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Abstract

It has been suggested that during the 1970s and 1980s, excess capacity played an important role in the performance of Latin American exports of manufactures. This paper shows that countercyclical factors should be expected for most exports, and submits the hypothesis that these effects are more important for a limited subset of products with special characteristics. Econometric testing of Argentine export functions could not reject this hypothesis. The paper ends by discussing the implications for export modeling and policy analysis.

J.E.L. Classification: F14, O54

Keywords: exports, countercyclical behavior, manufactures, price elasticity, Argentina, Latin America

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The Alleged Countercyclical Nature of Argentina's Exports of Manufactures

by *Elio Londero*[*]

1. INTRODUCTION

The study of the reasons underlying the performance of LDC's exports of manufactures during the last decades is important for a number of reasons. First, because for many LDCs manufactures constitute a significant part of total exports. Second, because in industrial policy terms, growth of such exports can be interpreted as resulting from maturing manufacturing sectors. Finally, because competing in international markets is expected to generate positive productivity effects for the exporting sectors, as well as for its domestic suppliers and competitors.

International markets, however, could also become an outlet for temporary excess capacity resulting from indivisibilities or temporary fluctuations in domestic demand. In such cases, exports of these products may require a special treatment in macroeconomic models, incentives from international competition to increase productivity may be reduced, and care should be exercised in considering these exports as a revelation of domestic productivity gains. For these reasons, an analysis of the determinants of exports of manufactures during prolonged periods is important and may consequently contribute to the design of appropriate economic policies.

The roles played by relative prices and domestic demand fluctuations as determinants of Latin America exports of manufactures have been recognized in several studies.[1] Zini's (1988) analysis of Brazilian exports, reaffirmed the basic results obtained in several other studies for that country, concluding that the price elasticity of Brazilian exports of manufactures is greater than that of total exports, and that they also respond to capacity utilization in the domestic market. In another study, Bonelli, Franco and Fritsch (1993) concluded that non-price factors "have become more important in explaining export performance in recent years" (p. 119). The authors attribute their findings to the delay of manufacturing firms in abandoning foreign markets when faced with real exchange rate fluctuations, because those markets have been costly to penetrate and develop. In a more recent study, Amazonas and Rand Barros (1996) found that "export supply" had a very high negative elasticity with respect to capacity utilization.

In an early study on Argentina's exports of manufactures, Felix (1974) found that for the 1956-68 period, aggregate nontraditional industrial exports, and particularly exports to non Latin American markets, were responsive to changes in capacity utilization, but showed small and statistically not significant coefficients for the price variable. Results for broadly classified industries (two digits ISIC Rev. 2)[2] also showed that 20 of 26 industries had capacity utilization variables with a negative sign, and 14 of those 20 coefficients were statistically significant at the 10 percent level or better. These findings, together with poor results for the exchange rate variable, led Felix to conclude that: "(a) exports to non-LAFTA[3] countries during the 1960s have been more responsive to excess capacity pressures than to price/cost changes ..., and (b) exports to LAFTA during the same period have been largely unresponsive to either stimulus ..." (p. 299).

Canitrot and Junco (1993a) suggested that the growth of manufacturing exports observed in Argentina during the 1970-90 period, and particularly during the 1978-90 subperiod, can be explained by the reduction in domestic demand. Based upon a casual association between changes in aggregate productivity levels for the manufacturing sector and changes in exports of manufactures, the authors concluded that "Enterprises exported what they did not sell in the domestic market[,] ... the so-called 'countercyclical hypothesis'" (p. 42). A similar association between total manufacturing production and exports of manufactures was interpreted by the authors as further confirmation of that hypothesis.

More recently, Cristini (1998) referred to "the tendency of companies to export residual production once the domestic market had been satisfied". The author went on to suggest that "Indeed, the development of industrial activity appears to be inversely related to the development of manufactured exports" (p.106).

While recognizing the importance of countercyclical determinants of exports for certain products, other authors have suggested that the performance of manufacturing exports for several Latin American countries, also reflects the maturing of the industrialization process (IDB, 1982; Teitel and Thoumi, 1986; Azpiazu and Kosacoff, 1989; Londero and Teitel, 1996; and Londero, Teitel et al., 1998). Export performance is interpreted as reflecting the narrowing of productivity differences with the rest of the world, and the effects of export incentives provided to compensate for anti-export bias in the trade regime. Recent empirical evidence at the establishment level supports the causation from productivity increases to export (Clerides, Lach and Tybout, 1996, 1998), and the importance of exports for increasing productivity levels of the overall sector (Bernard and Jensen, 1999).

The objective of this paper is to contribute to the understanding of the main determinants of LDCs exports of manufactures, with special attention to their so-called countercyclical behavior. To that effect, two simple models are used to characterize Argentina's exports of manufactures during the 1970-85,[4] and then their alleged countercyclical behavior is tested by statistically estimated export functions.

2. TWO GENERAL MODELS

2.1 Perfect substitutes

The analytical framework is based on Leamer and Stern (1970) and Goldstein and Khan (1985). It allows for price discrimination between domestic and foreign markets, a desirable feature for a country where manufactures were developed under protection in a relatively small domestic market, leading to relatively high levels of concentration.[5] It also incorporates the price of substitutes and complements in the domestic market. The available data, however, did not allow an empirical analysis of these features, which may be relevant for the study of specific commodities or narrowly defined aggregates.

The first model refers to trade in undifferentiated commodities (perfect substitutes) in perfectly competitive international markets, where individual producers are price takers, adjusting production capacity to the basic price of exports --Figure 1(a). Domestic demand for exported good i (Q_i^d) is a function of its domestic price p_i^d, that of its substitutes and complements in the domestic market p_s^d, and domestic output level Y. Foreign demand is infinitely elastic for the product-specific unit export revenue, i.e. $p_i^x = p_i^w \, e \, (1 + s_i)$, where p_i^w is the foreign currency border price of i, e is the exchange rate, and s_i is the *ad valorem* equivalent of subsidies net of taxes.

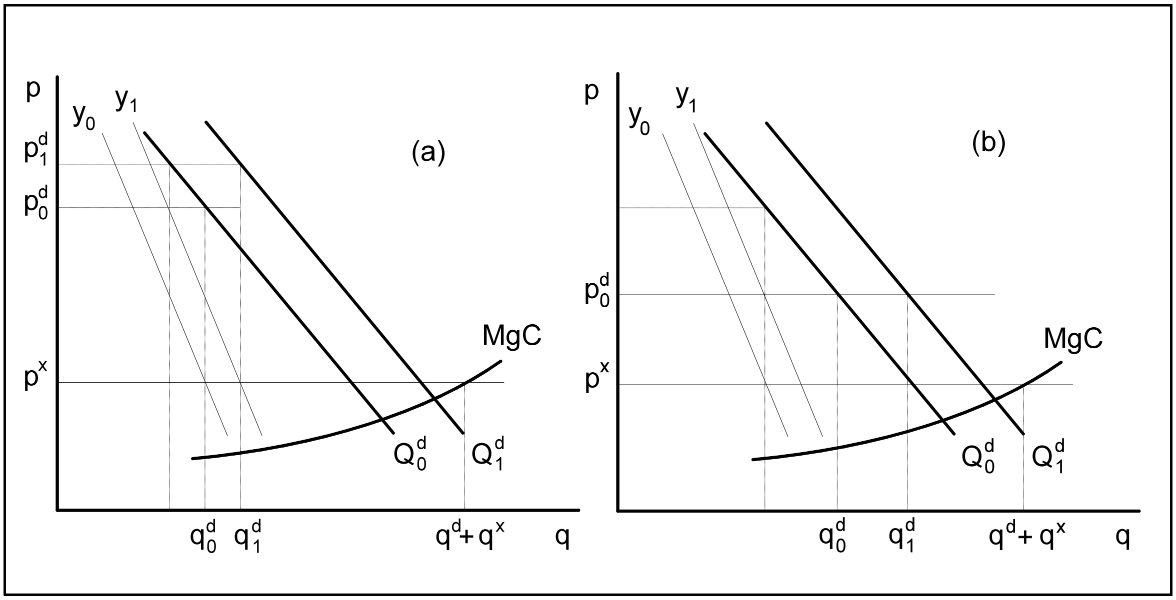

Figure 1. Perfect substitutes in the international market

Due to the producer's monopolistic power in the domestic market, the domestic price is endogenous to the partial equilibrium model, and changes in domestic demand --$Q_1^d - Q_0^d$ in Figure 1(a)-- affect not only exports, but also consumption ($q_1^d - q_0^d$). Therefore, the good is partially traded at the margin for domestic demand changes --i.e., small demand changes are met by changes in both exports and domestic consumption.[6] The good is fully traded at the margin for supply changes --i.e., small supply changes translate fully into changes in exports--, since producers are price takers in the international market. Consequently, total supply by domestic producers (Q_i^s) is a function of the unit export revenue p_i^x, a price index for inputs p_i^c, and a size variable for the economy (potential output Y^{pot}), since *ceteris paribus* the capacity of exporting sectors is expected to increase as the size of the economy increases. Thus the general model for a good produced by a "small open economy" competing with perfect substitutes in the international market may be specified as

$$Q_i^d = Q_i^d(p_i^d; p_s^d; Y) \tag{1}$$

$$p_i^x = p_i^w \, e \, (1 + s_i) \tag{2}$$

$$Q_i^s = Q_i^s(p_i^x; p_i^c; Y^{pot}) \tag{3}$$

If equations (1) and (3) are homogeneous of degree one in prices, Y, and Y^{pot}, all nominal variables may now be expressed relative to the price index for the inputs, and the above system becomes

$$q_i^d = q_i^d(p_i^d / p_i^c; p_s^d / p_i^c; Y / p_i^c) \tag{4}$$

$$p_i^x / p_i^c = [p_i^w\, e\, (1 + s_i)] / p_i^c \tag{5}$$

$$q_i^s = q_i^s(p_i^x / p_i^c; Y^{pot} / p_i^c) \tag{6}$$

where $p_i^x / p_i^c = ruxr_i$ is the product-specific real unit export revenue. Equations (5) and (6) determine total sales q_i. Then, domestic demand, together with marginal cost if there is price discrimination, determines domestic price and sales, and exports q_i^x are a residual, that is

$$q_i^x = q_i(ruxr_i; Y^{pot} / p_i^c) - q_i^d(p_i^d / p_i^c; p_s^d / p_i^c; Y / p_i^c) \tag{7}$$

The preceding model represents the general case. The good, however, may be fully traded for domestic demand changes, i.e. they are fully met by compensatory changes in exports, leaving production unaffected. That may be due to competing imports placing a cap on price discrimination --p_0^d in Figure 1(b)--, or to a very competitive domestic market where domestic producers are price takers ($p^d = p^x$). In both cases the domestic price becomes exogenous to the partial equilibrium model. In the first case, it is determined by that of imports and the import effective exchange rate, in which case a variable reflecting the relative price of those imports to the price of production inputs is required. In the second, when domestic producers are price takers, p_i^d is determined by the international price, the exchange rate and export incentives, and the domestic relative price variable becomes the *ruxr*. Consequently, when the good is fully traded the equation for exports of perfect substitutes becomes

$$q_i^x = q_i(ruxr_i; Y^{pot} / p_i^c) - q_i^d(ruxr_i; p_s^d / p_i^c; Y / p_i^c) \tag{8}$$

Application of this fuller specification of Goldstein and Khan (1985) model requires that, in addition to the data needed for the traditional approach, series for total sales are also available for the separate estimation of $q_i(\cdot)$.

Finally, in this approach there is no such a thing as the supply of exports (Goldstein and Khan, 1985, p. 1051). In the "small open economy", under the assumption of profit maximization, exporting firms determine total production according to marginal export revenues and marginal costs; domestic demand determines exports as a residual.

2.2 Imperfect substitutes

The second model represents trade in differentiated products (imperfect substitutes). Producers face a less than infinitely elastic demand for its products, in both domestic and international markets. Figure 2 represents such a case when producers are profit maximizers in both markets. In such a case, domestic and export prices and quantities are simultaneously determined, and the good is partially traded for both changes in domestic demand and supply. For example, in the case represented in Figure 2, adjustment to an increase in domestic demand ($Q_1^d - Q_0^d$) is induced by the increase in both domestic and export prices that leads to a reduction in the domestic consumption of those consuming Q_0^d at the original price p_0^d (Δq^d), a reduction in exports (Δq^x), and an increase in production (Δq^s). That is, $Q_1^d - Q_0^d = \Delta q^d + \Delta q^x + \Delta q^s$.

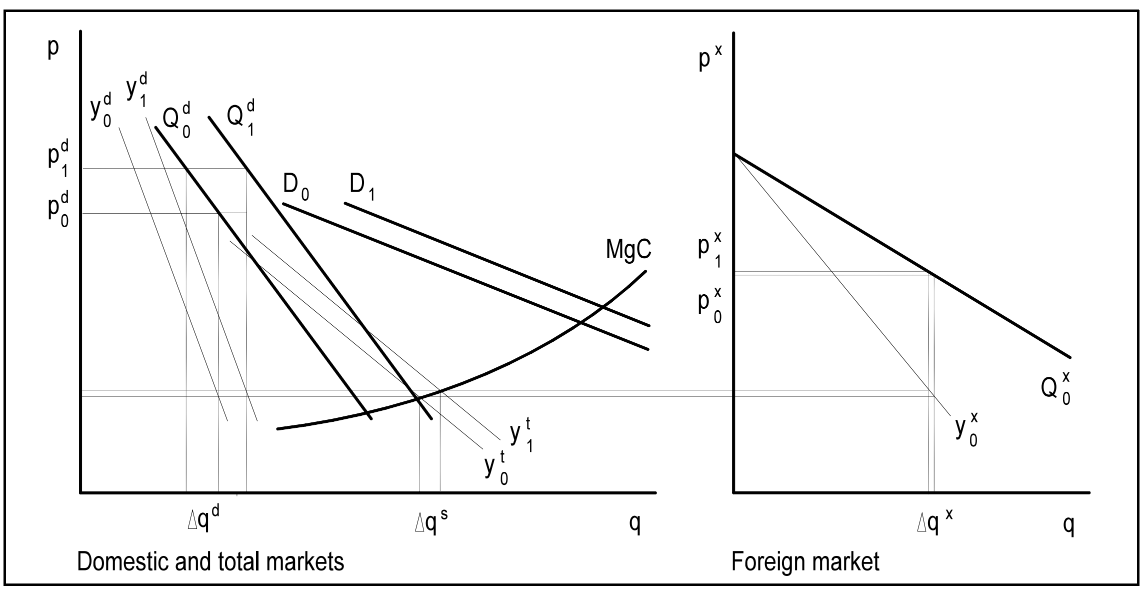

Figure 2. Imperfect substitutes in the international market

The demand for exports of product *i* will depend on: i) the basic price of the export in domestic currency; ii) the international price of the imperfect substitute *s*, expressed in domestic currency; iii) the *ad valorem* effects of protection levels; and iii) activity levels in each individual demanding economy. Since the price of substitutes in the international market enters the foreign demand equation, it is expressed in domestic currency using product *i* export exchange rate, i.e. the domestic currency price of the substitute will be $p_s^w\, e\,(1 + s_i)$, where e is the exchange rate and s_i is the *ad valorem* equivalent of subsidies net of taxes. As a result, the relative price between *i* and *s* depends exclusively on the two prices in the international market. Therefore, when expressed relative to the price of inputs, this price variable becomes

$$ruxr_s = p_s^w\, e\,(1 + s_i) \,/\, p_i^c \tag{9}$$

a measure very similar to the real unit export revenue for *i*.

Finally, as in the case of perfect substitutes, domestic demand for *i* is a function of its domestic price, that of its substitutes and complements, and output level. Foreign demand for *i* is a function of its international price ($ruxr_i$), that of its imperfect substitutes in the international market ($ruxr_s$), protective measures t_i^m, and world income (Y^w). Total supply of *i* is a function of the domestic price, the international price, and the size of the economy. Consequently, the system of equations representing the market of *i* will be

$$q_i^d = q_i^d(p_i^d / p_i^c;\, p_s^d / p_i^c;\, Y / p_i^c) \tag{10}$$

$$q_i^x = q_i^x(ruxr_i;\, ruxr_s;\, t_i^m;\, Y^w) \tag{11}$$

$$q_i^s = q_i^s(p_i^d / p_i^c;\, ruxr_i;\, Y^{pot} / p_i^c) \tag{12}$$

Given p_i^c, p_s^d, Y, $ruxr_s$, t_i^m, Y^w, and Y^{pot}, these three equations determine total production q_i, the domestic currency basic price of the export $ruxr_i = p_i^x / p_i^c$, and the domestic basic price of the sales to the domestic market p_i^d / p_i^c. Then, equation (12) and any of the demand equations determine the distribution of total sales between the domestic and the foreign markets.[7] In the case of exports, the corresponding equation would be

$$q_i^x = q_i - q_i^d$$

$$q_i^x = q_i(p_i^d / p_i^c; p_s^d / p_i^c; Y / p_i^c; ruxr_s; ruxr_i; t_i^m, Y^w; Y^{pot} / p_i^c) -$$

$$- q_i^d(p_i^d / p_i^c; p_s^d / p_i^c; Y / p_i^c) \qquad (13)$$

In this case, there is also no room for the "supply of exports". Given technical conditions and input prices, total production and the distribution of sales between the domestic and foreign markets are simultaneously determined by profit maximization conditions. Any change in domestic conditions would affect export volume and price, and any change in international markets would affect domestic sales and prices.

3. HYPOTHESES

According to the models presented above, a countercyclical behavior of exports is to be expected for all products with a positive income elasticity. In addition, as long as marginal export revenue exceeds short-run marginal export cost, a shrinking domestic market will create incentives for firms to increase exports in the short run in order to increase total profits. Transforming short run incentives into actual sales, however, would depend on the possibility of rapidly penetrating international markets. From this point of view, an important role for domestic demand will have to be expected for standardized intermediate inputs subject to precise physical or chemical specifications (e.g., fuels, basic chemicals, basic metals). These standardized specifications define their quality, and allow them to be traded as "commodities" in world markets (Azpiazu and Kosacoff, 1989; Londero, Remes and Teitel, 1998). Exports of these manufactured products can be more easily increased when domestic demand drops, since physical characteristics have been well standardized and compliance with these standards may be tested by the purchaser.

This is generally not the case for other manufactured products, that are judged first by the market through repeated transactions. Thus, increasing exports of these latter products tends to require significant investments in market penetration, making it more difficult to compensate cyclical reductions in their domestic demand by switching to international markets. On the other hand, exporters of these products may respond to real exchange rate fluctuations in the short run by shifting sales between the domestic and the world markets.

Another important product characteristic to take into consideration when analyzing the countercyclical behavior of exports, particularly in highly protected economies, is its capital and natural resource to output ratios. The higher these ratios, the higher will be the participation of gross operating surplus in price, providing a greater margin for short-term price reductions that may be required in order to compensate for a border price equivalent of domestic prices exceeding the f.o.b. equivalent of international prices. Thus, products with higher capital and natural resource to output ratios would be able to sustain those price reductions for longer periods of time. For those products with higher labor to output ratios, instead, persistent reductions in real unit export revenues may result in losing markets that took years to penetrate (Londero, 1997).

According to the above considerations, the nature of the exported product, in particular the extent of standardization of its characteristics, and the ability to absorb short-term price reductions, would play a significant role in explaining the extent to which domestic demand fluctuations affect export performance. More precisely, fluctuations in domestic demand are expected to have a greater impact on exports of "commodity like" intermediate goods produced with higher capital to output ratios, and less on other manufactures. On the other hand, manufactures of other, less homogeneous products, that require longer periods (higher investments) for penetrating foreign markets, are expected to be less elastic to domestic demand fluctuations. Since there is more product differentiation among these products, and consequently a greater role for competition among imperfect substitutes both in the domestic and the international markets, they are expected to be more responsive to international demand and relative prices.

4. MODEL APPLICATION

Data for estimating equations (8) and (13) for a sufficient number of individual products to test the hypotheses are not available, but it is possible to use aggregate data instead. Thus, the nature of these aggregates needs to be discussed, and the equations need to be revised accordingly. Product characteristics that are important for the hypotheses, as well as for the analysis of Argentina's exports of manufactures, are captured by following a slight modification of the classification proposed by

Azpiazu, Bisang and Kosacoff (1986). This classification splits ISIC-defined manufactures[8] into two groups according to the importance of agricultural inputs in total cost: those whose principal inputs "originate in agriculture" (MOA) and those whose principal inputs "originate in industry" (MOI). Since most of the products with the two characteristics of being "commodity-like" and originating in manufacturing processes with high capital to output ratios are part of MOIs, in this study the group is further divided into two. The first one is called MOI-inputs (MOII) and comprises intermediate goods originated in basic chemical and metal industries that fit the description of standardized inputs originating in industries with high capital to output ratios presented in section 3. The complement is called MOI-rest (MOIR), and it includes a wide array of manufactured products.[9] Figure 3 presents the evolution of the exports of manufactures according to this classification.

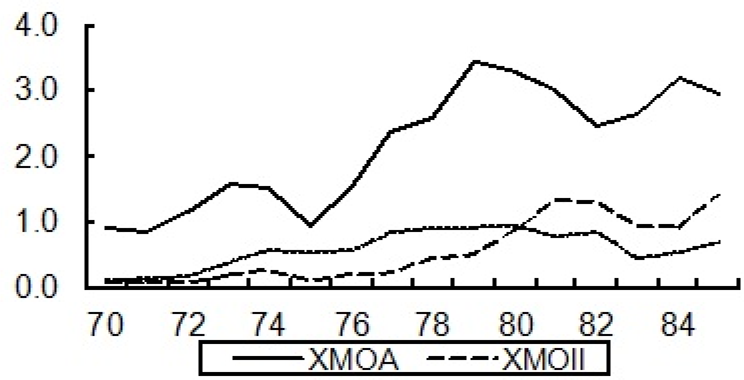

Figure 3

The economic policy environment and product specific measures led to underinvoicing and underreporting of exports during 1975 and the first quarter of 1976 (CEPAL, 1982, pp. 25 and 53). For this reason, reported data for those years were treated as missing.

Potential output Y^{pot} was estimated by trend GDP ($\hat{Y}$), which in turn was estimated by a linear regression for the subperiod preceding the debt crisis (1960-1980).[10] The projection of $\hat{Y}$ according to the 1960-1980 trend growth rate was used instead of Y^{pot} for the 1970-85 period (see Figure 4), since capacity during 1980-85 was the result of investment decisions made years before, and taking into

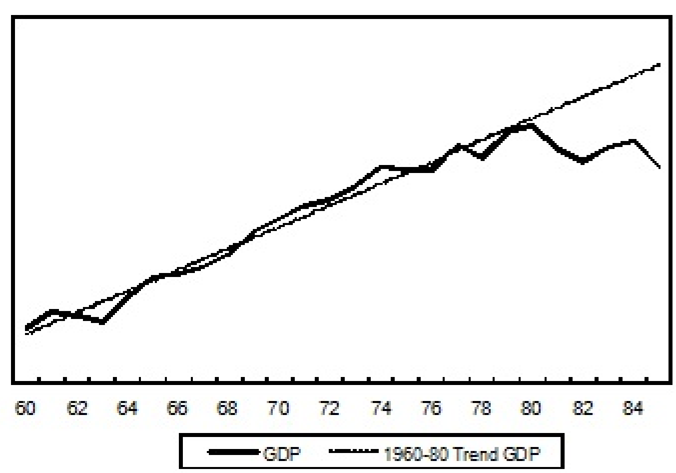

Figure 4

consideration more normal projections.

The income variable Y was replaced by two variables: trend GDP $\hat{Y}$, and the ratio of actual to trend GDP (u). This separation would allow to distinguish two different sources of changes in exports: changes in capacity for a given capacity utilization, represented by $\hat{Y}$, and changes in u for a given capacity (the countercyclical hypothesis).[11]

At level of aggregation used in this study, domestic price variables p_i^d / p_i^c and p_s^d / p_i^c would become ratios between similar price indices, thus losing most of their variability. Furthermore, indices for the domestic price of the output are not available for all groups, and the ones that could be constructed would carry a heavy influence from the composition and weights of the wholesale price index, instead of that of exports. In the case of the price index for the inputs, it would not be possible within reasonable costs to estimate group indices, and the use of one index for all groups would increase the lack of variability already mentioned. Therefore, domestic price variables were dropped.

In the case of *ruxr*, differences between imperfect substitutes would be erased by aggregation. Thus the $ruxr_s$ was also dropped from the specification, losing the ability of capturing substitution effects in the international market. The unit export revenue variable was lagged one period to reflect the time that elapses between the production decision and actual shipment. Detailed estimates of the *ruxr* that include reimbursements and financial incentives to exports are only available for 1970-85. Faced with the trade-off between a larger sample and a better price variable, in this study the choice was that of a better price variable. Finally, there are no readily available estimates of t_i^m.

The available data does not allow for the estimation of supply and domestic demand functions, as in equations (8) and (13). Thus, these equations became, respectively,

$$q_i^x = q_i^x(ruxr_{i,\,t-1};\ \hat{Y};\ u) \tag{14}$$

$$q_i^x = q_i^x(ruxr_{i,\,t-1};\ Y^w;\ \hat{Y};\ u) \tag{15}$$

As a result of the above, only $ruxr_i$ and Y^w would be left as determinants of foreign demand. The changes in the price of substitutes, in commercial policies, and in other determinants of foreign demand would be lost. To recover some of these effects, and considering that world imports of i,

M^w_i, would be a function of all these variables --that is, $M^w_i = M^w_i(ruxr_s; ruxr_i; t^m_i, Y^w)$--, world imports were included in equations (15) as an argument instead of simply world income. Total ALADI[12] imports (net of those of Argentina M^A_i) were also used in conjunction with M^w_i, since regional markets created by trade agreements are important for some Argentine exports, particularly those of MOIR. Thus, equation (15) became

$$q^x_i = q^x_i(ruxr_{i,\, t-1}; M^w_i; M^A_i; \hat{Y}; u) \tag{16}$$

The expected signs of the coefficients are positive for the *ruxr*, M^w_i and M^A_i, and negative for u (the countercyclical hypothesis). The coefficient for the *ruxr* would pick up the production response to changes in exports profitability (Δq^s in Figure 2), as well as the effects on exports of the changes in domestic sales induced by domestic price changes originating in unit export revenue changes (Δq^d in Figure 2). Since both effects push exports in the same direction, the coefficient for the *ruxr* is expected to carry an unequivocal positive sign. As regards $\hat{Y}$, the expected sign would be undetermined since an increase in capacity would *ceteris paribus* allow for additional production and thus exports, but it would also imply an additional domestic demand due to the expected positive income elasticity of domestic demand.[13]

MOA exports, that include products corresponding to both the perfect substitutes and the imperfect substitutes models, would be estimated by

$$q^x_{moa} = q_{moa}(ruxr_{moa,\, t-1}; M^w_{moa}; M^A_{con}; \hat{Y}; u) \tag{17}$$

where $ruxr_{moa,\, t-1}$ is an index of real unit export revenue for high natural resource content exports, M^w_{moa} is an index of world imports of MOII, and M^A_{con} are ALADI imports of consumption goods net of those of Argentina.

Exports of MOII are expected to behave according to the perfect substitutes model. Nevertheless, they will be estimated according to the same basic equation. The world market size variable M^w_{moii} is included in the equation expecting that it will have a coefficient close to zero. That may not necessarily be the case with the ALADI variable M^A_{int}, since it is a much smaller market protected from international competition, and therefore ALADI demand for Argentine MOII exports may not be perfectly elastic with respect to price. As a result, MOII exports would be initially estimated according to the same simplified model

$$q^x_{moii} = q_{moii}(ruxr_{moii,\, t-1};\, M^w_{moii};\, M^A_{int};\, \hat{Y};\, u) \tag{18}$$

where q^x_{moii} is an index of exports of MOII, $ruxr_{moii,\, t-1}$ is an index of the real unit export revenue for the group, M^w_{moii} are world imports of MOII, and M^A_{int} are ALADI imports of intermediate goods (net of Argentina's imports).

Exports of MOIR, expected to respond to the imperfect substitutes model, were specified as follows

$$q^x_{moir} = q^x_{moir}(ruxr_{moir,\, t-1};\, M^w_{moir};\, M^A_{tot};\, \hat{Y};\, u) \tag{19}$$

where $ruxr_{moir,\, t-1}$ is an index of real unit export revenue for low natural resource content exports, M^w_{moir} is an index of world imports of MOIR, and M^A_{tot} are total ALADI imports net of those of Argentina.

The small sample size significantly reduces the power of the tests for unit roots even if the series for the full 1970-85 period were available. For such a small sample size, it becomes almost impossible to reject the hypothesis of a unit root unless the values of the parameters are very distant from one, rendering the results of the test uninformative. In addition, missing data for 1975 and 1976 split the series, further reducing the power of a test to an unsatisfactory level. For these reasons, unit root tests were not attempted.

All equations were estimated using ordinary least squares. No simultaneous equation bias is expected from the total trade variables, because the participation of Argentina's imports in total world imports M^w_i is negligible, and because M^A_i is defined net of Argentina's exports. Some simultaneity bias may be present due to u, since an increase in the disturbance would increase exports and thus u. OLS was nevertheless used because the effects are expected to be small due to the small export coefficients (Table 2), and because the sample is small and multicollinearity is present (Kennedy, 1992, section 10.3).

5. RESULTS

5.1 General

The results of performing double-logarithmic regressions are presented in Table 1 The first column shows the results including all explanatory variables; the second column presents the results after dropping the least statistically significant of the two market size variables, and in the case of MOA exports dropping the statistically non-significant *u* variable as well. The *t* statistics are reported between parentheses followed by the level of statistical significance in percent. Tests are one tail, except for the constant and trend GDP.

The signs of the coefficients are generally the expected ones, with only two exceptions: i) ALADI imports carry a negative coefficient in the MOA equation, and ii) the price variable of the MOII equation carries a negative coefficient. Adjusted R^2s are generally high. Durbin-Watson statistics are normal for Total, MOA and MOI exports, and fall within the indecisive interval for MOII and MOIR exports.[14] Nevertheless, the reader should keep in mind that the limited number of observations suggests caution in interpreting the results.

When regressions include both the ALADI an the world import variables, coefficients have high associated standard errors due to multicollinearity. With the exception of MOII, the least important market in terms of the share of exports coincided with the statistically least significant coefficient. In the case of MOII, market share was initially higher for ALADI but switched to the rest of the world around the middle of the period. Elimination of the least statistically significant of the two collinear variables reduces the standard error of the regressors at little or no cost in terms of explanatory power, suggesting that there is little additional information provided by the eliminated variable. F-tests for redundant variables did not reject the hypothesis that these variables had a zero coefficient.

There is a second source of multicollinearity between trend output and world imports, and it affects primarily the equations for total and for MOA exports. There is collinearity between trend GDP and the MOII price variable, and between trend GDP and GDP/trend GDP (*u*). In the case of *u*, the observed negative correlation results from the decline in GDP with respect to the 1960-1980 trend in the mid seventies and the recession observed from 1981 on (see Figure 4).

Table 1. Exports of manufactures, 1971-85 [a]

(logarithms)	Total		MOA		MOI		MOII		MOIR	
Constant	35.9 (2.8) 5	36.4 (3.1) 5	35.8 (1.1)	13.4 (2.6) 5	49.4 (2.5) 5	22.9 (1.6)	-20.0 (0.7)	−32.2 (1.4)	65.5 (2.5) 5	46.3 (2.6) 5
Trend GDP	−2.4 (2.7) 5	−2.5 (3.0) 5	−2.4 (1.0)	−0.8 (2.2) 10	−3.5 (2.5) 5	−1.5 (1.6)	1.5 (0.8)	2.4 (1.6)	−4.7 (2.6) 5	−3.3 (2.8) 5
GDP/trend GDP	−1.3 (1.4)	−1.2 (1.5) 5	−0.8 (0.6)		−4.3 (3.7) 1	−3.6 (2.9) 1	−4.3 (2.8) 2.5	−3.7 (2.8) 2.5	−2.9 (1.9) 5	−2.7 (1.8) 10
$ruxr_{avg,\ t-1}$	0.1 (0.6)	0.1 (0.8)								
$ruxr_{nri,\ t-1}$			0.1 (0.4)	0.2 (1.7) 10						
$ruxr_{lnrc,\ t-1}$					0.3 (1.3)	0.6 (3.1) 1			1.0 (2.7) 2.5	1.3 (5.2) 1
$ruxr_{moii,\ t-1}$							−0.7 (2.7)	−0.7 (3.1)		
World imports, total	1.5 (3.4) 1	1.6 (6.4) 1								
World imports, MOA			1.9 (1.8) 10	1.2 (5.8) 1						
World imports, MOI					1.2 (1.8) 10					
World imports, MOII							0.4 (0.8)			
World imports, MOIR									1.0 (1.0)	
ALADI imports, total	0.05 (0.2)				0.9 (2.6) 2.5	1.4 (6.9) 1			1.5 (3.2) 1	1.8 (7.4) 1
ALADI imports, consumption			−0.2 (0.6)							
ALADI imports, intermediate							0.8 (2.7) 2.5	1.0 (5.5) 1		
Adjusted R^2	0.87	0.89	0.76	0.80	0.93	0.92	0.97	0.97	0.90	0.90
D-W	2.32	2.27	2.08	2.02	2.09	2.01	3.36	3.40	3.30	3.29

[a] Excludes 1975 and 1976, leaving 14 observations; an extra one is lost due to the lagged price variable. Absolute value of the *t* statistic between parentheses, followed by level of statistical significance in percent. D-W indecisive zones at the 95 percent confidence: 1.61 − 3.56 and 1.91

The coefficients for trend output are negative for all but one of the export groups, and the elasticities are large. For example, in the case of total exports a one percent increase in trend output would result in an estimated 2.4 percent reduction in exports. An increase in trend output for a given rate of utilization implies an increase in domestic demand that, for given relative prices and foreign market size, would reduce exports. Exports seem to have grown because the export-increasing effects of growth in capacity and in international demand more than compensated for the export-reducing effects of growing domestic demand. A positive coefficient for MOII indicates that capacity in these industries increased at a rate exceeding trend output, allowing for exports to grow as the economy expanded. In the case of MOIR, instead, trend growth had a negative and substantial effect on these exports. This high negative elasticity to trend growth is probably due in part to the high share of capital goods in MOIR, since domestic sales of capital goods are highly elastic to economic activity levels. Note that coefficients for the GDP trend variable in the MOII and MOIR equations gain statistical significance when eliminating the world trade variable, which is collinear with the GDP trend variable.

The results on countercyclical behavior are interesting. The effects perceived at the level of all exports of manufactures are determined primarily by MOI. MOA exports are much less (if at all) countercyclical. This may be due to the low income elasticity of food products, which account for a high share of MOA exports. As expected, MOI are much more countercyclical, and coefficients are much higher for MOII exports. The coefficients are statistically significant for most subgroups. A more detailed discussion on the size of the coefficients is provided in the following subsection.

Price elasticities carry the correct sign with the only exception of MOII exports. The price elasticity of MOA exports is low. Helped by the more competitive nature of the corresponding markets, changes in international prices for these products may be more easily transferred to agricultural rents through changes in the prices of their agricultural inputs (Londero, 1997). Such is clearly the case of vegetable oils, leather, or processed beef. As expected, MOII did not respond to price changes. The MOII price variable, however, is highly collinear with trend GDP due to the world price increases of steel and chemicals during the period. Elimination of the price variable due to its incorrect sign results in a sign switch for the trend GDP variable (bringing it in line with the sign for the other export groups), a more pronounced countercyclical behavior, but a low DW statistic suggesting the possibility of an omitted variable or an incorrect specification. A RESET test, however, cannot reject the hypothesis that the coefficients for the forecast vectors are zero. MOIR exports, instead, show a relatively high price elasticity reflecting the greater labor intensity of the products involved (Londero, Remes and Teitel, 1998).

As mentioned, total-trade elasticities are affected by collinearity between the two variables selected, causing for the standard errors of the respective coefficients to be high. Eliminating the least statistically significant total-trade variable either improves the explanatory power of the equation or reduces it minimally, suggesting that the eliminated variable has none or very limited independent explanatory power. Elimination of one of the total trade variables improves the statistical significance of all price coefficients.

Estimated coefficients for total trade elasticities of MOII exports provide the expected results. The coefficient for world trade in MOII is very small and not statistically different from zero, while that of ALADI is much larger, and statistically significant.

In the case of MOIR exports, the importance of the combined high price and ALADI-imports elasticities should be noted, since these two characteristics greatly affected MOIR export performance during the study period. First, because real unit export revenues plunged in the late seventies and early eighties due to the overvaluation of the domestic currency. Second, because ALADI imports severely declined after 1981 due to the debt crisis.

5.2 Countercyclical effects

The coefficients estimated for the countercyclical effects are sizable and statistically significant. The economic importance of these coefficients, however, cannot be judged independent of the size of the export coefficients. If the elasticity of exports of group i (X_i) with respect to u is

$$\mu_i = (u/X_i)(\mathrm{d}X_i/\mathrm{d}u)$$

the change in exports associated to a change in u would be

$$\mathrm{d}X_i = \mu_i\,(X_i/Q_i)\,Q_i\,(\mathrm{d}u/u) \qquad (20)$$

where Q_i is total output of i. Similarly, from the formula of the income elasticity of domestic sales η_i, the change in domestic sales D_i associated to a change in u would be

$$\mathrm{d}D_i = \eta_i\,(D_i/Q_i)\,Q_i\,(\mathrm{d}Y/Y) \qquad (21)$$

The ratio of (20) to (21) would provide the share of the change in domestic sales that is transformed into a change in exports. Consider the change in total exports and the average export coefficients presented in Table 2. At the average utilization of 94.6 percent, a 10 percent reduction in capacity utilization implies a 9.46 percent reduction in GDP and an increase in exports of

$$\Delta X = 0.079 \times Q \times 0.10 \times 1.2 = 0.0095 \times Q$$

where Q is the value of total manufacturing output. Assuming an income elasticity of domestic sales equal to one, domestic sales would decrease by

$$\Delta D = (1 - 0.079) \times Q \times 0.0946 \times 1 = 0.08713 \times Q$$

Thus, a 10 percent decrease in capacity utilization at the average utilization level would have resulted in additional exports amounting to 10.9 percent of the fall in domestic sales. Similar calculations for all subgroups of exports are presented in Table 2 using plausible values for the export coefficients and unitary income elasticities for all domestic sales. The results show low values for total exports of manufactures, and, as hypothesized, even lower values for MOIR exports. MOII exports, instead, and also as hypothesized, would absorb a greater share of a demand drop. That share would have been almost three times higher than that of MOIR exports.

Table 2. Estimated percentage of the reduction in domestic sales that is transformed into additional exports

Exports	Elasticities	Export coefficients	Percentage absorbed by exports
Total	−1.2	0.079	10.9
MOI	−3.6	0.044	17.5
MOII	−3.7	0.060	25.0
MOIR	−2.7	0.030	8.8

Note: Estimated at the average value of $u = 0.946$. An income elasticity of domestic sales equal to one was used for all groups. Export coefficient for MOIR estimated based on the fact that coefficient for MOI is a weighted average of MOII and MOIR.
Sources: Elasticities from Table 1; export coefficients from Azpiazu, Bisang and Kosacoff (1986, pp. 145-6).

It could be argued that MOIR domestic sales would be more income elastic than MOI because durable and capital goods are part of MOIR. To explore the implications of those possibilities, Table 3 presents the simulated results for alternative values of the income elasticity of domestic sales, showing that the higher the income elasticity of MOIR with respect to MOII the larger the ratio between the two percentages of domestic sales absorbed by exports.

Table 3. Ratios between percentage reductions in domestic sales that are transformed into additional exports for different values of the income elasticity of domestic sales

Assumed income elasticities (MOA,MOI)	Ratios (MOA/MOI)	Assumed income elasticities (MOII,MOIR)	Ratios (MOII/MOIR)
1, 1	0.38	1, 1	2.90
0.8, 1.2	0.57	1, 1.5	4.24
0.6, 1.2	0.76	1, 1.8	5.09
0.6, 1.5	0.95	1, 2	5.66

Source: Estimated according to the procedure described for Table 2.

6. CONCLUSIONS

A countercyclical behavior of exports is to be expected from profit maximizing producers. In fact, in the case of a traded good that faces competitive domestic and foreign markets, producers would be expected to export the totality of any reduction in domestic sales.

In the case of manufactures, the ability of producers of materializing countercyclical exports, and thus the importance of the countercyclical behavior, may depend on the physical nature of the product and the capital to output ratio of the manufacturing process. Products that are more standardized (commodity-like) and originate in industries with high capital to output ratios would be expected to show a more pronounced countercyclical behavior. Data for Argentina's exports for the 1970-85 period could not reject such hypothesis.

The analysis of Argentina's total exports of manufactures is likely to hide characteristics that are important for policy design. A broad classification between MOA and MOI exports would not solve the problem. The MOI group would still comprise two subgroups with very different behavior, and give the erroneous impression that MOI exports are largely countercyclical and price inelastic. MOI exports are better understood when decomposed into MOII and MOIR.

The results of this study show that over the 1970-85 period MOA exports were driven primarily by the evolution of world exports, and showed a low price elasticity. MOII were more countercyclical than any other group, unresponsive to prices, and driven by trend growth and the size of the ALADI markets. Conversely, MOIR exports, while also responding to growth in world markets, specially the ALADI market, were much more price elastic and able to absorb a much smaller share of domestic demand reductions into additional exports.

As a result, while it may be argued that the growth of MOII exports during the seventies and early eighties was partly due to unused capacity created in the expectation of a growth that did not materialize (Azpiazu and Kosacoff, 1989, chapter 3), that would not be the case for MOIR exports. Their performance seems to have been the result of a maturing manufacturing sector, external demand and relative prices. Those characteristics should be kept in mind when analyzing the export performance of these industries.

Finally, these results are based on relatively small number of observations. Further studies based on detailed estimates of the price variables for longer periods of time may shed additional light on the role of fluctuations in economic activity as determinants of export levels.

* * *

Appendix

Classification of exports

ISIC	Description
MOA	Manufactures of agricultural origin
3100 (excl.3134)	Food, beverages and tobacco, excl. soft drinks and carbonated waters
3211	Spinning, weaving and finishing textiles
3231	Tanneries and leather finishing
3232	Fur dressing and dying
3233	Products of leather and leather substitutes, excl. footwear and wearing apparel
3240	Footwear, excl. vulcanized or molded rubber or plastic footwear
3311	Sawmills, planing and other wood mills
3312	Wooden and cane containers and small cane ware
3319	Wood and cork products n.e.c.
3411	Pulp, paper and paperboard
MOII	Manufactures of industrial origin, commodity-like inputs
3511	Basic industrial chemicals, except fertilizer
3513	Synthetic resins, plastic materials and man-made fibers except glass
3529	Chemical products n.e.c.
3530	Petroleum refineries
3540	Miscellaneous products of petroleum and coal
3700	Basic metal industries
MOIR	Manufactures of industrial origin, rest
3134	Soft drinks and carbonated waters
3212	Made-up textile goods except wearing apparel
3213	Knitting mills
3214	Carpets and rugs
3215	Cordage, rope and twine
3219	Textiles n.e.c.

3220	Wearing apparel, except footwear
3320	Furniture and fixtures, except primarily of metal
3412	Containers and boxes of paper and paperboard
3419	Pulp, paper and paperboard articles n.e.c.
3420	Printing, publishing and allied industries
3512	Fertilizers and pesticides
3521	Paints, varnishes and lacquers
3522	Drugs and medicines
3523	Soap and cleaning preparations, perfumes, cosmetics, and other toilet preparations
3551	Tire and tube industries
3559	Rubber products n.e.c.
3560	Plastic products n.e.c.
3600	Non-metallic mineral products, except products of petroleum and coal
3800	Fabricated metal products, machinery and equipment
3900	Other manufacturing industries

Source: United Nations (1971a). The classification is based on Azpiazu, Bisang and Kosacoff (1986), as modified by Jorge Remes (Londero, Remes and Teitel, 1998).

Data Sources

Trade data: Series for the value of exports of manufactures classified by ISIC from the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). World imports of manufactured products classified by ISIC from the Statistics Unit of the Inter-American Development Bank, and were obtained by applying the SITC-ISIC cross-classification developed by the International Trade Division of the World Bank to the data provided by the United Nations Statistical Office, Commodity Trade Data Base (COMTRADE). That cross-classification closely follows that of United Nations (1971b), but includes coefficients that distribute some five-digit SITC groupings among three or four-digit ISIC groups. ALADI imports classified according to CUODE from the Statistics Unit of the Inter-American Development Bank, and were originally obtained from ECLAC. Series in current US dollars were expressed in constant dollars using the US producer price index for major commodity groups (processed foods and feeds for MOA, total industrial commodities for MOI, MOII, and MOIR).

GDP at constant prices: Economic and Social Data Base of the Inter-American Development Bank.

Real unit export revenues: From Londero, Remes and Teitel (1998), calculated as $ruxr_i = (p_i^w/p_i^d)\, er_i\, (1 + r_i + f_i)$, where p_i^w is the US producer price index for major commodity groups (i = processed foods and feeds for MOA, total industrial commodities for MOI, MOII, and MOIR), p_i^d is Argentina's non-agricultural wholesale price index, er_i is the nominal exchange rate, r_i is the reimbursement and f_i is the *ad valorem* equivalent of the financial incentives. Estimates were classified according to the natural resource content of the product into natural resource intensive, non-intensive in natural resources but with a high natural resource content, and low natural resource content (Londero, Teitel et al., 1998). A simple average of the three ($ruxr_{avg}$) was used for total exports, that for natural resource intensive goods ($ruxr_{nri}$) was used for MOA exports, that for low natural resource content goods ($ruxr_{lnrc}$) was used for MOI and MOIR exports. A special estimate for MOII exports was calculated as a simple average for the selected products corresponding to MOII. Domestic price indexes from ECLAC office in Buenos Aires, and originate in INDEC.

Footnotes

*. Inter-American Development Bank. Opinions expressed in this paper are those of the author and are not intended to represent views of the Bank. Comments by Simón Teitel, Glenn Westley, Antonio Spilimbergo, Lutz Kilian, and two anonymous referees are gratefully acknowledged.

1. See, inter alia, for Argentina, Felix (1974) and Azpiazu, Bisang and Kosacoff (1986); for Brazil, Cardoso and Dornbusch (1980), Zini (1988), Bonelli, Franco and Fritsch (1993), and Amazonas and Rands Barros (1996); for Peru, Schydlowsky, Hunt and Mezzera (1983); for Uruguay, Laens, Lorenzo and Osimani (1993); and for Latin America, IDB (1982).

2. ISIC, an industry based classification, stands for the International Standard Industrial Classification; see United Nations (1971a).

3. Latin America Free Trade Association.

4. The study period was determined by the availability of two types of data: i) export data classified according to ISIC using the same classification criteria; ii) data on real unit export revenues. See Section 4.

5. For evidence of price discrimination see INDEC (1987).

6. For an analysis of this and other cases of partially traded goods, see Londero (1996).

7. Like in the preceding case, the domestic relative price variable may be exogenous if, for example, the domestic price is fixed by the government.

8. For a discussion of the ISIC definition of manufactures versus that based on the Standard International Trade Classification (SITC), see Londero (1998).

9. ISIC codes included in each group are provided in the Appendix. The classification was originally proposed by Azpiazu, Bisang and Kosacoff (1986). The one used in this study incorporates the modifications proposed by Jorge Remes (see Londero, Remes and Teitel, 1998).

10. Exponential and Hodrick-Prescott trends were also tried. The linear trend provided the best fit.

11. Correlations for the 1970-80 period between alternative definitions of the *u* variable (linear trend, exponential trend and Hodrick-Prescott) provide coefficients equal to 1.00 with very high *t* statistics and R^2s.

12. ALADI is the Spanish acronym for the Latin American Association for Integration, formed by Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela, where countries grant trade preferences to each other, mostly on a bilateral basis.

13. Also, it is conceivable that exports of a good with a high income elasticity may decline as per capita income grows.

14. An alternative set of regressions using an exponential trend and the corresponding *u* variable yielded almost identical results. Another specification using estimates of the capital stock (Hofman, 1992) for potential output, and retaining the decomposition of income between trend and 'used trend', was rejected due to poor results.

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