Harmonised Standards and Firm Performance: Difference-in-Differences Evidence
Vojtech Olbrecht, Mendel University in Brno, Czech Republic, xolbrecl@mendelu.cz

One of the main objectives of the European Union is to enhance the competitiveness of companies within its Member States and those that may be supported by further development of the Single Market. Introduction of harmonized standards for production of goods and services encourages companies to take advantage of the Single Market by reducing transaction costs. In other words, the EU is adjusting the economic and legal framework in which companies operate in order to remove existing barriers from its vision of a well-functioning Single Market. This paper researches the relationship between these changes and performance of microeconomic agents – firms. The analysis uses a panel data regression model with difference-in-differences research design built on a sample of affected and not-affected firms as control groups to be able to extract effect caused by the regulation. The article provides evidence of the positive relationship between regulatory changes and microeconomic performance in the majority of standards and an insignificant relationship in cases of others. Further consideration is provided in order to interpret results as causal.

Introduction

Competitiveness is one of the greatest issues of the European Union today. The EU is trying to enhance it by a wide variety of tools, one of which is widening of market opportunities for companies, also known as the project of the Single Market that is aiming to raise markets from national to international. A building stone and one of first achievements of the Single Market area is free movement of goods and services. Yet Member States are allowed to impose special (e.g. technical) requirements on imported goods and services in order to protect the health of its citizens, the environment, etc. Imposition of such standards can create legislative non-tariff barriers to free movement and thus can make transactional costs for producers and importing companies prohibitively high, even though it is not intended to be protectionist.

However, there exists an EU “plan to unlock the full potential of the Single Market, creating more opportunities for people and business” (EC, 2016a). For this reason, the EU focuses on legislation that harmonises standards across its Member States and aims to lower transaction costs and enhance competitiveness and performance of its companies. Companies using these standards can benefit from free movement of their goods that are otherwise prohibited to be traded or produced.

The goal of this paper is to provide evidence on the effect of this particular area of legislation and to determine whether or not it has achieved its goal, therefore to perform ex post analysis of the benefit side of regulation. It is important to understand harmonised standards as one part of European legislation and partial (potential) improvement of the functioning of the Single Market rather than as standards alone with their detailed description.

The paper is interested in effects of harmonisation of standards on microeconomic performance of companies operating in standardised sectors. The article is not concerned with the specifics of adoption of a particular standard, nor whether the standard has been actually adopted by a company, but more with harmonisation of the standard as a base guaranteed by the EU which can be used no matter if these or other standards are in fact used. Despite this, some authors (Portugal-Perez et al., 2010) argue that it is cost-prohibitive to follow European legislation with other than EU standards.

These standards are of a private nature and therefore similar to e.g. ISO as they are not obligatory for companies to use (EC, 2016b) though they are issued by a public body (third party). Companies can

1 The paper was supported by Internal Grant of Faculty of Business and Economics at Mendel University in Brno no. PEF_DP_2016012
voluntarily decide whether they will use EU standards, other standards or no standards at all. Therefore, the introduction of EU standard establishes a new base that is available in the affected sector and can be used as a declaration of complying with required characteristics, processes, etc.

The presumable output should be that the harmonisation of standards has a positive effect on corporate performance. However, it can happen that the effect will be negative – possibly caused by an incorrectly specified standard – or insignificant – the introduction had no effect because of general disinterest in standardisation or availability and usage of other standards with no or low perceived benefits of changing to EU standards. In both of these cases, the effort included in standardisation is higher than its benefits.

The paper is structured as follows: chapter two discusses the basic theoretical foundation, chapter three provides an overview of materials and methods, chapter four introduces empirical results and chapter five concludes the paper.

Literature review

The importance of standards, standardisation and their harmonisation has its origins in institutional economics and in theories of economic growth. Prior to the work of Solow (1956), who established the most widely used framework for growth accounting, there was the work of Coase (1937) stressing transaction costs as an important part of economics and one of the possible sources of misallocations.

Following the work of Solow, there were several adjustments of his model, ranging from endogenizing technological progress (e.g. in Romer, 1986, Romer, 1990, Pack, 1994), to involvement of human capital (Mankiw et al., 1992) and more. The most important to this paper however was the introduction of fundamental factors of economic growth. These factors are able to influence accumulation of production factors (Snowdon and Vane, 2005) used in previous models (e.g. labour, capital and more) and consist of geography, trade, culture and institutions (Xu, 2011). Institutions are “rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction” (North, 1990, p. 3). Institutions are developed to simplify human interactions and to provide certainty in an otherwise uncertain environment, and contain also law and regulation (Boettke and Candella, 2014, Knack and Keefer, 1995). One area of institutions involves those that facilitate trade (also one of the fundamental factors) among companies and countries that were researched e.g. in Hall and Jones (1999), Barro (1996) and Frankel and Romer (1999).

There are many barriers to trade that may arise on the international market. Taxes, duties, quotas and more are institutions that were more or less eliminated by introduction of the Single Market for goods and services by the EU as part of the project to enhance competitiveness. Still, though most common barriers are removed, there are barriers consisting of either national legislation or information asymmetry that signifies transaction costs (Williamson, 1985). When individual countries as members of the Single Market do not accept another country’s products in order to protect its inhabitants or when business partners do not see a product as reliable by its being made in another country, transaction costs may increase to being unbearably high that the emerging effect would be comparable to a duty or quota.

A harmonised standard is a standard introduced by European Standards Organisations that confirm conformity with European legislation (EC, 2016b). They are similar to non-governmental international standards (such as ISO) in a way that they are voluntary and their usage is not required by legislation. Companies can either use these or other standards or not use any standards at all. The goal of EU standards, is to “ensure interoperability and safety, reduce costs and facilitate companies' integration in the value chain and trade” (EC, 2016c). As noted by the EU, standards should help with productivity and creation of the Single Market, as well as with other ideas (EC, 2016d). EU standards are focused on both producers and importers.

Standards can be viewed as institutions that are developed in order to facilitate transactions in an environment with high information asymmetry and therefore with high transaction costs needed to
overcome this asymmetry. There is a possibility of overcoming information asymmetry with signals (Spence, 1973), and standards can provide signals for potential stakeholders of a company.

The explanation provided above is not the only one possible and is called external. Companies can also view standards as know-how developed by external organizations that may improve internal processes in order to achieve higher productivity no matter what the external effect would be (Goedhuys and Sleuwaegen, 2013).

Standards can also increase costs as they require producers or traders to alter production for the individual market (Portugal-Perez et al., 2010), but this should not be a case of EU harmonisation of standards as these only harmonise already existing standards and remain voluntary applicable.

Besides private standards, there is also another category of public standards (Hobbs, 2010). Though the EU is a public body, its standards as researched in this paper are of a private nature, basically because companies are not legislatively bound to use them. The primary goal of private standards is to reduce transaction costs and information asymmetry (Hobbs, 2010).

Vast literature comprehends private standards research, such as ISO (International Standardization Organization). The results are either positive or insignificant. Corbet et al. (2005) argue for the positive effect in years following introduction of ISO, and positive results are provided also by Okay and Semiz (2010) and Sharma (2005). On the other hand, some results are confusing as they indicate higher operating performance and not significantly changed business performance (Naveh and Marcus, 2005) or have no effect caused by standardization (Wayhan et al., 2002). Private standards can be theoretically both trade enhancing and reducing (because of specific requirements on suppliers, compliance costs, etc.) (Hobbs, 2010).

There are also studies focused on specified standards for some industries, e.g. Schuster and Maertens (2015) on the food industry and Giacomarra et al. (2016) on the wine industry, or Portugal-Perez et al. (2010) who specifically address harmonisation standards (in electronics), but with effect on trade, not performance.

Materials and Methods

It is a challenging task to research effect caused by legislation. The simplest way to achieve this is by applying the Differences approach by extracting results prior to treatment from results after treatment, but this may (and most probably will) result in biased coefficients. Availability of a control group may actually decrease the bias and account for other-than-treatment effects. For our purposes, the control group should consist of companies operating in a similar environment where it could be possible to expect similar influences.

The research design applied in this paper is Differences in Difference (DD) performed on individual level (firm level) panel data. Treatment group is formed of companies in industry (either 2, 3, or 4-digit NACE Rev. 2) affected by particular regulation, and the control group is formed of all the other companies in the EU. The control group size is significantly larger than treatment group, which should allow individual differences to disappear. Specification of the control group as within the EU enables one to abstract from characteristics that are used in world-wide studies – e.g. political regime, geography, culture, etc. as these are more or less the same over all observed countries. It would also be possible to reduce the control group sample on companies with similar trend and behaviour, but because there is no particular reason why companies in affected and non-affected industries should behave the same, the best option possible seems to keep the control group at its initial proportions.

Data are retrieved from the Amadeus database (Bureau Van Dijk, 2015) for the years 2004-2013 and sectors A, B and C of NACE Rev. 2. The data sample consists of countries that were members of the EU for a particular year, i.e. a maximum of 27, but due to data limitations, the sample consists of only 21 of them, and the rest were excluded because of missing values on logarithmic forms of either added
value, number of employees or fixed assets (variables used to calculate total factor productivity). Data are merged with country-specific variables from the Eurostat database (Eurostat, 2016). Unavailable data were replaced by the EU (28) average for the particular year. All data were denominated by using producer prices in NACE Rev. 2. Section C for the year 2010 and all the monetary data are in thousands of EUR, unless stated otherwise.

The estimation method is OLS with fixed effects for companies and years that allows control (a) for all time-invariant variables on company level and (b) for all individual-invariant variables at one time. These two effects are needed for three reasons: (1) they enable accounting for unobservable characteristics, (2) their inclusion is needed for the DD approach as they represent dummies for individual (treated or untreated) and time (pre or post treatment) and (3) they enable control for the effect of economic slowdown of the years 2007 and following. Also, inclusion of constant term enables control for all effects invariant in time and across companies.

Considering this, the coefficient of DD should consist only of effects that are time and company variant. Therefore, only the effects that occurred in a particular year and particular industry are taken into account. Still, there might be some effects that may bias the DD coefficient. The model tries to eliminate these effects by including time-variant individual-variant variables taken from standard growth literature, as noted below.

This paper focuses on harmonised standards as those recognised by CEN, CENELEC or ETSI (EC, 2016b). These are divided by the EU into the categories Chemicals, Conformity assessment and management systems, Construction, Consumers and workers’ protection, Energy efficiency, Electric and electronic engineering, Healthcare engineering, Measuring technology, Mechanical engineering and means of transport, Services and Sustainability. An overview of those standards as provided at EC (2016b) is provided in the table below:

Table 1: Overview of standards (EC, 2016b)

<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
<th>Entry into force</th>
<th>NACE Rev. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>Chemical substances (REACH)</td>
<td>2007</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Pyrotechnic articles</td>
<td>2007, 2013</td>
<td>2051</td>
</tr>
<tr>
<td>Conformity ass. and mg systems</td>
<td>New Legislative Framework (NLF) and Eco-Management and Audit Scheme (EMAS)</td>
<td>2008, 2009</td>
<td>All</td>
</tr>
<tr>
<td>Cosmetic products</td>
<td>Cosmetics products</td>
<td>2013</td>
<td>2042</td>
</tr>
<tr>
<td></td>
<td>Toys safety</td>
<td>2011</td>
<td>324</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>Ecodesign and energy labelling</td>
<td>2009, 2010</td>
<td>2751</td>
</tr>
<tr>
<td>Electric and electronic engineering</td>
<td>Low Voltage (LVD)</td>
<td>2007</td>
<td>26, 27</td>
</tr>
<tr>
<td></td>
<td>Restriction of the use of certain hazardous substances (RoHS)</td>
<td>2011</td>
<td>26, 27</td>
</tr>
<tr>
<td>Measuring technology</td>
<td>Non-automatic weighing instruments (NAWI)</td>
<td>2009</td>
<td>2829, 2651</td>
</tr>
<tr>
<td>Mechanical engineering and means of transport</td>
<td>Gas appliances (GAD)</td>
<td>2009</td>
<td>Not found</td>
</tr>
<tr>
<td></td>
<td>Inspection of pesticide application equipment</td>
<td>2009</td>
<td>2020</td>
</tr>
<tr>
<td></td>
<td>Machinery (MD)</td>
<td>2006</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Rail system: interoperability</td>
<td>2008</td>
<td>302</td>
</tr>
<tr>
<td></td>
<td>Simple Pressure Vessels (SPVD)</td>
<td>2009</td>
<td>281</td>
</tr>
</tbody>
</table>
From all of available standards, only those were included that were applicable to NACE Rev. 2 sections A, B, or C and that were introduced in years 2005-2013 so that there would be at least one period before and one period after treatment.

The dependant variable is Total Factor Productivity and the calculation is based on Goedhuys and Srholec (2015). For each company in each year there is calculated:

$$ TFP_{it} = (\ln Y_{it} - \ln \bar{Y}) - \left(\sum_m (\omega_{itm} + \bar{\omega}_m) (\ln I_{itm} - \ln \bar{I}_m)\right) $$

where $i$ is the number of the company, $t$ is time, $m$ is input, $Y$ is value added, $\omega$ is the cost share of input, $I$ is input and above-lined are means of the overall sample. This indicator is resistant to outsourcing (as it accounts only for added value, the company cannot change it by outsourcing its production), and to substitution of labour by capital and vice-versa (which is not taken into account in the labour productivity indicator). Data on depreciation are taken from real amounts, not from the estimate as originally proposed in Goedhuys and Srholec (2015).

The regression model is as follows:

$$ TFP_{it} = \alpha + \beta_1 Labour_{it} + \beta_2 Capital_{it} + \beta_3 GDP_{it} + \beta_5 Treatment_{it} + \delta_i + \rho_t + \epsilon_{it} $$

where $Labour$ is the number of employees in the logarithm, $Capital$ are denominated fixed assets in the logarithm, $GDP$ is the country GDP in Euro per inhabitant denominated in the logarithm, $Treatment$ is the treatment effect describing whether the particular company belongs to treatment group and is the time after treatment was introduced, $\delta$ and $\rho$ are fixed effects (fe) and $\epsilon$ is error term.

The treatment effect is then described as:

$$ Treatment_{it} \begin{cases} 0 & \text{if } i \in \text{Control group} \\ 0 & \text{if } t < \text{Time of treatment} \\ 1 & \text{otherwise} \end{cases} $$

Inclusion of other variables than fixed effects and Treatment is motivated by the need for checking for other effects that are time varying and not the same over all companies (time invariant effects and effects affecting all companies the same are accounted for by fixed effects) as described above. Labour and Capital are the basic variables already discussed e.g. in Solow (1956) and generally used by research papers. These two also account for the size of the company that may be changing over time. Other variable (GDP) represents a cycle of the particular economy and the chance of the company participating in RD activities respectively (because GDP is correlated at 87 % with RD expenditures). There may be more control variables included, but most of those are time-invariant (e.g. political framework, culture, education, etc.), so they are already included in company fixed effects.

**Results**

In table 2, one can see means and numbers of observations of companies in the sample. From all companies available, only those with available data for added value, number of employees and fixed assets and within the EU were included. Unavailability of data decreased the number of countries from 27 to 21.
Table 2: Summary statistics

<table>
<thead>
<tr>
<th>Country</th>
<th>AT</th>
<th>BE</th>
<th>BG</th>
<th>CZ</th>
<th>DE</th>
<th>ES</th>
<th>FI</th>
<th>FR</th>
<th>GB</th>
<th>HU</th>
<th>IE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>5 924</td>
<td>21 567</td>
<td>65 631</td>
<td>85 398</td>
<td>107 469</td>
<td>477 556</td>
<td>42 034</td>
<td>237 337</td>
<td>73 970</td>
<td>15 323</td>
<td>3 249</td>
</tr>
<tr>
<td>TFP_mean</td>
<td>-0.311</td>
<td>-0.126</td>
<td>-2.073</td>
<td>-1.593</td>
<td>-0.430</td>
<td>-0.940</td>
<td>-0.551</td>
<td>-0.515</td>
<td>-0.473</td>
<td>-1.418</td>
<td>-0.341</td>
</tr>
<tr>
<td>Labour_mean</td>
<td>220</td>
<td>157</td>
<td>48</td>
<td>97</td>
<td>403</td>
<td>29</td>
<td>96</td>
<td>68</td>
<td>480</td>
<td>141</td>
<td>233</td>
</tr>
<tr>
<td>Capital_mean</td>
<td>23 134</td>
<td>69 318</td>
<td>1 145</td>
<td>3 587</td>
<td>50 143</td>
<td>3 692</td>
<td>12 647</td>
<td>6 687</td>
<td>124 282</td>
<td>6 801</td>
<td>41 485</td>
</tr>
<tr>
<td>GDP_mean</td>
<td>34 515</td>
<td>32 920</td>
<td>4 795</td>
<td>12 939</td>
<td>30 307</td>
<td>23 701</td>
<td>33 023</td>
<td>29 438</td>
<td>31 476</td>
<td>9 745</td>
<td>37 844</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>IT</th>
<th>LU</th>
<th>LV</th>
<th>NL</th>
<th>PL</th>
<th>PT</th>
<th>RO</th>
<th>SE</th>
<th>SI</th>
<th>SK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>675 153</td>
<td>526</td>
<td>2 675</td>
<td>885</td>
<td>28 570</td>
<td>160 595</td>
<td>137 316</td>
<td>7 182</td>
<td>14 778</td>
<td>43 155</td>
</tr>
<tr>
<td>TFP_mean</td>
<td>-0.724</td>
<td>-0.223</td>
<td>-1.277</td>
<td>-0.042</td>
<td>-1.585</td>
<td>-1.386</td>
<td>-2.170</td>
<td>-0.271</td>
<td>-0.996</td>
<td>-1.477</td>
</tr>
<tr>
<td>Labour_mean</td>
<td>38</td>
<td>219</td>
<td>23</td>
<td>1 198</td>
<td>163</td>
<td>24</td>
<td>51</td>
<td>158</td>
<td>73</td>
<td>69</td>
</tr>
<tr>
<td>Capital_mean</td>
<td>4 136</td>
<td>100 401</td>
<td>1 353</td>
<td>200 925</td>
<td>6 230</td>
<td>1 475</td>
<td>1 744</td>
<td>25 000</td>
<td>5 637</td>
<td>3 056</td>
</tr>
<tr>
<td>GDP_mean</td>
<td>254 244</td>
<td>75 678</td>
<td>9 491</td>
<td>36 184</td>
<td>8 073</td>
<td>15 977</td>
<td>6 437</td>
<td>36 906</td>
<td>16 836</td>
<td>11 006</td>
</tr>
</tbody>
</table>

Where TFP is total factor productivity, Labour is the number of employees, Capital are denominated fixed assets, GDP is the country GDP in Euro per inhabitant denominated.

Table 3 presents panel regressions with fixed time and cluster effects adjusted for 501,251 clusters at the company level. Models have no problems with heteroscedasticity and serial correlation as clustered standard errors are used. The Hausman test rejects the hypothesis that unique errors are not correlated with regressors, therefore use of fixed effects is appropriate. Cross-sectional dependence should not be a problem in the panel with a large number of units and short time (Torres-Reyna, 2007), models are significant as of F-tests, use of time fixed effects is important (they are not equal to zero) and correlation of independent variables is insignificant. Correlation between individual fixed effects and independent variables is around -0.54, which again confirms that random effects cannot be used.

Besides these regressions, two more were estimated for each standard – one with lagged treatment for 1 and 2 periods and one with leading treatment for 1 and 2 periods. Inclusion of these variables is important for observing a common trend and anticipation effect, as well as an effect following treatment, but they cannot be included in one model because of large data reduction caused by lagging or leading, so these variables merely serve as a source of additional information. Significance is evaluated at the 10 percent level.

The significance of lead variables (t+1, t+2) may indicate either anticipation of regulation (which can be the case of standards, because manufacturers can actually ask the EU to introduce a standard), or non-common trend that can diminish possible causal explanation. If it would be the second case, causal explanation cannot be provided because the non-common trend already differentiates treatment group from the control group, and therefore the effect indicated by treatment would not be its cause.

Lag variables (t-1, t-2) indicate a stronger effect in years following treatment than in the year of treatment itself (possibly if its introduction was in the latter months of a year). The significance of treatment variable itself signals persistence to the following years as it is defined as 1 for years following treatment. Either way, the significance of these variables is not regarded as complicated with respect to causal explanation.

The first standard is interested in registration, evaluation, authorisation and restriction of chemicals (also known as REACH). This legislation applies to all chemical substances and entered into force on 1 June 2007 (European Union, 2016). Its effect is positive and significant at the 1 percent significance level; therefore, the introduction has had a positive effect on the industry in comparison with other manufacturing companies from the EU. Inclusion of leading variables reveals significant negative leads. The lagged model has an insignificant variable at a year of treatment, but both lagged variables are significant and the 1-year lag is negative. Significant leads make causal explanation problematic.
Pyrotechnic articles introduce minimum safety requirements for the free movement of these items. This regulation entered into force on 4 July 2007 and was further developed in June 2013 (European Union, 2016). Introduction of the standard provides a significant positive effect on the industry with leading and lagged variables insignificant (in the lagged model also variable at the time of treatment is insignificant). Its adjustment in 2013 is insignificant, but 2013 is the last year of data availability, so possible effects may arise in the coming years. Insignificant leads indicate that there is a possibility of causal explanation.

Regulation on cosmetics products focuses on safety requirements, procedures and animal testing. The regulation entered into force on 11 July 2013 (European Union, 2016). The effect of regulation is positive and significant in the year of regulation. In the leading model, the year of treatment and 1-year lead are omitted because of collinearity and the 2-year lead is significant. In the lagged model, both lagged variables are omitted. The significant lead makes causal explanation problematic.

The toy safety standard identifies responsibilities of supply chain participants, declares requirements and more and entered into force on 20 July 2011 (European Union, 2016). The effect of regulation is insignificant in the main model and significant and negative in the lagged one, but this is reduced by the number of observations, and therefore cannot be taken into account.

The ecodesign standard is provided to frame requirements on energy consumption and entered into force on 20 November 2009, and was further adjusted on 19 June 2010 (European Union, 2016). Introductions of both of these were insignificant in models.

Standards on low voltage entered into force on 16 January 2007 and focused on safety objectives of low voltage equipment (European Union, 2016). Its impact is significant and positive (not in the leading model where it is insignificant). One of the leads is significant. In the lagged model, the treatment variable is significant and lagged variables are not. The significance of leading variables reveals problems of causal explanation of regulation.

The hazardous substances restriction standard entered into force on 21 July 2011 and focuses on making sure hazardous substances used in electrical and electronic equipment are harmless to human health and to the environment after disposal (European Union, 2016). The effect of this legislature is positive and significant, but the same is one leading variable and the other one is negative as well as the treatment year in the leading model. One of lagged variables is negative. Significant leads indicate problems for causal explanation.

Legislation on non-automatic (human-interacted) weighing instruments focuses on accuracy, trust and safety and entered force on 5 July 2009 (European Union, 2016). Its effect is positive and significant, but so is the effect of the following year (lead) and both preceding years (lags). Within lags and leads, the year of treatment is negative. Significant lead indicates problems with causal explanation.

The machinery standard focuses on health and safety requirements for both the public and workers. Its main directive entered into force on 29 June 2006 (European Union, 2016). The effect caused by this standard is positive and significant, but is also 1-year lead and lag. The significant lead reveals a problem with causal explanation.

The standard for compatibility of EU rail systems focuses on safety and efficiency by integration of the network system, qualifications, technical specifications, etc. The directive entered into force on 19 July
2008 (European Union, 2016). The effect is significant and positive, but its significance weakens in the leading model. The insignificance of leads provides an opportunity for a causal interpretation of results.

The simple pressure vessels directive focuses on safety of humans, animals and property and entered into force on 28 October 2009 (European Union, 2016). The effect caused by the standard is significant and positive, though in the leading model, the treatment variable is negative and the 2-year lead is significant. In the lagged model, all variables are significant and the year of treatment is negative. The significance of the lead is problematic with regard to possible causal interpretation.

Overall, there are three standards where the effect is positive and significant and the causal link was not rejected by lead variables. Though these effects cannot be considered as causal only by this test, more research must be conducted. In this paper, I intended to discuss only two issues linked with causality and matter in this case.

First it is self-selection effect. The problem with causality arises when individuals are allowed to choose whether they will belong to a treatment or a control group. This is the case in this paper as companies can freely decide what industry they will belong to. On the other hand, their motivation is driven possibly by something other than by harmonisation of standards. Also, there is a problem of missing data as individuals can choose whether to make company data public or not (even under threat of punishment).

The second is that the EU can choose which sectors will have their standards harmonised and it is reasonable to assume that those will be the least performing ones. On the other hand, the EU’s primary focus is not on TFP as an indicator of company performance of competitiveness.
Table 3: Regression of total factor productivity

<table>
<thead>
<tr>
<th>Labour</th>
<th>Chemical substances</th>
<th>Pyrotechnic articles 1</th>
<th>Pyrotechnic articles 2</th>
<th>Cosmetics</th>
<th>Toys safety</th>
<th>Ecodesign and energy labelling 1</th>
<th>Ecodesign and energy labelling 2</th>
<th>Low voltage</th>
<th>Restrictions of certain hazardous substances</th>
<th>Non-automatic weighing instruments</th>
<th>Inspection of pesticide application equipment</th>
<th>Machinery</th>
<th>Rail system</th>
<th>Simple pressure vessels</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-161.86)***</td>
<td>(-161.84)***</td>
<td>(-161.84)***</td>
<td>(-161.84)***</td>
<td>(-161.84)***</td>
<td>(-161.85)***</td>
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<td>667</td>
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where Labour is the number of employees in the logarithm, Capital is formed of denominated fixed assets in the logarithm, GDP is the country GDP in Euro per inhabitant denominated in the logarithm, Treatment is the treatment effect. Numbers in brackets are t-values. * is 10% significance, ** 5% significance, *** 1% significance.
Conclusion

This paper explores the effect of adjusting the economic and legal framework in order to promote corporate performance. Adjustment of the framework, in this case harmonisation of heterogeneous standards and thus creation of an applicable legislative base, has either a positive or insignificant effect on performance of companies. This can be explained as (1) harmonisation of standards providing a positive significant effect in a case where harmonisation was needed and there are no other standards developed or used in this area, or the EU standard provided a better platform and significant benefits for companies that decided to switch; therefore, changes in performance of the industry were significant, or (2) harmonisation does not provide any effect at all because the EU standard was either wrongfully specified, unimportant, there are other (better or not much worse) standards, or there are no standards needed.

In cases of positive significant effects, further analysis has been conducted in order to be able to reject a possible causal link between harmonisation of standards and performance. Out of 14 standards inspected, and 10 of those with positive and significant effect, only for 3 of them, possible causal explanation has not been rejected.

There are some aspects that can be adjusted in future research of the topic. Firstly, the article considers companies as affected only by their sector affiliation, not by their adoption of standards. With these data available, more careful analysis can be conducted. Secondly, causal links would need more careful handling and further research mainly because of the self-selection effect, targeted introduction of standards and possible other co-determinates.

The overall conclusion resulting from this paper is that though in most cases, analysis provides a positive effect of this regulation, it can be seen as causal only for the minority with other moderation needed.

Literature


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