

Consequences of Trade Liberalization on the Labor Market in Developing Economy: The Case of Tunisia

par

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Résumé : Les conséquences de la libéralisation des échanges sur le marché du travail des économies en développement : le cas de la Tunisie

Ce papier examine les effets, de court et de long terme, d'une libéralisation des échanges sur l'emploi et les salaires en se fondant sur des données (1971-1996) portant sur les secteurs des biens exportables et importables tunisiens. Les résultats des tests économétriques s'accordent avec les prédictions du modèle théorique d'Edwards (1988) pour les secteurs exportables. En revanche, pour les secteurs des biens importables, nous avons trouvé des résultats opposés à ses prédictions puisque l'emploi et les salaires augmentent. Nous avons conclu que cette divergence est expliquée par la spécificité de l'offre de travail tunisienne, qui est variable.

Abstract :

This paper investigates short and long run effects of trade liberalization on employment and wages using a specific factor trade model. Employment and wage equations are estimated using data (1971-1996) for importable and exportable sectors in Tunisia. Results from empirical testing using the model find some supports for the theoretical predictions of Edwards (1988) for the exportable sector. On the other hand, in the importable sectors, we find results that are opposed to those predicted by Edwards (1988) since employment and wages increase. A possible reason for the divergence of theory and practice is that the Edward's model is premised on the basis of a fixed supply of labour. Exportable employment could therefore only rise if importable employment fell. However, as we have seen, the supply of labour increased dramatically in Tunisia as women entered the labour market. This allowed employment in importable to be maintained (even slightly increase) as the exportable sector expanded.

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1. Introduction

There are relatively few studies about the effects of trade-induced shifts in the composition of employment and wage levels in developing countries. Analyses by Wood (1994), indicate that the shift from import substitution to export promotion policies will, in the case of developing country, expand the labor-intensive industries, increase overall labor demand and increase real wages in the long-run, *ceteris paribus*. However, it is important to note that trade liberalization and increased foreign competition may not only affect the composition of the tradeable goods sectors (i.e. the distribution between exportables and importables), but it may also affect both the efficiency with which all firms use factors (including labor) and the distribution of output within a sector between more and less efficient firms. Thus, the net long-run effects of trade liberalization on employment will depend upon the balance of structural and efficiency effects (i.e. the distribution of the output between firms and the factor returns) which cannot be identified from analyses of the composition of trade alone.

Furthermore, the short and long run effects of trade liberalization on employment and wages may diverge. This divergence depends on the degree of factor mobility and the competitiveness of labor markets.

The objective of this paper is to determine the effects of trade liberalization on employment and wages using a specific factor trade model. We do so using panel data evidence from Tunisia, an economy that has undergone significant trade liberalization and transformation since 1986. The data that we have used in this study have been gathered from two sources: the nation accounts of the National Statistic Institute (INS) and statistics coming from the Quantitative Economy Institute (IEQ) in order to have an industrial database for the labor market and statistics of trade.

Industrial sectors are classified as exportables and importables according to the share of exports and imports in the total production of each sector.

Indeed, Tunisia is viewed simultaneously as successfully liberalized and an economy with extensive government intervention in the labor market. As such, Tunisia provides a valuable studies case for investigating labor market adjustment to trade liberalization, given that there is now sufficient information relating to labor market condition under both its pre and post-liberalization experience.

The rest of the paper is organized as follows. In section 1 we investigate the theoretical short and long run labor market responses to trade liberalization. Section 2 provides a brief description of the nature of trade liberalization and of labor market developments in Tunisia during the period (1971-1996). Finally, in the section 3, we present the specific framework used to model and test the effects of trade liberalization on sectoral labor and wages.

2. Theoretical analyze of labor market adjustment to trade liberalization

Edwards (1988), investigates labor market adjustment to trade liberalization for a small, two factor (capital (K) and labor (L)) economy that produces three goods (exportables (X), importables (M) and non-tradeables (N)). This specific factor model typically allows for short-run capital-specificity (i.e. the capital is immobile between sectors in the short run), labor mobility between sectors and inelastic aggregate factor supply (Mussa, 1978). Production functions have conventional properties, the ranking of factor intensities is assumed to be $(K/L)_M > (K/L)_N > (K/L)_X$, there is incomplete specialization and factor supplies are fixed.

Given such a model, we summarize some of the main findings of Edwards in the following paragraphs. These results show the adjustment of employment and wage in the long and short run.

Table 1 : Long-run employment and wage adjustments following trade liberalization

| <i>Sectors</i> | <i>Production</i> | <i>Employment</i> | <i>Wage</i> |
|-----------------------|-------------------|-------------------|-------------|
| <i>Exportables</i> | I | I | I |
| <i>Importables</i> | D | D | I |
| <i>Non-tradeables</i> | I | ? | I |

I: increase, D: decrease and ?: denotes ambiguity. *Adapted from Edwards (1988)*

1. Long-run effects

In this type of model (a small open economy with three goods), when production factors can circulate freely between sectors, we conclude that:

- World prices, technology, and tariff determine domestic prices of the three goods.
- Equilibrium means that, without specialization, world prices of exportable and importable (plus tariffs) determine factor rewards, which in turn determine the price of non-tradeables (under competition).
- Non-tradeables demands determine factors used in their production as well as factors used in total production.

The long run effects of the fall in the relative price of importable following liberalization¹ are in line with those predicted by the Stolper-Samuelson theorem. Where exportables are relatively labor-intensive, tariff reduction increases demand for the economy's abundant factor, driving wages higher (and the return to capital lower).

The within-tradeables shift in production and employment is unambiguously towards exportables and away from importables, given the rise in the relative price of exportables.

In the case of non-tradeables there are opposing effects on long-run employment. On the one hand, production of non-tradeables can be expected to be higher, given the assumed pattern of factor intensities as demand grows (due to switching from tradeables and any positive income effects of tariff reduction). On the other hand, production of non-tradeables will be more capital-intensive following the rise in wages.

2. Short-run effects

Given that, in the short-run, the capital is sector-specific and that labor is mobile between sectors, Edward's model must be based on four factors in order to produce the three goods (labor, capital in exportables, capital in importables, and capital in non-tradeables). Indeed, since the capital is supposed to be sector-specific in the short run, the direct link between the price of tradeables and factor rewards is broken. Consequently, the price of non-tradeables will be determined by both demand and supply factors.

In the short-run, given that capital is sector-specific, reduction of importables price generates changes in non-tradeable price (Dornbusch, 1974), which depend on the pattern of substitution and on the extent of income effect. If the three goods are substitutes in consumption and production and if substitution effect dominates income effect, non-tradeable price will decrease relative to exportable price and increase relative to importables. In this case, output and employment must increase in the exportables sectors, while their adjustments in the non-tradeables are ambiguous: they are going to depend on the pattern of substitution between tradeables and non-tradeables. By contrast the fall in the relative price of importables combined with capital-specificity reduces production, labor intensity and employment.

Real wages in the Edwards model are defined in relative terms, i.e. relative to the numeraire, the price of exportables. In the long run, wages increase in the three sectors.

On the other hand, in the short term, the above changes in the relative prices of tradeables and non-tradeables following import liberalisation, mean that wages have increased relative to the

¹ In fact Edwards (1988) investigates a fall in the price of importables induced by a change in the world price i.e. a terms of trade change, but he points out that this is almost equivalent to an import tariff change results in a change of the same magnitude in the domestic price of imports. The exogenous shock generates, however, a higher income effect than the trade policy change.

Table 2 : Short-run employment and wage adjustments following trade liberalization in traditional trade models

| <i>Sectors</i> | <i>Output</i> | <i>Employment</i> | <i>Wages</i> |
|-----------------------|---------------|-------------------|--------------|
| <i>Exportables</i> | I | I | D |
| <i>Importables</i> | D | D | D |
| <i>Non-tradeables</i> | ? | ? | D |

I: increase, D: decrease and ?: denotes ambiguity. *Adapted from Edwards (1988)*

domestic price of importables, but decreased relative to the price of exportables and non-tradeables². Consequently, the real wage effects in the short run may be viewed as ambiguous, depending on the relative importance of importables, exportables and non-tradeables in the total consumption basket. In order to eliminate this ambiguity, we define the real wage effects in Table.2 in terms of non-tradeables.

Although it captures a great number of characteristics that are typical of several developing countries, including Tunisia, the preceding analysis is conducted in a relatively simple context, based on restrictive assumptions (fixed) regarding factor supplies. Indeed, employment and wage adjustments will be affected by the following variables:

- The heterogeneity of sectors and factors.
- Competitiveness and efficiency effects that can be caused by trade liberalization in products market and which affect employment levels.
- The sensitivity of short run wage effects to the scope for increasing capital stocks through foreign direct investment.

The presence of unemployed or non-participating labor that could be used to meet the increase in demand for exportables. For example, in Tunisia, as well as in many developing countries, expansion of certain exportable sectors may encourage female participation. This elasticity in aggregate labor supply can affect both the magnitude and direction of sectoral wage and employment responses.

3. Trade liberalization and labor market development in Tunisia

We seek now to test the model of our labor market adjustment to trade liberalization in the context of a specific, small and developing economy. Tunisia provides a case that agrees enough closely Edward's model. It has a relatively undiversified economic structure with homogeneous and clearly identifiable tradeable and non-tradeable sectors. Indeed, the low dimensionality of the Edwards model is more acceptable in this context than in larger, more diversified developing countries. Factor mobility characteristics and the relatively low levels of the measured unemployment are also in line with the assumptions set out in section 1³. Further, Tunisia has undertaken a significant and discernible trade liberalization, one that has been associated with substantial structural adjustment to the economy (Boudhiaf, 2000). Given that Tunisia didn't have political instability or other sources of shock during the period of trade liberalization, the analysis is not vulnerable to the obvious criticism that structural adjustment has been contemporaneous with a number of other significant influences besides trade liberalization.

Before the structural adjustment, Tunisia opted for a trade policy oriented toward the protection of the domestic market (BELKHIRIA 1994) and based on:

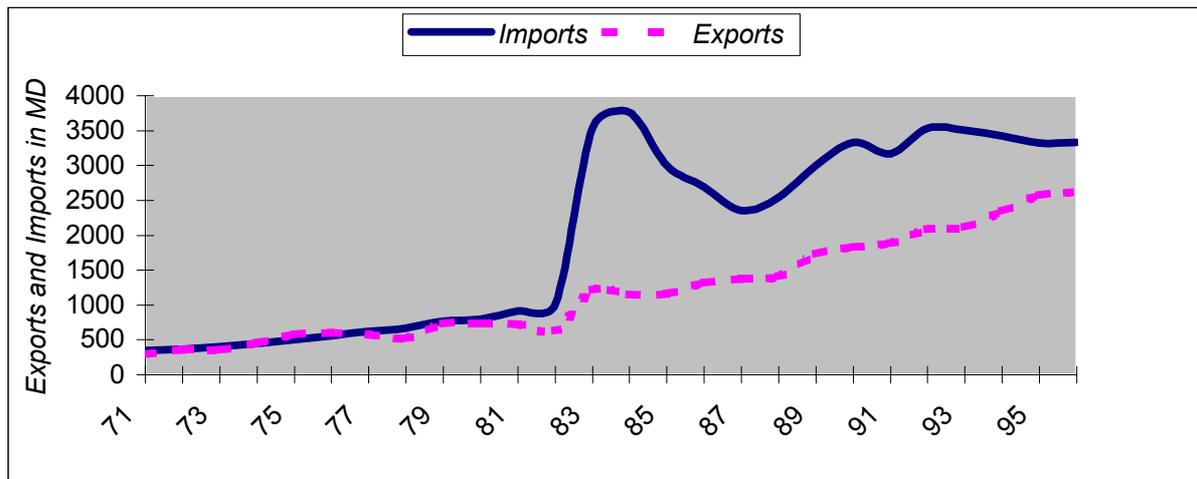
- An industrial policy of import substitution
- Export promotion since 1972 with the law of encouraging exporting industries that granted to enterprises fiscal advantages.

Despite the mixed measures of import substitution and export promotion, the exportable sectors (essentially Textile) are more labor intensive than the importable industrial sectors. For example, textile industries, and the materials of construction industries have created between 1975-1984 nearly

² The overall increase in the demand for labor, given the shift in production from importables to exportables, is with fixed capital stocks and therefore implies a falling marginal product of labor in the short run.

³ In particular high levels of labour utilisation are not characteristics of a « labor surplus » economy where one might anticipate very high elasticity's of sectoral labor supply.

Figure 1 : Export (in exportables sectors :MCCV, THC, Mine,HYDRO) and import evolutions (in importables sectors :IAA,IME,ICH,IMD)



Source: Institut National de Statistique (I.N.S) (les comptes de la nation: 1997)

1400 jobs per year against 1500 in the other industries⁴. In terms of production, the situation is less lucid since the part of all manufacturing industries in the GDP is 10,4% during the period 1972-1981.

1. Trade liberalization

During the period 1978-1986, Tunisia adopted a policy of macroeconomic stabilisation and exchange rate adjustment. Indeed, during this period taxes on imports have progressively increased and often gone beyond 100%.

Since 1986, numerous measures have been taken to further liberalise the international trade: the structural adjustment plan (1986), adherence to the GATT (1989), adherence to the OMC (1994), and the signature of a free-trade agreement with the European union (1995). According to Boudhiab (2000), the consequences of these measures on the international trade liberalisation for Tunisia spread on 3 periods. During the initial period of trade liberalisation (1986-1990), the level of protection for the economy was greatly lowered.

During the period 1990 - 1995 the nominal and effective rate of protection increased in general except for some products. This increase is explained by the consequences of the Uruguay Round that transformed non-tariff protection into tariff equivalent. Finally, during the third period (1995 - 1998), the nominal protection rate on agriculture increased, while the nominal protection rate for industrial products decreased in a significant way (see details in the contribution of Boudhiab 2000). The second liberalization index is given by the changes in the trade volume⁵ (Fig.1).

2. Labor market evolution

A complex network of institutional and legal arrangements that influence wages determination and work conditions (minimum wage) characterizes Tunisia labor market.

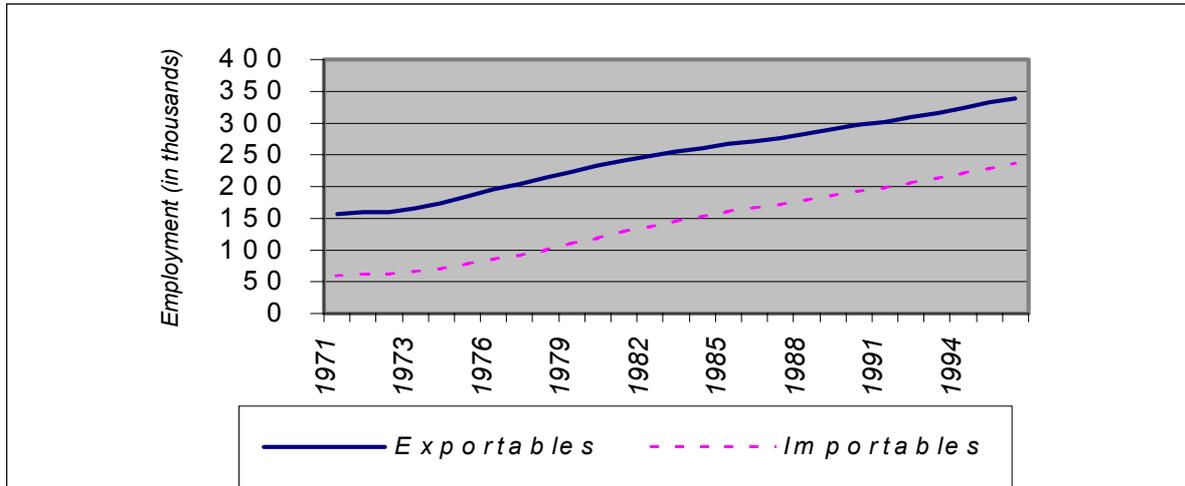
Trade union activity and collective bargaining are protected, but subject to elaborate conciliation and dispute settlement procedures, including provision for compulsory arbitration. As major employer, the government exercises an direct and indirect influence on the labor market through employment's policies decisions and periodic salary revisions. Changes of level and structure of employment in Tunisia through the last years are presented in the Fig.2⁶.

⁴ For a detailed description of labor market evolution see Dimassi, H. (1998).

⁵ Of course issues of counterfactuals and causality arise. The expansion of exports may have been assisted (in part at least) by other external and non-policy factors.

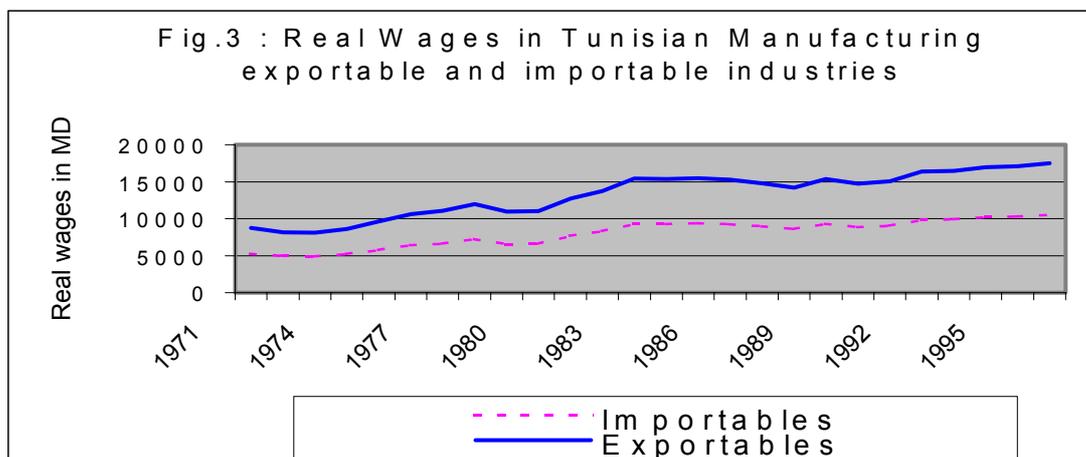
⁶ Fig 2 describes employment evolution in all sectors. While this evolution must not screen the decrease of employment in some sectors (ex: mines) and quality of dataset (IEQ estimations).

Figure 2 : Importables and exportables employment within Tunisian manufacturing industries



Source : Institut d'Economie Quantitative de Tunis (1998 Database)

Figure 3 : Real wages in Tunisian Manufacturing importable and exportable industries



Source : Institut d'Economie Quantitative de Tunis (1998 Database).

We can identify two phases of employment evolution in the exportable and importable sectors; a weak growth until 1974, and a stronger growth between 1975 and 1996. The increase in employment in the second phase is explained by two reasons; the dominant role of the exportable sector, particularly, textile, clothing and leather, a sector that has an important role in the Tunisian economy in terms of job creation. The second reason is related to the rise in participation of women in the labor market, encouraged by the important diffusion of female education and training since independence, and especially since 1980. However, after 1986 employment in importables witnessed a slight increase. This absence of employment reduction effects in the importables sector was due in part at least to the ability of exportables to grow through increase in female participation.

The effect of changing domestic and external demand conditions on real wages is illustrated in Fig.3.

From 1974, wages increased to compensate for the decline of salaried workers purchasing power. However, These increases only served to fuel the inflationary pressures building from increases in the price of international raw materials. The social unrest of 1978 and the bread riots of 1984 grew out of this strife and economic duress. After the adoption of the structural adjustment program (1986) one observes a real wage reduction until 1988, then a continuous increase up to the present time. However, this increase is stronger in the exportable sectors than in the importable goods sector.

4. Empirical Study

Several studies use regression techniques to look directly at employment determination within LDCs. However, the existing econometric studies that directly examine the impact of trade on labor market outcomes, are mainly based on U.S. data and experience. For example, Abowd and Lemieux (1990) examine the effect of import competition on collectively bargained wage and employment outcomes in the United States, in comparison with Canada.

Turning to the employment, for the purposes of the present paper, we have adopted a fairly simple static profit-maximizing model of firm behavior. Milner and Wright (1998), which are supposing a Cobb-Douglas production function of the following form, use this model:

$$Q_i = A^\gamma K_i^\alpha L_i^\beta \quad (1)$$

Where: Q = real output, K = capital stock, L = units of labor utilized (we suppose as Edwards that employment is mobile between sectors). And where α and β represent the factor share coefficients, γ allows for factors changing the efficiency of the production process, and i represent the industrial sectors.

A profit-maximizing firms will employ labor and capital at such levels that the marginal revenue product of labor equals wage w and the marginal revenue product of the capital equals the user cost c . Solving this system simultaneously to eliminate capital from the expression for firm output allows us to obtain the following expression:

$$Q_i = A^\gamma \left(\frac{\alpha L_i}{\beta} \cdot \frac{w}{c} \right)^\alpha L_i^\beta \quad (2)$$

Taking the logarithms and rearranging the equation (2) allows us to derive the firm's and therefore the industry's, derived demand for labor as:

$$\ln L_i = \theta_0 + \theta_1 \ln \left(\frac{w}{c} \right) + \theta_2 \ln Q_i \quad (3)$$

Where: $\theta_0 = -(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta) / (\alpha + \beta)$, $\theta_1 = -\alpha / (\alpha + \beta)$, $\theta_2 = 1 / (\alpha + \beta)$. This equation will form the basis of the estimation conducted in this paper.

Since the data set will be used has a cross-sectional and time series element, the estimating equation for the panel of industries in our study is of the form:

$$\ln L_{it} = \delta_t + \theta_1 \ln W_{it} + \theta_2 \ln Q_{it} + \theta_3 X_{it} + u_{it} \quad (4)$$

Where: L_{it} = total employment in industry i in time t , W_{it} = average real wage in industry i in time t (determined with regard to the general index of price), Q_{it} = real output in industry i in time t , X_{it} = variables which affect the efficiency of the function production, δ_t = time specific effect.

Wages may be determined by a large number of factors such as: efficiency wage considerations, the union bargaining and "insider-outsider" effects. To summarize these effects we estimate a wage equation of the form:

$$\ln W_{it} = \delta_t + \beta_1 X_{it} + \beta_2 \ln Q_{it} + \beta_3 \ln L_{it} + \beta_4 \ln W_{it-1} + u_{it} \quad (5)$$

Where: W_{it} , Q_{it} et L_{it} are as above and X_{it} are exogenous variables.

In the above work, X denotes a vector of variables, which may either be internal or external to individual firms engaged in the wage-setting process. For the purpose of our study, the key influences in this context are taken to be the extent of the foreign competition (and the moderating influence on the ability of firms to pay large wage increases) and the degree of employee market power. These effects are captured respectively by the addition of trade share term to the wage equation⁷. For the introduction of the trade share, we assume that the lowering of import barriers and increased competition on the domestic market will be reflected in increased import volumes or import

⁷ Milner and Wright (1998) capture these effects by the addition of trade-share and gender ratio (male/female employment) terms to the wage equation (in our paper, we do not integrate this ratio, because there is a lack of data employment by sex).

penetration in the domestic market. Similarly growth in export shares results in greater exposure of production in a particular sector to international competition.

The estimation of the effects of trade liberalization on the sectoral employment and wages is conducted in the following way:

- First, employment and wage functions are estimated separately for exportables and importables for the whole sample period. From this we are able to report short and long run employment and wage elasticities. These provide a basis for identifying the direction and the magnitude of direct and indirect effects of the inferred output changes associated with trade liberalization.
- Second, we investigate how changes in trade effects, additional to output effects, influence the demand for labor and wages by directly including terms (exports and imports) of trade in some of the equations. The rationale for these terms is that an increase in the openness of the economy may induce either efficiency effects in the case of the labor demand or discipline effects in the case of wage determination.

1. Data and estimation

The data set used in this study has been assembled using a diversity of sources (accounts of the nation of the National Statistic Institute (INS) and statistics coming from the Quantitative Economy Institute (IEQ)). We did so in order to allow the construction of an integrated database of industrial, labour market and trade statistics. Thus we have a panel on 8 manufacturing industries from 1971 to 1996. Industries are classified as exportables and importables on the basis of information about market orientation and the policy regime.

For the purposes of estimation, equations (4) and (5) are differenced so as to transform out the fixed effects, and dynamic labor demand and wage equations are implemented. We are in the case of a dynamics panel, with a bias in the coefficient on the lagged dependent variable among the regressors. Therefore, the bias of the OLS estimator stems from the correlation of the lagged dependent variable with the individual specific effects. For this reason we have used the endogenous variables dated $t - 2$ (cf Jennifer Smith, 1999). Since the OLS method does not solve the problem (the differencing will induce a bias in the coefficient on the lagged dependant variable), an instrumental approach must be adopted. As Milner and Wright (1998), the one used is the generalized method of moment's technique of Arellano and Bond (1991). But the GMM estimator needs a large number of observations, while our estimation is based on 8 sectors only. For this reason, we used a particular case of GMM that is the double square lesser (2sls). This technique uses lags of the endogenous variables dated $t - 2$ and earlier as instruments. In the case of wage equation, employment and real output are also treated as endogenous variables and suitably instrumented.

2. Results

Results of estimations of our model are presented in tables 3, 4 and 5. In tables 3 and 4, we have estimated employment and wage equations for the full sample from 1971-96. In column 1 we report a pooled regression that allows for time effects, while in columns 2 and 3 of these two tables intercept and interaction dummies are included to allow employment and wage responses to vary between the two sectors. These equations allow us not only to distinguish between the short run and the long run, but also to distinguish between the *ceteris paribus* responses of exportables (column 2) and importables (column 3).

Columns 4 of tables 3 and 4 report a basic dynamic specification of employment and wages for the period of liberalization, while in column 5 and for the period of trade liberalization import and export penetration are also included.

Generally, the estimated coefficients (sign and magnitude) are significant, and are in line with priors. Increases in industry output raise the demand for labor, whereas increases in average wage rates lower employment level. Also it could be seen that employment exhibits persistence as the change of employment depends significantly on its lagged value. As compared to the pooled regression, the results of exportables and importables sectors show a significant persistence effect of the wage and the output on the level of employment. This persistence effect is more important for the

Table 3 : Employment Equations for Tunisian Industry*

| | (1) | (2) | (3) | (4) | (5) |
|----------------------------------|------------------|------------------|-------------------|------------------|-------------------|
| C | 0.08 (0.001) | -0.13 (0.187) | 0.02 (0.002) | 0.01 (0.738) | -0.09 (0.850) |
| $\Delta \ln \text{Empl}_{t-1}$ | 0.24 (0.284) | 0.16 (0.055) | 0.86 (0.001) | -0.11 (0.390) | 0.15 (0.07) |
| $\Delta \ln \text{Wage}_t$ | -0.14 (0.018) | -0.54 (0.596) | -0.08 (0.002) | -0.08 (0.409) | -0.13 (0.167) |
| $\Delta \ln \text{Wage}_{t-1}$ | -0.09 (0.076) | 0.85 (0.128) | 0.07 (0.681) | -0.17 (0.269) | 0.21 (0.205) |
| $\Delta \ln \text{Wage}_{t-2}$ | -0.03 (0.007) | 0.95 (0.093) | -0.017 (0.238) | -0.15 (0.097) | -0.14 (0.232) |
| $\Delta \ln \text{Output}_t$ | 0.22 (0.048) | 0.68 (0.068) | 0.24 (0.128) | 0.94 (0.118) | 0.02 (0.87) |
| $\Delta \ln \text{Output}_{t-1}$ | -0.18 (0.035) | -0.40 (0.291) | -0.02 (0.210) | 0.07 (0.205) | -0.08 (0.113) |
| $\Delta \ln \text{Import}_t$ | | | | | 0.05 (0.108) |
| $\Delta \ln \text{Import}_{t-1}$ | | | | | 0.07 (0.177) |
| $\Delta \ln \text{Import}_{t-2}$ | | | | | -0.02 (0.575) |
| $\Delta \ln \text{Export}_t$ | | | | | 0.014 (0.139) |
| $\Delta \ln \text{Export}_{t-1}$ | | | | | -0.003 (0.988) |
| $\Delta \ln \text{Export}_{t-2}$ | | | | | 0.28 (0.188) |
| Time dummies | yes | yes | yes | yes | yes |
| R-Squared | 0.253 | 0.419 | 0.652 | 0.211 | 0.252 |
| Period | 1971-96 | 1971-96 | 1971-96 | 1986-96 | 1986-96 |
| Instruments | 2sls | 2sls | 2sls | 2sls | 2sls |
| Number of observations | 208 | 104 | 104 | 88 | 88 |

* P-value: between brackets ; the significant threshold is at 10%. Notes : (1) for all the period and sectors, (2) for all the period and the exportables sectors, (3) for all the period and the importables sectors, (4) the period of trade liberalization and (5) the import and export penetration in the period of trade liberalization.

importables sectors than the exportables sectors. For the period 1986-1996 (period of transition) there is an amortization effect (i.e. coefficient for the lags endogenous variables). In the sense of the effects of wages and output declines in the time. This change of tendency for the period 1986-96 denotes a change on the level of the economic structure that appears more flexibles.

Columns 1, 2 and 3 of tables 4 present the results for the estimated wage equation for the period 1971-96. The estimated coefficients are also generally in line with theoretical priors. Increases in output cause a rise of wages as firms take on more labor to meet their production needs, while expansions in employment independent of increased output generally cause a fall of wages.

Positive coefficients of the lags endogenous variables translate a persistence effect of the employment and output on wage. This effect is more important in the exportables sectors than in the importables sectors. The period 1986-96 has a persistence effect more important than the period 1971-86, which implies that for the latter period there was a weak effect of amortization.

Table 4 : Wage Equations for Tunisian Industry*

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------------|------------------|-------------------|------------------|------------------|-------------------|
| C | -0.43 (0.655) | 0.36 (0.769) | 0.10 (0.05) | 0.04 (0.05) | 0.03 (0.174) |
| $\Delta \ln \text{ Wage}_{t-1}$ | 0.03 (0.00) | 1.12 (0.00) | 0.24 (0.08) | 0.05 (0.073) | 0.42 (0.032) |
| $\Delta \ln \text{ Empl}_t$ | -0.02 (0.261) | -0.02 (0.204) | -2.26 (0.001) | -0.08 (0.001) | -0.02 (0.073) |
| $\Delta \ln \text{ Empl}_{t-1}$ | -0.03 (0.031) | -0.03 (0.049) | 1.61 (0.147) | 0.06 (0.001) | -0.024 (0.177) |
| $\Delta \ln \text{ Empl}_{t-2}$ | -0.02 (0.064) | -0.014 (0.125) | -0.02 (0.398) | -0.01 (0.138) | -0.08 (0.206) |
| $\Delta \ln \text{ Output}_t$ | 0.05 (0.104) | 0.047 (0.108) | 0.21 (0.019) | 0.03 (0.140) | 0.085 (0.103) |
| $\Delta \ln \text{ Output}_{t-1}$ | -0.04 (0.296) | -0.04 (0.417) | -0.17 (0.167) | -0.04 (0.154) | 0.03 (0.564) |
| $\Delta \ln \text{ Import}_t$ | | | | | 0.06 (0.015) |
| $\Delta \ln \text{ Import}_{t-1}$ | | | | | 0.05 (0.107) |
| $\Delta \ln \text{ Import}_{t-2}$ | | | | | 0.063 (0.051) |
| $\Delta \ln \text{ Export}_t$ | | | | | 0.09 (0.182) |
| $\Delta \ln \text{ Export}_{t-1}$ | | | | | 0.004 (0.136) |
| $\Delta \ln \text{ Export}_{t-2}$ | | | | | -0.022 (0.037) |
| Time dummies | yes | yes | yes | yes | yes |
| R-Squared | 0.449 | 0.424 | 0.725 | 0.654 | 0.604 |
| Period | 1971-96 | 1971-96 | 1971-96 | 1986-96 | 1986-96 |
| Instruments | 2sls | 2sls | 2sls | 2sls | 2sls |
| Number of observations | 208 | 104 | 104 | 88 | 88 |

* P-value: between brackets ; the significant threshold is at 10%. Notes : (1) for all the period and sectors, (2) for all the period and the exportables sectors, (3) for all the period and the importables sectors, (4) the period of trade liberalization and (5) the import and export penetration in the period of trade liberalization.

As discussed in the previous section, an important element in the theoretical model is that there will be differing wage and employment responses between importable and exportable sectors. Thus in column 2 and 3 (tables 3 and 4) intercept the employment and wage responses to vary between the two sectors following the trade liberalisation reform [i.e. (t), (t-1), and (t-2)].

These equations allow us not only to distinguish between the short and the long run, but also to allow us to distinguish between the responses of importables and exportables.

For example, the model of Edwards (1988) suggests that the impact of tariff reductions would serve to reduce the price of importables relative to that of exportables, and lead to switch of production in favour of exportables. Such a reform will have output, wage and employment implications for the economy being considered.

Since the initial shift in production will have both employment and wages effects, the implied change in employment in each sector ($i = x, m$) is given by:

Table 5 : Simulated Total Response Coefficients for Sectoral Employment and Wages Following an Output Shock*

| | <i>Impact</i> | <i>Short-run</i> | <i>Long-run</i> |
|---------------------------------|---------------|------------------|-----------------|
| <i>Employment change</i> | | | |
| <i>Exportables</i> | 0.65 | 0.282 | 0.918 |
| <i>Importables</i> | 0.22 | 0.21 | 0.41 |
| <i>Wage change</i> | | | |
| <i>Exportables</i> | 0.033 | -0.007 | 0.976 |
| <i>Importables</i> | 0.14 | 0.08 | 0.203 |

* Where shock is a rise in output on exportables and a fall in output on importables

$$\frac{d \ln N_i}{d \ln Q_i} = \frac{\delta \ln N_i}{\delta \ln Q_i} + \frac{\delta \ln N_i}{\delta \ln W_i} * \frac{\delta \ln W_i}{\delta \ln Q_i} \quad (6)$$

Where: N_i = employment in sector i, Q_i = real output in sector i, W_i = real wage rates in sector i, and the corresponding change in wages by:

$$\frac{d \ln W_i}{d \ln Q_i} = \frac{\delta \ln W_i}{\delta \ln Q_i} + \frac{\delta \ln W_i}{\delta \ln N_i} \frac{\delta \ln N_i}{\delta \ln Q_i} \quad (7)$$

The results of this analysis are presented in table 5. Three sets of responses are calculated. The impact effects are the contemporaneous, current-year (period t), responses. The short-run effects are the responses taking into account contemporaneous and lagged responses [period (t) and (t-1)]. The long-run effects take into account the full adjustment process.

First we can conclude that the estimated responses for exportables, it may be seen that they correspond to those predicted theoretically in tables 1 and 2. Exportables employment rises both in the short-run and the long run as resources are reallocated from importables sector. In contrast, wages fall in the short run and rise in the long run. This is due to the very low responsiveness of exportables wages to output in the short run, which implies that wage changes are dominated by increases in employment (an increase that entails a wage decrease). In the long run, output effects overcome and end up increasing wages.

Turning now to the wage and employment responses of importables, the estimated results imply that wages and employment increases together both in the short and the long run.

This is in contrast with predictions of theory where employment is predicted to fall in the short-run and the long-run, while wages rise in the long-run. The reason for this divergence is that the Edward's model is premised on the basis of fixed supply of labor. Thus exportable employment could therefore only rise if importable employment fell.

However, as we have seen, the supply of labor increased in Tunisia as women entered the labor market. This allowed employment in importables to be maintained (even to slightly increase) as the exportable sector expanded.

Finally we investigate the effects of introducing trade variables directly into wage and employment equations, but for the restricted period 1986-1996 (period in which Tunisia adopted its adjustment structural program). In column 5 of Tables 3 and 4 we have attempted to see the impact of export/import penetration on wage and employment equations.

As a matter of fact, we notice that import effect on employment and wages is positive but with a weak extent and significant at 10%. This can be explained by the fact that Tunisia is an importer of equipment goods.

The complementarity between capital and employment explains the employment rise following the increase of imports.

Turning to exports, we notice that the coefficient is very near from zero and significant at more than 10%. There is therefore a concentration of exports on a small number of industries (textile and clothing in the case of Tunisia) and the domination of exports in output in those sectors. The influence

of trade on wage comes about primarily via the export variable. We conclude that wages rise especially in sectors where exports increase.

5. Conclusion

This paper seeks to test empirically a model of labor market response to trade liberalization. The specific-factor model of labor response utilized in this paper predicts that there may be differential between importables and exportables sectors, between the short run and the long run. In order to determine these differential responses we estimate dynamic models of employment and wages using panel data estimation technique.

Two equations have been estimated in the case of Tunisia that has adopted in the 1980's a trade liberalization policy followed by the signature of the Free Trade Agreement with the European Union in 1995. For this case we find support only for Edwards theoretical model.

Indeed, employment and wages in exportable sectors increase on the long term in response to trade liberalization, but in the short run, wages decrease. In the case of importable sectors the estimated model to reduce employment and wages predicts output contraction. In actual fact, employment and wages have expanded in this sectors following liberalization.

Globally, we notice that trade liberalization has been favorable for Tunisian labor market progress, thanks to government efforts to prepare the Tunisian economy to this liberalization. These efforts results in institutions and services progress, in the enhancement of infrastructure quality, and to an adaptation of competence to concrete employer needs. Finally, This has led to an increase of foreign and national investments that are very favorable to employment creation. Therefore, the positive and significant effects of trade liberalization on employment and wages will persist in the long run if the Tunisian economy is able to attract investors and to increase exports.

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Appendix

Exportable sectors:

- Textiles, clothing & Leather (TCL).
- Construction Materials, Ceramics and Glass (CMCG)
- Mine
- Hydrocarbon (HYDRO)

Importable sectors:

- Food Processing (IAA)
- Electrical and Mechanical Industries (IME)
- Chemical Industries (ICH)
- Manufacturing Industries Diverse (IMD)

Data sources:

- Institut National de la Statistique (INS), les comptes de la Nation, février 1997.
- Institut d'Economie Quantitative (IEQ) (1998 database).