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IMPACT OF NON-TARIFF MEASURES ON SMEs IN TUNISIA

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Impact of Non-Tariff Measures on SMEs in Tunisia

Leila Baghdadi[12], Sonia Ben Kheder[3], Hassen Arouri[4]

Abstract

This paper analyses the overall effect of Non-Tariff Measures (NTMs) on firms in Tunisia, with a particular attention paid to small and medium-sized enterprises (SMEs). It draws a precise view of NTMs effects on firms' imports as well as on firms' productivity, costs and profits. We use firm-level data to take into account firm heterogeneity whose importance has been highlighted in recent literature. Results show a positive impact of NTMs on imports, productivity, labor costs and profitability. They highlight thus a trade-creation effect of NTMs as well as an enhanced learning by importing effect with NTMs. When splitting the global sample into small, medium and large firms, results exhibit a weaker trade-creation effect for SMEs and a greater learning by importing effect for large firms. An extended analysis, separating importing and exporting firms from those solely importing, suggests that two-ways traders benefit most from positive effects of NTMs. However, estimates controlling for offshore firms show a trade-diversion effect for those firms.

Keywords: non-tariff measures – imports - firm level data – firm performance

JEL classification: F13 – F14

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1. Introduction

With the fall in tariffs across time and across WTO negotiations, attention paid to Non-Tariff Measures (NTMs) has been growing and several studies examine the effects of such measures.

The main issues related to NTMs are the extent and the sense of their impact on trade flows. A first argument is that NTMs are barriers to trade and have important restrictive effects on trade flows, both exports and imports.

While investigation of NTMs is of a big interest for developed countries, it turns to be a crucial issue for developing countries for which the suspected discriminatory effect of NTMs is expected to be even stronger. Indeed, meeting the requirements dictated by NTMs is often more costly. It involves larger technical efforts and more cumbersome procedures for firms from the developing world than firms from the developed countries. However, a limited number of studies examine this key issue for developing countries. Most of them focus on exports, leaving the imports side not much explored. Furthermore, they rather examine specific measures (SPS, TBT, etc.), impeding the draw of general conclusions about the effect of NTMs.

Our objective in this study is to analyze the impact of NTMs on Tunisian imports, with a special focus on small and medium-sized enterprises (SMEs). To this aim, we follow the few recent papers using firm-level data in this field (Augier et al., 2013; Chen et al., 2006; Fontagné et al., 2015) in order to take into account firm heterogeneity. The richness of available data gives us the opportunity of following recent literature on trade by focusing on import flows. As regards to other economic effects of NTMs, our database allows us to examine employment and productivity but also further dimensions of importers performance which are still of poor empirical evidence in literature, e.g. wages and profitability. Conducting this study on Tunisia is of a particular interest for three reasons. First, literature examining imports of a developing country is scarce. Second, focusing on small and medium-sized enterprises (SMEs) is relevant because SMEs represent more than 65% of economic activities and employment in Tunisia. Third, as shown by Wong (2007), meeting NTMs requirements may be a more difficult task for SMEs in developing countries than in developed ones.

The remainder of our paper is organized as follows. In Section 2 we present the literature review. Section 3 provides a description of the data and some illustrative descriptive statistics. Section 4 presents the empirical strategy and main results. Section 5 presents robustness checks. Last section concludes.

2. Literature review

International trade is considered as a major channel for the diffusion of new technologies. In this context, the relationship between exports or imports and productivity and growth has been largely examined in literature. While first papers were essentially based on macro analysis, more recently they rather focus on firm level data.

Many papers explore the relationship between exports and productivity, especially through the exam of the self-selection hypothesis and the learning by exporting hypothesis. Among them Bernard and Jensen, 1995; Bernard and Jensen, 1999; Haidar, 2012, Iacovone et al., 2012. These works often highlight the self-selection hypothesis but do not confirm the learning by exporting hypothesis.

More scarce is the literature on imports. Recent papers have emphasized the positive effect of imported inputs on the productivity of firms (Halpern et al., 2006; Kasahara and Rodrigue, 2007; Bas and Strauss-Kahn, 2014). Stone and Shepherd (2011) show that the positive impact of intermediate inputs and capital goods imports on firm total factor productivity is even stronger in non-OECD countries. As regards the impact of imports on wages, studies mostly indicate that in developed countries, internationalized firms employ more workers (skilled and unskilled) and pay higher wages than firms only involved in the domestic market. On the contrary, Shepherd and Stone (2013) show that internationalized firms in developing and transition countries, especially importer and exporter ones, employ more workers but pay lower wages than firms only acting on the domestic market. However, authors conclude that findings may depend on the countries and the sectors involved in the study.

Therefore, given the theoretical and empirical evidence of the relationship between international trade and firms' performance indicators, it is of a primary importance to examine to which extent barriers such as NTMs could affect this relationship. One of the first papers investigating the effects of NTMs on developing countries is Otsuki, Wilson and Sewadeh (2001). Using a gravity model framework, authors analyze the effect of European Union SPS standards related to aflatoxin on exports of some African products. Gebrehiwet, Ngqangweni and Kirsten (2007) and Xiong and Beghin (2010) conduct similar analyses and study the effect of stringent aflatoxin regulations adopted by developed countries on African food exports. However, their results are contradictory. Gebrehiwet, Ngqangweni and Kirsten (2007) support findings of Otsuki, Wilson and Sewadeh (2001). They show that this kind of SPS standard negatively affect export flows while Xiong and Beghin (2010) find that the tightening of the European Union regulation on aflatoxins has no significant effect on groundnut exports from Africa.

Studies on imports and NTMs are scarce, and most focus on imports of developed countries. Nevertheless, a strand of this literature investigates the effect of NTMs on welfare, by examining the effect of import bans imposed in developed countries on imports from developing countries. In a cost-benefit analysis, van Tongeren et al. (2010) conduct three case studies to assess the economic effect of regulatory changes in trade. The first case study

compares a situation of raw milk cheese liberalized imports to a situation of an import ban in Quebec. Their results show that restriction to trade would result to a welfare loss in importing country. In the second case study, authors only focus on the export side. However, in their third case study they investigate tighter border inspection of cut flowers imported by European Union. Results show some gains to domestic producers. The latter are outweighed by losses borne by exporting countries due to the loss of quality caused by the time required for inspection.

James and Anderson (1998) and Javelosa and Schmitz (2006) conduct similar cost-benefit analyses evaluating the welfare effect of the import ban imposed by Australia on bananas. Both studies conclude that allowing the free importation would be better for Australia even if local producers do lose. Leroux and Maclaren (2011) mitigate these results and highlight the importance of taking into account the risks involved by removing import bans when conducting welfare analyses.

Given that anti-dumping measures have recently been frequently used by developing countries, few research papers investigate this issue (Bown and Tovar, 2011; Ganguli, 2008; Vandenbussche and Zanardi, 2010). All of them show that anti-dumping measures reduce the volume of imports.

Another strand of the literature adopts a gravity model to estimate the effect of NTMs on the volume of bilateral trade (Ghali et al., 2013; Hoekman and Nicita 2011, Baghdadi et al., 2016). These studies are conducted at an aggregate level and do not take into account firms heterogeneity. Ghali et al. (2013) investigate the impact of NTMs applied by Tunisia and Egypt on their imports. Their results do not show a significant deterrent effect of NTMs on Tunisian imports. Moreover, neither the extensive margin nor the intensive margin in Tunisia is affected by NTMs. These results are in line with those found by Baghdadi et al. (2016). Using a gravity model, the authors found an overall positive effect of NTMs ad valorem applied by Tunisia on its imports.

Augier et al. (2013) use firm-level data and explore the effect of NTMs considering a developing country from the importer side. More precisely, this study examines the effects of Morocco NTMs harmonization with the E.U. on Moroccan firms' profits and productivity. OLS estimates, at the firm-level and based on a theoretical two-country Melitz model (2003), show that harmonization with E.U. raised profits and labor productivity of Moroccan firms, sheltering it from southern competition but exposing it to a fiercer competition from exporters originating in industrialized countries.

As mentioned above, some papers emphasized the positive effect of imported intermediates on firm productivity. Examining if this positive effect is mitigated by imposing NTM, especially in developing countries, is thus a crucial issue. We contribute to this literature by estimating the impact of NTMs on imports and by providing evidence of the effects of imports facing NTMs on the productivity of firms in Tunisia. Furthermore, we extend the

analysis by examining the impact of facing NTMs-imports on other performance indicators, such as average wage and profitability.

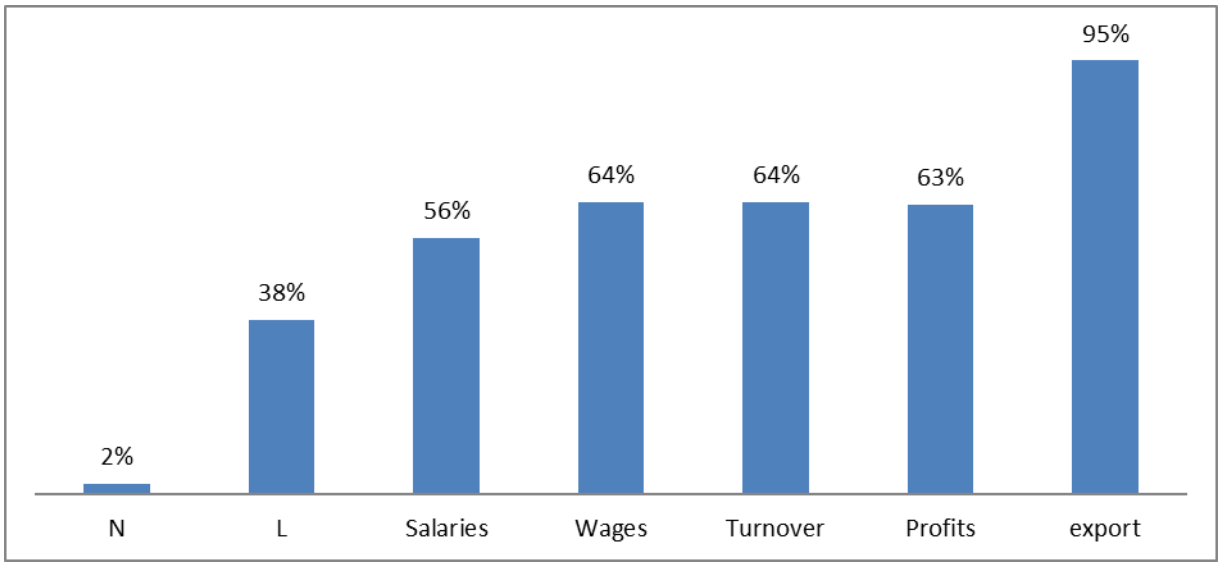
3. Description of the data and descriptive statistics

3.1. Firms data

Data related to Tunisian SMEs come from the Tunisian registry of firms, namely the Répertoire National des Entreprises (RNE) for the period 2000-2010, collected by the National Institute of Statistics in Tunisia (Institut National de la Statistique). The RNE uses information from the social security fund (Caisse Nationale de la Sécurité Sociale – CNSS) which is the source for the employment data, as well as from Tunisian Customs, the Tunisian Ministry of Finance, and the Tunisian Investment Promotion Agency (l'Agence de Promotion de l'Industrie et de l'Innovation – APII). It has information on the employment, age and main activity of all registered private firms. A huge advantage of the Répertoire is that it accounts for the bulk of all enterprises. This allows us to examine the dynamics of these firms, which are often not covered by firm censuses.

Figure 1shows descriptive statistics of Tunisian private sector. Private sector in Tunisia comprises 481 410 firms in total, of which 10969 are importing firms, whether only importing or importing and exporting. Importing firms thus represent a small share of 2%. Nevertheless, this small share of 2% employs 38% of total labor force and generates more than 60% of profits. These figures highlight the weight of importing sector in Tunisia in terms of employment and profits.

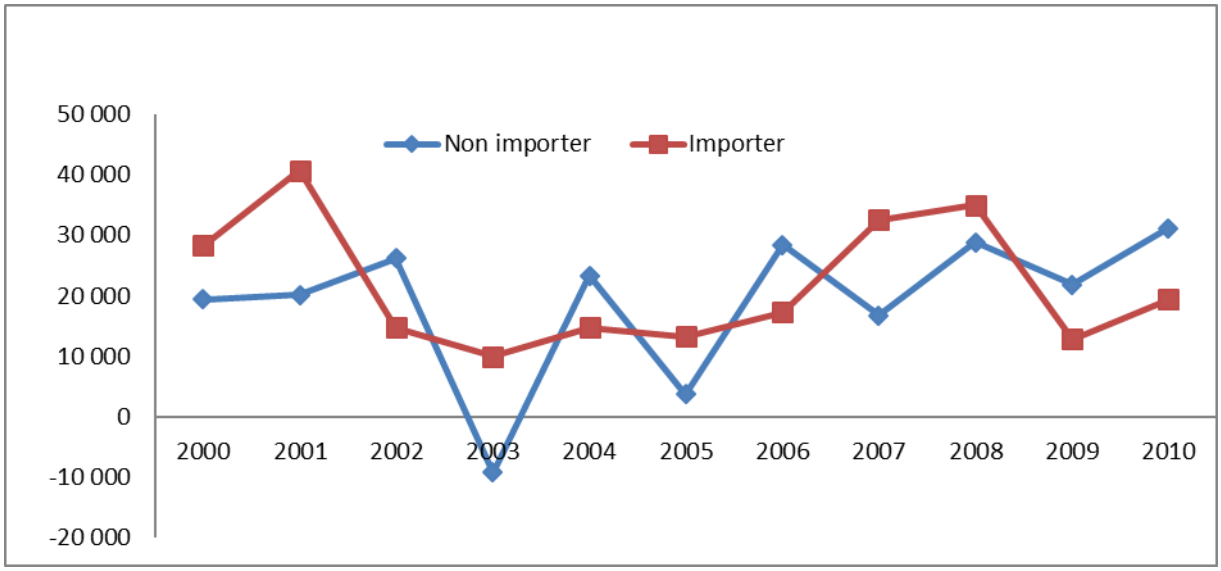
Figure 1 Economic significance of importing firms
(Importers' share of total)



Source: Authors calculations based on RNE data

Figure 2 shows that unlike non-importers, importing firms always created more jobs than they destroyed ones, even after global economic crises of 2001 and 2008. They contribute therefore to mitigate negative impacts of crises.

Figure 2 Net job creation



Source: Authors calculations based on RNE data

Overall, net job creation of importers is more regular than that of non-importers. The latter appears to be more fluctuating. One possible explanation is that internationalized firms are more exposed to external shocks than non-importers. However, importers recover rapidly compared to non-internationalized firms. They seem to be more resilient which might be due to better efficiency.

This intuition seems to be corroborated by figures in Table 1 where we can read that SMEs represent about 50% of importing firms, while they only represent 2% of non-importing firms. Indeed, more than 97.8% of non-importers are VSEs which are more vulnerable.

Table 1 Distribution of firms according to size

Size	**Non-importer**	**Importer**	**Total**
Micro Enterprises(<6)	460 118	5 023	465 141
Small Enterprises (6-49)	9 318	3 836	13 154
Medium Enterprises (50-199)	801	1 572	2 373
Large Enterprises	203	538	741

(>200)			
All	470 440	10 969	481 409

Source: *Authors calculations based on RNE data*

3.2 NTMs data

NTMs data are provided by the World Integrated Trade Solutions (WITS) and follow the Multi-Agency Support Team (MAST) classification (
Table *2*). These data are available for 2010 and used in our study for period 1999-2009.

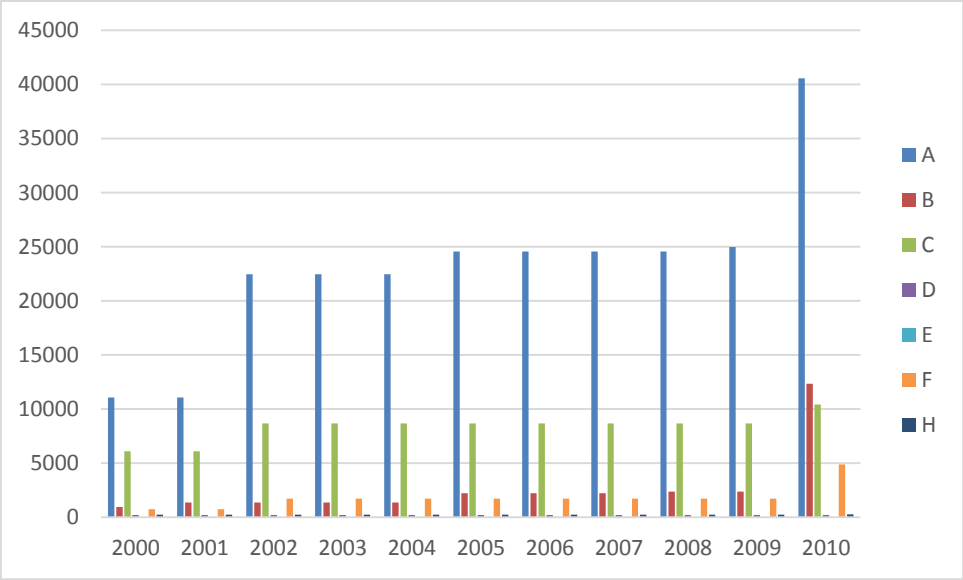
Table 2 MAST classification for non-tariff measures

Chapter	Non tariff measure
A	Sanitary and phytosanitary measures
B	Technical barriers to trade
C	Pre-shipment inspection and other formalities
D	Contingent trade-protective measures
E	Non-automatic licensing, quotas, prohibitions and quantity-control measures other than for SPS or TBT reasons
F	Price-control measures, including additional taxes and charges
G	Finance measures
H	Measures affecting competition
I	Trade-related investment measures
J	Distribution restrictions
K	Restrictions on post-sales services
L	Subsidies
M	Government procurement restrictions
N	Intellectual property
O	Rules of origin
P	Export-related measures

Measures from chapters colored in blue are not applied in Tunisia. Export-related measures are not considered in this study.
Source: Authors

While MAST classification lists 16 chapters of NTMs, only NTMS from 8 chapters are applied in Tunisia (Table 2). Therefore, our study focuses on these restricted chapters of NTMs less chapter P which is related to exports. We observe in Figure 3 that the most prominent chapters of NTM are chapter A “Sanitary and phytosanitary measures (SPS)”, chapter B “Technical Barriers to Trade (TBT)” and chapter C “Pre-shipment inspection and other formalities (PSI)”.

Figure 3 NTMs evolution, MAST classification



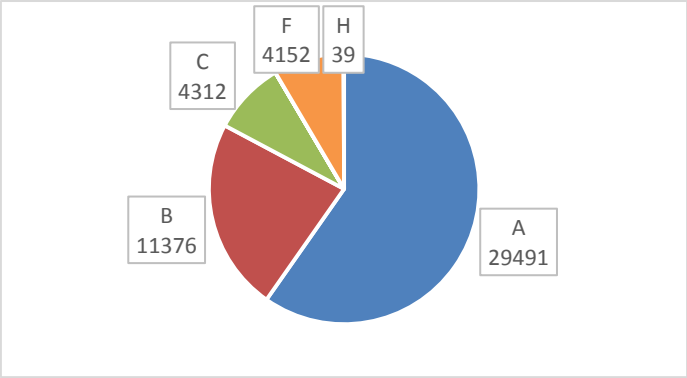
Source: Authors calculations based on WITS data

As regards the evolution of NTMs measures in Tunisia, we should note two important points. Firstly, while SPS measures have always been in the majority among NTMs measures and experienced the largest raising, at the beginning of the period PSI were the second category of NTMs and TBT were rarely used. However, TBT have witnessed the most important increase and stand at the end of our period of study as the second most prominent NTMs category. This increase of SPS measures and TBT may be tied to an effort of harmonization with the regulations of main Tunisia's trade partner, the EU.

The second important point is that NTMs implementation proceeded in two main waves. The first wave of NTMs implementation was in 2002 and the second wave in 2010.Only categories D "Contingent trade-protective measures (CTPM)" and E "Non-automatic licensing, quotas, prohibitions and quantity-control measures other than for SPS or TBT reasons (NAL)" have not varied during our period of study (0 NTM belonging to category E).

In total, during our period of study, 49.370 NTMs have been put in place in Tunisia. About 30% have been put in place at the first wave in 2002, and more than 60% at the wave of 2010. Nearly 60% of total NTMs increase belongs to category A "Sanitary and phytosanitary measures (SPS)" and 23% are Category B "Technical Barriers to Trade (TBT)". Categories C "Pre-shipment inspection and other formalities (PSI) ", F "Price-Control Measures, Including Additional Taxes And Charges (PC)" and H "Measures affecting competition (MAC)" represent a share of 8.73%, 8.4% and 0.08%, respectively (Figure 4).

Figure 4 Evolution of the share of NTMs by category, 2000-2010



Source: Authors calculations based on WITS data

4. Empirical strategy

4.1. Imports value

For the investigation of the effect of NTMs on imports, we adopt a similar specification than Augier et al. (2013), and estimate the following equation:

$$m_{i,s,j,t} = \alpha_0 + \beta_1 NTM_{s,t-1} + \beta_2 lnTar_{s,j,t} + \gamma V_{i,t} + \mu_{i,t} + \mu_{s,t} + \mu_{j,t} \quad (1)$$

With *i* standing for firm, *s* standing for HS 6 digit product category, *j* representing provenance country and *t* standing for year, $m_{i,s,j,t}$ stands for the value of trade flows (in logs) of product *s* imported by firm *i* from country *j* at year *t*.

$NTM_{s,t-1}$ represents the number of total non-tariff measures affecting firms' *i* imports of product *s* at time *t-1*. This variable is lagged one year in order to control for a potential reverse causality of NTMs imposed on products that are imported the most[5]. As mentioned in Bellemare et al. (2015), the use of a lagged variable could not be the appropriate way to take into account a reverse relationship. In our case, results with no lagged variables are similar with lagged ones[6].

$Tar_{s,j,t}$ is the bilateral tariff applied in Tunisia to imports of product s from country j. $V_{i,t}$ is a vector of firm characteristics including size, age and the trade status of the firm. Finally, $\mu_{i,t}$, $\mu_{s,t}$ and $\mu_{j,t}$ control for firm-time, sector-time and country-time fixed effect, respectively.

Models (1), (2), (3) and (4) in

[5] Considering the lagged variable of NTMs prevents us from including the second important wave of NTMs reported in 2010. However, remaining years (1999-2009) allow us to take into account the implementation of more than 18828 NTMs during the period.
[6] Results with no lagged variable are available upon request.

Table 3 show results from an OLS estimation of the effect of total NTMs on the value of imports of all, small, medium and large Tunisian firms, respectively.
We observe that the variable of interest, the number of total non-tariff measures, have a significant and positive effect on imports, regardless the size of the importing firm. This positive correlation refers to a trade creation effect of NTMs. Given that E.U. is the major partner of Tunisia and has stringent regulations, it seems possible that a tightening of NTMs makes European firms more competitive and then fosters even more imports from this partner.

This effect is slightly smaller for small firms than for medium and large firms (Models (2), (3) and (4)). In other words, an increase of NTMs generates a more important trade-creation effect for biggest firms. This is understandable since small firms should encounter more financial and logistic difficulties to further internationalize and take benefit from the new offered possibilities of trade with increasing NTMs.

As regards to tariffs, we observe that the coefficient is negative and significant in Model (1). An increase of tariff protection reduces as expected the total value of imports. This negative effect is larger for small firms for which an increase of tariffs reduces the imports by approximately1.81% (Model (2)). For medium and large firms, an increase of tariffs reduces the imports by approximateely1.38% and 0.89%, respectively (Models (3) and (4)). This is consistent with the NTM effect. It emphasizes the higher financial vulnerability of smaller firms, and to a lesser extent of medium firms, as compared to larger firms. The larger the firms are, the greater their ability to overcome additional costs of importing.

The above findings are also consistent with the coefficients on the size of the firms. Model (1) related to the global sample shows that larger firms import more. Largest companies have more organizational and financial aptitudes to import than small ones. However, the latter may fill this gap over the years, as mentioned by the coefficient on the age variable which is significant and positive for the total sample and small firms (Models (1) and (2)) while non-significant for medium firms and significantly negative for large firms (Models (3) and (4)).

Table 3 Impact of non tariff measures on import values

Import values				
	Total	**Small firms (<50)**	**Medium firms (50-199)**	**Large firms (>199)**
	(1)	**(2)**	**(3)**	**(4)**
Cumulative NTMs (t-1)	0.0021***	0.0018***	0.0025***	0.0026***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Log (1+Tariff)	-0.0035***	-0.0181***	0.0138***	0.0089***
	(0.0010)	(0.0012)	(0.0020)	(0.0024)
Log Age	0.0232**	0.0604***	-0.0284	-0.1195***
	(0.0091)	(0.0110)	(0.0243)	(0.0346)

Large firms	0.1515*** (0.0110)			
Medium firms	0.0905*** (0.0074)			
N	1632544	894288	413979	324277
R squared	0.1618	0.2297	0.1186	0.0819

***p<0.01; ** p<0.05;* p<0.1. Year, sector, firm and country fixed effects are included.
Standard errors into parentheses.

In a second step, we investigate the impact of NTMs by chapter (category) of measures. Results confirm a positive impact of NTMs on total import values for all chapters, except for chapters B and F. We observe that the negative impact of TBT (chapter B), whose evolution was the most important with SPS during the period of study, is essentially related to medium firms (Model 7). This result is consistent with findings in the literature emphasizing strong difficulties encountered by small and medium firms to comply with this type of NTMs (Wong, 2007).

Another relevant point is the non-significant effect of NTMs from chapter C "Pre-shipment inspection and other formalities (PSI)" on large firms, while significantly positive for all, small and medium enterprises. We documented in Section 5.2 that these measures were the third widespread measures in Tunisia. Since PSI measures are often implemented to correct custom procedures shortcomings, to reduce mistakes in the evaluation of imports value and to fight tariff evasion in developing countries. This result suggests that large firms are those that benefit the least from the modification of custom procedures and from fighting tariff evasion.

Findings show that NTMs from chapter F "Price-Control Measures" deter total imports (Model (5)), imports of small and medium firms (Models (6) and (7)), but not imports of large firms for which the correlation is significantly positive (Model (8)). This result highlights the fact that small and medium firms are more sensitive than larger firms to additional variable costs such as taxes and charges.

Table 4 : Impact of non tariff measures on import values, by chapter

Import values				
	Total	**Small firms (<50)**	**Medium firms (50-199)**	**Large firms (>199)**
	(5)	**(6)**	**(7)**	**(8)**
Cumulative A (t-1)	0.0027*** (0.0002)	0.0029*** (0.0002)	0.0028*** (0.0004)	0.0025*** (0.0005)
Cumulative B (t-1)	-0.0004* (0.0002)	0.0003 (0.0003)	-0.001** (0.0004)	-0.0007 (0.0005)

Cumulative C (t-1)	0.003*** (0.0003)	0.0056*** (0.0006)	0.0058*** (0.0008)	0.0005 (0.0007)
Cumulative D (t-1)	0.0648*** (0.0068)	0.068*** (0.0069)	0.1367*** (0.0297)	0.0199 (0.0244)
Cumulative F (t-1)	-0.0229*** (0.0020)	-0.0392*** (0.0024)	-0.032*** (0.0049)	0.0245*** (0.0052)
Cumulative H (t-1)	0.2039*** (0.0054)	0.248*** (0.0063)	0.1528*** (0.0127)	0.1426*** (0.0146)
Log (Tariff+1)	-0.0314*** (0.0026)	-0.0353*** (0.0031)	-0.0431*** (0.0059)	-0.0146** (0.0066)
Log Age	0.0628*** (0.0212)	0.1552*** (0.0251)	-0.1213* (0.0647)	0.0269 (0.0814)
Large firms	0.1444*** (0.0277)			
Medium firms	0.0808*** (0.0180)			
N	1632544	894288	413979	324277
R squared	0.2893	0.3607	0.2520	0.2082

***p<0.01; ** p<0.05;* p<0.1. Year, sector, firm and country fixed effects are included.
Standard errors into parentheses.

4.2. Productivity, salaries and profits

In order to investigate the impact of NTMs on economic performance of Tunisian firms, we consider a similar specification to equation (2) and estimate the following equation:

$$\ln \mathrm{X}_{\mathrm{it}} = \alpha_0 + \beta_1 C_{i,t-1} + \beta_2 lnAv_Tar_{i,t} + \delta \mathrm{V}_{\mathrm{it}} + \mu_i + \mu_s + \mu_t \quad (2)$$

X_{it} stands for the firm *i* variable of interest at time *t*. The variables considered are gross output per worker (productivity), labor cost per worker (average wage) and profits per worker (profitability).

$C_{i,t-1}$is the cover ratio of NTMs affecting firm *i* at year *t-1*. The cover ratio represents the percentage of imports of firm *i* subject to one or more NTMs at the ISIC 4-digit level at year *t-1*. It is given by:

$$C_{i,t-1} = \frac{\sum D_{NTM_{i,s,t-1}} m_{i,s,t}}{\sum m_{i,s,t}} \times 100$$

Where $D_{NTM_{i,s,t-1}}$ is a dummy variable indicating the presence of one or more NTMs at year *t-1*on product *s* imported by firm *i* at year *t* and $m_{i,s,t}$ represents product *s* imported value by firm *i* at year *t*. Therefore, the sum of the interaction between $D_{NTM_{i,s,t-1}}$ and $m_{i,s,t}$ gives us the value of imports at year *t* subject to one or more NTMs at year *t-1*.

$Av_Tar_{i,t}$ is the average tariff applied to imports of firm *i* at year *t* and $V_{it}$is a vector of control variables as defined above. μ_s control for industry specific effects and μ_t is a vector of dummies controlling for time specific effects.

Results regarding the impact of NTMs on firms' performance are presented in Table 5Table *5*. We observe that NTMs raise productivity (Model (9A)). Firms with a higher percentage of imports subject to at least one NTM are those for which the learning by doing argument pointed in the literature play the most. According to this argument, imports are an efficient vehicle for technology transfer and thus result in production efficiency (Bas and Strauss-Kahn, 2014; Kasahara and Rodrigue, 2007). However, this effect is small ($\leq$ 1%). Model (9B) findings suggest that this production efficiency due to NTMs conducts to the rise of the average wage. Model (9C) shows that NTMs lead to a rise of profitability by 0.75%. To sum up, results on the global sample of firms suggest that NTMs improve labor productivity which leads to the payment of higher average wages. Nevertheless, despite higher wages paid and NTMs additional costs, profitability of firms increases with NTMs.

Estimates on the different sizes of firms confirm preceding results (Models (10), (11) and (12)). Furthermore, coefficients are greater for large firms than small firms as regards the three dimensions of firms' performance. Larger firms have more ability to take benefit from technology transfer induced by NTMs, more financial power to pay higher salaries and still remain more profitable than small firms. However, the statistically significant and negative effect of large and medium firms dummies in Model (9A) points out to a higher productivity of small firms. Taking both findings together suggest that despite small firms are the most labor productive, they exploit in a smaller proportion the benefit of imports and of NTMs. These findings highlight the lack of capital and technical abilities which impede small firms from fully taking advantage of NTMs.

Table 5 OLS firms' performance results

(A) PRODUCTIVITY	**Total**	**Small firms**	**Medium firms**	**Large firms**
	(9)	**(<50) (10)**	**(50-199) (11)**	**(>199) (12)**
Cover ratio NTMs(t-1)	0.0028*** (0.0003)	0.0008*** (0.0002)	0.0018*** (0.0005)	0.0032** (0.0013)
Ln Average tariff	0.0007*** (0.0002)	0 (0.0002)	0.0007* (0.0004)	0.0011 (0.0011)
Ln Age	0.0037*** (0.0004)	-0.0016*** (0.0005)	0.0072*** (0.0009)	0.003 (0.0019)
Large firms	-0.2973*** (0.0169)			
Medium firms	-0.1355*** (0.0167)			
R squared	0.3038	0.3511	0.3835	0.2612
(B)AVERAGE WAGE				
Cover ratio NTMs(t-1)	0.0012*** (0.0001)	0.0006*** (0.0001)	0.0017*** (0.0002)	0.001*** (0.0003)
Ln Average Tariff	0.0004*** (0.0001)	-0.0002** (0.0001)	-0.0001 (0.0002)	0.001*** (0.0003)
Ln Age	0.0078*** (0.0001)	0.0116*** (0.0003)	0.0106*** (0.0004)	0.0064*** (0.0005)
Large firms	0.1642*** (0.0057)			
Medium firms	0.0958*** (0.0056)			
R squared	0.4566	0.3618	0.4401	0.5826
(C)PROFITABILITY				
Cover ratio NTMs(t-1)	0.0075*** (0.0004)	0.0024*** (0.0003)	0.0048*** (0.0009)	0.0097*** (0.0022)
Ln Average Tariff	-0.001*** (0.0004)	-0.0007** (0.0003)	0.0006 (0.0008)	-0.0026 (0.0018)
Log Age	0.0007 (0.0007)	-0.0042*** (0.0008)	0.007*** (0.0017)	-0.0034 (0.0031)
Large firms	-0.5126*** (0.0283)			
Medium firms	-0.2709*** (0.0277)			
N	112254	91256	15631	5367
R squared	0.1763	0.1369	0.1459	0.2191

***p<0.01; ** p<0.05;* p<0.1. Year, sector and firm fixed effects are included.
Standard errors into parentheses.

Considering the global sample of firms, estimates show that tariffs raise productivity and average wage while lower profitability (Models (9A), (9B) and (9C), respectively). These results are at odds of the expected effects of a lower productivity and a higher profitability of firms belonging to protected sectors. As mentioned by Augier et al., (2013), the unexpected positive correlation between tariffs and productivity can be explained in part by the fact that we only consider labor productivity, while a negative impact of tariffs on productivity should also consider capital productivity. Therefore, this finding is to be taken with caution, as mentioned by the loss of significance of tariffs on productivity when considering subsamples of different sizes of firms (Models (10A), (11A) and (12A)). Furthermore, the increase of the average wage ensuing from an increase of tariffs is only observed for large firms (Model (12B), while the declining profitability only affects small firms (Model (10C). As expected, small firms suffer the most from additional variable costs such as tariffs.

Table 6 below provides estimation results of equation (1) using an alternative measure of NTMs, i.e. the frequency index of NTMs. The frequency index refers to the presence or absence of an NTM and reveals the percentage of products at year *t* to which at least one NTM was applied at year *t-1*. We calculate the frequency index as follows:

$$F_{i,t-1} = \frac{\sum D_{NTM_{i,s,t-1}} Pr_{i,s,t}}{\sum Pr_{i,s,t}} \times 100$$

Where $D_{NTM_{i,s,t-1}}$ is a dummy variable indicating the presence at year *t-1*of one or more NTMs affecting product *s* imported by firm *i* at year *t* and $Pr_{i,s,t}$a dummy variable standing for the imported product *s* (taking value 1 if product *s* is imported by firm *i* at year t, 0 otherwise).

Table 6 OLS firms' performance results, frequency index

	Productivity	**Average Wage**	**Profitability**
	(13)	**(14)**	**(15)**
Frequency NTMs (t-1)	-0.0003	0.0003***	0.0033***
	(0.0003)	(0.0001)	(0.0006)
Ln Average Tariff	0.0007***	0.0005***	-0.001***
	(0.0002)	(0.0001)	(0.0004)
Log Age	0.0038***	0.0079***	0.0011
	(0.0004)	(0.0001)	(0.0007)
Large firms	-0.2958***	0.1649***	-0.5069***
	(0.0169)	(0.0057)	(0.0284)
Medium firms	-0.1344***	0.0964***	-0.2659***
	(0.0167)	(0.0056)	(0.0278)
N	112254	112254	112254
R Squared	0.3028	0.4552	0.1722

***p<0.01; ** p<0.05;* p<0.1. Year, sector and firm fixed effects are included.
Standard errors into parentheses.

Results are consistent with those found with the cover ratio as regards wages and profitability. They confirm that a greater share of products to which at least one NTM is applied increases average wage and profitability of firms. However, the effect of the frequency index on productivity is non-significant.

5. Extended analysis

In this section, we firstly investigate whether the trade regime of firms, i.e. importing and exporting or only importing, affects the reaction of firms following a change in NTMs.

Results of the estimation of equation (1) are presented in Table 7. They are similar for both specifications and confirm findings of Model (1). An increase of NTMs raises imports value for all firms, importing and exporting firms and only importing firms.

Table 7 Impact of non-tariff measures on imports value, by trade regime

	Importer and Exporter (16)	**Importer (17)**
Cumulative NTMs (t-1)	0.0024*** (.0001)	0.0028*** (.0001)
Log (1+Tariff)	-0.0024* (.0013)	-0.0394*** (.0015)
Log Age	0.0316*** (.0027)	0.0975*** (.0025)
Large firms	0.1544*** (.0052)	0.0378*** (.0091)
Medium firms	0.0971*** (.0045)	0.1597*** (.0063)
N	1011549	620995
R squared	0.0308	0.0589

***p<0.01; ** p<0.05;* p<0.1. Year, sector, firm and country fixed effects are included.
Standard errors into parentheses.

As regards tariffs, the significant and negative effect on imports showed in Model (1) seems to mainly result from importing firms (Model (17)), while tariffs are influencing importing and exporting firms with a weak level of significance (Model (16)).This finding suggests that importing and exporting firms, importing goods and services and re-exporting them to foreign markets, are less sensitive to prices increase than companies selling on the Tunisian market. This could be due to the fact that a large share of importing and exporting firms is submitted to the offshore regime and are exempted from paying tariffs during a 10-years period. An increase in tariffs does not affect them much.

Results of the estimation of equation (2) are presented in Table 8.The statistically significant and positive coefficient on NTMs variable confirm findings of Table 5 for both types of firms:

NTMs increase productivity of all importing firms, regardless of their trade regime. Furthermore, the larger coefficient in Model (18) suggests that this positive correlation between NTMs and productivity is exacerbated for importing and exporting firms. This finding suggests that the role of NTMs in upgrading products' quality is even more relevant in the case of importing and exporting firms than for solely importing firms. Importing products regulated by NTMs not only improves productivity of firms through the transfer of embodied technology or the use of intermediates of a better quality (learning by importing), but also may lead these more productive firms to self-select towards the export activity. This result confirms the strand of literature which shows that two-way traders are the most productive firms in average (Andersson et al., 2008; Castellani et al., 2010, Muuls and Pisu, 2009). However, this assumption should be confirmed by a deeper analysis, probably with further control of simultaneity. If imports are consistent with the learning by importing and the self-selection hypotheses, this is more likely to happen when imports involve goods and services affected by NTMs. Similar conclusions are drawn by results estimates related to the effect of NTMs on average wage and profitability. Findings also confirm results of Section 4.2 and suggest an expected enhanced effect on importing and exporting firms for both average wage and profitability.

Table 8 Impact of non tariff measures on firm's performance, by trade regime

	Importers and Exporters (18)	Importers only (19)
(A)PRODUCTIVITY		
Cover ratio(t-1)	0.0097***	0.0052***
	(0.0009)	(0.0004)
Ln (Average tariffs)	0.0001	-0.0003*
	(0.0004)	(0.0002)
Log Age	0.0038***	0.0006
	(0.0008)	(0.0004)
Large firms	-0.3313***	-0.4864***
	(0.0307)	(0.0164)
Medium firms	-0.2339***	-0.1344***
	(0.0303)	(0.0158)
R Squared	0.2647	0.4752
(B)AVERAGE WAGE		
Cover ratio(t-1)	0.0035***	0.0015***
	(0.0003)	(0.0002)
Log (1+tariffs)	0.0006***	0.0002***
	(0.0001)	(0.0001)
Log Age	0.0086***	0.0063***
	(0.0002)	(0.0002)
Large firms	0.1635***	0.0688***
	(0.009)	(0.0073)
Medium firms	0.0742***	0.0784***
	(0.0089)	(0.007)
R Squared	0.4542	0.5217
(C)PROFITABILITY		
Cover ratio(t-1)	0.0139***	0.0053***
	(0.0015)	(0.0007)
Log (1+tariffs)	-0.0025***	0.0003
	(0.0007)	(0.0003)
Log Age	-0.0029**	0.0036***
	(0.0013)	(0.0007)
Large firms	-0.5388***	-0.8302***
	(0.0518)	(0.0283)
Medium firms	-0.3853***	-0.3083***
	(0.0509)	(0.027)
R Squared	0.1576	0.3065
N	40359	71895

***p<0.01; ** p<0.05;* p<0.1. Year, sector, firm and country fixed effects are included. Standard errors into parentheses.

To go further into analysis, we run a second robustness test controlling for the offshore regime. This regime relies on an investment law (Law 72-38) which offers firms, called offshore firms, several tax and duty incentives. It is often applied as part of economic reforms in order to achieve a higher level of growth. On the contrary, firms in the onshore regime have

to pay their taxes, tariffs and duties. Given the existence of this regime in Tunisia, we add in our specification of Table 3 additional interaction terms between a dummy standing for offshore firms and NTM ($NTM_{s,t-1}Offshore$), this dummy and tariffs ($lnTar_{s,j,t}Offshore$).

Results are reported in Table 9.They are broadly similar to those reported in Tables 3 and 7. More specifically, they confirm the positive effect of NTMs on imports (Model (20), with a smaller magnitude as regards small firms comparatively to medium and large ones (Models (21), (22) and (23)). At the opposite, the negative and significant coefficient on the interaction term $NTM_{s,t-1}Offshore$, with a magnitude of 0.0036, refers to a trade-diversion effect of NTMs in the case of offshore firms. This result is not surprising since offshore firms purpose is exporting in a large extent towards E.U. To reach this goal, they must use inputs which respect standards even in the absence of NTMs in Tunisia. Therefore, the unique effect on offshore firms of increasing NTMs in Tunisia is to make them lose a comparative advantage, which may have as a consequence a decrease of their market share.

Table 9Impact of non-tariff measures on imports value, with offshore regime

Import values				
	Total	**Small firms (<50)**	**Medium firms (50-199)**	**Large firms (>199)**
	(20)	**(21)**	**(22)**	**(23)**
Cumulative NTMs (t-1)	0.0026***	0.002***	0.0032***	0.0032***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Ln (1+Tariff)	-0.018***	-0.0259***	-0.0131***	-0.0109***
	(0.0012)	(0.0014)	(0.0026)	(0.0032)
NTM(t-1)*offshore	-0.0036***	-0.0018***	-0.0053***	-0.0054***
	(0.0002)	(0.0003)	(0.0005)	(0.0005)
Ln (1+Tariff)*offshore	0.0418***	0.0378***	0.0574***	0.038***
	(0.0017)	(0.0026)	(0.0034)	(0.0041)
Ln Age	0.0025	0.0419***	-0.096***	-0.1542***
	(0.0091)	(0.0111)	(0.0246)	(0.0348)
Large firms	0.1491***			
	(0.0110)			
Medium firms	0.0887***			
	(0.0074)			
N	1632544	894288	413979	324277
R squared	0.1623	0.2299	0.1194	0.0825

***p<0.01; ** p<0.05;* p<0.1. Year, sector, firm and country fixed effects are included.
Standard errors into parentheses.

The negative effect of tariffs on imports is also confirmed. However, the coefficient on the interaction term of tariffs and offshore regime turns to be significantly positive. Offshore firms being exempted from customs duties on imported capital goods and inputs, an increase of tariffs should either not affect them or provide them a comparative advantage as compared to their onshore counterparts. Medium firms seem to benefit the most from this additional comparative advantage.

6. Concluding remarks

In this work, we examine the effect of non-tariff measures on imports value of Tunisian firms. Using an exhaustive Tunisian firm-level database over the period 2000-2010 coupled with the detailed WITS database regarding non-tariff measures, we show that an increase of NTMs positively affects total imports value. When conducted on sub-samples depending on the size of firms, estimates exhibit a weaker impact for small and medium firms comparatively to large firms, probably due to the enhanced ability of large firms to take benefit from new opportunities of internationalization. Furthermore, detailed estimates involving the different chapters of non-tariff measures show that the effect of NTMs is negative in the cases of Technical Barriers to Trade and Price Control Measures. The negative effect of TBT concerns medium firms and of PCM affects SMEs. Those findings refer to the sensitivity of SMEs to some measures generating additional variable costs of conformity or taxes.

Our rich database also enables us to investigate the effect of NTMs on firms' performance indicators. Results show that the increase of the share of imports of a firm subject to one or more NTMs increases the productivity of firms, induces a rise of the average wage and leads to a higher profitability. This is consistent with the learning-by-importing hypothesis. This effect seems more important for large firms, probably because they have more financial and technological capacities to take benefit of technology diffusion induced by imports. Providing technical assistance to SMEs may thus help them to fully benefit of NTMs.

In an extend analysis, we investigate whether the trade regime of firms, importing and exporting or solely importing, affects previous results. Findings confirm the positive impact of NTMs on imports as well as on firms' performance indicators for both categories of importing firms. Furthermore, larger coefficients displayed by the estimate of the importing and exporting firms specification contribute to highlight the self-selection hypothesis and the fact that two-way traders are the most productive and competitive firms. An additional estimate controlling for offshore regime allows us to conduct a deeper analysis and to show a trade-diversion effect of NTMs in the case of offshore firms.

To conclude, NTMs are found to enhance the positive effects generated by imports in Tunisia. For this reason, helping SMEs in exploiting induced benefits of NTMs is a crucial issue. Using input-output tables may help us to investigate further this issue. However, the trade-diversion effect documented for offshore firms fuels the actual policy debate in Tunisia as regards the existent dichotomy between onshore and offshore firms.

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