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Regulatory harmonization, profits, and productivity: Firm-level evidence from Morocco

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Abstract

This paper combines a new database on non-tariff measures (NTMs) with Morocco's firm census to explore the effect of regulatory harmonization with the E.U. on firm-level outcomes. Exploiting cross-sectoral variation in the timing and extent of regulatory harmonization, we find that harmonization waves correlate with rises in labor productivity and with higher markups, allowing self-financing of the adaptation process at the firm level. We identify an induced market-structure change that made the observed rise in markups possible. Namely, harmonization temporarily sheltered the Moroccan market from competition from low-end producers in other developing countries, who took time to adapt. We identified this effect through changes in both trade patterns and firm-level outcomes. Thus, harmonization apparently generated a self-financing adaptation process by affecting both firm-level incentives and market structure.

JEL Classification Numbers: F13, F15
Keywords: Morocco, Trade, Non-Tariff Measures, Firms, Harmonization, Profit, Productivity

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1. Introduction

Many important regional integration agreements (RTAs) include "deep-integration" clauses calling for convergence in non-tariff measures (NTM), i.e. in regulations and/or in conformity-assessment procedures. For instance, the E.U.'s Euromed agreements encourage partner countries to adopt broad swipes of Community regulations, while Chapter 25 of the proposed Trans-Pacific Partnership (TPP) calls for regulatory convergence, albeit in non-binding form. In North-South agreements such as Euromed or TPP, deep integration means that less advanced countries need to align domestic regulations on more stringent Northern standards. This may have implications for market structure and firm performance; however, these implications remain as yet largely unexplored. The present paper explores them empirically through the case of Morocco, one of the pioneers in the Euromed convergence process. Exploiting sectoral and time-wise variation in waves of NTM harmonization, we identify causal effects on firm-level outcomes through a difference-in-differences (DID) approach, controlling for unobserved heterogeneity with firm fixed effects. We find evidence of capital deepening—a symptom of modernization of production processes—but also of higher markups, suggesting changes in domestic market structure. The transmission mechanism from NTM harmonization to higher markups, which we explore through interaction terms, seems to be reduced competition from low-wage imports on the domestic market because of stiffer harmonized standards. These induced market-structure effects observed on Morocco's *domestic* market are novel. They are important to understand the political-economy of acceptance of stringent Northern standards by Southern partners, as adjustment costs are compensated by temporary protection while low-cost importers adapt marketing channels to the new harmonized standards (or give up and simply redeploy to markets that remain un-harmonized).

How prevalent are harmonization clauses in RTAs around the world? At the multilateral level, product regulations are subject to the disciplines of the WTO's TBT and SPS agreements; however, a number of RTAs, in particular those signed by the E.U. and U.S., contain deep-integration clauses that go beyond WTO rules, called "WTO+" by Horn, Mavroidis and Sapir (2010).[1] For instance, all of the 14 EU agreements they review include TBT provisions, although they are binding only with Cariforum, Mexico, Chile, Turkey and in the relatively close European Economic Area (EEA); and eight had SPS clauses, three of which enforceable. The U.S. had 12 agreements with WTO+ SPS provisions, legally enforceable through dispute settlement with Israel and NAFTA.

In terms of depth and form of convergence, E.U. agreements tend to be "hegemonistic" in that they push partners to adopt the EU's own regulations, standards and conformity assessment procedures. For instance, Article 51 of the European Community (EC)-Morocco RTA states that:

> "[t]he Parties shall cooperate in developing: (a) the use of Community rules in standardisation, metrology, quality control and conformity assessment; (b) the updating of

[1] The most comprehensive review is Piermartini and Budetta (2009) which covers 70 RTAs. Lesser (2007) also reviews of 28 North-South and South-South agreements. The most recent taxonomy can be found in Dür et al. (2014).

Moroccan laboratories, leading eventually to the conclusion of mutual recognition agreements for conformity assessment; (c) the bodies responsible for intellectual, industrial and commercial property and for standardization and quality in Morocco."

Article 51 of the EC-Tunisia RTA is identical, and article 40 of the EC-Palestinian Authority RTA Article 68 of the EC-Jordan agreement have similar clauses.

With more distant countries with which it does not have deep-integration agendas, E.U. agreements either have less stringent clauses or merely promote harmonization on international standards. For instance, Article 18 of the EC-Chile agreement only states that "[c]ooperation between the Parties will seek to promote efforts in (a) regulatory cooperation; (b) compatibility of technical regulations on the basis of international and European standards" while Article 19 of the EC-Mexico states that the Parties "shall work towards: […] (c) promoting the use of international standards, technical regulations and conformity assessment procedures on the basis of international agreements; (d) facilitating the adoption of their respective standards, technical regulations and conformity assessment procedures on the basis of international requirements." Similar clauses can be found in other North-South agreements like the Australia-Thailand RTA which states in Article 705 that "[t]he Parties shall, where appropriate, endeavor to work towards harmonization of their respective technical regulations, taking into account relevant international standards, recommendations and guidelines, in accordance with their international rights and obligations."

In sum, many RTAs feature harmonization clauses which may affect product-market competition. Unlike preferential tariff elimination, harmonization does not concern exporters, who must adapt to foreign standards whether they are harmonized or not; rather, it concerns producers selling on the harmonizing country's *domestic* market.

In a Southern country harmonizing "upward" (toward more stringent standards), firms may have to upgrade quality as if they were starting to export, through investments and/or learning; this adaptation process has been extensively analyzed in the literature in the case of exporting firms (see e.g. Clerides et al., 1998; de Loecker, 2007, Verhoogen, 2008, Harrison and Rodriguez-Clare, 2010, Bustos, 2011, or Atkin, Khandelwal and Osman, 2016).

In addition, harmonization may alter market access for foreign producers, affecting competition and markups. The effect of trade-policy changes on market structure has also been extensively studied in the context of tariff reductions (see e.g. Levinsohn, 1993; Harrison, 1994; Krishna and Mitra, 1998; Bernard et al., 2003; Feenstra and Weinstein, 2010; Arkolakis et al., 2012; de Loecker et al., 2016; de Blas and Russ, 2015; or Edmond et al., 2015). However, as discussed in Edmond et al., while there is extensive evidence trade liberalization enhances competition, its effect on equilibrium markups and their distribution is complex, depending on modeling assumptions.[2] In addition, in the case of NTM harmonization, unlike a tariff reduction, one cannot assume that the

[2] For instance, standard monopolistic-competition models with CES preferences have constant markups.

reform is liberalizing, which compounds indeterminacy. Thus, in this paper, we will take its effect on competition and markups as an empirical issue.

We study it in the context of Morocco, which is an interesting case study because it was the first country to obtain the E.U.'s "advanced status" granted on the basis of regulatory convergence to E.U. regulations. Moreover, as Morocco's regulations prior to harmonization were largely outdated and unevenly enforced, there is a reasonable presumption that new (harmonized) regulations were stricter, *de jure* or *de facto*, than the old ones they replaced. Our exploration combines firm-level panel data from Morocco's manufacturing census with data on the harmonization of Morocco's non-tariff measures (NTMs). The data on non-tariff measures comes from a new wave of data collection on NTMs carried out as part of a joint effort by the World Bank, UNCTAD, and the African Development Bank while one of the authors was at the World Bank. The regulatory data includes all trade-relevant regulations (technical regulations, sanitary and phytosanitary measures, prohibitions, quantitative restrictions, and so on) coded according to the 2009 MAST nomenclature for NTMs.[3] We combine it with Morocco's rich manufacturing survey which provides a wealth of information on firm characteristics including, inter alia, costs, employment, and turnover.

Our setting is not quite a natural experiment, but it has two appealing features in terms of causal identification. First, as shown by the text of the treaties, Morocco-E.U. harmonization was largely "hegemonistic", driven by a pan-Mediterranean E.U. trade agenda with little input from the Moroccan side, limiting the scope for reverse causation through political-economy channels. Second, as a result of administrative complexity, it proceeded in discrete waves whose dates varied across sectors, providing sector-wise and time-wise variation in the regulatory environment faced by Moroccan firms. We run placebo exercises to control for possible endogeneity of the timing of these waves to the readiness of Moroccan firms, and systematically use firm fixed effects to control for unobserved heterogeneity.

Firms having to upgrade quality to satisfy upwardly-harmonized product standards can be expected to invest in capital investment and hence to upgrade skills, like the Argentinian firms deciding to expanding into the Brazilian market in Bustos (2011). However, in our case, the decision problem is simpler because it is constrained by a regulatory change rather than a within-firm decision triggered by expanded opportunities (recall that harmonization concerns the *domestic* market). While we do not have matched employer-employee data like Bustos, our survey data allows for a simple calculation of labor productivity as a joint proxy for capital deepening and skill upgrading. We indeed find evidence of a causal effect of harmonization waves on labor productivity.

In addition to pushing domestic firms to upgrade quality, harmonization may also disrupt traditional import channels for low-end products from Asian countries. While harmonization may

[3] The 2009 MAST nomenclature was revised in 2012 as part of an effort to harmonize codes between the new data and the WTO's notifications system, but Morocco's data uses the 2009 codes.

not shut down altogether the Moroccan market to versatile Asian suppliers, or may not do so permanently, it affects the relative profitability of trade between destinations, making Morocco a more difficult market without a compensatory increase in consumer willingness to pay. Intuitively, this can be expected to induce some trade deflection away from the Moroccan market toward others markets, thus relieving low-end competitive pressure for Moroccan producers. One may then observe a temporary rise in the markups charged by Moroccan firms, helping them to finance the quality upgrading needed to satisfy the new, harmonized regulations. This is what we find, as harmonization raised productivity and markups more strongly in sectors where initial import penetration by developing-country producers was higher, and less in sectors where import penetration by high-income producers was higher. That is, our results suggest that harmonization helped shelter Moroccan producers from competition from low-cost exporters, while exposing them more to E.U. competition.

On net, we find a positive and highly significant effect of harmonization on productivity and markups, with stronger effects on markets that were initially highly exposed to developing-country penetration. Our results can be interpreted as suggesting that in the case of Morocco, harmonization (i) raised labor productivity through enhanced efficiency or capital deepening and (ii) provided the temporary protection from low-end competition which allowed firms to finance the necessary investments. We also find limited evidence that Moroccan firms found themselves more exposed to competition from industrial-country exporters after harmonization.

Our work contributes to a small literature on the trade effects of product regulations. Maur and Shepherd (2011) argued that the appropriate degree of regulatory stringency varies with economic development; so harmonization in North-South agreements can potentially be, for Southern partners, a socially suboptimal straightjacket for Southern partners. Disdier et al (2015) also showed that it can reinforce hub-and-spoke trade patterns by forcing the adaptation of the Southern partner's production technology to the Northern partner's regulations. Chen and Mattoo (2008) showed in a gravity equation that harmonization on regional standards improved market access for out-of-bloc exporters if they were from industrial countries, but reduced it if they were from developing countries. Disdier et al. (2015) found that harmonization as part of North-South RIAs could reinforce hub-and-spoke trade structures at the expense of South-South trade, as harmonization at stringent Northern levels raised costs for Southern producers and could price them out of other Southern markets where strict standards would not confer any competitive edge. In one of the few studies using firm-level data,[4] Reyes (2012) showed that the harmonization of E.U. electronics standards triggered the entry of new U.S. exporters, but that the tougher competitive environment crowded out Southern exporters, confirming Chen and Mattoo's earlier result on aggregate data. Wilson, Otsuki and Majumdsar (2003) estimated that harmonizing E.U.

[4] Other papers using firm-level data include Chen, Otsuki and Wilson (2006) who used a World Bank survey of 619 companies in 17 developing countries to explore the impact of NTMs on export markets, with information on NTMs also obtained from the same survey. Firm-level data (from the Amadeus database) was also used in an NTM context by Konings and Vandenbussche (2005) to explore the effect of antidumping measures on the markups of European firms.

antibiotics regulations for bovine meat on the Codex Alimentarius standard would benefit South African, Brazilian and Argentine beef exporters. Mangelsdorf, Portugal-Perez and Wilson (2012) showed that the harmonization of Chinese standards on international ones helped Chinese exporters overcome reputation problems. Finally, using a cross-section of firms from 59 countries, Goedhuys and Sleuwagen (2013) found that international standards certification raised productivity and turnover.[5]

The paper is organized as follows. Section 2 describes the data and discusses estimation issues. Section 3 presents baseline results. Section 4 presents extensions and robustness tests. Section 5 concludes.

2. Data and estimation

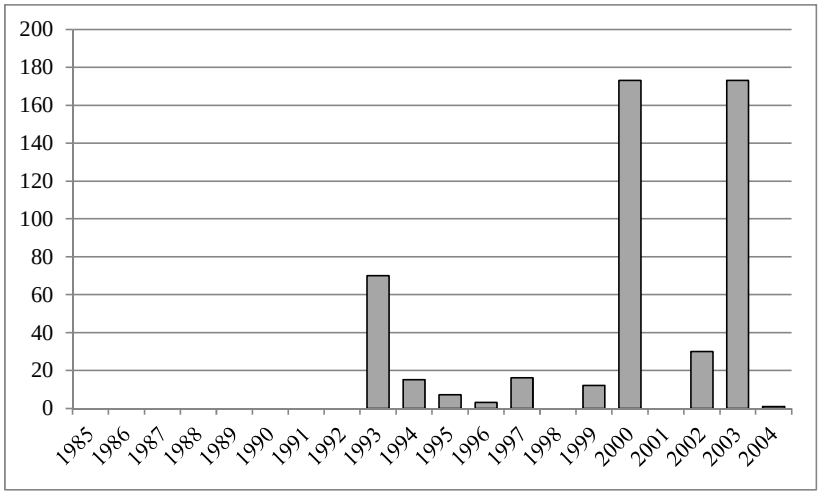
2.1. Data

Our NTM data was collected in 2010 as part of a joint research effort financed by the World Bank and UNCTAD with data collected, for Morocco and other Middle East and North African (MENA) countries, by FEMISE institute staff (see Cadot and Malouche 2012 for details).[6] It consists of an inventory of all trade-relevant regulations, including product standards, sanitary and phytosanitary (SPS) regulations, quantitative restrictions, import prohibitions, customs regulations, and so on, classified according to UNCTAD's MAST Classification (see UNCTAD 2013),[7] together with products affected by each regulation, coded by HS6. Thus, in what follows, a "measure" is a pair of HS6 and MAST codes. The inventory was drawn up in close collaboration with government authorities and was followed by a "validation workshop" where all relevant government agencies (trade, health, agriculture ministries, sanitary authorities, standards bureaus, and so on) had the opportunity to comment on its accuracy and completeness; the validation workshop was attended by one of the authors.

The inventory includes the date at which the relevant regulatory text was adopted and the originating/enforcement agency. It also includes a crucial piece of information for us, namely whether a measure was harmonized with E.U. standards or not. From now on, let a "harmonization" mean the introduction of a new NTM,[8] covering any number of HS6 products, for which the inventory indicates that it is harmonized with the corresponding E.U. NTM. Figure 1 shows a count of such harmonizations, by year, over our sample period. It can be seen that harmonization proceeded by waves, with three big waves in 1993, 2000 and 2003 respectively.

[5] The international standards certification data used by Godehuys and Sleuwagen was from the World Bank's Investment Climate Surveys; that is, they were based on the companies' survey responses and included non-governmental certifications like ISO.
[6] After consistency checks by UNCTAD specialists, the data is published as part of UNCTAD's TRAINS database, publicly accessible through the World Bank's WITS portal.
[7] Our data is based on the 2009 MAST classification, which includes, in its most detailed form, 121 categories of measures. It was updated in 2012 to be used in the WTO's SPS/TBT notification system.
[8] Typically a law or decree.

Figure 1. Harmonizations by year, all sectors



Source: Authors' compilation using multilateral NTM database

One possible issue with the data needs to be discussed. While we know the year of adoption of each measure in force as of 2010, we do not know what was in place before.[9] Thus, in principle, the regulatory change recorded at the entry into force of a new regulation could be either a relaxation, a stiffening, or a neutral change in regulation. For instance, a maximum residual level of pesticides in vegetables adopted in year *t* could be higher, lower or identical to the previous one. However, when measures were coded as harmonization with E.U. regulations, new measures were stiffer than the ones they replaced, especially in foodstuffs, as the E.U. had more stringent product and sanitary standards than Morocco. In addition, harmonization was often accompanied by technical assistance to the Moroccan administration on enforcement, implying that even in cases where regulatory texts looked similar to older ones, they were likely to bite more. Thus, one can safely assume that harmonized measures were stiffer than those they replaced.

At the sectoral level, the harmonization of Morocco's NTMs has proceeded in waves that vary in terms of timing and intensity. Table 1 illustrates the cross-sectoral variation in timing and intensity for a few 2-digit sectors (broader than the 4-digit sectors that we will use in the statistical analysis; we aggregate in Table 1 for readability). Unsurprisingly, the first sector to be affected is the food sector, a sensitive one in terms of consumer safety for the E.U.. If one takes the number of harmonizations as a proxy for the intensity of regulatory change, food & beverages is the most affected, with 57.8% of the total number of harmonizations, followed by chemicals (31.4%), reflecting again the sensitivity of those sectors in the E.U..

[9] There is data on NTMs in the 2001 TRAINS database but it is not as precise as the new wave, making comparison difficult.

Table 1. Number of harmonizations by 2-digit sector

	Food	Textile	Chem.	Plastics	Mach.	Furnit.
1985	0	0	0	0	0	0
1986	0	0	0	0	0	0
1987	0	0	0	0	0	0
1988	0	0	0	0	0	0
1989	0	0	0	0	0	0
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	65	0	0	5	0	0
1994	10	0	0	5	0	0
1995	7	0	0	0	0	0
1996	125	0	0	0	0	0
1997	0	0	16	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	12	0
2000	173	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	1	0	0	15	14
2003	31	0	141	0	0	1
2004	0	0	0	1	0	0

Note: Data aggregated from ISIC 4 to ISIC 2 digit.

Source: Multilateral NTM database

Our firm data comes from the Moroccan annual manufacturing census (*Enquête industrielle*) for 1985-2004, which contains data on turnover, value added, exports, employment, date of creation, and investment. It uses 4-digit industry codes from the Moroccan Nomenclature of Economic Activities, which is close to ISIC-4 and can easily be reconciled with it. We deflate production and value added with sector-level price indices. The raw dataset contains 8'337 firms; after applying Hall and Mairesse's procedure for cleaning this type of data (Hall and Mairesse 1995), we are left with 8'191 firms.

We use two outcome variables: Real labor productivity and markups. Labor productivity is value added per permanently-hired employee. The markup is gross operating income over sales, where gross operating income is value added minus payroll. Formally, let *i* index firms and *j* 4-digit sectors, with *j*(*i*) designating the sector to which firm *i* belongs. Let v_{it} be value added, Y_{it} sales, $w_{it}L_{it}$ payroll, Q_{it} labor productivity in nominal terms, π_{it} the markup over labor costs, and p_{jt} a 2-digit sector-level price deflator. Real labor productivity is

$$q_{it} = \frac{Q_{it}}{p_{j(i)t}} = \left(\frac{1}{p_{j(i)t}} \right) \left(\frac{v_{it}}{L_{it}} \right) \tag{1}$$

and the markup is

$$\pi_{it} = \frac{v_{it} - w_{it}L_{it}}{Y_{it}} \ . \tag{2}$$

Descriptive statistics are shown in Table 2.

Table 2. Descriptive statistics, Moroccan firms in manufacturing census

	Mean	Std. Dev.
Number of employees	67.40	188.68
Labor productivity a/	3.84	0.99
Operating profits (ratio)	0.10	1.86
Age	15.99	14.00
Export Share	0.18	0.36

Note:

a/ Log of value added per worker.

Over our sample period the growth of real labor productivity was almost nil (one tenth of one percent per year on average) a picture that is consistent with macro data, and profit was roughly stable between 10 and 20 percent over the sample period except for two dips, one in 1991 and one in 2004.

2.2. Estimation issues

Let $n_{j(i),t}$ be the cumulated number of harmonized measures in force in firm *i*'s 4-digit sector at *t*, $\tau_{j(i),t}$ the average tariff applied to imports in firm *i*'s sector at *t*, y_{it} the relevant outcome variable for firm *i* at *t* (either the log of labor productivity or the markup, depending on the equation), and $\mathbf{x}_{it}$ a vector of time-variant firm characteristics including age and lagged export share. Our baseline estimation equation is

$$y_{it} = \alpha_0 + \alpha_1 n_{j(i),t-1} + \alpha_2 \tau_{j(i)t} + \mathbf{x}_{it}^{'}\boldsymbol{\beta} + \delta_i + \delta_t + u_{it} \quad (3)$$

where δ_t and δ_t are respectively firm and time effects. In some specifications, we replace firm effects with sector effects. Equation (3) is basically a treatment-effects equation in which the treatment is applied at the sector level and is of variable intensity.

Estimating the treatment's effect raises the usual identification issues, including unobserved heterogeneity in levels and growth, error structure, and endogeneity.

As for unobserved heterogeneity in firm-level profits and productivity, we use firm fixed effects to control for time-invariant omitted variables as well as firm-level control variables available from Morroco's industrial survey. We also control for macroeconomic variables with time effects.

In terms of error structure, we cluster standard errors by 4-digit sector in order to avoid over-rejection of the null in DID equations, as recommended by Bertrand et al. (2004). This procedure controls for any type of serial correlation in errors within sector. In another variant, we cluster

standard errors more narrowly at the industry-year level in order to avoid a classic macro-variable-in-micro-unit problem (see Moulton 1990).[10]

As for endogeneity, there are two issues: The sectoral allocation of harmonization waves, and their timing. Intuitively, the political-economy concern behind the endogeneity issue is that pressing competition from low-wage imports—Morocco has a relatively high-cost labor market that is not compensated by high productivity—could have encouraged the Moroccan government to think strategically about harmonization as a way of shutting the door to low-cost Chinese competition, i.e. to anticipate the treatment effect we estimate here, and ask for harmonization selectively where it would reduce import pressure, for instance in the all-important textile & clothing sector. By a similar argument, the Moroccan government could have bargained for limited harmonization in sectors where industrial countries had a comparative advantage, such as chemicals.

As discussed in the introduction, the harmonization process was heavily dominated by the E.U. Commission's agenda which was regional rather than bilateral, limiting input from the Moroccan side. Moreover, a simple inspection of the sectoral allocation pattern of harmonization waves in Table 1 fits poorly any conceivable pattern of Moroccan political economy. For instance, the apparel sector, a major employer in Morocco and under intense pressure from low-cost competition, should have been a prime target for harmonization (e.g. concerning the synthetic components of fabrics which are regulated in the E.U. for potentially harmful chemicals). But there was very little harmonization in textiles and none at all in apparel. Conversely, the food & beverages and chemical sectors are sensitive ones in the E.U. (all chemicals are covered by the wide-ranging set of REACH regulations) and they are the ones most heavily covered by harmonized measures in our data. Similarly, the plastics sector has been affected by harmonization, although E.U. plastics regulations are relatively easy to comply with for Chinese producers, offering little gains to Moroccan producers in terms of protection as the Chinese government has been progressively adopting domestic regulations converging on a combination of E.U. and U.S. standards.[11] Although the sectoral allocation of harmonization waves does not seem to fit any intuitive pattern of reverse causation through political economy, in a robustness exercise we combine DID with propensity-score matching in order to ensure that firms in the control group (i.e. sectors where no harmonization took place) have similar characteristics to those in the treatment group (sectors that were harmonized), including initial levels of productivity and markups.

The timing of harmonization waves could also be a strategic margin of bargaining for the Moroccan governments, possibly leading to endogeneity bias through reverse causation from time-variant import shocks on sector-level performance to *when* harmonization waves were scheduled. As an informal check on this, we regress our 4-digit sector-level harmonization on the current and lagged change in developing-country import shares on the Moroccan market,

[10] Results are not affected (not shown here but available upon request).
[11] We are grateful to Alistair Irvine, Manager, Food Contact Compliance, Smithers Pira, for useful clarifications on this point.

controlling for time effects. Results are reported in Table 3. All coefficients are robustly insignificant, even though they are entered one by one in separate regressions and without sector fixed effects, an approach that typically facilitates rejection of the null. A similar regression on levels also returns insignificant estimates.

Table 3. The impact of imports from low-cost competitors on harmonization waves

Dep. Var.	First wave of harmonization (binary)				
Estimator: OLS	(1)	(2)	(3)	(4)	(5)
Δ Share of DC imports	0.0728	0.0291			
	(0.1285)	(0.0388)			
Δ Share of DC imports, L1	0.0011		0.0450		
	(0.1494)		(0.0407)		
Δ Share of DC imports, L2	-0.0187			0.0446	
	(0.1456)			(0.0456)	
Δ Share of DC imports, L3	-0.0262				0.0218
	(0.1210)				(0.0490)
Constant					
	0.0745***	0.0077	-0.0063	-0.0057	0.0759***
	(0.0288)	(0.0250)	(0.0263)	(0.0272)	(0.0282)
Fixed effects					
Year	Yes	Yes	Yes	Yes	Yes
Observations	868	1,135	1,107	993	882
R-squared	0.016	0.014	0.015	0.014	0.016

Note: *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.
L1: Lagged one year; L2: Lagged two years; L3: Lagged three years.

3. Results

3.1. Prima-facie evidence

Did harmonization waves make a difference to profits and labor productivity? As a first pass at the data, we draw time profiles of firm outcomes around harmonization dates, controlling for common factors. Let $t(j)$ be sector *j*'s "harmonization year" for, defined as the first year in which at least one NTM is harmonized in that sector, and let

$$\tilde{t}(j) = t - t(j) \tag{4}$$

be "analytical time". We define ten dummy variables indexed by k = -5, …,0,…,5, each marking an analytical year in a 10-year window around sector *j*'s harmonization year

$$\delta_{j(i),k} = \begin{cases} 1 & \text{if } t = \tilde{t}_{j(i),k} \\ 0 & \text{otherwise} \end{cases} \tag{5}$$

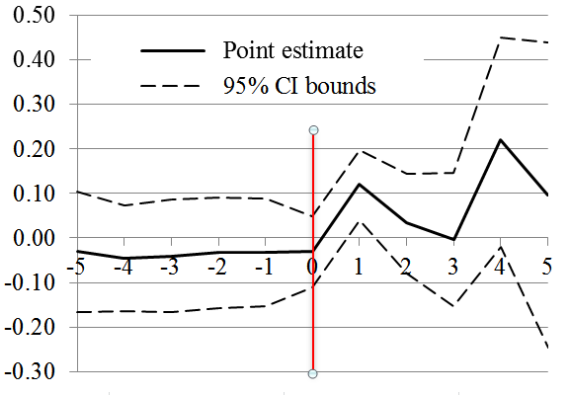
and regress firm outcomes (profits and productivity) on them, controlling for sector and calendar-year fixed effects:

$$y_{it} = \sum_{k=-5}^{k=+5} \delta_{j(i),k} + \delta_j + \delta_t + u_{it} \quad (6)$$

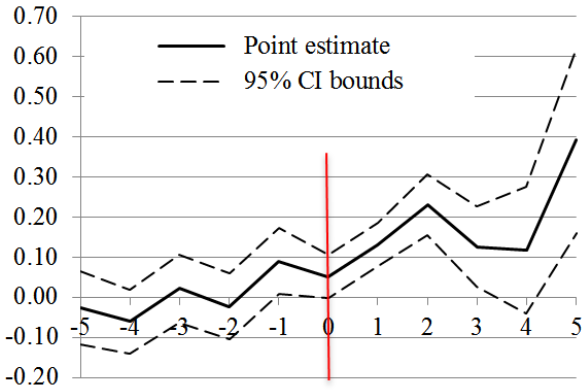
Figure 2 plots estimated coefficients $\hat{\delta}_{j(i)}(k)$ together with their 95% confidence intervals. The resulting curves give the profile of the divergence in firm outcomes from a counterfactual of firms outside the relevant window and/or in sectors that did not harmonize any NTM; that is, they plot a picture equivalent of an average firm outcome differential *k* years before and after the harmonization wave relevant to that firm, controlling for calendar-year and sector-level shocks via fixed effects δ_j and δ_t. The profiles suggest a positive effect of harmonization on profits (panel a) and on labor productivity (panel b), although possibly with anticipation effects in the case of labor productivity, which accords with intuition.

Figure 2. Profit and productivity path, before and after harmonization

(a) Profits



(b) Real labor productivity



Note: Time is rescaled to be zero, by sector, in the first year where a harmonization wave takes place.

3.2. Baseline results

We now turn to regression results for equation (3). Table 4 reports within-firm estimates of the effect of the count of sector-level harmonizations on profits and real labor productivity. Profits and labor productivity correlate strongly with harmonization counts in the within-firm specifications (columns 1 and 3).

In markup equations, the count of harmonizations is significant at 1% with a point estimate around 0.31-0.35. In labor-productivity equations, the count of harmonizations is also statistically significant at 1% in the within-firm specification (column 3).

Profits and labor productivity correlate respectively negatively and positively with firm age, although there is no prior on these relationships. Only productivity correlates robustly with the share of exports in turnover.[12] Tariffs have no effect on either profit or productivity.

Table 4. Baseline regression results, profits and productivity

Dep. var.	Operating profits		Real labor productivity	
Estimator: OLS	(1)	(2)	(3)	(4)
Harmonization a/	0.3506**	0.3151**	0.2321***	0.1220
	(0.1616)	(0.1286)	(0.0793)	(0.1106)
Tariff a/	0.1556	0.0806	0.1308	0.0090
	(0.1251)	(0.1343)	(0.1647)	(0.1732)
Age	-0.0190***	-0.0008***	0.0113**	0.0078***
	(0.0073)	(0.0002)	(0.0051)	(0.0014)
Export share a/	0.0279	0.0204	0.1482***	0.2459***
	(0.0244)	(0.0134)	(0.0289)	(0.0845)
Constant	0.2491*	-0.1338	3.4913***	3.5905***
	(0.1327)	(0.1101)	(0.1877)	(0.0974)
Fixed effects				
Firm	Yes	No	Yes	No
Sector	No	Yes	No	Yes
Year	Yes	Yes	Yes	Yes
Observations	35,187	35,187	35,187	35,187
R-squared	0.344	0.025	0.748	0.279

Note: Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.
a/ Lagged one year

These results suggest that Morocco's NTM harmonization with E.U. standards led to higher profit and labor productivity. The effect on productivity is intuitive. Compliance with stiffer standards is likely to encourage the acquisition of new, more advanced machinery. Although we do not have matched employer-employee data to verify the conjecture, this may involve additional training or the hiring of more skilled staff and a host of adaptation measures to improve product quality or reliability. All those would naturally raise labor productivity. One can think of this within-firm adaptation process as something akin to the adaptation process that firms undergo when they face new export opportunities, as in Verhoogen (2008) or Bustos (2011), except that here it concerns firms that sell on the domestic market.

As for profit, the result deserves more discussion. Our measure of profit is just a markup over labor costs. Firms investing in new capital need to finance it. The median firm in our industrial census is a small one with limited access to outside financing, as Morocco's credit market is far from an efficient one. Thus, part of the capital investment needs to be self-financed, which requires a rise in

[12] Theory predicts that exporters are larger and more productive than domestic sellers. Among exporters, the largest and most productive tend to have a wider spectrum of exported products (Chatterjee, Dix-Carneiro and Vychianon, 2013), so the share of exports in turnover can be expected to correlate with size. This may or may not imply a correlation with markups. With CES demand and no distribution costs, markups are independent of size (Melitz 2003); with additive distribution costs (Berman, Martin and Mayer 2012) or quasi-linear demand (Melitz and Ottaviano 2008), markups correlate positively with size.

markups. Thus, the two results (higher productivity and higher markups) are mutually consistent in a story where adaptation to stiffer standards requires capital upgrading; a rise in labor productivity not matched by a rise in markups would imply that adaptation to stiffer standards requires only cost-free re-organization of production.

However, the rise in markups begs a further question; namely, what change in market structure made it possible? We now explore a conjecture according to which harmonization both set incentives for firms to undergo a possibly costly adaptation process *and* simultaneously generated a change in market structure that allowed them to finance it through an induced rise in markups.

3.3. Did harmonization protect Morocco's home market?

We start by exploring whether Morocco's trade data shows variation, across sectors and time, that seems to respond to the occurrence of harmonization waves. For this, we run a simple DID regression of the log-share of developing countries in Moroccan imports at the (4-digit) sector-year level on our treatment variable (the sector-level harmonization count), controlling for 2-digit sector and year fixed effects. We also run a similar regression of the log-share of high-income countries.

Results are illustrated visually in Figure 3, with parameters estimates from both regressions shown together in bar charts, in plain when they are significant at 5% or more and in dotted otherwise, with bar height measuring semi-elasticities. Indeed, harmonization cuts the share of developing countries and raises that of high-income countries on the Moroccan market with an effect that persists for about three years, a plausible time span for the adaptation of initially low-end Asian import channels.[13] A doubling in the number of harmonized NTMs reduces, on average, the import share of low-income countries by 3-4% while raising that of high-income countries by 5%. Thus, there is prima-facie evidence of a change in the market environment faced by Moroccan firms.

Figure 3. The effect of harmonization waves on sector-level import shares (4-digit level)

Note: Insignificant estimates shown as blank columns with dotted lines. Bar heights measure the elasticity of import shares to harmonization counts.

[13] While the impact on high-income import shares is significant, the effect restricted to E.U. import shares is not.

We now return to the firm-level data and identify sector-specific effects by interacting treatment effects with the initial penetration rate of developing and high-income countries at the 4-digit sector level.[14] Let

$$\delta_{j(i)}^{DC} = \begin{cases} 1 & \text{if } \mu_{j(i)}^{DC} \equiv M_{j(i),t_0}^{DC} / M_{j(i),t_0} \geq \lambda \\ 0 & \text{otherwise} \end{cases} \quad (7)$$

where $M_{j(i),t_o}^{DC}$ is the value of imports from developing countries in firm *i*'s sector[15] in the sample period's initial year t_0 and $M_{j(i),t_o}$ is the sector's total import value. We set λ at 50 percent of total imports.[16] The new estimating equation includes an interaction term between the number of harmonized measures by sector-year, our base treatment, and the sector's initial status in terms of import penetration. Note that direct effects are absorbed by firm fixed effects.

$$y_{it} = \alpha_0 + \alpha_1 n_{j(i),t-1} + \alpha_2 \tau_{j(i)t} + \alpha_3 \left[n_{j(i),t-1} \times \delta_{j(i)}^{DC} \right] + \mathbf{x}_{it}^{'}\boldsymbol{\beta} + \delta_i + \delta_t + u_{it} \quad (8)$$

Similarly,

$$\delta_{j(i)}^{EU/OECD} = \begin{cases} 1 & \text{if } \mu_{j(i)}^{EU/OECD} \equiv M_{j(i),t_o}^{EU/OECD} / M_{j(i),t_o} \geq \lambda \\ 0 & \text{otherwise} \end{cases} \quad (9)$$

marks sectors with a high initial share of imports from EU or high OECD countries, i.e. where industrial countries have a comparative advantage.

Results are reported in Table 5. Interaction terms are positive in high-DC penetration sectors and negative in high OECD penetration ones, being significant for profit in both cases at the 1% level. An alternative interaction term in sectors with EU import penetration is also negative but not significant. Thus, harmonization seems to have changed the terms of competition by partially sheltering Moroccan producers from low-cost competition in sectors where developing-country exporters initially held strong positions, while exposing them to industrial-country competition in sectors where industrial-country exporters initially held strong positions. Effects on labor productivity are similar, which is consistent with the notion that the two mechanisms are related.

[14] Information about the origin of imports is available only since 1993 on Comtrade. Thus, what we call "inital year" is 1993, which is not a problem as the first harmonization started that year.

[15] Developing countries are defined here as all but high-income (OECD and non-OECD) using the World Bank's classification.

[16] We also set λ at the median in a different specification, with qualitatively similar although weaker results.

Table 5. Protection and entry effects

Dep. var.	Operating profits			Real labor productivity		
Estimator: OLS	(1)	(2)	(3)	(4)	(5)	(6)
Harmonization b/	0.3110**	0.5327**	0.5717***	0.1885***	0.4405***	0.4756***
	(0.1505)	(0.2476)	(0.1995)	(0.0674)	(0.0982)	(0.0777)
Harmonization interacted with						
High initial share of DC imports a/	0.2607**			0.2870***		
	(0.1302)			(0.0848)		
High initial share of EU imports a/		-0.2295			-0.2627***	
		(0.1881)			(0.0966)	
High initial share of OECD imports a/			-0.2607**			-0.2870***
			(0.1302)			(0.0848)
Tariff b/	0.1596	0.1552	0.1596	0.1352	0.1304	0.1352
	(0.1262)	(0.1263)	(0.1262)	(0.1654)	(0.1657)	(0.1654)
Age	-0.0190**	-0.0191**	-0.0190**	0.0114**	0.0112**	0.0114**
	(0.0072)	(0.0073)	(0.0072)	(0.0051)	(0.0052)	(0.0051)
Export share b/	0.0280	0.0281	0.0280	0.1483***	0.1484***	0.1483***
	(0.0244)	(0.0243)	(0.0244)	(0.0290)	(0.0289)	(0.0290)
Constant	0.2454*	0.2506*	0.2454*	3.4871***	3.4929***	3.4871***
	(0.1329)	(0.1350)	(0.1329)	(0.1883)	(0.1890)	(0.1883)
Fixed effects						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Marginal effects c/	0,5717***	0,3032**	0,3110**	0,4756***	0,1779***	0,1885***
	(0,1995)	(0,1384)	(0,1505)	(0,0778)	(0,0617)	(0,0674)
Observations	35,187	35,187	35,187	35,187	35,187	35,187
R-squared	0.344	0.344	0.344	0.748	0.748	0.748

Notes

Note: Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ With initial share above 50%.

b/ Lagged one year

c/ Estimated as $\hat{\alpha}_1 + \hat{\alpha}_3$ with bootstrapped standard errors.

4. Extensions and robustness

4.1. Extensions

The dynamics of market-structure effects are shown in Table 6, where each line corresponds to a different regression and only the marginal effect of the harmonization count is shown. Column 1 is estimated over all sectors and column 2 on high DC-penetration sectors only. Effects in both cases persist for four years, after which they become insignificant, suggesting that following the change in the regulatory environment it takes about four years for the market structure to adjust back. Thereafter, the market-sheltering effect of harmonized regulations does not seem to work anymore. Effects on labor productivity vanish after two years.

Table 6. Lagged effects

Harmonization lag	Operating profits		Real labor productivity	
	All sectors a/	High DC penetration b/	All sectors a/	High DC penetration b/
	(1)	(2)	(3)	(4)
t	0.2742**	0,3329***	0.1939***	0,2399***
	(0.1179)	(0,1252)	(0.0505)	(0,0653)
t-1 c/	0.3506**	0,5717***	0.2321***	0,4756***
	(0.1616)	(0,1995)	(0.0793)	(0,0778)
t-2	0.1324**	0,5341***	0.1057	0,9782***
	(0.0637)	(0,0781)	(0.1444)	(0,1411)
t-3	0.1511**	0,4657***	0.1332	0,9302***
	(0.0694)	(0,0840)	(0.1194)	(0,0899)
t-4	0.1979*	0,4953***	0.0569	0,3273**
	(0.1139)	(0,1296)	(0.0811)	(0,1559)

Notes

Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ Direct effect

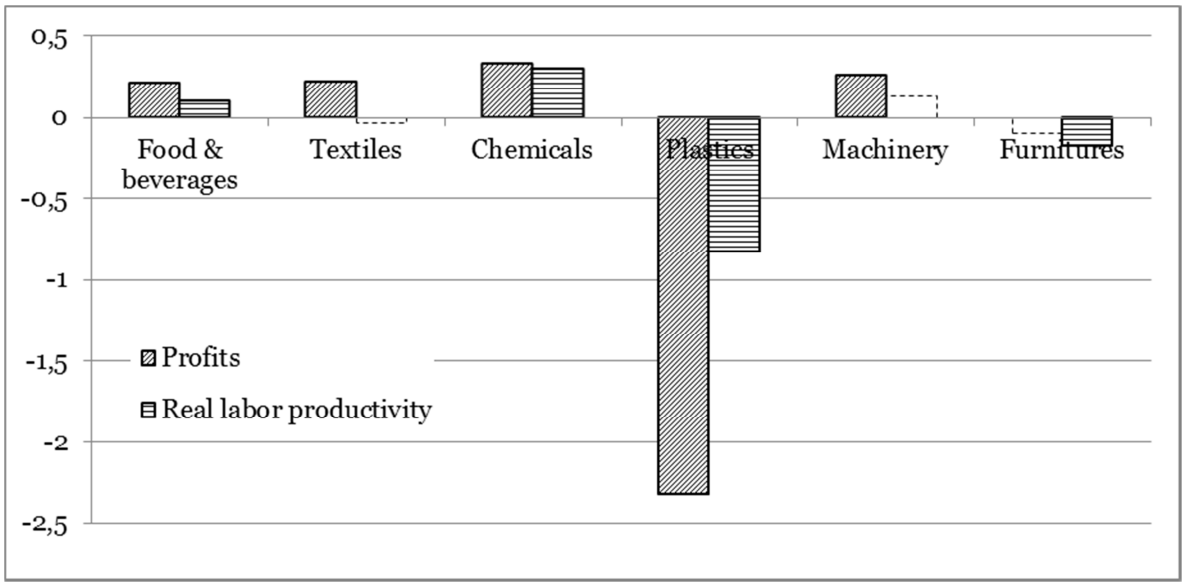
b/ Marginal effect including interaction term (high share of DC imports)

c/ Coefficient in column (1) corresponds to coeff. in column (1) of Table 4; coeff. in col. (2) corresponds to marginal effect in col. (1) of Table 5.

So far, we discussed heterogeneity in the effect of harmonization at the sector level through interaction terms with initial import penetration. Allowing coefficients to vary systematically across sectors through the interaction of harmonization with sector dummies, profitability effects appear similar on food & beverages, textiles, chemicals, and machinery, while productivity effects are less stable (parameter estimates are shown in bar charts in Figure 4). Note that these are "per-harmonized NTM" effects as the number of harmonizations varies strongly between sectors. The plastics sector stands out with negative and significant effects on both profits and labor productivity. E.U. regulations on plastics for food containers seem, according to an industry specialist contacted by the authors, to be more complex than U.S. FDA regulations but relatively easily to catch up with by Chinese competitors whose own domestic regulations are apparently converging toward a mixture of U.S. and E.U. regulations. If China is progressively adopting standards that are broadly compatible with E.U. and U.S. ones, harmonization may not be effective as a protection device while nevertheless involving high compliance costs. [17]

[17] Mangelsdorf, Portugal-Perez and Wilson (2012) have shown how the adoption of international standards by Chinese authorities seems to correlate with better export performance at the sector level.

Figure 4. The effect of harmonizations on profits and productivity, by broad sector



Note: Insignificant estimates shown as blank columns with dotted lines.

Our data contains limited firm-level information to explore treatment-effect heterogeneity as a function of the initial characteristics of firms that could potentially mediate the ultimate effect of harmonization on firm performance. The most immediate conjectures have to do with access to information and to financing. Harmonization was the result of high-level trade negotiations between Morocco and the E.U. about which large and foreign-owned firms were the most likely to be informed. As for financing, notwithstanding the markup effect already identified at the sector level, large and old firms typically enjoy easier access to bank finance. We test, again all these heterogeneity factors through interaction terms, but this time at the firm level. Results are shown in Table 7. As it turns out, very little comes out significant in terms of interaction terms and in both cases with a counter-intuitive sign.

Table 7. Harmonization effects and firm characteristics

Dep. var.	Operating profits				Real labor productivity			
Estimator: OLS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Harmonization a/	0.3026**	0.3441**	0.3757***	0.4098**	0.1162	0.1689	0.0986	0.1078
	(0.1402)	(0.1481)	(0.1322)	(0.1646)	(0.2895)	(0.1735)	(0.1941)	(0.1816)
Exporter b/	0.0041				0.4166***			
	(0.0148)				(0.0469)			
Foreign-own b/		0.0073				0.4306***		
		(0.0227)				(0.0578)		
Old b/			0.0011				0.0059	
			(0.0110)				(0.0242)	
Large b/				0.0148				0.4388***
				(0.0146)				(0.0369)
Harmonization interacted with								
Exporter b/	0.0229				-0.0304			
	(0.0858)				(0.4281)			
Foreign-own b/		-0.0437				-0.3355		
		(0.0599)				(0.3078)		
Old b/			-0.1471***				0.0572	
			(0.0500)				(0.2699)	
Large b/				-0.1478				0.0385
				(0.0927)				(0.1540)
Tariff a/	0.0811	0.1212	0.0830	0.0836	-0.0018	-0.0102	0.0080	0.0262
	(0.1347)	(0.1588)	(0.1346)	(0.1348)	(0.1674)	(0.1816)	(0.1730)	(0.1636)
Age	-0.0009***	-0.0007*	-0.0008***	-0.0009***	0.0068***	0.0076***	0.0076***	0.0052***
	(0.0002)	(0.0004)	(0.0002)	(0.0002)	(0.0013)	(0.0013)	(0.0015)	(0.0012)
Export share a/	0.0179	0.0250	0.0208	0.0152	0.0211	0.1556*	0.2465***	0.0738
	(0.0162)	(0.0163)	(0.0136)	(0.0147)	(0.0967)	(0.0808)	(0.0850)	(0.0848)
Constant	-0.1348	-0.1575	-0.1361	-0.1408	3.4975***	3.5770***	3.5917***	3.4553***
	(0.1101)	(0.1166)	(0.1102)	(0.1134)	(0.0959)	(0.0963)	(0.0974)	(0.0932)
Fixed effects								
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marginal effect c/	0,3255**	0,3004**	0,2286*	0,2620**	0,0858	-0,1667	0,1558	0,1464
	(0,1288)	(0,1317)	(0,1230)	(0,1139)	(0,1821)	(0,2053)	(0,1461)	(0,0819)
Observations	35,187	27,460	35,187	35,187	35,187	27,460	35,187	35,187
R-squared	0.025	0.029	0.025	0.025	0.299	0.318	0.279	0.308

Notes:

Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ Lagged one period

b/ Dummy variable

c/ With interacted term = 1

4.2. Robustness

We now turn to a number of robustness exercises. First, we include the number of new, domestic (non-harmonized) NTMs as a control variable to check if what did the trick was not the mere modernization of regulations instead of their harmonization. As discussed, our data does not allow us to assess whether new NTMs were stiffer or looser than those they replaced; so all we can test is for a "modernization" effect that would be independent of whether NTMs were internationally harmonized or not. Results are shown in Table 8.

Table 8. Controlling for non-harmonized NTMs

Dep. Var.	Operating profits		Real labor productivity	
Estimator: OLS	(1)	(2)	(3)	(4)
Harmonization a/	0.2153*	0.1709*	0.2390**	0.0092
	(0.1192)	(0.0937)	(0.0930)	(0.1431)
Tariff a/	0.1380	0.0655	0.1317	-0.0027
	(0.1253)	(0.1369)	(0.1623)	(0.1700)
Age	-0.0213***	-0.0008***	0.0114**	0.0078***
	(0.0081)	(0.0002)	(0.0050)	(0.0014)
Export share a/	0.0279	0.0211	0.1482***	0.2465***
	(0.0242)	(0.0129)	(0.0289)	(0.0838)
Domestic NTM a/ b/	0.1033	0.0946	-0.0053	0.0739
	(0.0841)	(0.0750)	(0.0368)	(0.0621)
Constant	0.2824**	-0.1553	3.4896***	3.5737***
	(0.1413)	(0.1167)	(0.1845)	(0.0956)
Fixed effetcs				
Firm	Yes	No	Yes	No
Sector	No	Yes	No	Yes
Year	Yes	Yes	Yes	Yes
Observations	35,187	35,187	35,187	35,187
R-squared	0.345	0.025	0.748	0.279

Notes

Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ Lagged one period

b/ Count of domestic (non-harmonized) NTMs by sector

Interestingly, whereas inference is not affected (the levels of significance is at 5% for profit and 1% for productivity), the point estimates go down substantially in the case of profits. As initial estimates without inclusion of non-harmonized NTMs were, arguably, on the high side, this is good news. However, given that new, non-harmonized NTMs have positive and significant (at 10% level) coefficients and that the sum of the two (on harmonized and non-harmonized NTMs) adds up to about the same overall effect, it still implies a very strong effect of regulatory modernization on firm profits. As for productivity, non-harmonized NTMs do not seem to have any significant effect, and their inclusion leaves the coefficient on harmonized ones in the same range as before. Thus, domestic, non-harmonized NTMs seem to have contributed to boost profits without affecting labor productivity, suggesting again a protection effect.

Next, as proposed by Heckman, Ichimura, and Todd (1997), we combine difference-in-differences with propensity score matching (PSM) in order to control for selection bias by comparing the change in the performance of firms in sector/years with NTM harmonization with that of similar firms in other sector-years. First-stage probit results are shown in Table 9.

Table 9. First stage probit results for harmonization treatment status

Dep. Var.	Harmonization	
Estimator: Probit	(1)	(2)
Age a/	0.0218***	0.0146***
	(0.00277)	(0.00303)
Export share a/	-0.477***	-0.382***
	(0.119)	(0.117)
Size a/ b/	-0.0386	-0.0841**
	(0.0382)	(0.0383)
Foreign-owned	0.0900	-0.104
	(0.102)	(0.109)
Lagged operating profits a/	-0.522***	
	(0.183)	
Lagged real productivity a/		0.474***
		(0.0527)
Constant	-0.758*	-2.879***
	(0.408)	(0.460)
Fixed effects		
Region	Yes	Yes
Industry (one-digit)	Yes	Yes
Observations	3,114	3,114

Notes

Robust standard errors are reported in parentheses. *** denotes significant at 1 percent level, ** at 5 percent level, * at 10 percent level

a/ Lagged three periods

b/ in log

Balancing-test results are shown in Table 10 and show that matching is effective in reducing disparities in firm characteristics (including lagged values of the dependent variable) between treatment and control groups.

Table 10. Balancing test results, before and after matching

		Average		Standard.	% reduct. in	T-test	
		Treated	Control	bias	standard. bias	t-stat.	p-value
Lagged operating profits	Unmatched	0.147	0.162	-9.0		-1.35	0.176
	Matched	0.143	0.149	-3.3	62.8	-0.32	0.753
Age	Unmatched	21.306	14.647	44.6		8.00	0.000
	Matched	21.354	21.407	-0.4	99.2	-0.04	0.970
Export share	Unmatched	0.238	0.320	-19.6		-3.07	0.002
	Matched	0.243	0.214	6.8	65.2	0.87	0.383
Size	Unmatched	3.782	3.711	5.5		0.89	0.375
	Matched	3.774	3.849	-5.8	-5.6	-0.68	0.498
Foreign-owned	Unmatched	0.180	0.193	-3.2		-0.52	0.601
	Matched	0.186	0.200	-3.5	-9.5	-0.41	0.679
Lagged real productivity	Unmatched	4.428	3.777	69.3		11.06	0.000
	Matched	4.405	4.515	-11.7	83.1	-1.29	0.196
Age	Unmatched	21.306	14.647	44.6		8.00	0.000
	Matched	21.589	22.41	-5.5	87.7	-0.57	0.570
Export share	Unmatched	0.238	0.32	-19.6		-3.07	0.002
	Matched	0.239	0.0208	7.5	61.9	0.97	0.332
Size	Unmatched	3.782	3.711	5.5		0.89	0.375
	Matched	3.775	3.933	-12.1	-121.6	-1.37	0.171
Foreign-owned	Unmatched	0.18	0.193	-3.2		-0.52	0.601
	Matched	0.184	0.22	-9.2	-182.5	-1.05	0.292

The equivalent of our baseline results, but run on the matched sample, are shown in Table 11. They are qualitatively similar, although both markup and productivity effects are substantially smaller: A wave of harmonization at the sector level, ceteris paribus, now raises the markup rate by 13.11% and labor productivity by 15.39%, a plausible range.

Table 11. Baseline results on matched sample

Dep. Var.: Harmonization	Count	Binary	Count	Binary
Estimator: OLS on matched	Operating profits		Real labor productivity	
sample	(1)	(2)	(3)	(4)
Harmonization a/	0.3813**	0.1311*	0.2374*	0.1539***
	(0.1708)	(0.0760)	(0.1202)	(0.0572)
Tariff a/	0.0730	0.0220	0.0778	-0.0115
	(0.1235)	(0.1284)	(0.1826)	(0.1638)
Age	-0.0261***	-0.0279***	0.0110*	0.0075
	(0.0087)	(0.0095)	(0.0062)	(0.0056)
Export share a/	0.0100	0.0132	0.1468***	0.1509***
	(0.0293)	(0.0290)	(0.0477)	(0.0488)
Constant	0.4560***	0.5238***	3.5866***	3.7093***
	(0.1476)	(0.1739)	(0.2321)	(0.2013)
Fixed effects				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Observations	15,455	15,455	15,469	15,469
R-squared	0.158	0.158	0.695	0.695

Note: Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ Lagged one year

We now test whether our results are "polluted" by the presence of a few import prohibitions, which have little to do with quality upgrading. Results from the baseline regression with import prohibitions excluded are displayed in Table 12 and remain unchanged.

Table 12. Baseline results without import prohibitions

Dep. Var.	Operating profits	Real labor productivity
Estimator: OLS	(1)	(2)
Harmonization a/b/	0.3672**	0.2546***
	(0.1721)	(0.0832)
Tariff a/	0.0875	0.0246
	(0.1022)	(0.1324)
Age	-0.0247***	0.0073*
	(0.0082)	(0.0043)
Export share a/	0.0303	0.1454***
	(0.0250)	(0.0291)
Constant	0.3726***	3.6229***
	(0.1157)	(0.1423)
Fixed effects		
Firm	Yes	Yes
Year	Yes	Yes
Observations	33,864	33,864
R-squared	0.345	0.750

Notes

Robust standard errors clustered at sector level, are reported in parentheses. *** denotes significant at the 1 percent level, ** at the 5 percent level, * at the 10 percent level.

a/ Lagged one period

b/ Dummy variable, = 1 if count > 0

Finally, in order to verify that our central result is not spurious, we run a standard placebo exercise consisting of generating random times for sector-level harmonization waves and running our binary specification 1'000 times on these random times, each time retrieving the point estimate and its standard error. Average values are shown in Table 13. Both for profits and productivity, the average *t* value calculated as the ratio of the average point estimate to the average standard error is substantially below the critical level and insignificant at any level.

Table 13. Placebo exercise results

Dependent variable	Mean parameter estimate	Mean standard error	Mean t-value	Replication number
Profit	0.1464	0.2532	0.5784	1 000
Labor productivity	-0.0432	0.0611	-0.7079	1 000

5. Concluding remarks

This paper explored the effect of NTM harmonization on firm performance, an issue that is central to new regional trade agreements while still largely unexplored. We were able to explore it in the context of a policy experiment where regulatory change for the country under investigation—Morocco—was mandated by a powerful and sophisticated Northern partner—the E.U.—making it close to a natural experiment with limited scope for domestic political-economy interference.

In addition to a unique policy-reform setting, we were able to draw on a new, extremely detailed dataset on NTMs in Morocco which included type of measures, harmonization conditions, and date of adoption, the latter varying across products. Thus, we had both cross-sectoral and time-wise variation in the policy experiment. Finally, we were able to combine the data with Morocco's detailed firm census. This allowed us to take the analysis down to the level of the firm, controlling for unobserved heterogeneity with firm fixed effects throughout. Thus, our setting lent itself to clean identification of causal effects.

NTM harmonization essentially meant, for Moroccan producers, that they needed to comply with E.U. standards even when selling on the domestic market. Thus, the product and process adaptation required could be expected to be similar to the product/process adaptation that Verhoogen (2008) or Bustos (2011) identified in the case of firms faced with expanded export opportunities, but in a simpler context without the simultaneous determination of decisions to export and upgrade, since upgrading was mandated by an exogenous regulatory change.

At the level of the firm, we were able to identify two key effects. First, when faced with the obligation to harmonize their products with E.U. standards, Moroccan firms seem to have upgraded capital equipment and/or productive efficiency, the effect being revealed through a rise in labor productivity. We observed this effect within firm around the timing of the harmonization, with some anticipation. Second, Moroccan firms seem to have applied higher markups after harmonization, consistent with the need to finance those investments (Morocco is a lower-middle income country where access to bank finance is limited for firms that are not affiliates of large foreign groups). Thus, NTM harmonization forced domestic producers selling on their home market to upgrade pretty much like if they started exporting.

At the sectoral level, we were able to identify a further effect helping to explain how the upgrading was economically feasible with market upheaval. We found that in sectors with initially high import penetration by developing-country producers—e.g. consumer goods largely imported from low-cost Asian sources—the positive effect of harmonization on markups was enhanced. The reason for this appeared in the evolution of trade flows: Harmonization took importers at least partly by surprise (regulatory changes in Mediterranean countries are typically shrouded in opacity) and reduced their ability to sell on the Moroccan market for a few years after harmonization was adopted. This temporary trade diversion provided Moroccan firms with a window to raise markups to finance the required capital upgrading, making the process largely self-financing.

References

Arkolakis, Costas; A. Costinot and A. Rodriguez-Clare (2012), "New Trade Models, Same Old Gains? *American Economic Review* 102, 94-130.

Atkin, David; A. K. Khandelwal and A. Osman (2016), "Exporting and Firm Performance: Evidence from a Randomized Trial"; mimeo.

Berman, Nicolas; P. Martin and T. Mayer (2012), "How do Different Firms React to Exchange-rate Changes?"; *Quarterly Journal of Economics* 127, 437-492.

Bernard, Andrew; J. Eaton, J. B. Jensen, and S. Kortum (2003), "Plants and Productivity in International Trade"; *International Economic Review* 93, 1268-1290.

Bertrand, Marianne; E. Duflo, and S. Mullainathan (2004), "How Much Should We Trust Difference-in-Difference Estimates?"; *Quarterly Journal of Economics* 119, 249-275.

de Blas, Beatriz, and K. Russ (2015), "Understanding Markups in the Open Economy"; *American Economic Journal: Macroeconomics* 7, 157-180.

Bustos, Paula (2011), "Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms"; *American Economic Review* 101, 304-40.

Cadot, Olivier, and M. Malouche (2012), *Non-tariff measures: A fresh look at trade policy's new frontier*; London/Washington, D.C.: CEPR/The World Bank.

Clerides, Sofronis; S. Lach, and J. Tybout (1998), "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco"; *Quarterly Journal of Economics* 113, 903-947.

Chatterjee, Arpita; R. Dix-Carneiro and J. Vichyanond (2013), "Multi-Product Firms and Exchange-Rate Fluctuations"; *American Economic Journal: Economic Policy* 5, 77-110.

Chen, Maggie, and A. Mattoo (2008), "Regionalism in Standards: Good or Bad for Trade?"; *Canadian Journal of Economics* 41, 838-863.

—, T. Otsuki and J. Wilson (2006), "Do standards matter for export success ?", Washington, D.C.: The World Bank, Policy Research Working Paper Series 3809.

Disdier, Anne-Célia; L. Fontagné and O. Cadot (2015) "North-South Standards Harmonization and International Trade"; *World Bank Economic Review* 29, 327-352.

Dür, Andreas; L. Baccini and M. Elsig (2014), "The Design of International Trade Agreements: Introducing a New Dataset"; *Review of International Organizations* 9, 353-375.

Edmond, Chris; V. Midrigan and D. Yi Xu (2015), "Competition, Markups, and the Gains from International Trade"; *American Economic Review* 105, 3183-3221.

Feenstra, Robert, and D. Weinstein (2010) "Globalization, Markups, and the U.S. Price Level; NBER working paper #15749; Boston, MA: National Bureau of Economic Research; forthcoming, *Journal of Political Economy*.

Goedhuys, Micheline, and L. Sleuwagen (2013), "The Impact of International Standards Certification on the Performance of Firms in Less Developed Countries"; *World Development* 47, 87–101.

Hall, B. H., Mairesse, J. (1995), "Exploring The Relationship Between R&D and Productivity In French Manufacturing Firms", *Journal of Econometrics* 65, 263-293.

Harrison, Ann (1994), "Productivity, Imperfect Competition, and Trade Reform: Theory and Evidence; *Journal of International Economics* 36, 53-73.

— and A. Rodriguez-Clare (2010), "Trade, Foreign Investment, and Industrial Policy for Developing Countries"; in K. Arrow and M. Intriligator, eds., *Handbook of Development Economics*, vol 5, pp. 4039-4214; Amsterdam: Elsevier.

Horn, Henrik; P.C. Mavroidis, and A. Sapir (2010), "Beyond the WTO? An Anatomy of EU and US Preferential Trade Agreements", *World Economy* 33, 1565-1588.

Konings, J. and H. Vandenbussche (2005) "Antidumping protection and markups of domestic firms", *Journal of International Economics* 65, 151-165.

Krishna, Pravin, and D. Mitra (1998), "Trade Liberalization, Market Discipline, and Productivity Growth: New Evidence from India"; *Journal of Development Economics* 56, 447-462.

Lesser, Caroline (2007), "Do Bilateral and Regional Approaches for Reducing Technical Barriers to Trade Converge Towards the Multilateral Trading System?", OECD Trade Policy Paper #58; Paris: Organization for Economic Cooperation & Development.

Levinsohn, James (1993), "Testing the Imports-as-Market-Discipline Hypothesis"; *Journal of International Economics* 35, 1-22.

de Loecker, Jan (2007), "Do Exports Generate Higher Productivity? Evidence from Slovenia"; *Journal of International Economics* 73, 69-98.

— ; P. Goldberg, A. Khandelwal, and N. Pavcnik (2016), "Prices, Markups, and Trade Reform"; *Econometrica* 84, 445–510.

Mangelsdorf, Axel; A. Portugal-Perez and J. Wilson (2012) "Food standards and exports: evidence for China"; *World Trade Review* 11, 507-526.

Mangelsdorff, Axel; A. Portugal-Perez, and J. Wilson (2012), "Do Better Standards Facilitate Exports? Evidence from China"; in O. Cadot and M. Malouche, eds., *Non-tariff measures: A fresh look at trade policy's new frontier*; London/Washington, D.C.: CEPR/The World Bank, pp. 141-154.

Maur, Jean-Christophe, and B. Shepherd (2011), "Product Standards in Preferential Trade Agreements", in JC Maur and JP Chauffour, eds., *Preferential Trade Agreements and Development: Issues and Implications*, Washington, D.C.: The World Bank.

Melitz, Marc (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity"; *Econometrica* 71, 1695-725.

— and G. Ottaviano (2008), "Market Size, Trade, and Productivity"; *Review of Economic Studies* 75, 295–316.

Moulton, Brent (1990), "An illustration of a pitfall in estimating the effects of aggregate variables on micor units"; *Review of Economics and Statistics* 72, 334-338.

Otsuki, Tsunehiro; J. Wilson and B. Majumdar (2003), "Balancing Food Safety and Risk: Do Drug Residue Limits Affect International Trade in Beef?"; *Journal of International Trade and Economic Development* 12: 377-402.

—; — and M. Sewadeh (2001b), "Saving Two In A Billion: Quantifying The Trade Effect Of European Food Safety Standards On African Exports"; *Food Policy* 26: 495–514.

Piermartini, Roberta, and M. Budetta (2009), A Mapping of Regional Rules on Technical Barriers to Trade", in A. Estevadeordal, K. Suominen, eds., *Regional Rules in the Global Trading System*; Cambridge, UK: Cambridge University Press.

Reyes, Jose Daniel (2011), "International Harmonization of Product Standards and Firm Heterogeneity in International Trade"; World Bank Policy Research Working Paper 5677; Washington, DC: The World Bank.

— (2012), "The Pro-Competitive Effect of International Harmonization of Product Standards"; in O. Cadot and M. Malouche, eds., *Non-tariff measures: A fresh look at trade policy's new frontier*; London/Washington, D.C.: CEPR/The World Bank, pp. 167-186.

UNCTAD (2013), *Classification of Non-Tariff Measures, February 2012 Version*; New York and Geneva: United Nations.

Verhoogen, Eric A. (2008) "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector" *Quarterly Journal of Economics* 123, 489-530.

"Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore."

Pascal

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