The Pakistan Development Review
34 : 4 Part III (Winter 1995) pp. 1181—1189

Export Earnings Instability in Pakistan

AHMAD TARIQ and QAZI NAJEEB

1. INTRODUCTION

Since independence, Pakistan, like many other countries, has been facing the problem of the balance-of-payments deficit. A number of policies have been introduced during different periods for rapid and continuous growth in Pakistan's exports. These policies, like import substitution, devaluation of the rupee in 1972, export finance schemes, tax concessions, delinking of the rupee from the U.S. dollar in 1982, etc., have helped in boosting its exports to some extent but not enough to stabilise its export earnings. The fluctuations in export earnings are known to have serious consequences. Specifically, unstable export earnings affect the investment decisions by hindering the continuous import of industrial raw materials. This, in turn, impedes the growth of the industrial sector. Moreover, it causes fluctuations in the GNP and promotes uncertainty in the economy. This uncertainty plays a decisive role in the private sector's hesitation to invest in the large-scale manufacturing industries, thereby hampering the country's overall development. Keeping in view the possibly serious consequences of export earnings instability, a study exploring its causes is in order. Concentration of exports on a few commodities and exporting to only a few markets is among the possible explanations of the current instability in Pakistan's export earnings. Due to commodity concentration, the chances of offsetting the impact of adverse price movements in the international market are reduced. This commodity concentration is often associated with the concentration on primary products and is, therefore, the basis for a policy of diversification away from primary products. A diversification away from primary products and towards industrial goods is desirable for another reason, not central to this paper; and that is that the terms of trade argument which claims that the relative prices of the primary products have increased slowly relative to the prices of the manufactured goods in the international market.

This study is an attempt to determine the causes of export earnings in Pakistan using time-series data from the period 1969-70 to 1990-91. The data is taken from

Ahmad Tariq is Development Engineer at Johnson and Phillips Industries, Lahore. Qazi Najeeb is Assistant Professor, Department of Economics, International Islamic University, Islamabad.

Authors' Note: We are grateful to the Institute of Policy Studies for providing typing facilities.

Government of Pakistan (1991, 1992). The plan of this study is as follows. Section 2 explains some important factors which cause export instability. Section 3 develops the methodology of analysis. Section 4 presents the empirical results. Section 5 summarises the findings of the study and draws possible policy implications.

2. CAUSES OF INSTABILITY

Primary commodities often experience supply-side instability. Various factors play a role in these supply shifts. In the case of agricultural commodities, these factors may be crop failure due to weather variability, pest attacks, diseases, and cobweb supply effects. Commercial policy changes due to tariffs and taxes can also cause supply shifts. In the case of agricultural commodities, Pakistan, like other less developed countries (LDCs), specialises in agricultural and primary products. The agriculture sector's dependence on nature causes fluctuations in supply conditions of primary products, thus making export receipts unstable. Also, primary products are known to have low supply and demand elasticities, thus making the export receipts unstable. Primary products are divided into food and raw materials, and these items have distinct supply and demand conditions. The food items are known to have low income elasticities, whereas the demand for raw materials is affected more by cyclical variations in income levels. According to Massell (1970), countries with more dependence on raw material exports tend to experience an above-average instability in their export receipts. Food-exporting countries, however, experience less instability in their earnings. Demand elasticity for a given country's exports depends on that country's market share. A country like Pakistan having an insignificant share of the world market (0.18 percent) will be faced with almost horizontal (perfectly elastic) demand curve, whereas a country with a large market share will face a demand curve with an elasticity closer to that of the total demand curve. The import demand conditions of primary and agricultural products also cause the export receipts of a country to fluctuate. Each country faces a net foreign demand curve, based on aggregate world supply and demand. This demand curve may shift due to price changes of competing goods, or due to the cyclical variations in the income of importing countries.

The commodity concentration is often regarded as the major cause of export earnings instability in different countries. It is assumed that because of the concentration, fluctuations in some exports in one direction may not be offset by counter-fluctuations by other commodities in the other direction. The instability of export earnings also depends on the instability of individual commodities as well as the correlation between different pairs of commodities. Products that are affected by similar market forces have a tendency to move together. However, dissimilar products may vary independently. A country whose exports consist of only a few commodities is expected to have unstable export earnings. However, a country with diversified exports will experience a greater export earnings stability. A line of reasoning similar to that relating to commodity

concentration and instability can also be applied to the number of destinations of exports. This means that if a country's exports are going only to a few countries, export earnings might fluctuate a lot. However, if exports go to many different countries, demand shifts in some importing countries can be offset by opposing demand shifts in other countries, thereby making the total export receipts more stable.

Briefly, the LDCs specialise in primary products exports, and it is believed that the exports of primary products are subject to greater short-run fluctuations as compared to manufactured goods. Secondly, countries that export primary products tend to have a high commodity concentration than industrialised countries. Finally, the geographic concentration may also make export earnings unstable. In the next section, we develop a model to incorporate these factors for the empirical analysis.

3. METHODOLOGY

Export instability in literature is defined as the short-run fluctuations in export earnings corrected for trend. Trend correction is needed because in its absence a country with a rapid growth rate (even if constant) will show a very high instability. The change over time in the value of exports in a country stems from the interaction of numerous market forces, both on the supply and demand sides. In this regard, the long-run forces determine the trend and the short-run forces determine the fluctuations around the trend.

Measurement of Export Instability

Over the years, researchers have used various methods to measure instability. In these studies, the first consideration is given to find a trend of export earnings which fits the data well. The trend lines are linear and exponential respectively, and are measured as

$$X_t = \alpha_0 + \alpha_1 t + u_t$$
$$log\ X_t = \beta_0 + \beta_1 t + u_t$$

where t is the time in years, X_t is the actual value of export earnings in a given year t, and u_t is the error term.

The exponential trend-line is used in this study. The theoretical justification for this choice is that countries plan in terms of their growth rates and not in terms of absolute increments. Also, the exponential trend provides a better fit than the linear trend, in Pakistan's case. The results obtained for the exponential trend regression for Pakistan are:

$$log' X_t = 7.2926 + 0.0725t,\ R^2 = 0.9082$$

The trend values for each of the years are calculated by taking the antilog of the exponential trend, i.e.,

$$X_t = antilog\ (\beta_0 + \beta_1 t)$$

Each year's instability (see Appendix Table) is measured by taking the percentage deviation of each year's actual value X_t from the trend value X'_t

$$I_t = \left(\frac{X_t - X_t}{X_t}\right) * 100$$

where $t = 1, ..., 22$ (years).

Measurement of Explanatory Variables

On the basis of the preceding discussion, the instability of export earnings appears to be affected by the commodity concentration of exports (*C*); the geographic concentration of exports (*G*); the ratio of primary products in exports (*P*); the raw material ratio (R_r) in total exports; and the food ratio (R_f). Another factor that can effect instability is the fluctuations in export quantities (Q_i). These factors are used as the explanatory variables in our multiple regression analysis.

In order to calculate *C*, nineteen commodities are selected. These commodities account for 75–88 percent of Pakistan's export earnings. Seventeen of these commodities are at the SITC 3-digit level (rice, raw wool, raw cotton and cotton waste, leather, cotton yarn and thread, cotton cloth, petroleum and products, synthetic textiles, footwear, animal casings, *guar* and products, paints and varnishes, tobacco—raw and manufactured, readymade garments and hosiery, surgical instruments, carpets and rugs, and sports goods) and two are at the SITC 2-digit level (fish and fish preparations, and drugs and chemicals). *C* is calculated using Gini-Hirschman coefficient.

$$C = 100 \sqrt{\sum_{i=1}^{n} \left(\frac{X_{it}}{X_t}\right)^2}$$

where

X_{it} = export earnings from commodity *i* in year *t* in rupees (millions);
X_t = total export earnings in year *t* in rupees (millions); and
n = number of commodities.

The highest possible value of *C* is 100. This happens if the country exports only one commodity. The lowest possible value is $100/\sqrt{n}$, which happens when the export receipts are evenly distributed among '*n*' different commodities.

For the calculation of *G*, nine markets are selected (OIC, Consortium, Other than Consortium, CMEA, ASEAN, Other America, Other Europe, Other Asia, Other Africa). *G* is also calculated using Gini-Hirschman coefficient.

$$G = 100 \sqrt{\sum_{j=1}^{m} \left(\frac{X_{jt}}{X_t}\right)^2}$$

where

X_{jt} = export earnings from market j in year t in rupees (millions);
X_t = total export earnings in year t in rupees (millions); and
n = number of markets.

Primary products ratio (P) is the proportion of total export earnings derived from SITC groups 0–4. Out of the 19 selected, 8 fall in this category (fish and fish preparations, rice, raw wool, raw cotton and cotton waste, petroleum and products, animal casings, *guar* and products, and tobacco—raw and manufactured). Raw materials ratio (R_r) is the proportion of total export earnings derived from SITC groups 0, 1, and 4. Commodities in this category are raw wool, raw cotton and cotton waste, petroleum and products, and animal casings. Food ratio (R_f) is the ratio of SITC groups 2 and 3 to the total export earnings. Commodities in this category are fish and fish preparations, rice, *guar* and products, and tobacco—raw and manufactured. Fluctuations in export quantity index (Q_i) are calculated as follows:

$$Q_{it} = \left(\frac{Q_t - Q_{t-1}}{Q_{t-1}}\right) * 100$$

where Q_t and Q_{t-1} are quantity indices from the present and past years, respectively.

4. EMPIRICAL RESULTS

To explain the effect of explanatory variables on instability, a number of regressions of the following form were computed:

$$I_t = \beta_0 + \beta_1 C_t + \beta_2 G_t + \beta_3 P_t + \beta_4 R_{rt} + \beta_5 R_{ft} + \beta_6 Q_{it} + \varepsilon_t$$

Table 1 reports four regressions. All regressions are significant, but auto-correlation is indicated (Durbin-Watson values are not close to 2). These regressions are all corrected for auto-correlation and the corrected results are reported in Table 2. R^2 values for all regressions are higher than the ones in Table 1. Regression 1 in Table 2 shows the results of regression of I on C, G, P,[1] and Q_i. Regression 2 shows the regression of I on C, G, R_r, R_f, and Q_i. Three variables were found to be significant at the 10 percent level in these 2 auto-correlation-corrected regressions (C, R_f, and Q_i). A regression of these three variables was computed, and the results are reported in regression 3 of Table 2. R^2 for this regression is greater than the R^2 for regression 1 and

[1] P is the sum of R_r and R_f, so the inclusion of these variables in the same regression with P will not give any new information.

Table 1

Multiple Regression Results

	Regression1	Regression2	Regression3	Regression4
C	4.09	3.63	3.34	3.64
	(3.70)	(4.00)	(4.32)	(4.80)
G	1.25	0.57		
	(1.19)	(0.56)		
P	–0.51			
	(–0.89)			
R_r		–0.05		
		(–0.11)		
R_f		–1.16	–1.33	–1.44
		(–2.03)	(–3.70)	(–4.05)
Q_i	0.23	0.17	0.17	
	(1.60)	(1.29)	(1.37)	
R^2	0.567	0.669	0.658	0.622
D-W	1.55	1.68	1.60	1.73

Table 2

Auto-correlation-corrected Results

	Regression1	Regression2	Regression3	Regression4
C	3.72	3.50	3.22	3.63
	(2.89)**	(3.47)**	(3.69)***	(4.45)***
G	1.02	0.45		
	(0.96)	(0.43)		
P	–0.47			
	(–0.77)			
R_r		–0.09		
		(–0.17)		
R_f		–1.20	–1.31	–1.45
		(–1.92)*	(–3.17)***	(–3.75)***
Q_i	0.25	0.19	0.19	
	(1.81)*	(1.42)	(1.52)	
R^2	0.591	0.676	0.668	0.625

Note: The figures in parentheses below the coefficients are *t*-statistics.

* Indicates statistical significance at the 90 percent level of confidence.

** Indicates statistical significance at the 95 percent level of confidence.

*** Indicates statistical significance at the 99 percent level of confidence.

only slightly less than regression 2. This means that the dropped variables (P, G, and R_r) had no effect on instability. Both C and R_f are significant at the 1 percent level. However, Q_i is insignificant even at the 10 percent level. Regression 4 in Table 2 shows the results of the auto-correlation-corrected regression of I on C and R_f. It can be seen that almost all of the instability is explained by these two variables because there is only a slight decrease of R^2 from regression 3 to regression 4.

The two variables significant in all the regressions are C and R_f, with C having a positive significance and R_f a negative significance. The only other weakly significant variable in regression 1 is Q_i. All the other variables are insignificant. On the basis of t-ratios in regressions 3 and 4 (Table 2), the most significant variable is C. This result supports the hypothesised relationship between instability and commodity concentration. This finding is also consistent with the view that shifts in foreign demand are a major reason of export instability.

The coefficient of R_f is significantly negative at the 1 percent level. This suggests that a country deriving a large percentage of its export earnings from food items tends to experience less export instability. On the other hand, if the country is heavily dependent on raw materials or manufactures, it tends to experience more export instability. This result is consistent with the notion that instability of a country's export receipts is, to a large extent, the result of year-to-year fluctuations in the demand for its exports. If instability results mainly from the shifts in the supply curves, the agricultural commodities (foods and, to some extent, raw materials) are expected to experience greater fluctuations than manufactures. On the other hand, if instability results from fluctuations in the general demand level, it tends to affect most goods but has a greater impact on goods with high short-run income elasticities. Since food items tend to have low income elasticities, they experience less sharp fluctuations. The coefficient of Q_i is positive and (barely) significant at the 10 percent level in regression 1. This provides weak support to the claim that quantity fluctuations cause instability. This result, in turn, is consistent with the importance of shifts in foreign demand as a source of instability. Geographic concentration (G) has a t-ratio of about 1 in regression 1 and less than 1 in regression 2 (Table 2). It is insignificant at the 10 percent level, and appears to be unimportant as the explanatory variable. This suggests that in the case of Pakistan, geographic concentration is unrelated to export earnings instability. The statistical insignificance of P and R_r contrasts with the high significance of R_f. Apparently, the export instability is not influenced by the allocation of resources between raw materials and manufactures. The insignificance of R_r and negative significance of R_f suggests that there is no tendency for primary products to be more unstable than manufactures.

5. CONCLUDING REMARKS

The relationship of instability and degree of commodity concentration (C) in Pakistan was found to be strong. Our results show that C explained a large portion of the

instability in total export earnings. Therefore, a policy that succeeded in the diversification of exports would reduce the fluctuations in export earnings. The geographic concentration (G) and the instability in Pakistan's export earnings were not correlated at all. Therefore, a policy to diversify exports geographically would not help in reducing instability. The primary products ratio (P) and the raw materials ratio (R_r) are often considered important in explaining instability in a less developed country. However, in Pakistan's case these variables were not related to instability. The reason for this could be a decline in P over time, which decreased to about 20 percent of total export earnings in 1990-91. Quantity fluctuations (Q_i) are only weakly related to instability. This result was contrary to the popular belief that fluctuations in export quantities were strongly related to instability. The strong negative significance of food ratio (R_f) shows that the encouragement of food exports would reduce instability. Food items have low income elasticities and are a stabilising factor in exports. Pakistan is a low-income country where even small fluctuations in export earnings can have a lasting impact. Therefore, Pakistan needs to diversify its exports a great deal. For a meaningful policy, the policy-makers in Pakistan should be very clear as to what extent the diversification is needed, and how this diversification would affect the growth rate of the GNP and the distribution of income?

Appendix

Table 1

Data for Dependent and Explanatory Variables (Percentage)

Year	I	C	G	P	Rr	Rf	Qi
1969-70	–7.588	29.064	46.617	33.064	19.577	13.673	–10.916
1970-71	–0.039	30.105	45.708	32.533	17.668	14.414	20.556
1971-72	29.764	37.762	49.471	44.749	31.385	13.319	36.534
1972-73	45.03	34.466	50.143	39.364	16.735	17.717	26.972
1973-74	–0.445	32.16	44.985	39.435	6.604	26.119	–13.621
1974-75	0.39	32.068	45.801	47.958	16.945	26.813	0.239
1975-76	1.891	31.233	47.041	43.562	11.41	27.682	16.192
1976-77	–18.914	30.775	51.017	40.924	6.145	28.378	–6.593
1977-78	–17.745	28.667	47.073	35.693	14.199	23.721	5.062
1978-79	–19.872	30.185	50.354	32.349	8.325	24.91	31.977
1979-80	–4.639	30.064	47.499	42.025	22.384	21.888	4.478
1980-81	4.771	30.624	46.1	43.798	23.931	22.206	8.519
1981-82	–11.147	26.943	48.583	34.686	19.665	20.285	–9.28
1982-83	0.42	24.702	52.895	29.981	15.057	14.491	24.063
1983-84	–9.561	25.597	55.842	28.895	7.33	19.176	–5.411
1984-85	–18.212	24.908	53.484	28.913	14.113	13.349	2.912
1985-86	4.024	27.446	51.018	34.56	18.664	15.125	45.564
1986-87	11.105	27.129	54.875	26.511	13.701	12.422	34.38
1987-88	3.095	27.453	55.271	28.253	15.18	12.532	–16.289
1988-89	7.538	30.087	53.573	32.786	21.294	9.811	14.872
1989-90	2.823	28.126	56.95	20.326	10.34	7.774	–12.058
1990-91	21.604	29.102	54.897	18.671	8.824	8.093	15.102

REFERENCES

Pakistan, Government of (1991) *Pakistan Statistical Yearbook.* Karachi: Federal Bureau of Statistics. (Various Years.)

Pakistan, Government of (1992) *Economic Survey*. Islamabad: Economic Adviser's Wing. Finance Division. (Various Years.)

Massell, B. F. (1970) Export Instability and Economic Structure. *American Economic Review* 60:4 618–30.