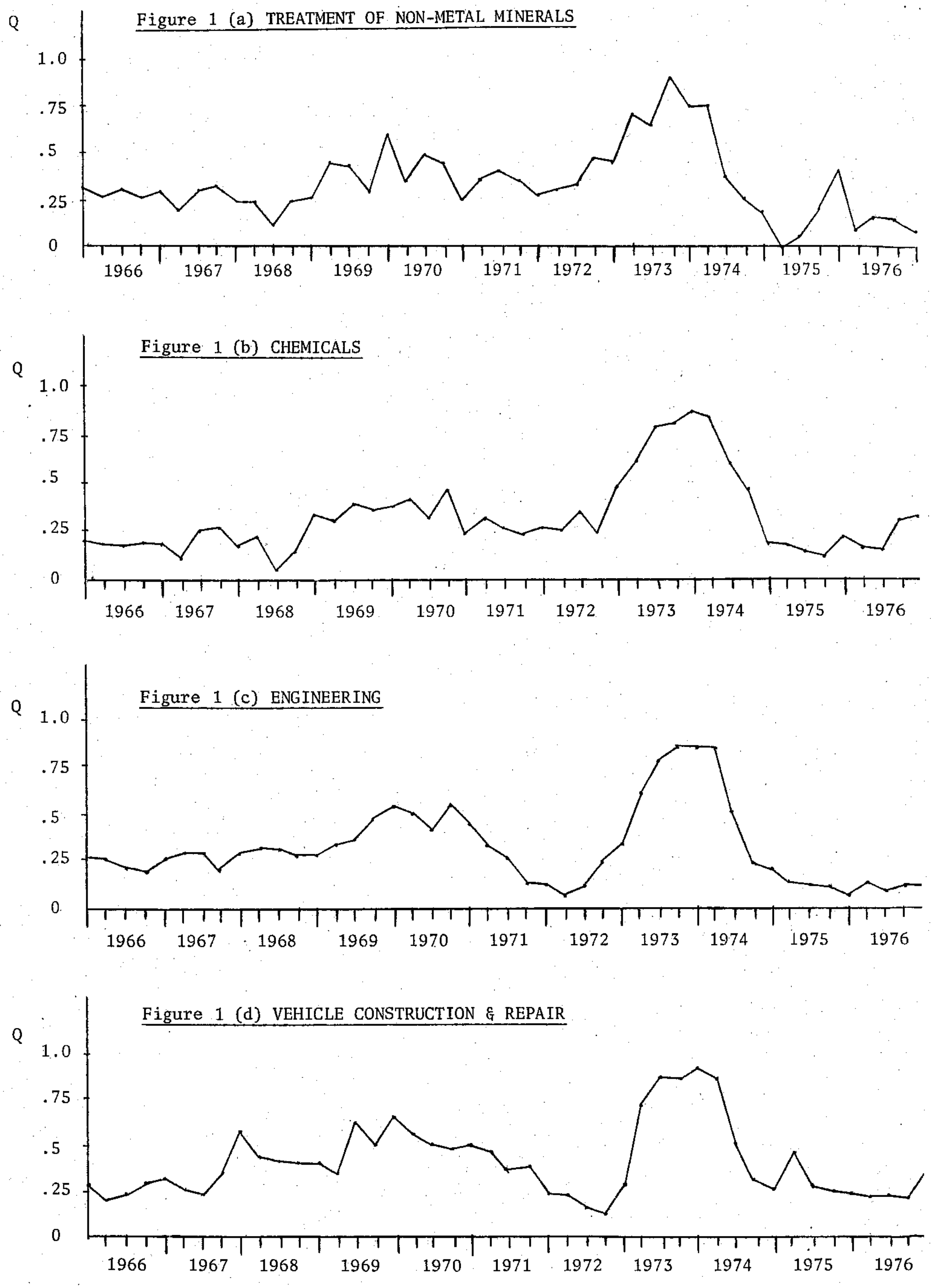
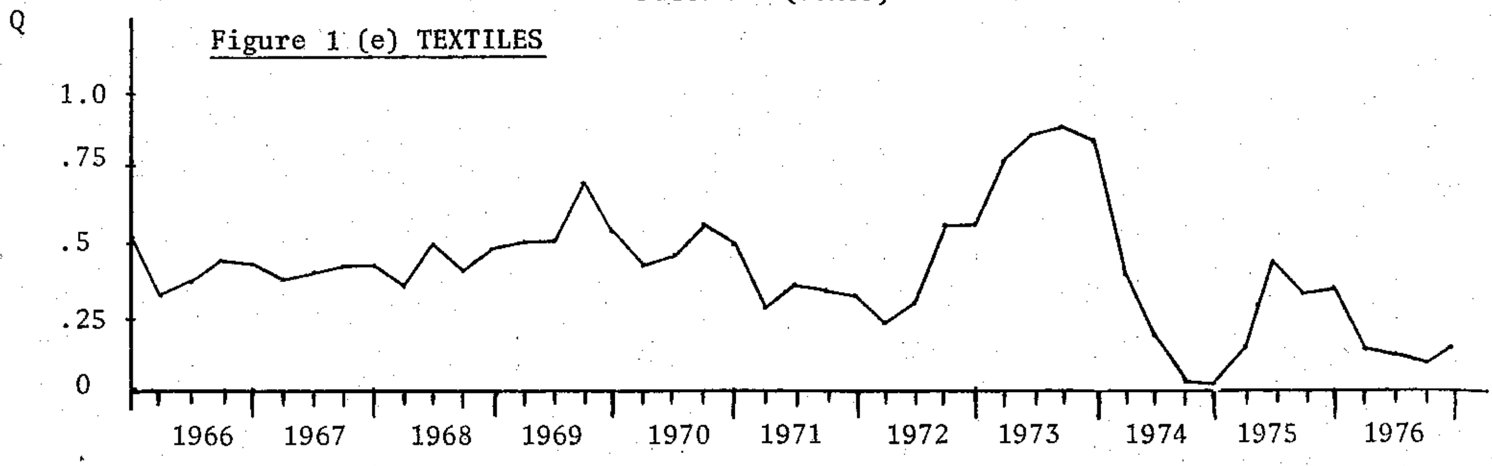
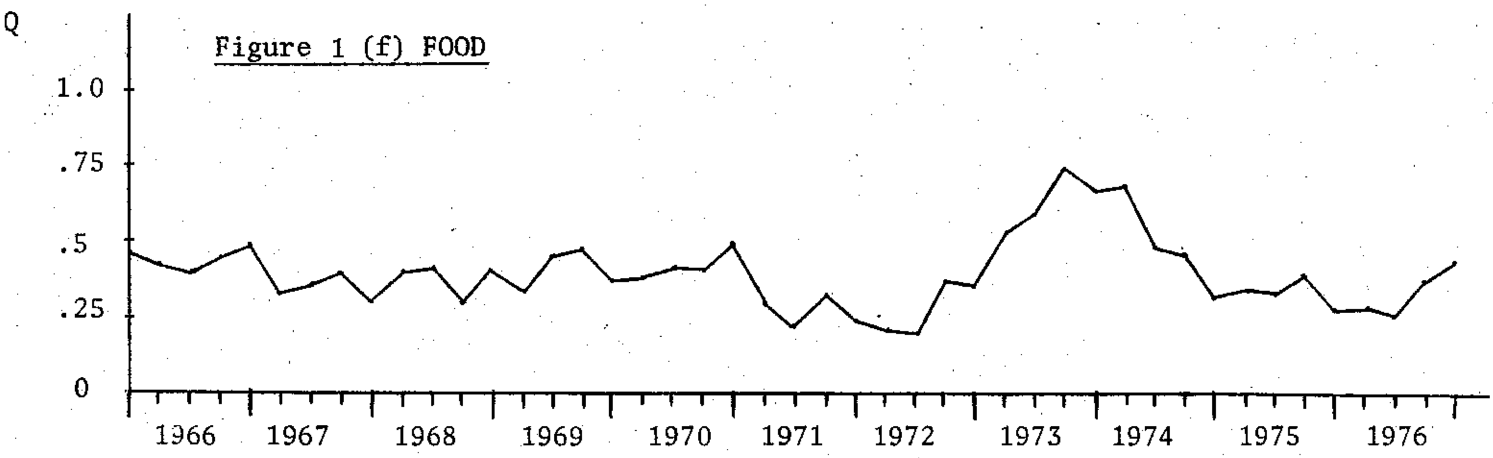
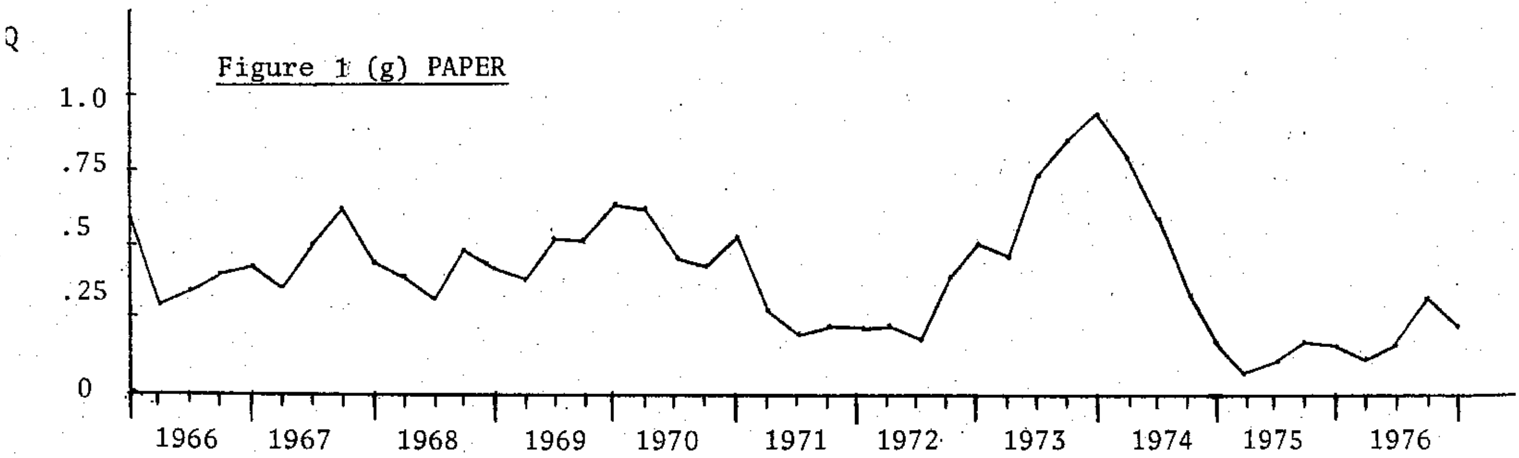
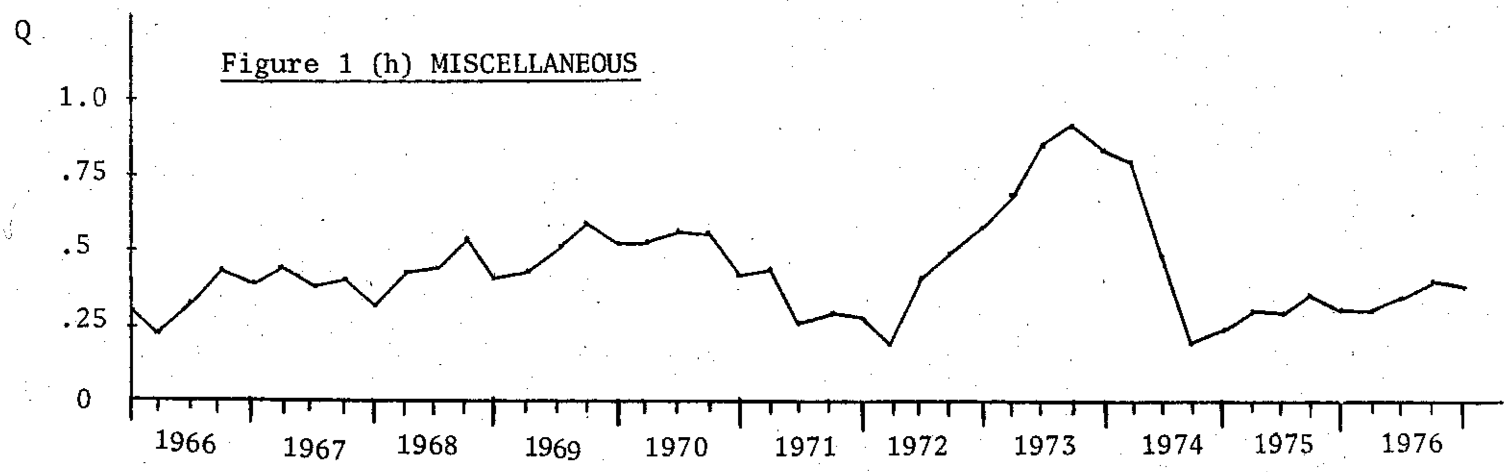


FIGURE 1 (contd)









positive pressure of demand effect may be gained from Figure 1. This shows that the disaggregated measures all identify the quarters September 1973 to March 1974 as periods of high domestic pressure of demand; it is for this period that Barry and Guille [6, p. 142] conclude that the economy was "bumping along the full capacity ceiling".

The measure of pressure of demand we have developed has many advantages : it is easy to construct, independent of trends in the sizes of individual industries and, most importantly for the purpose of regression analysis, it contains more independent variation than capacity measures constructed from activity variables. This latter feature lessens the likelihood of multicollinearity between the activity variable and the pressure of demand variable.[6]

A possible limitation of the measure is that it is constructed from responses which are not weighted in any way, and the firms to whom the questionnaires are sent are selected to achieve industrial and geographic coverage. No scientific sampling process is attempted. This means that in forming the Q index, the response of a small firm is given as much weight as a large firm. Despite this limitation, the empirical examples of Section 4 provide empirical evidence that the measures perform well in the import demand equations.

Unfortunately, there are no readily available disaggregated measures with which we can compare Q . Because the aggregate measure is simply an unweighted sum of the number of respondents indicating that factors other than orders are limiting production divided by total responses, it is not particularly suitable for comparison with other aggregate measures constructed from components which are properly weighted. Despite this, the aggregate Q measure is significantly correlated with an aggregate Wharton index of capacity utilization.[7] The simple correlation coefficient of the aggregate Q measure and the Wharton index is 0.70, which is significant at the one per cent level. Since the ACMA-BNSW Survey is distributed in the last month of each quarter a more relevant comparison may be made using the Wharton index for the last month of each quarter. This correlation is slightly higher, 0.72 (also significant at the one per cent level). These results are reassuring, because the Wharton index is generally regarded as the best measure of pressure of demand available (Taylor and McKendrick [27]).

Apart from the fact that the aggregate Q index is unweighted, there is another source of divergence between the measures which arises from the mode of construction of the Wharton index. Briefly, the construction of a Wharton index involves fitting straight lines between peaks in a time-series plot of output. The peaks that are selected represent periods when industry was operating at a high level of capacity utilization. The capacity measure is the ratio of actual output to the trend-line output in a period. Consequently, the periods in which the chosen peaks occur represent periods for which the Wharton index indicates one hundred per cent capacity utilization. Taylor and McKendrick [27] identify two major problems with this index : (i) the selected peak output levels may not be of the same strength and may not in fact represent full-capacity output, (ii) the technique cannot work when the pressure of demand in an economy is low for a length of time, and there are no prominent peaks.

The first of these difficulties indicates that the Wharton index is an inaccurate measure of the intensity of the positive pressure of demand effect.

From Figure 1 it is clear that the bottleneck of 1973/74 dwarfs those of earlier periods; however a Wharton index would attribute the same intensity to the earlier but smaller peaks. For example, the Wharton index used in the comparison above shows one hundred per cent aggregate capacity utilisation in the months August 1969 and September 1973.

5. A TRANSFORMED MEASURE

There is another important consideration in constructing a pressure of demand proxy for use in import demand estimation. In most empirical work, the effect of domestic pressure of demand on the demand for imports is usually written as a linear or logarithmic function of the pressure of demand proxy. For these functional forms it may be inappropriate to use the pressure of demand measure directly as a pressure of demand proxy because we would not expect the effect of increases in pressure of demand on imports necessarily to be linear or linear in logarithms. This could be especially important if the pressure of demand measure is bounded. For example, if the pressure of demand measure is bounded between zero and one, we would not expect a one per cent increase in the measure to have the same effect on imports when the measure equals 0.6 as say when the measure equals 0.8; this is because whereas the pressure of demand measure is bounded, the factors for which it is a proxy are not.

The Q measure we have derived is bounded between zero and one; however it can readily be transformed to yield a pressure of demand proxy which is non-linear in Q and unbounded. A suitable transformation is the following :

$$Z = (Q - Q^*)/(1 - Q) \quad ; \quad (Q < 1) \cdot \quad (7)$$

This transformation has the following mathematical properties : as $Q \to 1$, $Z \to \infty$; as $Q \to 0$, $Z \to -Q^*$; $\partial Z/\partial Q > 0$, and $\partial^2 Z/\partial Q^2 > 0$ indicating that as Q increases, the stimulus to imports increases at an increasing rate. Since $\partial Z/\partial Q > 0$, the expected sign of the coefficient of Z in an estimated import demand function is positive.

This measure can also be partitioned to yield a positive pressure series (ZP) and a negative pressure series (ZN) using the threshold value $Q^* = 0.5$, as before. The ZP and ZN series, disaggregated into the eight ACMA-BNSW industry categories are listed in Appendix 1 for the period commencing with the March quarter of 1966 to the March quarter of 1977.[8]

These pressure of demand proxies (ZP and ZN) were used by Alaouze, Marsden and Zeitsch [3] in their disaggregated (four digit ASIC level) import demand study. Among the thirty-two four digit ASIC's studied, they found significant positive and negative pressure of demand effects together for two ASIC's; a significant positive pressure of demand effect only for thirteen ASIC's; and a significant negative pressure of demand effect only for three ASIC's.

This study was repeated by Alaouze [4] for data covering the same range of commodities at the Input-Output (IO) level of aggregation. Among the twenty-three IO's estimated the coefficients of ZP and ZN were both significant for two IO's, the coefficient of ZP (only) was significant in three cases, and the coefficient of ZN (only) was significant in five cases. The results of this study would seem to indicate that the negative pressure of demand effect is predominant, which is at variance with the results found by Alaouze et al. Since the major difference between the two studies is the level of aggregation, it can be concluded that the major reason for this difference is the level of aggregation.

The equations of the IO study were then re-estimated using the partitioned but untransformed measure, QP and QN , and in some cases, the unpartitioned measure, Q . The following results were obtained. In four cases, some of the estimated coefficients of QP and QN and ZP and ZN were significant but supported conflicting hypotheses. On the basis of the estimates of other parameters and associated statistics, there were no grounds for choosing a particular partitioned specification, therefore these IO's were re-estimated using the unpartitioned and untransformed measure Q . In all four cases the coefficient of Q was insignificant. In two cases, the estimates of all the coefficients of QN, QP and ZP and ZN were significant. In addition, there was a significant difference between the estimated coefficients of ZP and ZN but there was no significant difference between the estimated parameters of QP and QN . Again, there were no substantial differences between the two partitioned measures as far as the other parameters and associated statistics were concerned and therefore there were no grounds for preferring a particular specification. In four cases, one of the coefficients of ZP and ZN was significant; however, none of the coefficients of QP and QN were significant. In two cases, the coefficients of QP and QN were both significant but none of the coefficients of ZP and ZN were significant. However, there was no significant difference between the estimated coefficients of QP and QN. In two cases, one of the coefficients of QN and QP was significant but none of the coefficients of

ZP and ZN were significant. These two IO's were re-estimated using Q and in one case the estimated coefficient was significant and in the other case it was not significant. Of the remaining nine IO's, none of the estimated coefficients of QP, QN and ZP and ZN was significant. When these were re-estimated using Q, a significant coefficient was found in one case. Out of the twenty-three IO's estimated, in only one case were the estimates of the other parameters sensitive to the treatment of pressure of demand.

In summary, a significant positive pressure of demand effect was unambiguously estimated for eight IO's, and a significant negative pressure of demand effect was unambiguously estimated for six IO's (four of these results were for the same IO), and a significant unspecified pressure of demand effect was estimated for five IO's out of a total of twenty-three. These results indicate that all three approaches (partitioning, partitioning and transforming, and the conventional method of using an unpartitioned measure) are useful in analysing the effect of pressure of demand on imports. The contrast in the results obtained in the study of Alaouze, Marsden and Zeitsch [3] at the four digit ASIC level of aggregation and Alaouze [4] based on the IO level of aggregation, indicates that the partitioned-transformed measure does not perform as well at high levels of aggregation.[4]

It should be pointed out that these studies (like that of Gregory [11]) were based on estimating the logarithmic transformation of the CES expansion path equation which does not contain an activity variable. In the following section, estimates of import demand equations (of the form (1)) are presented.

6. AN EMPIRICAL COMPARISON OF SOME PRESSURE OF DEMAND PROXIES

In this section we present estimates of import demand functions for three highly disaggregated commodity groups so that the performance of two proxies for aggregate pressure of demand (the Wharton index discussed in Section 4 and the ratio of registered vacancies to the number of persons unemployed discussed in Section 1) can be compared with the disaggregated proxies developed in this paper. The three commodities chosen are the four digit ASIC groups : ASIC 2611 (Pulp, Paper and Paperboard), ASIC 3432 (Rigid Plastic Sheeting) and ASIC 2132 (Vegetable Products). These ASIC's were chosen because their estimation is not hampered by factors such as tariff quotas and import licensing, and reasonable estimates were obtained using a simple functional form which is often used in import demand studies. The pressure of demand measures derived in this paper used in the comparison for each of these ASIC's were :

ASIC 2611 (Pulp, Paper and Paperboard) - ACMA-BNSW group 7 (Paper);
ASIC 3432 (Rigid Plastic Sheeting) - ACMA-BNSW group 8 (Miscellaneous); and
ASIC 2132 (Vegetable Products) - ACMA-BNSW group 6 (Food and Tobacco).

In deriving the estimating equation, it was assumed that the ordering lag for imports is one and a half quarters and for the domestically produced substitute, one half a quarter. This assumption plus the small country assumption (Australian imports do not affect the world price) imply that all the explanatory variables in the estimating equation are predetermined. Given that we believe these assumptions approximate reality, we do not expect simultaneity bias to be a problem. Another implication of the long ordering lag for imports is that unintended inventories of imports can accumulate as a result of unrealized expectations (Alaouze [2]). In this study, however, we assume that no unintended inventories of imports occurred during the sample period.

The following variables were used in the comparison :

(i) M_t : an index of imports cleared by customs in quarter (t) .

(ii) P_{2t} : an index of the price of imports cleared in quarter (t) . This is assumed to be equal to the price quoted to importers in the ordering period (t - 3/2) .

(iii) $\hat{P}_{1t}$: The price of the domestic substitute expected to be quoted to purchasers of the good in its ordering period (t - 1/2) for goods ordered for delivery in quarter (t) as viewed in the import-ordering period (t - 3/2) . The construction of this variable is briefly described in Appendix 2 .

(iv) S_{1t}, S_{2t}, S_{3t} : seasonal dummies for the September, December and March quarters respectively .

(v) A_t : the level of non-farm GDP at constant (1966/67) prices, for quarter t .

(vi) Q_t : the pressure of demand proxy for the Food group of the ACMA-BNSW Survey for quarter (t) .

(vii) Z_t : the non-linear transformation of Q_t .

(viii) W_t : the aggregate Wharton index of capacity utilization for quarter (t) .

(ix) UV_t : the ratio of total vacancies registered with the CES to the total number of unemployed persons registered with the CES in quarter (t) .

(x) QP_t and QN_t : the positive and negative pressure of demand components of Q_t , obtained by the partitioning described in the paper .

(xi) ZP_t and ZN_t : the positive and negative pressure of demand components of Z_t obtained from the partitioning described in the paper .

A brief descritpion of the import price and quantity indexes and the domestic price index used in this paper, together with the sources of the other data, may be found in Appendix 2. The period for which data for all the variables listed above were available is the September quarter 1968 to the June quarter 1975. However, four observations are lost in constructing the $\hat{P}_{1t}$ variable, so that the variables in the study cover the period September 1968 to June 1975.

In the functional form chosen, the log of imports is explained by a linear function of the variables (some of which are in logarithms) listed above. The first five variables listed appear in every equation estimated; of the remaining six variables (pairs of variables in two cases), only one was used in conjunction with the first five in each equation estimated. Most of the explanatory variables are lagged two quarters to correspond (approximately) to the import-ordering period. The six estimated equations for ASIC's 2611 and 3432 appear in Tables 1 and 2 respectively. In determining the significance of estimated parameters shown in these tables, one-tailed tests were used for all coefficients, except the seasonal dummies and constants.

The first four equations listed in Table 1 (for ASIC 2611) were estimated using the unpartitioned pressure of demand proxies. This is the conventional approach. Comparing these four equations, it is obvious that the untransformed measure derived in this paper, Q , is clearly superior (in terms of $\bar{R}^2$, DW and t statistics) to the transformed measure Z , the Wharton index and the unemployment to vacancies ratio. Equations 1.5 and 1.6 were estimated using the partitioned untransformed measures QP and QN and the partitioned transformed measures ZP and ZN derived in this paper. The coefficients of the partitioned measures are all significant at the one per cent level. The $\bar{R}^2$ and DW statistics associated with these two equations are fairly similar and very close to the corresponding values for equation 1.1. Comparison of equation 1.2 and 1.6 shows that partitioning of the transformed measure Z improves the fit considerably ($\bar{R}^2 = 0.71$ versus 0.56). The estimates of the parameters (and their t statistics) associated with other variables (such as the price ratio and activity), however, are all very close and do not provide grounds for choosing between equations 1.1, 1.5 and 1.6. This implies that partitioning and/or transforming the pressure of demand variable is essentially independent of the estimation of the other parameters, at least in the case of these sample data.

Table 1 : Results for ASIC 2611 (Pulp, Paper and Paperboard)

(1.1)
$$\log M_t = \underset{(4.289)}{0.6656^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(6.348)}{0.7985^{**}} Q_{t-2} + \underset{(1.879)}{0.5574^{*}} \log A_{t-2} - \underset{(-0.0207)}{0.5356}$$
$$n = 24 , \quad \bar{R}^2 = .7852 , \quad DW = 1.692^{*}$$

(1.2)
$$\log M_t = \underset{(3.330)}{0.7492^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(3.515)}{0.0851^{**}} Z_{t-2} + \underset{(1.159)}{0.4958} \log A_{t-2} + \underset{(0.0910)}{0.3450}$$
$$n = 24 , \quad \bar{R}^2 = .5597 , \quad DW = 1.648$$

(1.3)
$$\log M_t = \underset{(2.643}{0.5940^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(2.977)}{0.0423^{**}} W_{t-2} + \underset{(3.118)}{1.271^{**}} \log A_{t-2} - \underset{(-2.664)}{10.520^{**}}$$
$$n = 24 , \quad \bar{R}^2 = .5513 , \quad DW = 1.337$$

(1.4)
$$\log M_t = \underset{(3.144)}{0.7724^{*}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(3.000)}{0.0695^{**}} UV_{t-2} + \underset{(1.408)}{0.6239} \log A_{t-2} - \underset{(-0.2116)}{0.0821}$$
$$n = 24 , \quad \bar{R}^2 = .5533 , \quad DW = 1.369$$

(1.5)
$$\log M_t = \underset{(4.235)}{0.6736^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(5.058)}{0.76^{**}} QP_{t-2} + \underset{(2.500)}{0.6804^{**}} QN_{t-2} + \underset{(1.842)}{0.5571^{*}} \log A_{t-2} - \underset{(-0.1894)}{0.4995}$$
$$n = 24 , \quad \bar{R}^2 = .7767 , \quad DW = 1.716^{*}$$

(1.6)
$$\log M_t = \underset{(3.412)}{0.6595^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(2.428)}{0.005546^{**}} ZP_{t-2} + \underset{(3.365)}{0.6873^{**}} ZN_{t-2} + \underset{(1.898)}{0.7012^{*}} \log A_{t-2} - \underset{(-0.4207)}{1.361}$$
$$n = 24 , \quad \bar{R}^2 = .7119 , \quad DW = 1.758^{*}$$

An asterisk (*) indicates that the coefficient is significant at the five per cent level, and two asterisks (**) indicate significance at the one per cent level. For coefficients whose expected sign is known, significance is determined using one tail of the t-distribution ; n is the number of observations, $\bar{R}^2$ is the R^2 adjusted for degrees of freedom and DW is the Durbin-Watson statistic. An asterisk on the Durbin-Watson statistic indicates that the null nypothesis of zero first order autocorrelation in the residuals is accepted at the five per cent level.

In comparing the first four equations in Table 2 (for ASIC 3432) it is clear that the unpartitioned and untransformed measure demand in this paper, Q , the Wharton index and the unemployment to vacancies ratio perform equally well. The coefficients of the pressure of demand proxies in equations 2.1, 2.3 and 2.4 are not significant, the $\bar{R}^2$ and DW statistics are about the same, although slightly higher for the Wharton index (equation 2.3). The results for the unpartitioned and transformed measure derived in this paper, Z , shown in equation 2.2 indicate that transforming the measure has improved the t-statistic of the coefficient of the pressure of demand proxy and produced slightly higher $\bar{R}^2$ and DW statistics than those obtained for the untransformed measures. This is an improvement attributable to transforming the measure. The results obtained for the partioned measures QP and QN and ZP and ZN are shown in equations 2.5 and 2.6. Examining these it is clear that the estimated equation for the partitioned but untransformed measure is poorer than any of the equations estimated for the unpartitioned measures. The equation estimated for the partitioned and transformed measure is, however, clearly superior to the equations estimated for the unpartitioned measures and the partitioned but untransformed measures. The coefficient of the positive pressure of demand proxy ZP is significant, and the $\bar{R}^2$ and DW statistics are both higher than for the other estimating equations. Partitioning and transforming the measure has therefore enabled the detection of a significant positive pressure of demand effect where the conventional approach would have suggested that imports are insensitive to domestic pressure of demand.

The results for ASIC 2132 (Vegetable Products) are shown in Table 3. The first four equations indicate that the unpartitioned measures derived in this paper, Q and Z , and the Wharton index all perform fairly well and are clearly superior to the unemployment vacancies ratio. The coefficients of the partitioned measures QP, QN and ZP and ZN are all

Table 2 : Results for ASIC 3432 (Rigid Plastic Sheeting)

(2.1)
$$\log M_t = \underset{(2.013)}{0.6785^{*}} \log(\hat{P}_{1t}/P_{2t}) + \underset{(0.5896)}{0.0826}\, Q_{t-2} + \underset{(4.352)}{1.841^{**}} \log A_{t-2} + \underset{(3.340)}{0.3150^{**}} S_{1t} + \underset{(2.483)}{0.2140^{*}} S_{2t} + \underset{(1.329)}{0.1017} S_{3t} - \underset{(-3.073)}{11.37^{**}}$$

$n = 24$, $\bar{R}^2 = .7157$, DW = 1.452

(2.2)
$$\log M_t = \underset{(2.509)}{0.9006^{**}} \log(\hat{P}_{1t}/P_{2t}) + \underset{(1.489)}{0.0390}\, Z_{t-2} + \underset{(3.052)}{1.475^{**}} \log A_{t-2} + \underset{(3.102)}{0.2844^{**}} S_{1t} + \underset{(2.355)}{0.1944^{**}} S_{2t} + \underset{(1.410)}{0.1017} S_{3t} - \underset{(-1.921)}{0.8140}$$

$n = 24$, $\bar{R}^2 = .7434$, DW = 1.509

(2.3)
$$\log M_t = \underset{(1.783)}{0.5999^{*}} \log(\hat{P}_{1t}/P_{2t}) - \underset{(-0.7871)}{0.0079}\, W_{t-2} + \underset{(4.990)}{1.922^{**}} \log A_{t-2} + \underset{(3.659)}{0.3308^{**}} S_{1t} + \underset{(2.724)}{0.2276^{*}} S_{2t} + \underset{(1.481)}{0.1115} S_{3t} - \underset{(-3.134)}{11.26^{**}}$$

$n = 24$, $\bar{R}^2 = .7201$, DW = 1.499

(2.4)
$$\log M_t = \underset{(1.917)}{0.6454^{*}} \log(\hat{P}_{1t}/P_{2t}) + \underset{(-0.1996)}{0.0032}\, UV_{t-2} + \underset{(4.857)}{1.963^{*}} \log A_{t-2} + \underset{(3.568)}{0.3352^{**}} S_{1t} + \underset{(2.544)}{0.2315^{*}} S_{2t} + \underset{(1.428)}{0.1097} S_{3t} - \underset{(-3.486)}{12.39^{**}}$$

$n = 24$, $\bar{R}^2 = .7106$, DW = 1.440

(2.5)
$$\log M_t = \underset{(1.264)}{0.4302} \log(\hat{P}_{1t}/P_{2t}) - \underset{(-0.6692)}{0.1109}\, QP_{t-2} - \underset{(-1.420)}{0.4192}\, QN_{t-2} + \underset{(5.032)}{2.091} \log A_{t-2} + \underset{(3.906)}{0.3512^{**}} S_{1t} + \underset{(3.041)}{0.2514^{**}} S_{2t} + \underset{(1.678)}{0.1209} S_{3t} - \underset{(-3.713)}{13.39^{**}}$$

$n = 24$, $\bar{R}^2 = .7533$, DW = 1.134

(2.6)
$$\log M_t = \underset{(3.017)}{1.094^{**}} \log(\hat{P}_{1t}/P_{2t}) + \underset{(2.213)}{0.0676^{*}}\, ZP_{t-2} - \underset{(-1.416)}{0.2751}\, ZN_{t-2} + \underset{(2.289)}{1.150^{*}} A_{t-2} + \underset{(2.914)}{0.259^{*}} S_{1t} + \underset{(2.257)}{0.1791^{*}} S_{2t} + \underset{(1.577)}{0.1088} S_{3t} - \underset{(-1.218)}{5.350}$$

$n = 24$, $\bar{R}^2 = .7662$, DW = 1.623

An asterisk (*) indicates that the coefficient is significant at the five per cent level, and two asterisks (**) indicate significance at the one per cent level. For coefficients whose expected sign is known, significance is determined using one tail of the t-distribution; n is the number of observations, $\bar{R}^2$ is the R^2 adjusted for degrees of freedom and DW is the Durbin-Watson statistic.

Table 5 : Results for ASIC 2132 (Vegetable Products)

(1)
$$\log M_t = \underset{(4.199)}{1.151^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(5.530)}{1.867^{**}} Q_{t-2} + \underset{(3.551)}{2.239^{**}} \log A_{t-2} + \underset{(2.667)}{0.4039^{**}} S_{1t} + \underset{(2.359)}{0.3083^{*}} S_{2t} + \underset{(0.7795)}{0.1004} S_{3t} - \underset{(-2.875)}{15.86^{**}}$$

$n = 24$, $\bar{R}^2 = .8271$, DW = 1.892

(2)
$$\log M_t = \underset{(4.833)}{1.301^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(5.473)}{0.8305^{**}} Z_{t-2} + \underset{(3.153)}{2.062^{**}} \log A_{t-2} + \underset{(2.635)}{0.4023^{**}} S_{1t} + \underset{(2.197)}{0.2904^{*}} S_{2t} + \underset{(0.921)}{0.1192} S_{3t} - \underset{(-2.316)}{13.45^{*}}$$

$n = 24$, $\bar{R}^2 = .8249$, DW = 1.892

(3)
$$\log M_t = \underset{(4.537)}{1.126^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(6.407)}{0.0962^{**}} W_{t-2} + \underset{(9.313)}{4.477^{**}} \log A_{t-1} + \underset{(4.638)}{0.6077^{**}} S_{1t} + \underset{(3.265)}{0.3819^{**}} S_{2t} + \underset{(0.503)}{0.0591} S_{3t} - \underset{(-9.481)}{44.13^{**}}$$

$n = 24$, $\bar{R}^2 = .8583$, DW = 1.553

(4)
$$\log M_t = \underset{(3.763)}{1.484^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(2.093)}{0.0805^{**}} UV_{t-2} + \underset{(4.358)}{3.610^{**}} \log A_{t-2} + \underset{(2.570)}{0.5649^{**}} S_1 + \underset{(1.214)}{0.2540} S_2 + \underset{(0.6043)}{0.1167} S_3 - \underset{(-3.702)}{27.21^{**}}$$

$n = 24$, $\bar{R}^2 = .6152$, DW = 1.326

(5)
$$\log M_t = \underset{(4.081)}{1.151^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(5.194)}{1.848^{**}} QP_{t-2} + \underset{(3.178)}{1.756^{**}} QN_{t-2} + \underset{(2.775)}{2.134^{**}} \log A_{t-2} + \underset{(2.206)}{0.3845^{*}} S_{1t} + \underset{(1.761)}{0.2854} S_{2t} + \underset{(0.617)}{0.0875} S_{3t} - \underset{(-2.175)}{14.88^{*}}$$

$n = 24$, $\bar{R}^2 = .8173$, DW = 1.876

(6)
$$\log M_t = \underset{(4.324)}{1.216^{**}} \log (\hat{P}_{1t}/P_{2t}) + \underset{(3.155)}{0.6751^{**}} ZP_{t-2} + \underset{(3.061)}{1.204^{**}} ZN_{t-2} + \underset{(3.171)}{2.070^{**}} \log A_{t-2} + \underset{(2.614)}{0.3985^{**}} S_{1t} + \underset{(2.261)}{0.2990^{*}} S_{2t} + \underset{(0.803)}{0.1044} S_{3t} - \underset{(-2.321)}{13.46^{*}}$$

$n = 24$, $\bar{R}^2 = .8254$, DW = 1.956

An asterisk (*) indicates that the coefficient is significant at the five per cent level, and two asterisks (**) indicate significance at the one per cent level. For coefficients whose expected sign is known, significance is determined using one tail of the t-distribution; n is the number of observations, $\bar{R}^2$ is the R^2 adjusted for degrees of freedom and DW is the Durbin-Watson statistic.

significant, however there is no significant difference between the estimated coefficients for each pair of measures. In addition, because of the fairly similar $\bar{R}^2$ and DW statistics there are no empirical grounds for favouring one over the other, nor for favouring the equations estimated using the partitioned measures over the equations obtained using the unpartitioned measures Q , Z and the Wharton index.

7. CONCLUSIONS

There is evidence from this study and those of Alaouze, Marsden and Zeitsch [3] and Alaouze [4] that the disaggregated pressure of demand measures derived in this paper perform well as pressure of demand proxies in disaggregated import demand studies. Evidence has also been provided in this study and that of Alaouze [4] that partitioning and transforming the pressure of demand proxy can lead to the detection of a significant pressure of demand effect when the conventional approach of using an unpartitioned proxy, or one partitioned but not transformed, would lead to the conclusion that imports are not affected by pressure of demand. The Alaouze [4] study also provides instances where the untransformed partitioned measure detects significant pressure of demand effects where the transformed partitioned measure does not. The empirical evidence presented suggests that partitioned and/or transformed pressure of demand variables are capable of enriching the structural explanation of import demand behaviour, particularly at the disaggregated level.

Although generalizations cannot be made on the basis of three examples, it can be tentatively concluded that the poor performance of the aggregate unemployment to vacancies ratio in two out of the three examples presented in this paper is in agreement with the criticisms of this and similar measures outlined in Section 1. It can also be tentatively concluded that the measures derived in this paper perform at least as well as the best aggregate measure available (the Wharton index) in disaggregated studies.

APPENDIX 1

TABLE 1.1

The Pressure of Demand Measure (Q) by Industry Group*

Year	Quarter	Treatment of non-metal minerals	Chemicals	Engineering	Vehicle Construction and Repair	Textiles	Food	Paper	Miscellaneous	Aggregate
1966	M	.31	.20	.27	.28	.51	.44	.59	.29	.35
	J	.27	.18	.26	.21	.32	.43	.30	.22	.28
	S	.31	.17	.22	.24	.37	.41	.35	.32	.29
	D	.27.	.19	.19	.34	.44	.46	.39	.43	.32
1967	M	.29	.18	.27	.36	.43	.50	.42	.39	.35
	J	.20	.10	.30	.27	.38	.33	.36	.44	.32
	S	.31	.26	.30	.23	.40	.37	.50	.37	.34
	D	.33	.27	.21	.35	.42	.40	.62	.40	.34
1968	M	.25	.17	.29	.57	.43	.31	.43	.31	.35
	J	.25	.22	.32	.44	.36	.41	.39	.43	.36
	S	.12	.05	.32	.41	.50	.42	.31	.44	.36
	D	.25	.15	.28	.39	.41	.29	.48	.54	.36
1969	M	.27	.33	.28	.41	.49	.41	.42	.40	.38
	J	.47	.31	.33	.35	.51	.34	.38	.43	.39
	S	.44	.39	.37	.62	.51	.46	.52	.51	.46
	D	.29	.37	.48	.50	.70	.48	.52	.60	.52
1970	M	.60	.38	.55	.65	.54	.38	.63	.52	.53
	J	.36	.42	.50	.56	.43	.39	.62	.53	.49
	S	.50	.32	.42	.50	.46	.42	.46	.56	.45
	D	.45	.47	.55	.48	.57	.41	.43	.56	.52
1971	M	.25	.25	.45	.50	.51	.49	.52	.41	.45
	J	.36	.32	.33	.46	.29	.30	.28	.45	.35
	S	.40	.26	.26	.37	.37	.23	.20	.25	.28
	D	.36	.24	.13	.39	.35	.32	.23	.29	.26
1972	M	.27	.27	.12	.25	.33	.24	.22	.27	.22
	J	.30	.26	.06	.23	.24	.22	.24	.18	.17
	S	.33	.35	.12	.17	.31	.20	.18	.41	.23
	D	.47	.25	.25	.13	.57	.37	.39	.49	.35
1973	M	.44	.48	.34	.28	.57	.37	.50	.57	.42
	J	.70	.62	.61	.70	.78	.53	.46	.70	.63
	S	.64	.79	.78	.85	.87	.60	.74	.85	.78
	D	.90	.82	.86	.85	.89	.75	.85	.92	.86
1974	M	.75	.88	.86	.91	.84	.67	.94	.84	.84
	J	.75	.85	.86	.84	.40	.70	.79	.80	.77
	S	.37	.60	.52	.50	.20	.49	.59	.48	.47
	D	.25	.47	.24	.32	.05	.47	.33	.19	.28
1975	M	.18	.19	.21	.27	.03	.32	.19	.24	.21
	J	0.00	.18	.13	.46	.16	.34	.07	.30	.22
	S	.06	.14	.12	.27	.44	.33	.12	.29	.23
	D	.20	.12	.12	.25	.33	.40	.19	.35	.25
1976	M	.40	.22	.07	.24	.35	.28	.17	.31	.21
	J	.07	.16	.13	.23	.15	.29	.12	.31	.19
	S	.15	.15	.09	.22	.13	.26	.17	.35	.18
	D	.14	.31	.12	.21	.10	.37	.33	.40	.23
1977	M	.09	.33	.12	.35	.16	.44	.23	.38	.26

* The eight industry classifications are : (1) Treatment of Non-Metal Minerals (cement, bricks, pottery, glass), (2) Chemicals (paint, oils, pharmaceuticals), (3) Engineering (machinery, iron and steel, electrical, industrial metals), (4) Vehicle Construction and Repair (rail, bus, motor, ship, aircraft), (5) Textiles (leather, clothing), (6) Food (drink, tobacco), (7) Paper (printing, cardboard), (8) Miscellaneous (including manufactures of wood, rubber, plastics).

TABLE 1.2

The Positive Pressure of Demand Proxy (ZP) by Industry Group*

Year	Quarter	Treatment of non-metal minerals	Chemicals	Engineering	Vehicle Construction and Repair	Textiles	Food	Paper	Miscellaneous	Aggregate
1966	M	0.00	0.00	0.00	0.00	.02	0.00	.22	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1967	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	.32	0.00	0.00
1968	M	0.00	0.00	0.00	.16	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.09	0.00
1969	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	.02	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	.32	.02	0.00	.04	.02	0.00
	D	0.00	0.00	0.00	0.00	.67	0.00	.04	.25	.04
1970	M	.25	0.00	.11	.43	.09	0.00	.35	.04	.06
	J	0.00	0.00	0.00	.14	0.00	0.00	.32	.06	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.14	0.00
	D	0.00	0.00	.11	0.00	.16	0.00	0.00	.14	.04
1971	M	0.00	0.00	0.00	0.00	.02	0.00	.04	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	.16	0.00	0.00	0.00	0.00
1973	M	0.00	0.00	0.00	0.00	.16	0.00	0.00	.16	0.00
	J	.67	.32	.28	.67	1.27	.06	0.00	.67	.35
	S	.39	1.38	1.27	2.33	2.85	.25	.92	2.33	1.27
	D	4.00	1.78	2.57	2.33	3.55	1.00	2.33	5.25	2.57
1974	M	1.00	3.17	2.57	4.56	2.13	.52	7.33	2.13	2.13
	J	1.00	2.33	2.57	2.13	0.00	.67	1.38	1.50	1.17
	S	0.00	.25	.04	0.00	0.00	0.00	.22	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* The eight industry classifications are : (1) Treatment of Non-Metal Minerals (cement, bricks, pottery, glass), (2) Chemicals (paint, oils, pharmaceuticals), (3) Engineering (machinery, iron and steel, electrical, industrial metals), (4) Vehicle Construction and Repair (rail, bus, motor, ship, aircraft), (5) Textiles (leather, clothing), (6) Food (drink, tobacco), (7) Paper (printing, cardboard), (8) Miscellaneous (including manufactures of wood, rubber, plastics).

TABLE 1.3

The Negative Pressure of Demand Proxy (ZN) by Industry Group*

Year	Quarter	Treatment of non-metal minerals	Chemicals	Engineering	Vehicle Construction and Repair	Textiles	Food	Paper	Miscellaneous	Aggregate
1966	M	-.28	-.38	-.32	-.31	0.00	-.11	0.00	-.30	-.23
	J	-.32	-.39	-.32	-.37	-.26	-.12	-.29	-.36	-.31
	S	-.28	-.40	-.36	-.34	-.21	-.15	-.23	-.26	-.30
	D	-.32	-.38	-.38	-.24	-.11	-.07	-.18	-.12	-.26
1967	M	-.30	-.39	-.32	-.22	-.12	0.00	-.14	-.18	-.23
	J	-.38	-.44	-.29	-.32	-.19	-.25	-.22	-.11	-.26
	S	-.28	-.32	-.29	-.35	-.17	-.21	0.00	-.21	-.24
	D	-.25	-.32	-.37	-.23	-.14	-.17	0.00	-.17	-.24
1968	M	-.33	-.40	-.30	0.00	-.12	-.28	-.12	-.28	-.23
	J	-.33	-.36	-.26	-.11	-.22	-.15	-.18	-.12	-.22
	S	-.43	-.47	-.26	-.15	0.00	-.14	-.28	-.11	-.22
	D	-.33	-.41	-.31	-.18	-.15	-.30	-.04	0.00	-.22
1969	M	-.32	-.25	-.31	-.15	-.02	-.15	-.14	-.17	-.19
	J	-.06	-.28	-.25	-.23	0.00	-.24	-.19	-.12	-.18
	S	-.11	-.18	-.21	0.00	0.00	-.07	0.00	0.00	-.07
	D	-.30	-.21	-.04	0.00	0.00	-.04	0.00	0.00	0.00
1970	M	0.00	-.19	0.00	0.00	0.00	-.19	0.00	0.00	0.00
	J	-.22	-.14	0.00	0.00	-.12	-.18	0.00	0.00	-.02
	S	0.00	-.26	-.14	0.00	-.07	-.14	-.07	0.00	-.09
	D	-.09	-.06	0.00	-.04	0.00	-.15	-.12	0.00	0.00
1971	M	-.33	-.33	-.09	0.00	0.00	-.02	0.00	-.15	-.09
	J	-.22	-.26	-.25	-.07	-.30	-.29	-.31	-.09	-.23
	S	-.17	-.32	-.32	-.21	-.21	-.35	-.38	-.33	-.31
	D	-.22	-.34	-.43	-.18	-.23	-.26	-.35	-.30	-.32
1972	M	-.32	-.32	-.43	-.33	-.25	-.34	-.36	-.32	-.36
	J	-.29	-.32	-.47	-.35	-.34	-.36	-.34	-.39	-.40
	S	-.25	-.23	-.43	-.40	-.28	-.38	-.39	-.15	-.35
	D	-.06	-.33	-.33	-.43	0.00	-.21	-.18	-.02	-.23
1973	M	-.11	-.04	-.24	-.31	0.00	-.21	0.00	0.00	-.14
	J	0.00	0.00	0.00	0.00	0.00	0.00	-.07	0.00	0.00
	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1974	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	J	0.00	0.00	0.00	0.00	-.17	0.00	0.00	0.00	0.00
	S	-.21	0.00	0.00	0.00	-.38	-.02	0.00	-.04	-.06
	D	-.33	-.06	-.34	-.26	-.47	-.06	-.25	-.38	-.31
1975	M	-.39	-.38	-.37	-.32	-.48	-.26	-.38	-.34	-.37
	J	-.50	-.39	-.43	-.07	-.40	-.24	-.46	-.29	-.36
	S	-.47	-.42	-.43	-.32	-.11	-.25	-.43	-.30	-.35
	D	-.38	-.43	-.43	-.33	-.25	-.17	-.38	-.23	-.33
1976	M	-.17	-.36	-.46	-.34	-.23	-.31	-.40	-.28	-.37
	J	-.46	-.40	-.43	-.35	-.41	-.30	-.43	-.28	-.38
	S	-.41	-.41	-.45	-.36	-.43	-.32	-.40	-.23	-.39
	D	-.42	-.28	-.43	-.37	-.44	-.21	-.25	-.17	-.35
1977	M	-.45	-.25	-.43	-.23	-.40	-.11	-.35	-.19	-.32

* The eight industry classifications are : (1) Treatment of Non-Metal Minerals (cement, bricks, pottery, glass), (2) Chemicals (paint, oils, pharmaceuticals), (3) Engineering (machinery, iron and steel, electrical, industrial metals), (4) Vehicle Construction and Repair (rail, bus, motor, ship, aircraft), (5) Textiles (leather, clothing), (6) Food (drink, tobacco), (7) Paper (printing, cardboard), (8) Miscellaneous (including manufactures of wood, rubber, plastics).

APPENDIX 2

Sources and Construction of the Data

Basic Data : The import price and quantity and the price of the domestic substitute indexes used in this study were constructed by the Industries Assistance Commission and form part of the first comprehensive data base constructed for Australian trade flows. Because much of this data is in preliminary form, the data base has not as yet been published. The import price indexes are Fisher indexes constructed from unit values at the tariff item level using fob plus duty value weights, the costs of insurance and freight (cif) are therefore not included. The import quantity indexes are similarly Fisher indexes constructed using fob plus duty value weights. These are discussed in detail in Marsden and Milkovits [18]. The behaviour of indexes based on fob plus duty and cif plus duty for large tariff changes were simulated and it was found that movements in the fob series closely parallel those of a cif based series (the difference in all cases was less than half of one per cent). Indexes of the price of the domestic substitute are indexes of wholesale prices base weighted by the 1971-72 value of sales and transfers.

The $\hat{P}_{1t}$ Series : This series was constructed using a one quarter linear least squares sliding trend projection from the import-ordering period $(t - 3/2)$ into the ordering period for the domestic substitute $(t - \frac{1}{2})$. Four observations were used in forming the projection for the series used in this paper. Forming a linear least squares sliding trend projection simply involves fitting a least-squares line to a number of observations and extrapolating the line to the period for which the projection is required. The least-squares formula used in forming the projection reduces to a weighted sum of the observations used in forming the projection (m) , where the weights depend upon m and the length of the projection. The projection was carried out on deseasonalised prices expressed in logarithms and the seasonality for the relevant quarter was added to this projected price. This procedure was used to preserve the seasonality in the data and also to avoid the possibility of obtaining a negative expected price as a result of extrapolating a series of falling actual prices. In forming the projection, it was assumed that the price of the domestic substitute observed in period (t) was equal to that quoted in the ordering period $(t - \frac{1}{2})$, this assumption avoided the problem of having to centre the data on half quarters. This procedure is based on Powell [23, pp. 132-133] and Powell and Gruen [24] and was used in Alaouze, Marsden and Zeitsch [3].

The UV_t Series : This was obtained from Employment and Unemployment, Australian Bureau of Statistics (Reference No. 9.1).

The A_t Series : This activity series was obtained from Supplement to Quarterly Estimates of National Income and Expenditure December Quarter 1976 - September Quarter 1959 to June Quarter 1974, Australian Bureau of Statistics (Reference No. 7.10), and Quarterly Estimates of National Income and Expenditure, Australian Bureau of Statistics (Reference No. 7.5).

The W_t Series : The Wharton Index was supplied by the Reserve Bank of Australia. It is described in detail in Footnote 7 and in the text.

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FOOTNOTES

* I am grateful to a number of my colleagues working on the IMPACT Project (Industries Assistance Commission, Melbourne) for their constructive comments on earlier drafts of this paper.

1. Because measures of the pressure of demand reflect the extent to which the capacity of the economy to produce goods and services is utilised they are commonly called capacity utilisation or simply capacity variables. For a discussion of the theoretical difficulties involved in defining the concept of capacity, see Klein [15]. The problems associated with some common measures of capacity are discussed in Phillips [22], Evans [10, pp. 255-256] and Taylor and McKendrick [27].

2. It has been postulated that a ratchet mechanism operates for imports, that is, that imports caused by domestic bottlenecks (the positive effect) tend to persist. This hypothesis was tested by Barker [5] and White and Thirwall [28] and in both cases rejected. This is not a surprising result given that the negative effect would tend to neutralise the effect of past bottlenecks on imports.

3. For a detailed discussion of the ACMA-BNSW survey procedure, and the usual quantitative and qualitative uses to which the survey has been put, see : Kerr [14] and Blyth [7].

4. The eight industry classifications are : (1) Treatment of Non-Metal Minerals (cement, bricks, pottery, glass), (2) Chemicals (paint, oils, pharmaceuticals), (3) Engineering (machinery, iron and steel, electrical, industrial metals), (4) Vehicle Construction and Repair (rail, bus, motor, ship, aircraft), (5) Textiles (leather, clothing), (6) Food (drink, tobacco), (7) Paper (printing, cardboard), (8) Miscellaneous (including manufacturers of wood, rubber, plastics).

5. A similar measure can be constructed from the replies to the following question in the Confederation of British Industry (CBI) Industrial Trends Survey : "Is your present level of output below capacity (i.e. are you working below a satisfactory full rate of operation)?" The proportion of firms answering "No" is a measure of the proportion of firms operating at full capacity. The CBI index of capacity utilisation is formed by taking the difference between the proportion answering "Yes" and the proportion answering "No". Details of the CBI Survey may be found in [9] and an application of the CBI index in the estimation of import demand functions in Rees and Layard [25].

6. Rees and Layard [25, p. 6] in comparing the performance of the CBI index of capacity utilisation (which is constructed from a question in the CBI Industrial Trends Survey) with a Wharton index of capacity utilisation conclude : "In regression, the CBI statistic and the Wharton index perform equally well. Since the CBI index contains more independent information than the Wharton index and is less affected by fluctuations in output due to strikes, we have chosen to use it."

7. This unpublished index was constructed by researchers at the Reserve Bank using the ANZ Bank index of factory production, seasonally adjusted, and is an updated version of the one used by Barry and Guille [6]. The index is in monthly form and spans the period January 1968 to August 1976. The quarterly index mentioned in the text was obtained by averaging the monthly data.

8. It is clear that the transformation used in forming the Z measure is fairly arbitrary; it is therefore possible that there may be a return associated with trying alternative transformations. It is unlikely, however, that testing for non-linearity in the positive pressure of demand effect by estimating coefficients associated with segments of the positive pressure of demand series (as in Gregory [11]) would be successful, because only a small proportion of the total number of observations are associated with bottleneck conditions. This is clear from the graphs presented in Figure 1.

9. Unfortunately, the critical values of the DW are not tabulated for more than five explanatory variables.