

# TRADE LIBERALISATION, RENT SHARING AND WAGE INEQUALITY IN TUNISIA, 1998-2002

## Abstract

This paper attempts to empirically explore the effects of trade liberalization process in Tunisia on average real wages and wage inequality, via industry rents. For this purpose, we adopt, following Revenga (1997), a flexible model of wage setting that can accommodate both the presence of rent-sharing behavior and competitive wage determination. The rent-sharing mechanism may affect firms' employment response to trade liberalization. Indeed, bargaining workers could accept a reduction in wages subsequent to rent dissipation in order to preserve jobs. We assess this hypothesis by regressing a labor demand function derived from a model of employment determination that integrates trade impacts, following Mouelhi (2007).

Key Words: trade openness, rent sharing, skilled workers, unskilled workers, labor demand, North Africa, Tunisia.

## 1. Introduction

The issue of trade and wage inequality between skilled and unskilled workers has received increasing attention in recent economic literature. Most studies have been focusing on developed countries, but there have been a number of studies on developing Latin American and Asian countries as well. The majority of them have found that trade reforms initiated in less-industrialized countries coincide with an increase in wage inequality. Explanations suggested are mainly related to skill premium increase driven by the raise of the relative demand of skilled workers. We can cite the skill-biased technological change (Hanson and Harrison, 1995; Görg and Ströbl, 2001, Pavcnik, 2003, Edwards, 2004) as well as the increase of FDI flows towards developing countries and the shift of intermediate goods production to the South (Feenstra and Hanson, 1996; Zhu and Trefler, 2005). However, trade liberalization contributes to wage inequality through other channels than the return to skill such as the industry wage premium. Goldberg and Pavcnik (2005) define it as “the portion of individual wages that cannot be explained by worker, firm, or job characteristics, but can be explained by the worker’s industry affiliation”<sup>i</sup>.

Industry wage differentials may be relevant in predicting the impact of trade liberalization under different assumptions. This is likely, first, in short and medium-run models of trade where labour market rigidities prevent workers free movement across sectors. Second, industry wage premiums may take the form of industry rents in trade models introducing imperfect competition and rent sharing<sup>ii</sup>. Finally, trade liberalization could affect industry wages through productivity enhancements if these gains are transmitted to workers, (Harrison, 1994). While trade theory offers many rationales to the industry wage premium channel, only few empirical studies have investigated it in the case of developing countries. We can mention for example Revenga (1997), Currie and Harrison (1997), Feliciano (2001), Attanasio et al. (2004), Goldberg and Pavcnik (2005).

This paper is particularly interested in the impact of trade liberalization in Tunisia on the rent component of the industry wage premium. Many studies on Latin American developing countries report that under import substitution, governments largely protected unskilled-labour intensive sectors<sup>iii</sup>, which seems at first glance paradoxical, given their comparative advantage pattern (Hanson and Harrison, 1999; Pavcnik et al., 2004; Attanasio et al., 2004). Explanations provided by the literature to such a puzzle are related to political economy considerations. Indeed, the structure of wage protection in these countries may be more correlated to the political process than to the notion of comparative advantage. Furthermore, Marktanner (2000) demonstrates, though for developed countries, that it may be more politically reasonable to use trade policy than income redistribution to counteract rising income inequality resulting from globalization.

Protection-induced industry rents coupled with rent sharing agreements allowed workers in these unskilled-labour intensive sectors to benefit from wages higher than the market rate. To the extent that these sectors were also relatively the most affected by trade reforms, we would expect these changes to translate into unskilled workers relative income. This, in turn, affects skilled-unskilled wage differentials.

For this purpose, we adopt, following Revenga (1997), a flexible model of wage setting that can accommodate both the presence of rent-sharing behavior and competitive wage determination. However, our empirical approach differs in that instead of confining the analysis to the assessment of trade openness effects on average real wage through industry rents, we attempt to estimate them for different types of workers (skilled and unskilled) and firms (skill-intensive and unskilled labour-intensive). This enables us, firstly, to better take into consideration the heterogeneity in bargaining power and the ability to capture rents across firms. Secondly, it makes possible to conclude about the implications of rent evolution on wage inequality.

Additionally to its distributional effects, rent sharing may also have significant macroeconomic implications. As pointed out by Martins (2007), it reduces employment fluctuations if in periods of lower profits, firms are able to restrain the rents shared with workers during periods of greater prosperity. Therefore, in such cases, we may expect that economic shocks as the dismantling of trade barriers will lead to wage adjustments and relatively small employment shifts. Interestingly, this gives the echo to findings of recent studies on the employment effects of trade liberalization in developing countries. Currie and Harrison (1997) come upon small employment responses to tariff and quotas reductions in Morocco. Revenga (1997) and Feliciano (2001) present similar evidences concerning the impacts of trade reforms on the Mexican labour market. Puzzled by such results, these authors investigated several explanations related notably to the existence of labour market rigidities as important hiring and firing costs and minimum wage legislation. However, two relevant plausible reasons emerge from the empirical analysis. In Mexico, where 30% of the labour force is unionized, Ana Revenga finds that most of the adjustment to trade reform occurred through wage reductions. The fall in real wages was greater in firms where rent-sharing arrangements had allowed workers to benefit from higher protection. For Morocco, it appears that labour has no significant market power. Hanson and Harrison (1999) explain that capital did not share the rents under protection with workers which constrained it to bear a large fraction of the costs of adjustment after trade liberalization. Currie and Harrison (1997) show that this was made by cutting profit margins (lowering prices)<sup>iv</sup>.

In the light of these findings, it would be frustrating not to explore the effects of rent sharing on the Tunisian employment response to trade openness. Such an investigation would enable us to have a comprehensive knowledge about the way Tunisian firms have adjusted to such reforms. We are interested to identify whether it was through rents, and hence wages decline, or employment losses, or both responses? For this purpose, we consider a dynamic

model of employment determination which incorporates trade effects, desegregates the labour demand depending on skill and takes into account the existence of adjustment costs, following Mouelhi (2007).

Overall, this paper is motivated by two objectives. The first objective is to empirically explore the effects of trade liberalization process in Tunisia on average real wages and wage inequality, through industry rent changes. This rent is, thus, apprehended as a channel through which trade liberalization impacts skilled-unskilled wage differentials. The second concern is to investigate the employment effects of trade reforms providing a complete scheme about the pattern of labor market responses.

We perform the entire empirical analysis using a firm level database drawn from the national annual survey report on firms (NASRF) provided by the Tunisian National Institute of Statistics (TNIS). The annual data cover 635 firms from manufacturing and non manufacturing sectors during the period 1998-2002. We consider this period as an interesting episode to capture wage and employment effects of trade reforms. Indeed, economic impacts of the numerous measures that have been carried by Tunisia to further liberalize trade, since 1987, were generally not enough perceptible before 1998.

Results suggest that skill-intensive Tunisian firms' response to trade policy changes transited mainly only through quasi-rent reduction. However, unskilled-labour intensive firms adjusted by increasing labour demand. Two more inter-related findings deserve interest: 1- Skilled labour was more able than unskilled labour to capture rents before trade reforms. 2- Hence, the reduction of rents appears to have reduced wage inequality between skilled and unskilled labour, over the period 1998-2002 in Tunisia.

This paper is organised as follows: section 2 discusses the literature on industry wage premiums. Section 3 focuses on the link between trade liberalisation and industry wage

premiums. Section 4 emphasizes the potential implications of a rent-sharing behaviour on firms' employment responses. Section 5 describes the Tunisian trade liberalization process and gives some evidences concerning rent-sharing in the Tunisian context. Section 6 lays down the database used and the framework of the empirical analysis as well as the main econometric results. Section 7 concludes.

## **2. The literature on industry wage premiums**

Many empirical studies have demonstrated that workers with comparable human capital and job characteristics can nevertheless earn different wages depending on their industry affiliation. The impact that this membership may exert on the worker's wage is defined as the industry wage premium. A variety of explanations related to these wage differentials is reported by authors as Dickens and Katz (1987), Katz et al. (1989), Krueger and Summers (1988), Groshen (1991) and Mishra and Kumar (2005).

Relaxing the assumption of uniformity among workers in a competitive labor market, we may consider that innate or acquired unobservable quality differences exist between workers. These abilities may allow them to select appropriate industries, (Murphy and Topel, 1990; Maurin and Goux, 1999). High quality workers will choose for example industries with higher quality returns. Employers, at the other side, may practice segregation by ability in the selection process in order to choose workers of uniform productivity (Groshen, 1991). Such segregation could be related to the ability-sensitivity of the employer's technology. In fact, according to Groshen (1991), employers with ability-sensitive technologies hire disproportionately more high-ability workers and, thus, pay higher wages<sup>v</sup>. Hence, quality differentials between industries can give rise to wage differentials.

Industry wage premium may also compensate for differences in job attributes across industries such as undesirable working conditions or risk of layoff... (Brown, 1980; Topel,

1984; Krueger and Summers, 1987; Murphy and Topel, 1987; Groshen, 1991). Industry-specific skills constitute also an explanation of inter-industry wage differentials. In fact, industries may compensate workers for accumulating a particular set of skills that are essential to the production process (Parent, 2000).

Explanations presented above take place without falsification of the prediction of perfect competition. However, industry wage differentials could be also considered in a context of imperfectly competitive labor markets (Krueger and Summers, 1988). In such cases, the efficiency wages theories are invoked as rationale. These theories postulate that some employers may maximize profits by paying workers a premium above the market-clearing wage. The payment of noncompetitive wages is primarily motivated by an increase in productivity that has three main sources: the minimization of turnover if turnover costs are a decreasing function of the wages firm pays (Salop, 1979), the encouragement of workers good performance by increasing the job loss cost (Bulow and Summers, 1986) and the attraction of high quality workers when applicant's quality is not directly observable (Krueger, 1988). Since differences in firms' ability to sustain the costs of turnover, to supervise workers and to measure labor quality exist because of differences in the technology of production or in management capacity, firm wage differentials and by aggregation industry wage differentials may occur.

The existence both of rents to the firms and of employee bargaining power that is consistent across occupations may also lead to produce industry wage variation (Groshen, 1991). The reasons explaining that firms accept to confer rents on workers are related to efficiency wages theories. We can cite the considerations of motivation, morale, stability and higher productivity (Katz *et al*, 1989).

### **3. Trade liberalization and industry wage premiums**

Trade liberalization could affect industry wage differentials both under perfect and imperfect competition. Most discussion of such impact in a context of perfectly competitive product and factor markets is based on the specific factors model that assumes short-run immobility of labor. Considering a developing country with two sectors (say textile and electronics) and three types of labor: a skilled labor specific to the textile sector, an unskilled labor specific to the electronics sector<sup>vi</sup> and a labor of general use which is mobile, this framework predicts that trade liberalization will increase the real return to the factor specific to the sector that observes an increase in its relative price, namely unskilled workers. On the other hand, we will observe a decrease of the real return to skilled labor<sup>vii</sup>. This may contribute to reduce wage inequality. The impact on the third category of labor is ambiguous and will depend on its consumption pattern.

Introducing imperfect competition in product and factor markets introduces additional channels through which trade liberalization impacts industry wage premiums. According to Rose (1987), regulatory protectionism could be a source of rents creation. Thus, in the presence of workers bargaining power, protectionism could generate industry wage premiums that tend to be reduced or completely eliminated consequently to the trade liberalization process. If unskilled-labour intensive sectors register relatively higher tariff cuts, we would expect trade-induced wage premiums changes in these sectors to deteriorate unskilled workers relative income. This, in turn, affects negatively wage inequality. It is also possible that unions extract the rents associated with protection in the form of employment guarantees rather than higher wages (McDonald and Solow, 1981). This may be the case if we consider a model assuming seniority-based layoff rules, where senior workers are more interested in higher wages, while junior workers are seeking for preventing layoffs. Under these assumptions, Grossman (1987) shows that the impact of trade liberalization depends also on the seniority structure of the union.



Trade liberalization may also induce productivity changes at the firm level by increasing competition, and thus the incentive to innovate, in a protected market dominated by a few domestic firms, (Helpman and Krugman, 1989). Empirically, many studies have established a positive link between trade reforms and firm productivity in developing countries (Harrison, 1994 for Cote d'Ivoire; Krishna and Mitra, 1998, for India, Pavcnik, 2002, for Chile..). If productivity enhancements are passed through industry wages, the industries with the higher productivity gains due to trade policy reforms will face an increase in their wages.

A relatively small number of empirical studies have tried to investigate the relationship between industry wage premiums and trade protection. Studying the Colombian case, Attanasio *et al.* (2004) find that workers employed in industries with the largest tariff reductions experienced a decline of their wages relative to the economy-wide average. Moreover, it seems that these sectors had the highest shares of unskilled workers and the lowest wages prior to trade reforms. Thus, trade policy has contributed to deteriorate wage dispersion. Controlling for unobserved sector heterogeneity through industry fixed effects, Goldberg and Pavcnik (2005) find, for Colombia, a positive relationship between tariffs and industry wage premiums. This finding is consistent with the existence of industry rents that are reduced by trade liberalization, or alternatively with the predictions of the short and medium-run models of trade, in which labor is immobile across sectors. For Mexico, Feliciano (2001) shows that trade reforms affected industry wage differentials only by reducing license coverage. Investigating a differentiated impact depending on education level, the author does not observe a disparity between the ability to capture rent of workers with 0-11 years of schooling and those with more than 12 years of schooling. However, according to Feliciano (2001), since the most affected industries are unskilled labor-intensive, trade reforms had a greater impact on their wages.

The results of Mishra and Kumar (2005), for India, suggest that in sectors with largest tariff reductions, wages increased relative to the economy-wide average. These findings are consistent with liberalization induced-productivity increases at the firm-level. The authors consider that trade liberalization has contributed to decrease wage inequality in India.

Developing a model of labor demand which allows for imperfect competition and endogenous technological change in order to estimate the effect of trade reform in Morocco on firm-level employment and wages, Currie and Harrison (1997) show that non exporting, private sector firms reacted mainly by raising productivity and cutting profit margins, which explains the lack of employment adjustments in that sector.

Finding similar insignificant industry employment effects of trade reforms in Mexico, Revenga (1997) focuses on the role of rent sharing. The author adopted a flexible model of wage setting that accommodates both rent-sharing behavior and competitive wage determination. Results show that trade reforms reduced the rents available to be captured by firms and workers. Revenga gives also evidence that skilled workers were previously better at capturing these rents, which suggests that the industry wage premium channel is likely to have contributed to moderate the wage inequality increase in Mexico after the start of trade liberalization process.

#### **4. Rent sharing: an explanation for small employment responses to trade Liberalization?**

The dominant conclusion of the empirical literature exploring labor market adjustments to trade reforms in developing countries reveals that employment effects are minor, [Krueger (1983), Currie and Harrison (1997), Revenga (1997)]. Many reasons for this apparent divergence between theoretical predictions and empirical evidence are invoked. We may cite the restrictive labor market regulations (Revenga, 1997) and the inappropriateness of

the Heckscher-Ohlin-Samuelson (HOS) prediction of intersectoral reallocation in a context the intra-industry trade in intermediate products, (Hoekman and Winters, 2005). Furthermore, Currie and Harrison (1997) and Revenga (1997) emphasize the ability of firms facing import competition to react by cutting profit margins<sup>viii</sup> and industry rents in a situation of imperfect product and labor markets. Regarding the last hint, we should note the scarcity of empirical studies that model the effects of openness on wages and employment integrating the assumption of rent sharing between workers and shareholders. We may cite Abowd and Lemieux (1993) for Canada, Revenga (1997) for Mexico and Cassoni and Labadie (2001) for Uruguay. Two different bargaining frameworks are generally specified in this context. First, a “right-to-manage” model is considered when we assume that firms and unions bargain over the wage in presence of product market rent. Then, firms set the level of employment unilaterally. The higher wages that will result from the bargain increase marginal costs and hence reduce employment. In this type of model, employment level is lower due to imperfections in both the product market and the labour market (Geroski et al., 1996). According to Cassoni and Labadie (2001), the “right-to-manage” model is particularly interesting when collective wage negotiations take place at the industry level. This is explained by the difficulty to bargain over employment at firm level, at least simultaneously. The second model is the “efficient bargaining” model. This model assumes that unions and employers bargain over both wages and employment<sup>ix</sup> which means as pointed out by Cassoni and Labadie (2001) that employment stability is explicitly included in the bargaining agenda. This model is adequate when collective agreements exist at the firm-level. The higher the concern of unions about job stability, the lower the wage level and the higher the employment level bargained.

Considering a “right-to-manage” model, Revenga (1997) assumes that changes in industry-level trade protection affect firm-level wages through the reduction of sector rents

and hence, through the reduction of the rent component of wages in firms where workers are able to exert a bargaining power. Similarly, yet under both types of contracts, Abowd and Lemieux (1993) consider that quasi-rents per worker are a “sufficient statistic for the effect of product market conditions<sup>x</sup> on the firm's ability to pay”.

The nature of wages and employment adjustments depends on the nature of the wage setting mechanism itself (Revenga, 1997). If wages contain a rent component, workers may accept to reduce wages to preserve jobs. However, in case of high seniority level of employees or important proportion of permanent workers, they may choose to maintain a high level of wages for those who remain employed, at the expense of those who lose their jobs. Finally, if workers do not benefit from a significant bargaining power, wage and employment responses will be largely dominated by developments in the industry labour market.

Interestingly, when conducting their empirical analysis, Cassoni and Labadie (2001) adopt the two bargaining models to characterize the behaviour of the Uruguayan manufacturing firms over the period 1985-1999. The authors opt for this approach because unions in Uruguay started bargaining at a more decentralised level in the nineties and included in their negotiations employment and work conditions, concomitantly with the trade liberalization initiated in 1992-1993. Applying the “right-to-manage” model over the period 1985-1991, Cassoni and Labadie (2001) demonstrate that in the late eighties, strong unions managed to get a higher proportion of the protection-induced rents. Then, over the period 1991-1999, results deriving from an “efficient bargaining” model suggest that unions developed different mechanisms of adjustments to the trade openness across industries that allowed to alleviate the employment effects. Indeed, they moderate their wage demands and in some industries allowed wages to fall.

Studying the impact of trade liberalization on employment and wages in the Mexican manufacturing sector using a “right-to-manage” framework, Revenga (1997) shows that

unions were able to capture part of the rent generated by tariffs but not those generated by quota protection. The author comments as following firms' response to trade openness: "When rents are dissipated due to a decline in tariffs, the union's bargained wage adjusts, dampening the needed employment responses. When rents disappeared because of quota reduction, there's less room for wage concessions and employment bears the brunt of adjustment"<sup>xi</sup>.

## **5. Country background**

### *5.1 The Tunisian Trade Liberalization Process*

Tunisia initiated a structural adjustment plan in 1986 that signed the start of the trade liberalization process. It entailed a process of lowering and setting uniform tariffs such that the average import duties declined from 41% in 1986 to 33% in 1987 and to 29% in 1990<sup>xii</sup>. The highest duty rate was reduced from 200% to 43% (Mouelhi, 2007). The ERP relative to all outputs excluding Hydrocarbon fell from 70% in 1986 to 44% in 1990. Trade reform pattern was not uniform across manufacturing industries over the period 1986-1991. For instance, unskilled intensive sectors as the food-processing and textile industries that benefited from a relatively higher protection level prior to trade liberalization observed a decrease of their effective protection rates by about 300 and 150 percentage points respectively. However, skill intensive sectors underwent either an increase of their rate of protection or a minor decrease within the same period. For instance, the ERP shifted from 40% to 82% in construction materials, glass and ceramics industry and from 88% to 101% in the electrical and mechanical industries. Concerning the chemical industries, the ERP moved from 88% to 78% between 1986 and 1991. Overall, skill intensive industries were less protected prior to the reforms. Therefore, they were subject to smaller reductions in tariff protection. Similar patterns of protection are reported in Colombia (Attanasio et al, 2004), Mexico (Hanson and Harrison, 1999) and Morocco (Currie and Harrison, 1997). In 1990,

Tunisia signed the GATT agreements. The adherence to the WTO was achieved in 1995. Reflecting the government's objective to comply with the GATT/WTO negotiated rates, Tunisia witnessed over the period 1990-1998 an increase in the nominal protection rates on agricultural final goods because of non-tariff protection transformation. The nominal protection rates on industrial final goods increased for the same reason while the nominal protection rates on industrial intermediate goods decreased due to the focus of the openness process at this stage on equipments and inputs. This led to an increase of the effective rate of protection for a majority of products (the ERP attained 56% in 1995 and 71% in 1998). The trade liberalization process has become more active since 1997 given that the effective rate of protection decreased from 71% to 49% in 2002.

### *5.2 Rent sharing in Tunisia*

There are many reasons to expect that employees in developing countries exert a bargaining power so as to share rents with their employers. First, relatively strict labour market legislation characterizing these countries may strengthen the workers' ability to exert wage bargaining pressures (Martins and Esteves, 2006). Second, according to Rusinek and Rycx (2008), rent-sharing is not exclusive to unionized sectors if collective agreements are extended to non-unionized members. However, as Martins and Esteves (2006) point out, we may also identify other reasons supporting the opposite view that employers in developing countries are particularly immune to any possible wage bargaining pressures arising from their employees. This rationale stems from a number of studies by Hanson and Harrison (1999) and Currie and Harrison arguing that in practice developing countries labour markets are relatively fluid due to poor compliance with existing regulations such as the minimum wages legislation. Therefore, unions in the South are not effectively strong. Furthermore, the important size of the informal sector and the high workers turnover make it less easy to bargain over rents (Martins and Esteves, 2006).

Some features of the Tunisian labour market support the hypothesis of rent sharing between employers and employees. First, we can cite the importance of tripartite national and sector wage negotiations. These negotiations take place each three years and are performed within joint committees bringing together employer and union representatives under the aegis of the government. We should note the existence of a unique national workers union “UGTT” that has the legitimacy to lead the dialogue with the government and employers organizations. UGTT enjoys a great popularity as it actively contributed to Tunisia’s independence. The UTICA and the UTAP are the employers organizations related respectively to the trade and industry sectors and the agriculture and fishing sectors.

The Tunisian legal system imposes to bargaining agents to negotiate primarily at the sector level. Firms not enclosed in sector agreements are not allowed to initiate wage agreements. Ennaceur (2000) points out that even if the labour code permits to conclude firm-level agreements, in practice wage negotiations are generally centralized at the national and sector level. Rusinek and Rycx (2008) note that firm agreements complementing industry agreements may lead to broaden the scope of rent sharing as the workers possibly represented by trade unions may align their requirements to the specificities of the establishment. However, Tarchouna (1999) explains that the UGTT generally prefers industry-wide bargaining in the context of abundant and precarious unskilled labour as well as important proportion of small-size firms. Indeed, conducting collective bargaining at the highest level of the Trade union hierarchy increases the ability to exert pressure on the employers’ organizations.

The second feature is the high level of unionization (20%)<sup>xiii</sup> relatively to developed countries standards. However, this rate varies across firms depending on whether they are private or public. Indeed, sectors dominated by public investments register a high level of unionization (railway 67%, electricity 65% and mining 71%) while the textile sector that

accounts for a significant number of private firms registers 7% of union adherents among its workers<sup>xiv</sup>. Yet, even in case of low level of unionization, workers may capture a large part of the rents that firms earn (Katz et al., 1989) by creating informal organizations (Dunlop, 1957), by exerting a union-threat effect (Dickens, 1986) and by taking advantage of their role as firm-specific human capital, (Lindbeck and Snower, 1987). Geroski et al. (1996) conclude on the basis of plant level evidence that mark-ups are not exclusively captured by unions, which implies that reductions in union power may decrease but would not remove wage premia.

## 6. Empirical analysis

### 6.1 *The empirical strategy*

The empirical analysis is performed in two steps. First, we explore the link between real wages and trade protection-induced firms' quasi-rents. We seek to identify whether a mechanism of rent-sharing between employers and employees exist and we attempt to explore its impact on wage disparities. For this purpose, we adopt following Revenga (1997) and Abowd and Lemieux (1993) a flexible model of wage setting that allows for both the presence of rent-sharing and competitive wage determination. As the rent-sharing behaviour may affect employment responses to external shocks, the second step of this analysis addresses the issue of trade liberalization impact on labour demand. The objective is to draw a global picture about the adjustment mechanisms of Tunisian firms to the intensification of foreign competition. If results reveal that rent is a wage component, we may expect an inhibited employment reaction. The model considered at the second step is a model of employment determination which incorporates trade effects and allows for desegregation of the labour demand depending on skill, following Mouelhi (2007).

### 6.2 *The rent-sharing model*

We consider like Abowd and Lemieux (1993) and Revenga (1997) a right-to-manage model as it is the most adequate with respect to the Tunisian bargaining system (See stylized



facts above). We assume that the firm and the union bargain only over wages. Then, the firm sets unilaterally employment at the level that maximizes its profit, given the negotiated wage rate. The Nash solution presented by Abowd and Lemieux (1993) to this bargaining problem yields the following settlement wage equation:

$$w_{it} = \lambda_i w_{it}^U + (1 - \lambda_i) w_{it}^A \quad (1)$$

Where:

$w$ : the wage outcome

$\lambda_i$ : The bargaining power parameter for the workers in firm  $i$ .

$w^U$ : The union's preferred wage outcome.

$w^A$ : The alternative wage (the wage in the corresponding industry), which represents also the competitive wage.

If  $\lambda_i=0$ , workers don't exert any bargaining power in the firm. Wages are determined by external labor market conditions.

If  $\lambda_i \neq 0$ , workers are able to capture rents. This will drive a wedge between the wage set in the firm and the competitive outcome.

Equation (1) is seen by Revenga (1997) as a flexible model of wage setting that allows for both rent-sharing behavior and competitive wage determination. Hence, it may account for the heterogeneity in bargaining power across firms.

It is possible to express equation (1) as:

$$w_{it} = \lambda_i w_{it}^U + w_{it}^A - \lambda_i w_{it}^A \quad (2)$$

And then, as:

$$w_{it} = \lambda_i (w_{it}^U - w_{it}^A) + w_{it}^A \quad (3)$$

The objective here is to estimate the bargaining power parameter  $\lambda$ . However, this is somewhat difficult since the union's preferred wage outcome  $w^U$  is not observed. If it was observed,  $(w_{it}^U - w_{it}^A)$  could be seen as a summary measure of the state of the product market competition or alternatively, the quasi-rent per worker  $QR$ .

To overtake this problem, Abowd and Lemieux (1993) and Revenga (1997) use a different approach. They model the wage outcome as a function of the quasi-rent per worker  $QR$  evaluated at the settlement wage  $W$  and of the industry wage  $W^A$ , as follows:

$$w_{it} = \tilde{\lambda}_i QR(w_{it}) + w_{it}^A \quad (4)$$

$$\tilde{\lambda}_i \cong \alpha \lambda_i$$

$$\text{where } \alpha \leq 1$$

$\tilde{\lambda}$  is defined as a quasi-rent-splitting parameter that determines how much of the quasi-rent is captured by the union. It can be interpreted as a lower bound to the estimates of  $\lambda$  that would be obtained by regressing equation (3), if  $W^U$  was observed.

Assuming heterogeneity in worker's bargaining power leads to the following expression of equation (4), with  $\bar{\lambda}$  the average bargaining power parameter across firms:

$$w_{it} = \alpha \bar{\lambda} QR(w_{it}) + w_{it}^A + \varepsilon_i \quad (5)$$

$$\text{Where } \tilde{\lambda}_i \cong \alpha \lambda_i = \alpha \bar{\lambda} + \varepsilon_i$$

$$\text{and } \alpha \leq 1$$

Estimating the average parameter  $\alpha \bar{\lambda}$  will give us a measure of workers ability to capture product market rents within firms' sample.

Following Revenga (1997) and Abowd and Lemieux (1993), quasi rents per worker are constructed as subsequent:

$$QR_{it} = \frac{(VA_{it} - w_{it}^A L_{it})}{L_{it}} \quad (6)$$

Where  $VA_{it}$  is value added,  $L_{it}$  total firm employment and  $w_{it}^A$  is the alternative (industry) wage.

The quasi-rent is assumed to be positive.

Trade liberalization is likely to imply a reduction in sector rents. In this framework, such impact would be captured by changes in quasi-rents per worker at the firm level (Revenga, 1997). At the same time, the error component in equation (5) is likely to be correlated with the regressor  $QR (W_{it})$ . Using instrumental variables estimates would yield to

obtain consistent estimates of  $\alpha\bar{\lambda}$ . Abowd and Lemieux (1993) point out the necessity to “instrument the quasi-rent using an external shock, or a natural experiment, that hits the industry independently of the behaviour of both firms and unions”<sup>xv</sup>. In our case, changes in trade protection would be relevant instruments for the endogenous quasi-rent variable as they may reflect exogenous demand shocks. Furthermore, relying on these instruments help to achieve the purpose of this empirical analysis which is to assess the impact of trade liberalization on changes in the rent component of wages, and consequently on skilled-unskilled wage gap. In this paper, considered instruments are customs duties collected relative to imports and the effective rate of protection. Given that they are industry level proxies of trade policy changes, they are likely to be exogenous to the firm, yet correlated with firm-level quasi rents<sup>xvi</sup>. The relevance of these instruments is tested using the Sargan test of overidentifying restrictions.

Hence, we obtain the following system of equations to estimate:

$$\begin{cases} w_{it} = \alpha\bar{\lambda}QR(w_{it}) + w_{it}^A + \varepsilon_{it} \\ QR(w_{it}) = \sigma_i + TP_{jt} + \zeta_{it} \end{cases} \quad (7)$$

Where  $TP_j$  is a vector of industry trade-protection variables and  $\sigma_i$  captures fixed effects.

To compute the different variables of this model, we employ firm-level data<sup>xvii</sup> taken from the national annual survey report on firms (NASRF) performed by the Tunisian National Institute of Statistics (TNIS) over the period 1997-2002. After the elimination of extreme outliers as well as data corresponding to the year 1997<sup>xviii</sup> and confining our attention to firms that remain in the sample for at least three years<sup>xix</sup>, we have obtained an unbalanced panel consisting of a sample of 635 firms from 12 sectors. The data include a large set of variables about value added (VA), number of workers (L), capital stock (K), sales, expenditures disaggregated by equipment type, tangible and intangible fixed assets. In addition, two sector industrial price indexes are provided, respectively elaborated from 20 and 50 products lists.

We should also note that the database offers a labour decomposition by skill. Skilled labour activities include engineering, management, administration, and general office tasks while the activities of unskilled workers include machine operation, production supervision, repair, maintenance and cleaning<sup>xx</sup>. Besides, data on the total wage bill are available, though, without skill distinction. This is unfortunate, since these data are essential to the current study. In order to overtake this problem, we followed *the decomposition technique of Maurin and Parent (1993)* to decompose the total wage bill by skill, given the skilled and unskilled shares on total employment<sup>xxi</sup>. Besides, we computed a capital stock proxy since the available data provided by the TNIS for this variable regard a small balanced sample. We followed Mairesse and Hall (1996) by considering the tangible fixed assets deflated by the gross fixed capital formation deflator as a capital stock proxy. The wage outcome  $w$  is computed as the average real wage for a firm  $i$  at time  $t$ <sup>xxii</sup>. The alternative or “outside” wage is computed as the average real wage in the industry following Abowd and Lemieux (1993) and Revenga (1997). The quasi-rent per worker is constructed as shown in equation (6) using data on firms’ value added ( $VA$ ) and number of workers ( $N$ ) directly provided by this database. Finally, trade measures such as imports relative to the value added, customs duties relative to total imports and effective rate of protection are sector-level data and are provided by the Tunisian Institute of Quantitative Economics (IQE).

### 6.3 Regression results

We start the empirical analysis by exploring the importance of rent sharing in wage determination. For this purpose, we first present in Table 1 “within” estimates of equation (5) that links firm-level wages to quasi rents per worker. We then perform instrumental variables estimations of the rent sharing equation (7). Results reported in columns (1) to (3) of Table 1 show a positive and strongly significant relationship between real annual wage and quasi-rent per worker that is robust to the inclusion of year effects. This indicates that rent sharing is an

important component of wage determination in Tunisia. In column (3), we incorporate as Abowd and Lemieux (1992) and Revenga (1997) an interaction term  $QR*[QR- average (QR)]$ . This term measures the deviation of firm-level quasi-rents from the sample average. Converging with Abowd and Lemieux (1992), results suggest a negative and significant effect of this term at the 1% level. This means that that the share of quasi-rents captured by the union  $\tilde{\lambda} * QR$  is inversely proportional to the size of the quasi-rent expressed by the interaction term. This implies that unions extract a large share of quasi-rent from less profitable firms and a smaller share from more profitable ones. Therefore, in the Tunisian case also, empirical evidences seem to confirm that bargaining workers do not perfectly price discriminate among firms. These findings are in line with the hypothesis that unions may set a similar wage for firms related to the same sector which is likely to occur given the existence of sector wage agreements in Tunisia. The coefficient on the capital to value added ratio is positive and significantly different from zero in all specifications. This implies that, holding other firm characteristics constant, firms that have larger capital stock also accord to their workers higher wages. The coefficient on the industry real wage (alternative wage) is highly significant. Hence, firm wages seem to be also driven by industry labour market features.

The double least squares (2SLS) regressions derived from equation (7) are reported in Table 2. Year and individual fixed effects are added to control respectively for business cycle effects and disparities in wage effects across firms. Columns (1) and (2) present the first stage estimates while columns (3) and (4) present the second stage estimates. Instruments used for the endogenous quasi-rent variable are respectively the ratio of customs duties to imports and the effective rate of protection. We favour these instruments to conventional trade measures like the ratio of imports to sector value added and the ratio of exports to value added. Indeed, we are more interested in capturing trade protection strategy than trade outcomes. We also

incorporate interaction variables that permit to trade policy effects to vary with the proportion of skilled workers in the firm labour force.

**Insert TAB. 1 here**

The first stage estimates do not reveal significant potential effect of trade protection on firms' wages when we consider the coefficients on trade protection. Nevertheless, the notable feature of the results is that the composition of the workforce appears to be relevant in considering firm's wage effects. In fact, they clearly reveal that the greater the portion of skilled workers in the firm, the more trade protection increases the quasi-rent per worker. One plausible explanation, already invoked by Revenga (1997), is that skilled workers are better able to extract or capture rents in a skill-scarce country. However, in Tunisia, their bargaining power is likely to be exerted primarily through informal channels rather than unionization, given that only 24% of UGTT leaders are college graduates in 2004<sup>xxiii</sup>. The second stage estimates show positive and statistically significant coefficients on quasi rent per worker in both specifications. They are also larger than those deduced by within estimates. The Sargan test applied confirms the relevance of the instruments used. The Hausman test rejects the null hypothesis of the independence of the residuals with the instrumented variable for all the specifications presented. The coefficient on the capital to value added ratio is robust to estimators change as it conserves a positive and statistically significant sign.

**Insert TAB. 2 here**

▪ *Firms distinction by skill intensity*

In order to make robustness checks, we consider two types of firms distinguished by skill intensity. Skill-intensive firms are those whose skilled/unskilled employment ratio is above the median. Columns (1) and (3) in Table 3 report respectively within estimates and two stage least squares estimates for skilled labour-intensive firms while columns (2) and (4) consider the same specifications for unskilled-labour intensive firms. The Hausman test

confirms the independence of the error term and the quasi-rent per worker, which leads to favour the two stage least squares estimates. Results suggest that the decrease of quasi-rent due to trade liberalization is associated, for both types, with a decrease in real wages. The industry rent is therefore a channel through which skill-intensive as well as unskilled-labour intensive firms facing increased foreign competition are likely to adjust. However, the magnitude of the wage response is higher for the former.

**Insert TAB. 3 here**

- *Quasi-rent per worker and wage inequality*

In order to assess the role of quasi-rent in wage inequality evolution which is the main attempt of this paper, we regress the ratio of skilled workers to unskilled workers total wage bills on the quasi-rent per worker variable, the alternative industry wage and the capital on value added ratio. The first variable is our measure of wage inequality. Table 4 shows that the coefficient on the quasi-rent is positive, strongly significant and robust to changes in firms' type. A decrease in quasi-rent due to trade openness is related to a decrease in wage disparities. This result seems to be unexpected at first glance if we refer to some empirical studies that do not take into consideration workers heterogeneity in bargaining power. Our findings in section 6.3 reveal that rent sharing was conditional to the proportion of skilled workers in the firm. This category seems to have been the most able to exert pressure on employers and extract the available rent. Therefore, it is also the category most affected by trade policy changes. However, we should also note that other factors intervene in the net impact of trade liberalization on wage inequality like trade-induced skill-biased technological progress that is likely to increase the relative demand of skilled workers and thus, contributes to the widening of wage disparities between skilled and unskilled workers.

**Insert TAB. 4 here**

#### 6.4 Employment determination model

In the light of the results displayed in the previous section, we may expect that the rent sharing mechanism may have buffered potential firm employment variations that are likely to occur due to openness chocks. In order to gauge this hypothesis, we consider a model of employment determination which incorporates trade effects and allows for desegregation of the labour demand depending on skill, following Mouelhi (2007).

The labour demand function for the category  $j$  ( $j = Q, NQ$ ) can be written as the subsequent equation (8):

$$\ln L_{it}^j = (1 - \lambda^j) \ln L_{it-1}^j + \lambda_j \theta_1^j \ln y_{it} + \lambda_j \theta_2^j \ln K_{it} + \lambda_j \theta_3^j \ln TP_{it} + \lambda_j \theta_4^j \ln W_{Q_i} + \lambda_j \theta_5^j \ln W_{NQ_i} + \lambda_j \theta_6^j \mu_t + \alpha_i^j + v_{it}^j \quad (8)$$

The dependent variable is the employment level. Explanatory variables are respectively, the initial employment level  $L_{it-1}$ , the firm value added  $y_{it}$ , the capital stock  $K_{it}$  and a trade protection measure  $TP_{it}$  which is the ratio of custom duties on imports. The average real wage associated to each skill category (skilled and unskilled workers) is noted respectively  $W_Q$  and  $W_{NQ}$ . These variables are time invariant in our case. Time effects  $\mu_t$  and fixed effects  $\alpha_i$  are included to capture the impact of omitted variables that are specific to a year  $t$  or a firm  $i$ . In fact, there is a delay between demand chocks and firm's level of employment adaptation.  $\lambda$  represents the labour adjustment parameter. All variables are expressed in logarithm.

Equation (8) specifies a dynamic model in that it includes the lagged dependent variable  $L_{it-1}$  as an explanatory variable. The presence of this variable in the right-hand side makes inconsistent the classical estimators since it is correlated, by construction, with the error term. Empirical literature relies in such case on the system Generalized Method of moments (GMM) estimator suggested by Arellano and Bond (1998). This estimator is



deduced from a system of equations in first differences and in levels. It allows controlling for omitted invariant variables and corrects for the potential endogeneity of some explanatory variables. Lagged first differences are used as instruments for equation in levels and lagged levels of explanatory variables are used as instruments for equation in first difference<sup>xxiv</sup>.

### *6.5 Regression results*

The empirical results based on system GMM estimates of equation (8) are reported in table 5. Columns (1) and (2) report the results for the estimation of equation (8) with the total labour demand as dependent variable. We assume that output, capital stock and lagged labour demand are predetermined given that shocks to labour demand in period  $t-1$  could affect the level of the output and capital in period  $t$ . Therefore, the instruments used for equations in first differences are observations of capital, labour and output, dated  $(t-2)$  and earlier. Trade protection, year dummies and real wages are treated as exogenous variables. We report the results of the Sargan test that checks for the validity of instruments used. We also consider a test of no-serial autocorrelation that examines whether the residual of the regression in differences is second-order serially correlated. In all specifications, these tests give evidence for, respectively, the pertinence of instruments used and the absence of second-order autocorrelation. The test of hypothesis  $\lambda = 1$  that adjustment costs are null rejects it at the 1% level of significance in all columns. This confirms the interest to use a dynamic specification for the employment equation. Results in columns (1) and (2) suggest that the coefficient on the lagged dependent variable is about 0.85 which means that firms adjust only 15% of their deviations from the optimality in one year and confirms the existence of important labour reallocation costs in Tunisia. Besides, it converges with the findings of Mouelhi (2007) relatively to the period 1983-1994. The coefficient on the output variable which controls notably for business cycle fluctuations is positive and statistically significant. This means that an increase in output raises the labour demand. The coefficient on customs duties to imports

appears to be statistically insignificant even after controlling for skilled and unskilled workers real wages in column<sup>xxv</sup> (2).

Distinguishing two types of labour depending on skill in columns (3) and (4) does not reveal differences in employment response to the trade liberalization shock. In columns (5) and (6), we consider respectively the labour demand in skill-intensive and unskilled-labour intensive firms as a dependent variable. The latter is likely to observe an increase in employment consequently to trade liberalization. Indeed, a decrease of the customs to imports ratio by 10% leads to an increase of the labour demand in unskilled-intensive firms by about 2%. These results are in line with those of Mouelhi (2007) demonstrating that unskilled-labour intensive firms in Tunisia used other means of adjustment than that of cutting employment, as productivity improvement. Our findings also coincide with the predictions of the Heckcher-Ohlin model that imply an increase in labor demand in these exportable sectors due to trade liberalization. However, skill intensive importable sectors, in our case, do not show statistically significant labour demand variation; while we expect that they are impacted by trade policy reforms through several channels (trade-induced skill biased technological change, reallocation effects consistent with the neoclassical trade theory...).

Linking these findings with results of section 6.3 relative to wage adjustments, we may deduce that skill-intensive Tunisian firms' response to trade policy changes transited mainly through quasi-rent reduction. The ability of skilled workers to capture the available rent during trade protection allowed them to buffer the employment variation under the liberalization shock by accepting wage reductions after quasi-rent dissipation. On the other hand, unskilled-labour intensive firms adjusted using two different mechanisms. They increased labour demand and decreased the quasi-rent per worker. The muted employment response with regard to skilled workers category is also explained by a relatively lower speed

of adjustment suggesting that adjustment costs constituted a significant impediment to their mobility.

**Insert TAB. 5 here**

## **7. Conclusion**

This article presented micro-level evidence related to the impact of the rent component of the industry wage premium on real and relative wages in Tunisian firms. It appears that rent-sharing is an important feature of the wage determination mechanism. Workers were able to capture a relatively large proportion of the rent induced by trade protection. Indeed, the quasi-rent splitting parameter which measures how much of this premium was extracted by unions is estimated to be on the order of 75%-90%. However, we should note that rent-sharing was conditional to the share of skilled workers in the firm. The higher their proportion in workforce, the more workers were able to benefit from the protection-induced rent. A consequent important finding suggests that a 10% decline in quasi-rent implies a reduction in wage disparities between skilled and unskilled labour of about 3.5%, over the period 1998-2002. This impact being more pronounced in skill-intensive firms.

This relatively important wage response may inhibit employment adjustment. The rent-sharing mechanism may indeed buffer the trade liberalization shock to the extent that workers accept wage decrease to preserve existing jobs. To draw a global picture about firms' reactions to foreign competition, we complete the first analysis by estimating a model of employment determination, following Mouelhi (2007) which incorporates trade effects and allows for desegregation of the labour demand depending on skill. Our findings converge with those of Mouelhi (2007) who shows that unskilled-labor intensive Tunisian firms, which are export oriented, react to greater competition from abroad by increasing labor demand. In our case, a decrease of the custom duties to imports ratio by 10% raises labor demand in these

firms by 2% over 1998-2002. However, we do not observe a statistically significant employment response of skill-intensive firms.

Overall, it appears that skill-intensive Tunisian firms' response to trade policy changes transited mainly through quasi-rent reduction. The ability of skilled workers to capture the available rent during trade protection allowed them to absorb the employment variation that may occur by accepting wage reductions<sup>xxvi</sup>. On the other hand, unskilled-labour intensive firms adjusted using two different mechanisms. They increased labour demand and decreased the quasi-rent per worker.

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## APPENDIX

**Firm total wage bill decomposition technique of Maurin and Parent (1993)<sup>xxvii</sup> :**

We define the following variables:

$TWB$  : Total wage bill in firm  $i$

$L$  : Total employment in firm  $i$

$L_Q$  : Number of firm’s skilled workers.

$L_{NQ}$  : Number of firm’s unskilled workers.

$l_Q$  : Skilled workers share of total employment relative to a firm i

$l_{NQ}$  : Unskilled workers share of total employment relative to a firm i

$WB$  : Average wage bill per worker in firm i

$WB_Q$  : Skilled worker's average wage bill in firm i

$WB_{NQ}$  : Unskilled worker's average wage bill in firm i

The (TNIS) firm level database provides firm data on total wage bill, as well as skilled and unskilled workers employment. Unskilled workers are considered as our category of reference. Assuming that Q indexes the skilled workers category and NQ the unskilled workers category, we obtain the following expression of the average individual wage bill relative to a firm i:

$$\begin{aligned}\frac{TWB}{L} = WB &= WB_Q l_Q + WB_{NQ} l_{NQ} \\ &= WB_Q l_Q + WB_{NQ} (1 - l_Q) \\ &= l_Q (WB_Q - WB_{NQ}) + WB_{NQ}\end{aligned}\quad (9)$$

Our objective is to estimate skilled and unskilled wage bills, over the period 1998-2002, for each firm of the sample provided by the national annual survey report on firms.

To this purpose, we regress the following random coefficient model using the Swamy's estimator, where  $v_{it}$  is an error term.

$$WB_{it} = \underbrace{WB_{NQi}}_{\beta_{0i}} + \underbrace{(WB_Q - WB_{NQ})_i}_{\beta_{1i}} \cdot l_{Qit} + v_{it} \quad (10)$$

The parameter  $\beta_{0t}$  corresponds to the average unskilled workers wage bill  $WB_{NQ}$  relative the firm i, for the entire period 1998-2002. Then, given estimated values of  $\beta_{0t}$  and  $\beta_{1t}$ , we may deduce the average skilled workers wage bill  $WB_Q$  associated to the firm i, for the entire period 1998-2002. Note here, that this estimation provides only firm heterogeneity: we do not obtain estimates for each year of our observation period. To this aim, we multiply average firms' wage bills corresponding to each category of workers by the corresponding workers' numbers available for each year. Hence, we find skilled and unskilled total wage bills, for each company of the sample and each year of observation.



- <sup>i</sup> P.K. Goldberg, N.Pavcnik (2005), "Trade, wages and the political economy of trade protection: evidence from the Colombian trade reform", *Journal of International Economics*, Vol. 66, p 78.
- <sup>ii</sup> Martins (2007) defines "rent sharing" as : "referring to a situation in which rents (profits above the level that results from paying all factors their market rates) are shared by the firm, at least in some part, with the employees of that firm".
- <sup>iii</sup> Tunisia is likely to have pursued the same policy (see Section 5).
- <sup>iv</sup> Even in Mexico, Venables and Van Wijnbergen (1993) show that trade reforms led to significant reductions in price-cost margins.
- <sup>v</sup> Even if Groshen (1991) tries to explain within industry wage differentials (across plants and firms) when considering employers segregation process, this rationale could be easily extended to the industry level that better emphasizes inter-sectoral technologies differences.
- <sup>vi</sup> These factors cannot move across industries because of high moving costs, for example.
- <sup>vii</sup> If we assume that the textile sector is the one that experiences the largest tariff reductions in developing countries (and thus a reduction in its output price) as it is suggested by stylized facts, the specific-factors model predicts a decrease of the relative returns to unskilled workers.
- <sup>viii</sup> The impact on workers' wages of profit margin reduction depends on the extent to which labor had a market power in the pre-liberalization period. If capital did not share rents with labor as it is observed by Currie and Harrison (1997) for Morocco, it is forced to bear the largest fraction of adjustment costs after trade reforms.
- <sup>ix</sup> The denomination of the model is due to the fact that it is privately efficient for both parties to contract in this way. It satisfies the specific preferences of the firm and the union.
- <sup>x</sup> Abowd, J A., Lemieux. T., 1993. "The effects of product market competition on collective bargaining agreements: the case of foreign competition in Canada", *The Quarterly Journal of Economics*, Vol. 108, No. 4 , November, p 986.
- <sup>xi</sup> Revenga, A., 1997, "Employment and wage effects of trade liberalization: the case of Mexican manufacturing," *Journal of Labor Economics*, Vol 15, No 3, Part 2, S39.
- <sup>xii</sup> Les Cahiers de L'Institut d'Economie quantitative (IEQ), n°9, Décembre 1991, p 51
- <sup>xiii</sup> Ennaceur, M.,2000. « Les syndicats et la mondialisation : le cas de la Tunisie », Document de travail DP/120/2000, Institut International d'Etudes Sociales, OIT, Genève, p7.
- <sup>xiv</sup> Amami. M.M., 2008. "Les syndicalistes tunisiens à l'épreuve des changements, quelles représentations ? Pour quels enjeux identitaires ?", Mémoire de Master en Anthropologie sociale et culturelle, Institut Supérieur des Sciences Humaines de Tunis, Université de Tunis El Manar, Mars.
- <sup>xv</sup> Abowd, J A., Lemieux. T., 1993. "The effects of product market competition on collective bargaining agreements: the case of foreign competition in Canada", *The Quarterly Journal of Economics*, Vol. 108, No. 4 , November, p 991.
- <sup>xvi</sup> It would be more relevant to use in addition, non-tariff barriers measures as the coverage of import licensing. Unfortunately, such measures are not available for our period of interest.
- <sup>xvii</sup> It is the only firm-level database available in Tunisia.
- <sup>xviii</sup> Data corresponding to 1997 (the beginning date of the survey) suffer from many shortcomings.
- <sup>xix</sup> This removal is related to the wage bill decomposition technique applied that is presented in the appendix. In a random-coefficients model, the number of observations in each panel must be greater than the number of regressors (including the constant). Thus, the first step in fitting Swamy's random coefficient model was to drop panels with less than three observations.
- <sup>xx</sup> This is nearly the white-collar/blue-collar workers classification applied by Hanson and Harrison (1995).
- <sup>xxi</sup> This decomposition technique is presented in the appendix.
- <sup>xxii</sup> Nominal wages are deflated using an industrial price index elaborated from 50 products list.
- <sup>xxiii</sup> "Vers un renouveau syndical: diagnostic quantitatif de l'UGTT par ses cadres", publication du département des études et de la documentation de l'UGTT, Tunis, Novembre 2006, p 21.
- <sup>xxiv</sup> According to Mouelhi (2007), the system GMM estimator is based on extra moment restrictions that offer efficiency gains relative to the Arellano and Bond (1991) estimator (first-difference GMM estimator) and permits the identification of the effects of time invariant variables.
- <sup>xxv</sup> We have also tried to introduce the average real wage in the firm independently of skill distinction. The coefficient on trade protection remains insignificant.
- <sup>xxvi</sup> The absence of employment response in skill-intensive firms raises also the issue of the existence of labor market rigidities in Tunisia that distort reallocation movements. Besides, as reported in columns (5) and (6) of Table 6, adjustment costs are likely to be higher for skilled workers than for unskilled workers.
- <sup>xxvii</sup> Maurin. E et Parent. M.C (1993), « Productivité et coût du travail par qualifications » in « Actes de la 18<sup>ème</sup> journée des centrales de bilans sur le thème : Croissance, emploi, productivité », Association Française des Centrales de bilans AFCB, Paris, 23 novembre 1993.

**TAB.1 - Within estimates of firm wage equations**

	Within estimates		
	Dependent variable : Firm average real wage		
	(1)	(2)	(3)
Quasi rent per worker (QR)	0.189 (0.047) ***	0.187 (0.047) ***	0.300 (0.030) ***
Alternative industry real wage	0.482 (0.086) ***	0.566 (0.074) ***	0.622 (0.071) ***
QR*[QR-avg (QR)]			-0.130 (0.020) ***
Ln (capital stock/ Value added)	-0.387 (0.418)	-0.541 (0.431)	-0.611 (0.546) ***
Fixed effects	Yes	Yes	Yes
Year effects	Yes	No	Yes
R <sup>2</sup> (within)	0.22	0.21	0.29
Observations	2712	2712	2712
Number of firms	621	621	621

Note: Standard errors between parentheses: \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The interaction term measures the deviation of firm-level quasi-rents from the sample average. The regressions include a constant term.

**TAB. 4 - Quasi rent per worker and wage inequality**

	Dependent Variable: the ratio of skilled workers to unskilled workers total wage bills.			
	Overall sample		Skill-intensive firms	Unskilled labour intensive firms
	(1)	(2)	(3)	(4)
Alternative industry real wage	0.643 (0.170) ***	0.378 (0.187) **	0.490 (0.285) *	0.278 (0.236)
Capital stock/Value added	0.405 (0.058) ***	0.385 (0.076) ***	0.495 (0.140) ***	0.366 (0.107) ***
Quasi rent per worker (QR)	0.354 (0.038) ***	0.349 (0.056) ***	0.400 (0.089) ***	0.302 (0.065) ***
Fixed effects	Yes	Yes	Yes	Yes
Year effects	No	Yes	Yes	Yes
Observations	2039	2039	885	1154
Number of firms	529	529	245	284
R-squared	0.82	0.82	0.78	0.84

Note: Standard errors between parentheses: \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.The regressions include a constant term.

**TAB. 2 - Results of 2SLS firm wage equations estimates**

	First stage of 2SLS firm wage equation estimates		Second stage of 2SLS firm wage equations estimates	
	Dependent variable: quasi rent per worker		Dependent variable: firm average real wage	
	(1)	(2)	(4)	(5)
Quasi rent per worker			0.910 (0.167)***	0.755 (0.155)***
alternative industry real wage	0.364 (0.338)	0.400 (0.527)	0.030 (0.250)	0.057 (0.326)
Capital stock/Value added	0.208 (0.085)**	0.310 (0.235)	0.832 (0.144)**	0.929 (0.172)
Custom duties/Imports	0.096 (0.177)			
Custom duties/Imports* skilled share	0.451 (0.115)***			
Effective rate of protection		0.151 (0.117)		
Effective rate of protection*skilled share		0.265 (0.059)***		
Fixed effects	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
Observations	1391	575	1391	
Number of firms	343	185	343	185
R-squared	0.22	0.18	0.32	0.25
Instruments			Custom duties/Imports and Custom duties/Imports* skilled share	Effective rate of protection and Effective rate of protection*skilled share
Sargan test of overidentifying restrictions			0.214 Chi-sq(1) P-value = 0.64	1.678 Chi-sq(1) P-value = 0.195
Hausman specification test			Chi2 (7)=20.13 Prob>chi2= 0.005	Chi2 (7)=23.06 Prob>chi2 =0.0008

Note: Standard errors between parentheses: \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The regressions include a constant term. The number of observations is automatically reduced when trade protection variables are introduced as instruments. Related data cover mainly firms belonging to manufacturing industries. Furthermore, data relative to the effective rate of protection (ERP) contain many gaps.

**TAB. 3 - Results of 2SLS firm wage equations estimates by firms' skill intensity**

	Within estimation		2 stages least squares estimation	
	Skill-intensive (1)	Unskilled labour intensive (2)	Skill-intensive (3)	Unskilled labour intensive (4)
	Dependent variable : Firm average real wage			
Alternative industry real wage	0.249 (0.092) ** *	0.238 (0.103) **	-0.446 (0.505)	0.443 (0.267) *
Capital stock/ Value added	0.237 (0.053) ** *	0.227 (0.083) ***	0.801 (0.209) ***	0.787 (0.177) ***
Quasi rent per worker (QR)	0.262 (0.042) ** *	0.249 (0.055) ***	0.997 (0.258) ***	0.802 (0.199) ***
Fixed effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Observations	958	1180	542	849
Number of firms	251	258	146	197
Instruments			Custom duties/Imports and Custom duties/Imports *	Custom duties/Imports and Custom duties/Imports* skilled share
Hausman specification test			chi2 (7) = 17.36 Prob>chi2= 0.06 0.011	chi2 (7) = 20.45 Prob>chi2 = 0.0047 0.007
Sargan test of overidentifying restrictions			Chi-sq(1) P-value = 0.92	Chi-sq(1) P-value = 0.93
R-squared	0.88	0.88	0.26	0.32

Note: Standard errors between parentheses: \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The regressions include a constant term. The number of observations is automatically reduced when trade protection variables are introduced as instruments. Related data cover mainly firms belonging to manufacturing industries.

**TAB. 5- Employment effects**

	Overall sample				Skill intensive firms	Unskilled intensive firms
	(1) Total employment	(2)	(3) Skilled workers employment	(4) Unskilled workers employment	(5) Total employment	(6)
L(-1):lag of log employment	0.847 (0.162) ***	0.865 (0.865) ***	0.327 (0.232)	0.538 (0.168) ***	0.926 (0.218) ***	0.633 (0.143) ***
Customs duties/imports	-0.044 (0.115)	-0.023 (0.097)	-0.089 (0.081)	-0.095 (0.156)	-0.012 (0.087)	-0.192 (0.105) *
Value added	0.133 (0.039) ***	0.135 (0.038) ***	-0.025 (0.108)	0.477 (0.196) **	0.048 (0.055) **	0.103 (0.050) **
Capital stock	-0.029 (0.144)	-0.051 (0.123)	0.181 (0.185)	-0.180 (0.218)	-0.107 (0.122)	0.189 (0.149)
Skilled workers Average wage		-0.006 (0.031)	-0.035 (0.086)	0.204 (0.253)	0.034 (0.075)	-0.070 (0.050)
Unskilled workers Average wage		-.044 (0.044)	0.121 (0.121)	-0.293 (0.497)	-0.031 (0.048)	-0.122 (0.070)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
1 <sup>st</sup> order serial correlation p-level	0.007	0.004	0.027	0.0000	0.05	0.002
2 <sup>nd</sup> order serial correlation p-level	0.384	0.380	0.565	0.613	0.352	0.943
Sargan instrumental validity test	0.493	0.402	0.103	0.08	0.809	0.143
Instruments count	21	23	23	23	23	23
Observations	1417	1417	915	1385	474	943
Number of firms	388	388	249	385	139	249

Note: Standard errors between parentheses: \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.The regressions include a constant term. All variables are in log form.



