

IMPORTED INPUTS AND EXPORT GROWTH: EVIDENCE FROM TUNISIA

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A great body of literature has provided empirical evidence on the key role of international trade in boosting income growth of less developed countries (LDCs).

Several factors deriving from outward oriented strategies may lead to higher rates of real GDP growth. First, income growth may increase as a result of improved resource allocation which, in turn, is due to increased competitive pressure (Haddad, 1993).

Foreign competition may drive inefficient domestic producers to exploit scale economies, eliminate waste, adopt best practice, or shut down. Second, a higher degree of openness allows LDCs to absorb technology developed in advanced nations at a faster rate (i.e. the so-called technology diffusion mechanism) (Helpman, 1997).

Third, the opening up of domestic markets to international competitors is likely to attract foreign direct investment (FDI) which, in turn, may yield important spillovers for the host country such as employing local workforce and training them as well as providing technical assistance to local suppliers and customers (Kokko et al, 1996). Additionally, since FDI generally embodies new technology, its impact on LDCs economy is often of paramount importance. Fourth, outward-oriented policies may facilitate income growth through the "learning by exporting" effect. LDCs may learn about product design and new technologies or management techniques from foreign buyers to whom they export (Rhee et al., 1984).

ABSTRACT

This paper studies the role of imported inputs in improving Tunisian export growth during the 1980's. Exporting firms might have improved their competitiveness as a result of significant reductions in average cost that, in turn, were caused by favourable changes in relative imported inputs' prices. A pooled time-series model is set up in order to estimate the effects of changes in effective rate of tariff protection on exports as a proportion of GDP. The attention is focused on the impact of the dismantling of tariff barriers for four product categories: all goods, manufactured products, machinery and electrical, and textile. Empirical results suggest that several factors, including the dinar's real devaluation and the removal of import restrictions, which since the mid-80's have accompanied the process of trade liberalisation in Tunisia exerted a strong positive influence on export growth.

RÉSUMÉ

Ce document présente une étude sur le rôle des importations dans la relance de la croissance des exportations tunisiennes durant les années 80. Les compagnies exportatrices ont eu la possibilité d'accroître leur productivité à la suite des baisses significatives des coûts moyens, engendrés par un taux de change favorable sur les prix relatifs aux importations. Un modèle "pooled time-serie" a été établi afin d'estimer les effets du change pour le taux effectif des protections tarifaires sur les exportations comme une proportion du PNB. L'analyse s'est plus particulièrement portée sur le démantèlement des barrières tarifaires pour quatre catégories de produits: tous les biens, les produits manufacturés, les machines-outils et électriques, le textile. Les résultats empiriques semblent souligner que certains facteurs, notamment la réelle dévaluation du Dinar et le retrait des restrictions sur les importations, qui ont accompagné depuis les années 80 le processus de libéralisation des échanges en Tunisie, ont eu une forte influence positive sur la croissance des exportations.

This paper focuses its attention on a further channel through which international trade may lead to higher output growth.

A more open and outward oriented economy may in fact relax a crucial bottleneck of the export-led development strategy.

Export performance may significantly improve as a result of an increase in needed imports of raw materials, intermediate inputs and capital goods that are either not produced locally or for which there is an important shortage in domestic markets. Due to the removal of import restrictions on inputs, exporting firms may face reductions in average cost and thereby improve their competitiveness.

Accordingly, import liberalization programs may positively affect aggregate output growth by improving export performances.

This study analyses the trade liberalization experience of Tunisia in the 1980's. Since the mid-80's Tunisia has changed its trade policy from an import substitution strategy to an export-oriented one. This process of trade liberalization has been accompanied by important internal reforms (e.g. the Tunisia's Structural Adjustment Program launched in 1985) with the ultimate goal of improving competitiveness. Export growth since 1986 has outpaced that of the first half of the 1980's especially due to real exchange rate depreciation. In order to test the impact of import liberalization on export performance we set up a model where a variable for effective tariff protection rates is added to other variables used to account for changes in the export function. We pool data for the whole Tunisian economy and for the manufacturing sector.

The structure of the remainder of the paper is as follows. Section 2 provides a brief description of the main fea-

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tures of the trade liberalization process in Tunisia. In section 3 an examination of aggregate trade statistics suggests a raw relationship between imports and exports within the manufacturing and the agricultural sectors. In section 4, after having introduced the model on the export function, the empirical results are presented. Section 5 concludes.

TRADE LIBERALIZATION IN TUNISIA

In the mid-80's Tunisia launched an ambitious liberalization programs that comprised the reduction and rationalization of high tariffs and the dismantling of widespread imports restrictions. The initial objective of the Tunisia trade liberalization plan was to remove all import restrictions by the end of 1991 but, as the liberalization process moved into the more sensible areas of imports competing with locally produced commodities, the completion date was postponed to 1994. In the second half of the 1980's average tariff rates and effective protection were reduced in most sectors and tariff range was considerably narrowed. Nevertheless, while protection for goods not produced in Tunisia has been practically abolished, the dismantling of non-tariff barriers for local products has been gradually offset by the introduction of higher tariffs in the form of surtaxes (e.g. Provisional Complementary Duties introduced in 1991). Additionally, it is interesting to note that the Tunisian government has also revitalized an anti-dumping and countervailing measures scheme which could be used to limit the possible adverse effect of liberalization on the national economy. The Tunisian process of trade liberalization has been accompanied by internal reforms. These include the deregulation of domestic prices and the curtailment of production subsidies. Prudent macroeconomic policies have been adopted in order to contribute to the promotion of a business environment conducive to foreign direct investment (FDI). Moreover, harmonization of standards and provisions for the protection of intellectual property has also facilitated the integration of the Tunisian economy into world trade. On the other hand, the Tunisian government has strongly supported an active-export promotion strategy providing fiscal and financial advantages to exporting enterprises. Fiscal advantages include income allowances and the partial exemption from all indirect taxes and charges.

A FIRST EXAMINATION

Several studies (Gorkcekus, 1997; Tybout and Westbrook, 1995) have analyzed the effects of the removal of constraints on imported inputs on the competitiveness of LDCs firms. For instance, Tybout and Westbrook, using plant-level data and isolating the effects of different factors on productivity, find that in Mexico between 1984 and 1990 productivity rose dramatically in manufacturing exportable producers especially due to considerable reductions in average cost that, in turn, were caused by

favourable changes in imported inputs' relative prices. Interestingly, scale efficiency gains were minor and have not been found correlated with increases in foreign competition. A first examination of Tunisian aggregate trade statistics provides empirical evidence on the positive correlation between export growth and improved access to intermediate and capital goods in the 1980's. The most striking example is within the manufacturing sector. In the textiles and clothing sector there is virtually no production of raw materials (cotton, silk, wool); Tunisian industry imports most raw materials and semi-manufactures. The process of trade liberalization has largely reduced tariff barriers for up-stream textile products, which are inputs in domestic production, relative to downstream finished goods, which compete with local production. This means that a high proportion of Tunisian export enterprises enjoy practically duty-free treatment for imported raw materials and semi-finished goods. Clothing industry seems to have greatly benefited from the import supply effect. The rapid growth in textile imports (e.g. woven fabrics and cotton) is strictly associated with growth in clothing industry. Textile imports, which accounted for 6.9 per cent of the total in 1980, reached about 14.4 per cent in 1990 (**table 1**). The share of clothing exports jumped from 15.2 per cent in 1980 to nearly 32.3 per cent in 1990 (**table 2**). Tunisian textile production is highly integrated into the European outward-processing industry. Since the clothing industry has played a "leading" role in boosting aggregate output in Tunisia during the 1980's, the aforementioned figures underscore the key importance of imported goods within the export-led development strategy. It is interesting to note that, as a consequence of the introduction of trade liberalization programs in 1985, between 1985 and 1989 higher rates of textile import growth are associated with higher rates of clothing export growth relative to the 1980-1985 period. Still within the manufacturing sector, other figures suggest the export-enhancing effects of imported intermediate and capital goods. Available data shows in fact that Tunisian export performance might have improved as result of an increase in imports of manufacturing machinery and equipment. Manufacturing productivity might have increased simply by deploying the innovative intermediate and capital goods that Tunisian producers have acquired in foreign markets. Between 1980 and 1990 the ratio of the imports of the manufactured product categories "other electrical machinery" and "power generating machinery" with respect to total imported goods increased from 3.9 per cent to 5.4 and from 1.1 per cent to 1.7 per cent respectively (**table 1**). In the aforementioned period the share of manufactured product exports went from 35.7 per cent to 69.1 per cent (**table 2**).

Table 3 indicates that since 1985 the Tunisian government has supported imports of needed intermediate and capital goods such as textile and manufacturing machin-

Table 1 Merchandise imports of Tunisia by broad product categories, 1980-90 (Percentage share).

	1980	1985	1986	1987	1988	1989	1990
Textile	6.9	9	11.6	13.5	13.1	12.6	14.4
Other electrical machinery	3.9	4.4	4.6	5.1	5	4.8	5.4
Power generating machinery	1.1	1.2	1.3	1.5	1.7	1.4	1.7

Source: Unstat, Comtrade database.

Table 2 Merchandise exports of Tunisia by broad product categories, 1980-90 (Percentage share).

	1980	1985	1986	1987	1988	1989	1990
Manufactured products	35.7	44.5	59.8	60.3	67.6	66.1	69.1
Clothing	15.2	17.2	24.5	25.5	27	26.5	32.3

Source: Unstat, Comtrade database.

Table 3 Effective rates of tariff protection, 1980-1989 (Percentage).

	1980	1985	1986	1987	1988	1989
Textile	272	203	194	107	82	76
Machinery and electrical	96	104	88	73	63	98
Total	70	84	70	52	42	43

Source: Institut d'économie quantitative.

ery by lowering tariff protection rates⁽¹⁾.

AN ECONOMETRIC ANALYSIS

Since sufficient observations are not available to estimate either a time series or a cross-section equation, we combine cross-section and time-series data to obtain more efficient parameter estimates (*pooling*). **Table 4** explains how data are combined in order to estimate the effect of changes in import restrictions on export performance. We consider the effect of changes in effective rates of tariff protection for four product categories: all goods, manufactured goods, machinery and electrical and textile. Based on the examination of aggregate trade statistics carried out in section 3, it is expected that changes in import restrictions on machinery and electrical and on textile will be found to have an impact on manufacturing and clothing exports respectively. In estimating the export function we take into consideration the influence exerted by changes in real exchange rate, changes in labour productivity and by changes in effective rates of tariff protection. A way to capture the effects of the vari-

Table 4 The Structure of the Pooled Model.

Dependent variable	Independent variables	
Exports as a proportion of GDP	Labour productivity	Effective rate of tariff protection
All goods Manufactured goods Manufactured goods Clothing	All goods Manufactured goods Manufactured goods Clothing	All goods Manufactured goods Machinery and electrical Textile

ous combinations between imported inputs and exported output is to take only relatively broad product categories into account. We introduce three dummy variables (we use textile as benchmarking product category) to control for product category specific effects not captured by other explanatory variables.

The export specification applied is:

$$\ln EX_{it} = C + a \ln RER_t + b \ln PR_{it} + d \ln ERTP_{it} + e D_1 + f D_2 + g D_3 + \varepsilon_t$$

where EX_{it} is the ratio of exports as a proportion of GDP for product categories i in period t ; C the constant; RER the real exchange rate in period t ; PR the labour productivity for product categories i in period t ; $ERTP$ the effective rates of tariff protection for product categories i in period t ; D_1 is the dummy variable that takes the value of one for all goods and zero otherwise; D_2 is the dummy variable that takes the value one for manufacturing goods and zero otherwise; D_3 is the dummy variable that takes the value of one for machinery and electrical and zero otherwise; ε the error term in period t .

An important advantage of the log-linear model is that the elasticity of the independent variable with respect to changes in the dependent variable coincides with the estimated value of the regression coefficient of the dependent variable⁽²⁾. The model is tested empirically using yearly data in 1980 and from 1983 to 1989. Unfortunately, data unavailability on effective rates of tariff protection in 1981 and 1982 has forced us to use a limited number of observations. The total number of observations is 32. The data source of GDP, real exchange rate is World Bank's World Development Indicators 1998. Real exchange rate is the nominal exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator. Data on exports are from Commodity Trade (COMTRADE) database of the United Nations Statistics Division (UNSTAT). The International Trade Standard Classification (ITSC) has been used here. Data on effective rates of tariff protection come from the Institut d'é-

(1) However, one may note that effective rates of tariff protection for machinery and electrical increased in 1989.

(2) In the log linear model ($\ln y = (\alpha + \beta \ln x)$) the elasticity of y with respect to changes in x coincides with the regression coefficient β .
 $\eta = [(dy/y)/(dx/x)] = (d \ln y)/(d \ln x) = \beta$.

conomie quantitative in Tunis. They refer to m. f. n. (most favoured nation) tariff protection only and do not take into account subsidies. Data on labour productivity come from a linear extrapolation of GATT estimates (GATT, 1994, Volume 1, Table V.1 (c), p. 101). Labour productivity is measured as value added per employee. Table 5 reports the results of ordinary least squares (OLS) regression on the export function. The model fits well and the estimated coefficients are all statistically significant, except for labour productivity, and have the expected sign. Empirical results show that Tunisian export performance was highly responsive to changes in real exchange rate in the 1980's. This result confirms the key role of dinar's real devaluation in 1985 in significantly increasing export growth. In terms of their relative contributions to export growth, real exchange rate changes appear to be substantially more important than changes in all the other independent variables considered. This finding is consistent with the results obtained by Krueger (1978). Using data from the individual country studies Krueger finds that real exchange rate changes exert the strongest influence on export growth.

As one would have expected the coefficient on effective rates of tariff protection has been found negative. This means that lower tariff barriers yielded higher export growth in Tunisia. On the contrary, increases in the ratio of exports as a proportion of GDP are associated with increases in labour productivity. Enterprises displaying higher rate of productivity are likely to enhance their competitiveness. Nevertheless, this regression presents two main problems. First, the estimated coefficient on labour productivity has not been found statistically significant. Second, since in the mid-80's Tunisian trade policy was changed to an outward orientation with a view to improving competitiveness, one might believe that this structural change has affected the relationship between the ratio of exports as a proportion of GDP and all the explanatory variables used in the regression. This means that some of or all regression coefficients might be different in subsets of data. To test this hypothesis we use a Chow test.

Multicollinearity

A high correlation between effective rates of tariff protection and labour productivity may cause the first problem. Labour productivity may increase as effective rates of tariff protection decline and thereby lead to an increase in imported raw materials, intermediate goods and capital goods. As a consequence, it becomes difficult to disentangle the separate effects of the two aforementioned explanatory variables on exports as a proportion of GDP. There are at least two ways to deal with this problem⁽³⁾.

(3) This situation is known in econometrics as *multicollinearity*.

**Table 5 OLS, Dependent Variables
In (ratio of exports as a proportion of GDP).**

Variables	Coefficients
Constant	3.776 (0.757) *
Real exchange rate	-1.070 (0.512) *
Labour Productivity	0.072 (0.063)
Effective Rate of Tariff Protection	-0.439 (0.11) *
Dummy 1	3.539 (0.135) *
Dummy 2	3.18 (0.097) *
Dummy 3	2.98 (0.109) *
R-squared	0.987
SE	0.193
DW	1.52

Number of observations 32
SE in parentheses
(*) denotes significance at 5 per cent.

The first one is to use the "extraneous" estimate method. We proceed as follows. We get an estimate of the labour productivity elasticity from the export specification and use this estimate to "correct" the export as a proportion of GDP series for labour productivity variation and then estimate the elasticity of effective rates of tariff protection. Since, as indicated in **table 5**, the value of the estimated coefficient on labour productivity is 0.072 we regress $(\ln EX - 0.072 \ln PR)$ on $\ln RER$. The results of this OLS estimate are depicted in **table 6**. All the estimated parameters, including the dummy variables, are statistically significant and have the expected sign. One should note that the values of the coefficients on real exchange rate and effective rates of tariff protection are almost identical to the ones shown in table 5. The second method consists in dropping variables suspected of causing the problem from the regression. Since our aim is to estimate the effects of import liberalization programs on export growth, we drop labour productivity variable. **Table 7** shows the results of an OLS regression on exports as a proportion of GDP using effective rates of tariff protection and real exchange rate as explanatory variables. All the estimated coefficients are statistically significant and have the expected sign. One should note that the value of the elasticity of effective rates of tariff protection is close to the corresponding ones showed in tables 5 and 6. Not only both methods have eliminated the problem of multicollinearity but they have also come up with similar estimates of the value of effective rates of tariff protection. This confirms our previous finding according to which exports as a proportion of GDP are sensitive to changes in effective rate of tariff protection.

Chow test

To test whether the relationship between exports as a

**Table 6 OLS, Dependent Variables
In (ratio of exports as a proportion of GDP).**

Variables	Coefficients
Constant	-3.772 (0.498) *
Real exchange rate	-1.07 (0.493) *
Effective Rate of Tariff Protection	-0.44 (0.098) *
Dummy 1	3.539 (0.124) *
Dummy 2	3.18 (0.094) *
Dummy 3	2.98 (0.106) *
R-squared	0.987
SE	0.189
DW	1.52

Number of observations 32
SE in parentheses
(*) denotes significance at 5 per cent.

**Table 7 OLS, Dependent Variables
In (ratio of exports as a proportion of GDP).**

Variables	Coefficients
Constant	-3.141 (0.511) *
Real exchange rate	-0.958 (0.505) **
Effective Rate of Tariff Protection	-0.489 (0.101) *
Dummy 1	3.484 (0.127) *
Dummy 2	3.191 (0.097) *
Dummy 3	2.969 (0.109) *
R-squared	0.986
SE	0.194
DW	1.48

Number of observations 32
SE in parentheses
(*) denotes significance at 5 per cent
(**) denotes significance at 10 per cent.

proportion of GDP and effective rates of tariff protection changed after the Tunisian government's decision to pursue an outward development strategy in 1985, we use a Chow test and we run two different regressions. The first regression covers 1980 and the 1983-1985 period while the second one considers data from 1986 to 1989.

The F statistic for testing the restriction that the coefficients in the two equations are the same is

$$F [7, 18] = \frac{(0.935 - 0.01 - 0.03)/7}{(0.01 + 0.03)/18} = 56.89$$

The tabled critical value is 2.58 for 5 per cent signifi-

cance, so we would reject the hypothesis that the coefficient vectors are the same in the two periods.

This result is a mixed blessing. On the one hand, it suggests in a very strong way that the trade liberalization process between 1986 and 1989 had a drastic impact on Tunisian export performance. On the other hand, it undermines the reliability of our estimated coefficients. In principle to address this issue one should run two separate regressions: one for the 1980-1985 period and the other covering the 1986-1989 period. But, unfortunately, the number of observations in each of the two regressions (i.e. 16) is not sufficient to obtain efficient coefficient estimates.

CONCLUSIONS

This paper has analyzed the role of imported inputs in improving Tunisian export growth during the 1980's. Although it has not been possible to come up with a reliable estimate of the elasticity of effective rates of tariff protection with respect to changes in exports as a proportion of GDP, our empirical findings demonstrate that drastic cuts in tariff protection levels experienced by Tunisia since 1986 resulted in structural changes in the export function.

A possible explanation for this result could lie in the increased role of imports of raw materials, intermediate and capital goods in buttressing export growth. Future research could address this issue using data at more disaggregate level such as, for instance, plant-level data and employing a higher number of observations. ●

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