Competitiveness Proofing Toy Related Industry

Impact of new lead migration limits on the competitiveness of European manufacturers

Client: DG Enterprise and Industry

Rotterdam, 31 July 2012

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Draft

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Dr. Gert-Jan Linders
Oscar Guinea

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ECORYS

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ECORYS Nederland BV
Watermanweg 44
3067 GG Rotterdam

P.O. Box 4175
3006 AD Rotterdam
The Netherlands

T +31 (0)10 453 88 00
F +31 (0)10 453 07 68
E netherlands@ecorys.com
Registration no. 24316726

W www.ecorys.nl

1 Background and aims of the study

1.1 Policy context

The Toy Safety Directive (TSD) was introduced in 1988 to regulate aspects of health and safety of (the use of) toys. Among the health aspects, the TSD stipulates the content of chemical ingredients in toys that can become bio-accessible to young children by mouthing behaviour. These so-called migration limits of chemical ingredients have been changed in a revision of the TSD in 2009. The change implies more strict limits for migration of most chemical elements considered. The migration limits for chemical elements in TSD 2009 will enter into effect for toys marketed in the EU in July 2013.

The migration limits for one of these chemical elements, lead, is currently under scrutiny. Due to their fast metabolism, lead exposure is much more harmful to children than to adults. Following new scientific evidence on health effects, the European Food Safety Authority (EFSA) has recommended a further reduction in the lead exposure from food and non-food products. This has led the EC to consider further tightening of the migration limits.

Lead is a chemical element that occurs naturally in our environment. Many materials are "contaminated" with lead. For example, it may occur in drinking water and various metal ores. It also occurs in mineral ores such as kaolin and in various pigments. Toys can contain metal parts, painted parts, or colouring pigments and softeners/extenders used as raw materials. These are all potential sources for lead contamination.

Conformity of toy products to lead migration regulations in TSD is assessed by testing of toys under various migration scenarios. The relevant scenario for the TSD on migration of lead is mouthing behaviour by infants and toddlers. For testing migration of lead in this scenario, three sources of toy material entering the body via mouthing (bio-accessibility of lead) are relevant:

- Dry or brittle toy material;
- Liquid or sticky toy material; and
- Scraped-off toy material.

For each of these sources, a specific amount of ingested material is derived, based on a worst-case ingestion event. The migration limits are based on these events, and derived from a maximum tolerable daily intake of lead by young children (e.g., see SCHER, 2010).

Policy options

In order to inform the EU decision making process about the benefits and costs of the change in regulation, an impact assessment is currently prepared by the EC. In particular, the impact assessment will compare several policy options for a change in lead migration limits. These policy options are summarized in the table below.

Option 0 leaves the lead migration limits as they have been determined by TSD 2009. These limits will be effective as EU regulation from July 2013. This implies that our baseline for comparing the impact of policy options is the situation before lead migration limits in TSD 2009 enter into effect. More on this will follow later on, as it shapes choices in our approach.

The first option for further tightening is presented as Option 1. Under this option, new and tighter lead migration limits will apply to all toy products. Option 2 intends to take into account that lead often occurs naturally in raw materials used in production of toys. For some raw materials, it may be impossible to meet the new migration limits proposed. Alternatively, some toy products may be composed of such materials to a high extent. The EC wants to assess the difference in impact if some raw materials or final toy products would be exempted from the tightening.

Option 3 is an alternative proposed by the industry association of EU writing instruments manufacturers (EWIMA). EWIMA indicates that this option would be technically feasible for producers of certain toy segments, without compromising the functional quality of their products.

Table 1. Policy options for lead migration limits in toys.

	Option 0 (TSD 2009)	Option 1	Option 2	Option 3
Toy Material	Migration Limits (mg/kg)			
Dry, brittle, powder-like or pliable	13.5	4	As Option 1, but with partial exoneration.	9
Liquid or sticky	3.4	1		3.4
Scraped-off	160	47		50

1.2 Aims of the study

Competitiveness proofing provides specific inputs to the impact assessment of a change in regulation. The analysis is confined to part of the economic costs and benefits involved. Specifically, competitiveness proofing aims to assess the impact of, in this case, a new regulation on the *competitiveness* of EU industry. The operational guidance to competitiveness proofing (EC, 2012) refers to the following definition of competitiveness:

> "Competitiveness is a measure of an economy's ability to provide its population with high and rising standards of living and high rates of employment on a sustainable basis. Vigorous competition in a supportive business environment is a key driver of productivity growth and competitiveness." (p. 4)

This study aims to assess the impact of three different policy options for lead migration limits on competitiveness of the directly affected EU industry. Based on the comparison, the study intends to provide policy recommendations in terms of preferred options and possible measures to mitigate effects.

The remainder of the report is organized as follows. Section 2 discusses the scope and approach of the analysis. Section 3 defines and describes the affected industry, using key indicators of competitiveness, and pays specific attention to international competitiveness. Section 4 presents the impact assessment of the policy options, and Section 5 concludes and presents policy recommendations.

2 Scope, approach and methodology

2.1 Competitiveness proofing

Competitiveness proofing offers a tool to compare policy options in terms of their impact on the affected industry and value chain.

Since 2010 the European Commission carries out reinforced analysis of the impacts on industrial competitiveness for all important new policy proposals with significant effects on industry as part of the impact assessment process.[1] This measure was presented as a "competitiveness proofing" to be integrated in the overall analysis of economic, environmental and social impacts (total welfare approach). In January 2012 a 'Competitiveness Proofing Toolkit' was presented for use in the Impact Assessment procedures.[2]

This publication states that "[t]he aims of competitiveness proofing are to: (i) further improve the analytical quality of impact assessment reports with regard to impacts on competitiveness, and (ii) facilitate the design of policies that take full account of competitiveness impacts, given their overall set of objectives" (EC, 2012, p. 5).
In the competitiveness proofing the focus will be on three dimensions of enterprise competitiveness (EC, 2012, p. 8):

- *Cost competitiveness*: the cost of doing business, which includes cost of intermediate inputs (incl. energy) and of factors of production (labour and capital);
- *Capacity to innovate*: the capacity of the business to produce more and/or higher quality products and services that meet better customers' preferences;
- *International competitiveness:* the above two aspects could also be assessed in an international comparative perspective, so that the likely impact of the policy proposal on [competition and barriers to entry and] the European industries' market shares and revealed comparative advantages is taken into account.

Furthermore, competitiveness proofing aims to assess whether these effects are likely to affect EU small- and medium enterprise (SME) disproportionately.

2.2 Approach and methodology

In this study, the impact on competitiveness is analysed qualitatively and, where possible, a quantification of impacts is presented. In particular, a quantification of the impact of cost and price changes on sector-specific competitiveness in terms of production and employment levels is provided. For some aspects of competitiveness, such as the capacity to innovate and the differential impact on SME, the assessment of impacts is only qualitative.

At the industry level, indicators of competitiveness are production and employment levels, labour productivity and innovativeness. In a setting of vigorous competition, the ability to maintain or

[1] An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage, COM(2010)614, 28 October 2010.
[2] European Commission, "Operational guidance for assessing impacts on sectoral competitiveness within the commission impact assessment system", SEC(2012) 91, January 2012.

increase market share on the EU and global market by EU industry (reflected in production and employment impacts) is a reflection of competitiveness.[3]

Production levels can be analysed in quantitative terms at the highest possible level of detail available in public statistics. These data are the starting point for quantification of impacts on production and employment.

The quantification of impacts relies on a combination of available data at different levels of aggregation in statistical nomenclatures and information from the survey consultation and interviews with two stakeholder associations. Therefore, estimates of quantitative impact on production and employment in the affected industry should be interpreted as providing rough estimates of the order of magnitude of the effects of various policy options. Because employment impacts are derived as linear transformation (i.e., in direct proportion to-) of the production impacts, they are subject to larger uncertainty and should be interpreted even more cautiously.

The analysis follows the steps listed below, which we will briefly discuss in this section:

- Define the industry and describe the value chain;
- Provide a qualitative assessment of the impacts on competitiveness;
- Where possible, estimate the quantitative impact on competitiveness.

Definition and description of the industry

A clear definition of the directly affected industry is the starting point of the analysis. The objective is to match the definition as closely as possible to statistical nomenclature and this definition was checked with stakeholder associations during interviews (see Annex III).

Competitiveness proofing describes impacts relative to the baseline. The basic quantitative overview of the sector describes the current competitiveness of the affected industry. Together with the basic structure of the value chain, this provides the context for comparison and policy recommendations. Statistics are often available only at an aggregated level that makes the data less relevant to describe the directly affected industry. Hence, we need to assume that aggregate indicators (e.g., on productivity) also apply to the relevant industry, or combine databases and assume that proportionality can be used to extrapolate data from one indicator to the other (e.g., from production shares to employment levels). This increases uncertainty surrounding the basic quantitative overview of the relevant industry and quantification of impacts of the policy options.

We will describe the industry, its current size and competitiveness in terms of:

- Production value;
- Employment;
- Number of enterprises and distribution of activity by size class;
- Labour productivity;
- Innovation capacity;
- Shares in world exports;
- Revealed comparative advantage in exports.[4]

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[3] Note that gaining market share can also come at the expense of competitiveness. Vigorous competition implies that returns to capital will be close to the cost of capital needed for production and innovation; cutting prices below long-run economic unit costs is not a viable path to competitiveness. This type of market share competition would decrease competitiveness of the industry or firms involved.

[4] For some of these variables, analysis necessarily has to restrict itself to a level of aggregation that is too high for our immediate concerns due to data limitations. Sometimes assumptions on relevant shares, based on additional information from the survey or interviews, may help to derive estimates for more detailed product categories; in other cases, we have to settle for aggregate indicators as an approximation for the product level information that is missing (e.g., for innovation capacity). We will indicate this where needed.

We make use of databases at Eurostat (SBS, BERD, Innovation Scorecard and Prodcom) and UN COMTRADE. Product codes in Prodcom are available for the relevant sector, but may contain products that are not affected as well as affected products. This database provides information on production value and quantity, but does not contain data on indicators such as productivity, profit margins, capital intensity, or number and size of enterprises.

Product codes in the CN classification for trade are available for a wide set of products, comparable to Prodcom. Comparable worldwide trade data using COMTRADE, however, are only available at a higher level of aggregation than Prodcom.

Sector codes in Eurostat SBS are available only at a high level of aggregation, where Art and Crafts materials are part of a rest category of manufacturing activities not elsewhere classified. Though SBS includes data on profitability, labour costs, and number of enterprises, this information is available at a level not directly applicable to the relevant sector.

After description of the sector's current state of play, the remainder of the analysis deals with the assessment of the policy options in terms of competitiveness impact. Part of the assessment will be qualitative, and will be supported as much as possible by quantitative estimates. Given the uncertainties caused by data limitations, quantitative estimates should be interpreted to indicate orders of magnitude of effects.

Qualitative assessment of competitiveness with basic quantification

The assessment of impacts on competitiveness is partly qualitative with basic quantification, and provides a further quantification of impacts in terms of production and employment that will be explained under the next heading in this section.

The qualitative assessment is based on the basic quantitative overview of the sector in Section 3 and the information gathered by the EC consultation and in the interviews with two stakeholder associations (see Annex III) on the impact of the policy options on the three dimensions of competitiveness.[5]

This information concerns, among other things:

- Share of art and crafts toys in turnover;
- Prevalence of offshore production;
- Prevalence of extra-EU exports;
- Impact on production costs;
- Motivation for increased costs;
- Cost share of raw materials and testing concerning lead content;
- Pass-on of cost increase into price;
- Impact and motivation on competitiveness on the global market.

This information will be used where relevant to inform the qualitative assessment and policy recommendations with basic quantification of impacts, and will be used to provide input for the further quantitative estimates of impacts on production and employment.

[5] The survey was open until early May. This study has made use of the response to the survey available on 24 April (36 responses).

Further quantitative analysis of impacts on competitiveness

We combine quantitative information from publicly available statistical databases with information from the survey consultation and interviews with stakeholder associations. Where public data are not available, we make use of assumptions that are based as much as possible on the survey consultation and interviews or on the relevant literature. The purpose of the quantitative analysis is to derive estimates of the impact of the policy options on costs, prices, production value and employment for the affected industry.

For quantification of the impact of policy options, we make use of production data at the highest possible level of disaggregation, supplemented with more aggregated input-output data and employment data. We use three main secondary data sources for the quantitative analysis:

- Eurostat Prodcom, for detailed production value and quantity statistics;
- Eurostat SBS, for employment and production statistics at a higher level of aggregation;
- Eurostat harmonized IO table, to derive export shares and net operating rates at a higher level of aggregation.

The main information taken from the interviews and survey of stakeholders is:

- Ranges for cost impacts of the policy options;
- Toy segment share in the Art and Crafts industry;
- Pass-on of costs into prices;
- Impact on cost according to company size.

Estimates for the responsiveness of market demand with respect to price are taken from available literature as far as possible.

Impacts on production reflect the response of market demand to price changes. The demand response is derived from estimated price impacts of the policy options. The price impacts are based on primary data from the EC consultation survey on expected cost impacts, and assumptions on pass-on of cost impacts that are supported by survey information and statistics on net operating rates from input-output data.

Annex IV includes a mathematical presentation of the main equation used in the quantitative analysis, which derives price changes from underlying changes in costs and assumptions about cost pass-on. The main equation estimates the percentage price change for a (group of) product(s) as the weighted sum of the percentage change in total production costs and the percentage change in profits per unit of output produced. The percentage change in total production costs per unit is taken from the information collected from the response to the survey consultation available at the time of the analysis. The change in the profit margin that follows from the cost change determines the extent to which a cost change is passed-on in the price of the products. We make assumptions on cost pass-on that are based on the survey and assessment of the relevant market structure based on available data.

Using information from the EC survey consultation of the affected industry, we develop scenarios of cost increase related to the various policy options. These scenario's serve two purposes:

- They reflect the variation in cost impact reported in the survey;
- They accommodate uncertainty of the estimates for quantitative impacts that necessarily follow from the need to make assumptions due to data limitations, by generating a range for quantitative impacts of the policy options on production and employment.

We refer to Annex I and Section 4 for more detailed discussion of the assumptions that we make in the quantitative simulation of policy impacts, and for the analysis itself. Annex IV includes a mathematical presentation of the main equation used in the quantitative analysis.

3 Description of the industry

3.1 Definition of the industry directly affected by the regulation

The definition of the industry affected starts from two angles, *viz.* statistical nomenclatures, but first and foremost, consideration of where lead contamination can become manifest in toys.

Lead in toys…

Toys can contain metal alloys and painted parts that may be contaminated by lead content. As suggested in interviews with industry associations (TIE, EWIMA, also see Annex III), metal parts and regular paint are not the most important sources of lead contamination in terms of meeting lead migration limits. As long as parts and painted materials are coated and toy material is solid (e.g., metal parts, painted plastic toys), migration can occur only from scraped-off material. Even the proposed tighter limits for scraped-off material can be met by toy producers. Modern synthetic paints, moreover, do not contain lead, unlike before.[6] Dust from metal alloy parts in constructional toys (such as screws, bushings, washers) are a source of scraped-off material, but may lead to problems for industry if it is considered as powder-like material for which a tighter limit would apply.

Liquid toys and brittle or pliable toy material are most affected by the new regulation proposed, as the use of raw materials that are naturally contaminated by lead is at the core of many of these products. Colouring pigments (such as titanium dioxide), and softeners or fillers (such as kaolin and clay) are used in art and crafts toys such as modelling clay, colour pencils, paint tablets, powder paint, liquid finger paints and poster paints, pastels and wax crayons. These materials are often an important element in the toy (up to 80% of the material according to EWIMA, as in colour pencil leads), and have a crucial role for the technical functioning of the product (e.g., ensuring gradual abrasion without breaking, enabling opaque colouring).

Liquid, sticky and brittle, dry or pliable toys, for the purpose of this competitiveness proofing, will be indicated as Art and Crafts toys. The first category of toys above falls under the heading of Other toys.

Mouthing behaviour for Art and Crafts toys seems a more likely scenario than for toys containing metal alloys, both as these toys are available for infants and toddlers and because older children may still use them and show mouthing behaviour (which is less likely for toys in general than for writing, drawing and painting toys). Because costs and competitiveness of Art and Crafts toys are likely to be affected more by the regulation, they are the main focus of the competitiveness proofing analysis.

… and toys in statistics

Relevant industry and product data at Eurostat are available in structural business statistics (SBS), and Prodcom statistics. Both databases are based on the NACE classification of economic activities; Prodcom codes are an extension of NACE codes into more detailed products within industries.

[6] See, e.g., http://www.mmk.be/afbeeldingen/File/FicheLoodverf.pdf.

A confrontation of the considerations put forward above with available statistics at Eurostat is presented in the table below. The product codes identified in Prodcom and NACE, and listed in Table 2 below, include most of the Art and Crafts toys that are likely to be affected by the regulation, such as modelling clay, colour pencils, paint tablets, powder paint, liquid finger paints and poster paints, pastels and wax crayons. This is confirmed by the replies to the survey consultation, where firms could indicate their most relevant product codes and their product range. A key complicating factor, however, is that Art and Crafts toys are not classified in the toy industry, but are part of the writing instruments and paint (art and crafts materials) industries.

The producers in this industry do not only produce Art and Crafts products for the toy market, but also products for professional, school or hobby use that are not marketed as toys. This is reflected in the statistical nomenclature (e.g., signboard painters' and artists' colours, tailors' chalks) and is typical for the industry according to the interview with the industry association (see Annex III). EWIMA indicated that the share of affected toys in turnover may typically vary between 10-35% and is up to 70% for SMEs in Italy and Germany, two of the largest producers (based on product range, see Annex III). Based on replies to the survey, the toy market share in turnover of Art and Crafts materials may vary between 23-63% on average.

The available product codes for Art and Crafts products mostly include products that have been listed as affected (see the products mentioned above), but also products that may not contain lead contaminated ingredients. For example, graphite black pencil leads do not contain pigments, contrary to colour pencils and pencil leads. However, they may still contain extenders such as kaolin to enable smooth abrasion. It is therefore likely that the vast majority of products under these codes make use of lead contaminated ingredients. According to the survey response used as input for this study, about 60% of the firms that state to be involved in producing, distributing or importing Art and Crafts toys indicate that lead contaminated raw materials are used in their production process.[7]

Given the available statistical nomenclature and product codes, we need to make assumptions concerning the share of the relevant Art and Crafts sector that is affected by the regulation. Informed by the interview with EWIMA and the survey results available at the time of the analysis, we have assumed a share of 50% in total turnover of Arts and Crafts materials for the affected toys at the EU level.

Table 2. Sector definition

	Classification			
Toy category	**Prodcom 2007**	**Prodcom 2010**	**NACE rev. 1.1**	**NACE rev. 2**
Art and Crafts toys:				
Artists', students', or signboard painters' colours; amusement colours and modifying tints in tablets, tubes, jars, bottles, or pans	24.30.23.50 24.30.23.70	20.30.23.50 20.30.23.70	24.30	20.30

[7] The majority of responses that indicate that either no such inputs are used in their production process, or that they do not know are for firms that do not produce the toys themselves, but only distribute or import such toys. Here, the survey question can be interpreted in several ways: e.g., distributors and importers do not use raw materials that contain lead in their own production process of producing trade services even though the products that they import and/or distribute may contain such raw materials. Therefore, we argue that the figure of 60% is likely to be an understatement of the percentage of the relevant toys that make use of lead contaminated raw materials.

Toy category	Classification			
	Prodcom 2007	Prodcom 2010	NACE rev. 1.1	NACE rev. 2
Pencils and crayons with leads encased in a rigid sheath (excluding pencils for medicinal, cosmetic or toilet uses)	36.63.24.10	32.99.15.10	36.63	32.99
Black or coloured pencil leads	36.63.24.30	32.99.15.30	36.63	32.99
Pastels, drawing charcoals, writing or drawing chalks and tailors' chalks	36.63.24.50	32.99.15.50	36.63	32.99
Other toys:				
Manufacture of games and toys, of which for example: - Construction sets and constructional toys (excluding of wood or plastics, scale model assembly kits); - Toy die-cast miniature models of metal	-	-	36.50	32.40

Notes: Source: Eurostat, see http://ec.europa.eu/eurostat/ramon/

Value chain of the affected industry

Interviews with two industry associations, EWIMA and TIE (see Annex III), have indicated that the effects upstream in the value chain of the affected industry are negligible. Response to the survey consultation of the industry available at the time of the analysis indicates that lead contaminated raw materials such as kaolin and pigments and testing costs represent a substantial share of total production costs to the industry (29% for such raw materials and 12% for testing costs, on average). However, the affected industry represents only a small proportion of total demand for these products and services. The Games and toys and Art and Crafts industries mainly supply consumers as end users.

3.2 Industry structure and competitiveness

The competitiveness of the affected industry is a reflection of a number of variables. In this section, we will present statistics on a number of dimensions of competitiveness:

- Market size;
- Production value and quantity;
- Employment;
- Number of enterprises;
- Labour productivity;
- Innovation capacity.

Where relevant, comparison to manufacturing industry as a whole will be made.

Data limitations complicate the analysis for Art and Crafts toys at the level of the relevant industry. The share of the toys market segment in the art and crafts sector is not registered in Eurostat data. Also, some of the variables, such as employment, labour productivity and number of enterprises, are available at a higher level of aggregation only. For Other toys, it is not clear which share of the industry is affected by lead content regulation. We will describe this sector first and foremost to provide a further benchmark for Art and Crafts toys.

3.2.1 The EU market in the affected industry: production, trade and consumption

A first element to determine current competitiveness is the market size of the affected industry. The market is defined as consumption by EU residents. Because direct information on this variable is not available, we estimate the volume of the market by defining the value of consumption as the sum of production and imports, subtracting exports.

The table below presents an overview of the market in terms of production, import and export for the Art and Craft materials industry and the Manufacture of games and toys industry.[8] Data are for 2008.[9] The data for this table are taken from Eurostat Prodcom database (for EU-27 production, export and import of Art and Crafts materials), and from Eurostat SBS (for EU-27 production of Games and toys) and UN COMTRADE (for EU-27 exports and imports of Games and toys).[10]

[8] The Art and Crafts materials industry consists of the relevant Prodcom product codes as presented in Section 2. This includes writing instruments and art and crafts paint materials. Manufacture of games and toys reflects the NACE (rev. 2) 4-digit code.

[9] The year 2008 is the most recent year that has fair data availability at the EU-27 level in the SBS database. Furthermore, this year is not to far from the benchmark year 2007 used in the quantitative competitiveness proofing analysis (see Section 2 for discussion).

[10] UN trade data are denominated in US$. To convert figures to euro, we have used the average of daily (working days) reference exhange rates published by ECB, which was US$ 1.47 per 1 euro in 2008 (see http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html). UN COMTRADE data are preferred for this study, because they allow to analyse competitiveness on the global market for EU-27 industry. Trade data have been accessed via WITS.

Table 3. EU-27 market size of affected industry in 2008 (million euro).

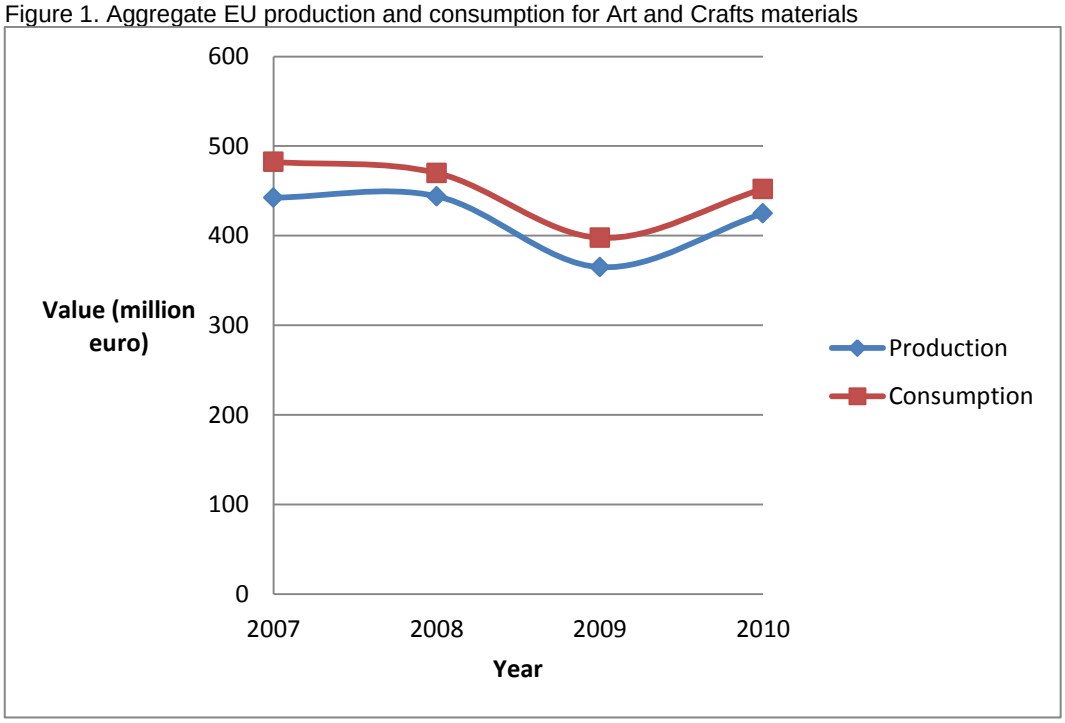
	Production	Import	Export	Consumption
Art and Crafts materials	444	177	153	469
of which:				
Amusement colours (sets)	147	29	15	162
Amusement colours (exc. sets)	152	20	52	119
Pencils and crayons	111	90	51	150
Pencil leads	10	6	15	1
Pastels, drawing charcoals, chalks	24	33	19	38
Manufacture of games and toys[1]	5,756	8,099	1,477	12,378

Notes: Art and Crafts materials figures include toys segment and other market segments. Data from Eurostat Prodcom/Europroms database (for EU-27 production, export and import of Art and Crafts materials), and from Eurostat SBS (for production of Games and toys) and UN COMTRADE (for EU-27 exports and imports of Games and toys).

[1] EU-27 production value is not available. We have used the sum of production values across EU-27 member states that were reported.

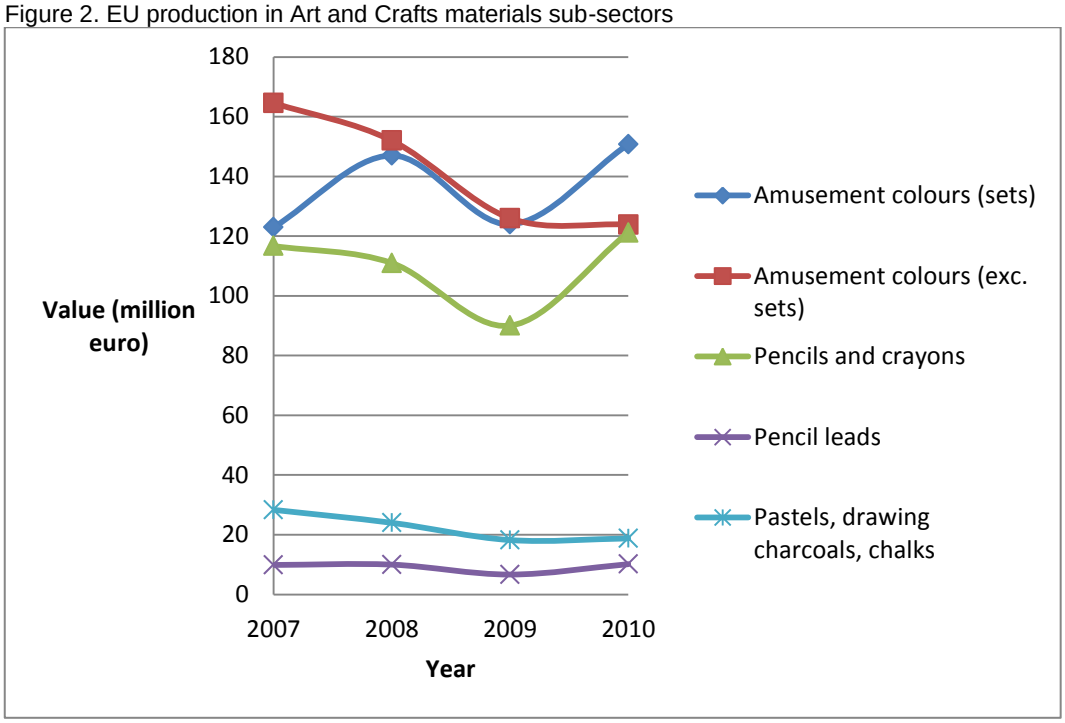
The Figures below compare production and consumption for the Art and Crafts materials industry and its sub-sectors over the period 2007-2010. The impact of the economic crisis is visible as a decline, particularly in 2009, of which the sector has not fully recovered yet. Production and consumption in 2010 were back at the level of 2008 for most sub-sectors.

Figure 1. Aggregate EU production and consumption for Art and Crafts materials



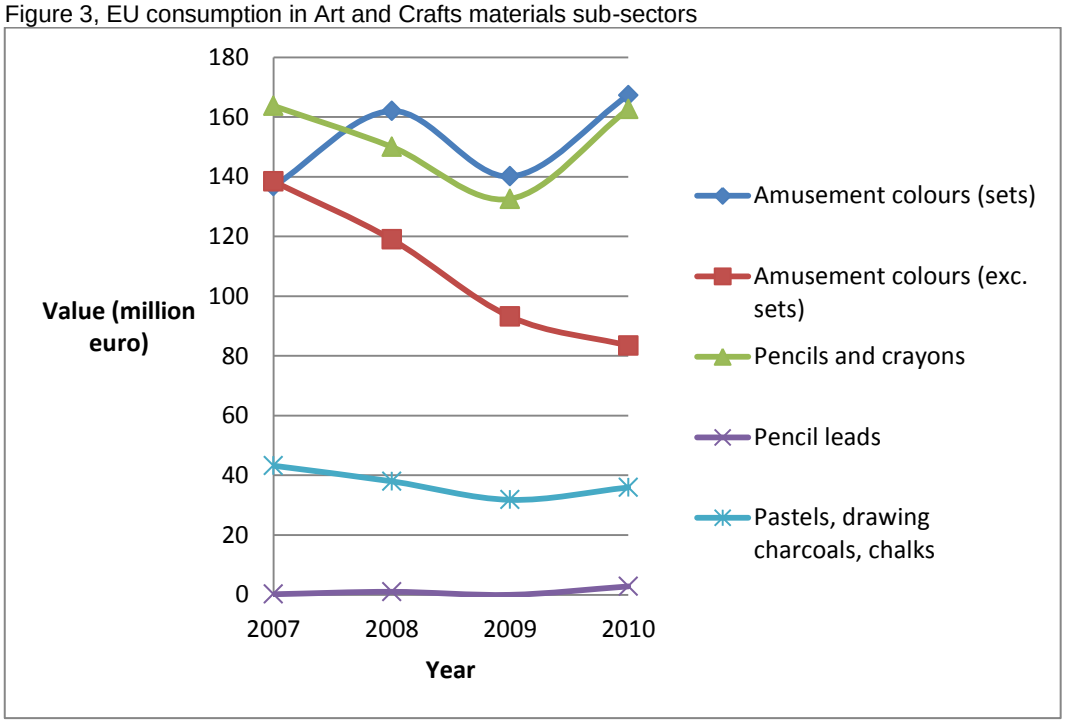
Source: Eurostat (Europroms and Prodcom).

Figure 2. EU production in Art and Crafts materials sub-sectors



Source: Eurostat (Europroms and Prodcom).

Figure 3, EU consumption in Art and Crafts materials sub-sectors



Source: Eurostat (Europroms and Prodcom).

The following observations on the EU-27 market for the affected industries can be made:

- The EU **market for art and crafts materials** depends for about **38% on imports**. **Exports** to third countries represent about **34% of production**. The interview with EWIMA resulted in trade shares of similar orders of magnitude. These figures have to be interpreted with caution, though. First, as noted by Williams (2008), combining Prodcom production and trade data to establish market size is not common practice anymore. Data inconsistencies may result in

negative values for market size estimates.[11] Second, imports and exports include re-exports. Imports for re-export are not intended for domestic (EU-27) consumption, and re-exports do not originate from domestic production. The impact of re-exports is clear in the figures reported for pencil leads, where export exceeds production.

- The EU market for **other toys** depends for about **65% on imports**. **Exports** to third countries represent about **26% of production**. The interview with TIE indicated that an even larger share of imports is likely.
- Both EU markets are highly **internationally integrated**. Import as well as export to third countries is substantial, at around one third at least. The **art and crafts materials market, however, seems to be served to a higher extent by EU producers**. For other toys, more than half of the products on the EU market appear to be imported. Having said this, the survey among firms indicates that offshoring of toys production to third countries (mainly China and other countries in Asia) is important. A large share of imports into the EU may still be linked to EU-based companies (branded imports of EU firms in the industry, and own brand imports by retailers). Re-exports are likely to be important as well for some products.
- The share of consumption of art and crafts materials relative to consumption of games and toys is about 4%. If we assume a 50% share of toys in art and crafts materials (an assumption that we make based on the EC survey of the industry and the interview with EWIMA, as explained in Section 3.1), the relevant ratio is 2%. This is lower than the share of 5.4% in 2007, reported by TIE (2008). Although it is not clear what the TIE figures are exactly based on, they define the games and toys sector as traditional toys, excluding video games. These represent about 40% of the EU-27 imports, and 30% of the consumption of games and toys (based on Prodcom). If we take this into account, the **relevant estimated share of Art and Crafts consumption in total consumption of toys is 5.4%** (based on Table 3). This suggests that our definition of the affected art and crafts materials industry leads to **very similar outcomes** as reported in TIE (2008).

Within the EU-27, the main countries in terms of production in the affected industries are listed in the table below.

Table 4. Main production locations in the EU-27 (2008).

Rank	Amusement colours (sets)	Amusement colours (exc. sets)	Pencils and crayons	Pencil leads[1]	Pastels, drawing charcoals, chalks[2]	Manufacture of games and toys
1	Italy (38)	UK (34)	Germany (53)	-	Germany (27)	Germany (36)
2	France (28)	Germany (20)	Czech R. (18)	-	UK(5)	Spain (13)
3	Spain (12)	France (19)	UK (12)	-	-	Austria (13)
4	Germany (10)	Spain (2)	-	-	-	UK (12)
5	UK (7)	Denmark (1)	-	-	-	Italy (11)
Share “not available”	4%	24%	17%	100%	68%	-

Notes: Percentage share of total in between brackets. Rankings are based on countries for which production values were reported. See the last row for the share of production value not disclosed to country of origin.[1] The countries for which production showed as confidential (‘-’) are: Germany, UK, Portugal, Czech Republic, France, Hungary and Romania. The other EU-27 MS report zero-valued production. [2] The countries for which production showed as confidential are: Portugal, Czech Republic, Bulgaria, Romania, France and Poland.

[11] Trade figures reported in Prodcom are known as Europroms data. They are based on Eurostat COMEXT trade data, converted to Prodcom codes where possible.

The production appears to be concentrated mainly in a set of EU-15 countries (Germany, Italy, the UK, France and Spain). These are also the largest EU economies, with shares in total manufacturing production of: 26% (Germany), 15% (Italy), 12% (France), 9% (UK) and 8% (Spain). The Czech Republic (pencils) and Austria (Games and toys) enter into the top rankings between these larger economies.

The pencils and pastels groups appear to show a more concentrated market than amusement colours and games and toys. This may also relate to the smaller size of their market, in combination with economic specialization at the detailed industry level. This conclusion can be drawn more confidently for pencils and crayons, than for the other two groups, due to a large share of non-available statistics at the country level.

3.2.2 *Industry structure and performance: some key indicators*

To dive deeper into the affected industry, we have to rely on rough assumptions. Data on employment, productivity and the structure of industry in terms of the number and average size of enterprises is only available at a higher level of aggregation (4-digit NACE classification). The relevant NACE classes are: Manufacture of games and toys (NACE 32.40), and Other manufacturing n.e.c. (NACE 32.99).

Some tentative information can still be of use to our description of the industry. The table below summarizes some key variables for the affected industry and for manufacturing as a whole.

Table 5. Key industry indicators for the EU-27 (2008).

Sector	Number of enterprises	Number of persons employed	Turnover (million euro)	Value added (million euro)
Manufacture of games and toys	5,213	51,300	7,869	2,754
(Share of total manufacturing, %)	(0.25)	(0.16)	(0.11)	(0.16)
Other Manufacturing n.e.c.	26,339	142,500	14,332	4,917
(Share of total manufacturing, %)	(1.2)	(0.43)	(0.20)	(0.29)
Manufacture of paints, varnishes and similar coatings, printing ink and mastics	4415	164,400	42,329	10,924
	(0.21)	(0.50)	(0.59)	(0.65)
Estimates for Art and Crafts materials[1]	332	2885	490	140
	(0.016)	(0.0088)	(0.0069)	(0.0084)
Total Manufacturing	2,123,104	32,960,500	7,136,428	1,669,537

Notes: Source: SBS, accessed May 2012. Some figures are from series 'Industry by employment size classes (NACE Rev.2 B-E) (sbs_sc_ind_r2)'; other figures are from series 'Annual detailed enterprise statistics for industry (NACE Rev.2 B-E) (sbs_na_ind_r2)'. These series may yield somewhat different figures. [1] Estimates for Art and Crafts are derived on the basis of production shares of relevant products (Prodcom) in their aggregate 4-digit NACE class. These shares have been applied to the number of enterprises, employment, turnover and value added.

The following observations present themselves concerning industry structure and performance:

- Manufacture of paints and varnishes, that contains Amusement colours, appears a sector with above average company size. The share in manufacturing employment exceeds the share in

the number of enterprises by a factor 2.5. Measured by employment and value added shares, productivity of the sector is higher than for EU manufacturing as a whole. This can also refer to the fact that the sector may be relatively capital intensive.

- Manufacture of **games and toys** has a **somewhat smaller average company size** than manufacturing as a whole. The sector has **average labour productivity**.
- Manufacturing n.e.c., which contains pencils, pencil leads, crayons, pastels, chalks, etc., has the smallest average company size. This sector shows a substantially lower than average labour productivity, which may also point at a high labour intensity and a high share of labour cost in value added.
- Hence, the **prevalence of SME may be more pronounced in some parts of the toy sector than in others.** Direct data at the relevant product level are not available, unfortunately. The interviews with EWIMA and TIE have pointed out that firms are mostly SME, particularly in the Art and Crafts industry.
- Based on shares of our individual Art and Crafts product groups in production for their 4-digit NACE class (calculated using the Prodcom detailed production values), we can construct an estimate for the **Art and Crafts** materials segment. This is presented in the table as well. The results show that while **average firm size** in the industry falls **below** the manufacturing sector **average**, **labour productivity** is about **average**.
- The **size of the affected sector** can also be read from these estimates. At the EU-27 level, about **3000 jobs** would be related to Art and Crafts materials, both toys segment and non-toys segment (such as office supplies and professional or hobby use). Value added amounts to about **140 million euro** annually, based on 2008 estimates.
- **Conclusions** based on the constructed average have to be **interpreted cautiously**, though. As shown in the EC survey responses, many firms are multi-industry firms. Especially at a very detailed industry level, classifying firms into a sector according to their main activity (as SBS does for 4-digit classes), may be misleading. A firm classified in Games and toys may still have a large share of Art and Crafts production; in fact their single largest product lines may be in Art and Crafts.

Though very tentative, due to the high level of aggregation, the multi-product firm, and data limitations, the table below gives an indication of the importance of SMEs in terms of employment. For manufacturing as a whole and relevant NACE classes, it goes beyond average firm size, to show employment shares in various company size classes.

The distribution shows that the **importance of small firms** (especially micro-firms) is higher for Manufacturing n.e.c. (which includes **pencils, pencil leads, crayons, pastels, chalks**). Manufacturing of games and toys shows a very average distribution, despite average firm size that is somewhat lower than average. The difference is in the extremes, though. The percentage of employment in micro-firms is higher than average while the percentage of large enterprise employment is lower. For **Amusement colours**, little more information can be extracted from this table, as most of the categories for Manufacture of paints are not disclosed. Available figures confirm that **large to medium firms may be more important** in this NACE class than on average for manufacturing industry.

Table 6. Share of employment by company size class, EU-27, 2008

Indicator	Total	Companies with 0-9 employees	Companies with 10-19 employees	Companies with 20-49 employees	Companies with 50-249 employees	Companies with 250 or more employees
Persons employed in Manufacture of games and toys (%)	100	16	8	12	27	37
Persons employed in Manufacturing n.e.c. (%)	100	30	14	15	27	14
Persons employed in Manufacture of paints, varnishes and similar coatings, ... (%)	100	5	5	n.a.	30	n.a.
Number of persons employed by total manufacturing (%)	**100**	**13**	**9**	**12**	**26**	**41**

Notes: figures may not add up to 100% due to rounding. Source: Eurostat SBS.

3.2.3 *Innovation capacity in the affected industry*

Data on innovation capacity in the affected industry are scarce. Innovation data from Eurostat CIS are only directly available at 2-digit NACE, which is too aggregated. Eurostat R&D expenditure data are also not available at a satisfactory level of detail.

Eurostat BERD and Innovation scoreboard data[12] allow a tentative comparison of R&D intensity in the affected industry, compared to the economy as a whole. The results are presented in the table below. Though definitions differ somewhat between these databases, the ratio between R&D investments as percentage of industry turnover and the share of R&D expenditure in GDP offers some insight.[13]

Table 7 Industry R&D intensity relative to EU-27 macroeconomic average.

	Ratio R&D share in GDP vis-a-vis EU-27 average		Ratio R&D investment in net sales vis-a-vis EU-27 R&D share in GDP			
	Macro-economy (BERD data)		Man. of games and toys (Innovation scoreboard)		Manufacturing n.e.c. (Innovation scoreboard)	
Country	2007	2008	2007	2008	2007	2008
Belgium	1.02	1.03	-	-	-	0.88
Denmark	1.39	1.48	1.71	1.75	-	-
Finland	1.88	1.93	-	-	1.61	1.42
France	1.12	1.10	-	-	2.30	2.14
Germany	1.37	1.40	-	-	1.47	1.55
Italy	0.63	0.63	-	-	0.56	0.55

[12] See DG Enterprise and Industry website, on the Innovation scoreboard data source: "The Innovation Union Scoreboard includes innovation indicators and trend analyses for the EU27 Member States, as well as for Croatia, Iceland, the Former Yugoslav Republic of Macedonia, Norway, Serbia, Switzerland and Turkey. It also includes comparisons based on a more reduced set of indicators between the EU27 and 10 global competitors." The data on the indicators that are used in Table 7 have been accessed via Eurostat.

[13] GDP (value added) and turnover are different concepts of output value. Still, development over time and comparison between industries and countries is a useful source of information.

	Ratio R&D share in GDP vis-a-vis EU-27 average		Ratio R&D investment in net sales vis-a-vis EU-27 R&D share in GDP			
	Macro-economy (BERD data)		Man. of games and toys (Innovation scoreboard)		Manufacturing n.e.c. (Innovation scoreboard)	
Japan	1.86	1.80	2.11	1.33	3.11	2.89
Netherlands	0.98	0.92	-	-	1.85	1.44
South Korea	1.74	1.75	-	-	0.63	1.75
Spain	0.69	0.70	-	-	0.15	1.82
Sweden	1.84	1.93	-	-	1.04	1.03
Switzerland	-	1.56			3.55	3.48
UK	0.96	0.93	2.13	18.68	1.28	1.22
US	1.44	1.45	5.94	7.36	1.75	1.77
EU average[1]	**1.85**	**1.92**	**1.85**	**1.92**	**1.85**	**1.92**

Source: Eurostat BERD and Innovation scoreboard. Notes: Data for 'Manufacture of paints, ...' were not available in the Innovation scoreboard. [1] All the ratios in the table have been expressed relative to these EU-27 average values of the R&D share in GDP.

- **R&D intensity** in both relevant NACE **sectors** does **not appear** to be **lower than** for the **aggregate economy**. The ratio is often larger than one, even though turnover (denominator in innovation scoreboard) is larger than value added at the industry level.
- The **non-EU OECD countries invest relatively more in R&D**, compared to the EU-27 average. This holds both for expenditure at the macroeconomic level, and even more in the relevant NACE industries.
- R&D expenditure in Manufacturing n.e.c. appears to **lag behind the US**, and particularly behind **Switzerland and Japan**, except for France. This may point at similar patterns for part of the **Art and Crafts industry**. For Games and toys, less evidence is available, but still suggests a leading position in R&D effort in the US.
- In some EU countries, a large **rise over time** occurs in the industry R&D versus national R&D intensity (**UK, Spain**). This appears to reflect mainly **sensitivity to the business cycle**. In both countries, the effect continues over 2009-2010. This may point out that turnover and value added at sector level respond more directly to the crisis, while R&D is not lowered instantly or even increased. Such a response is much less pronounced in average R&D intensity of GDP across the EU-27.

3.3 International competitiveness of the EU industry

Though the internal EU market is the main outlet for the EU Games and toys and Art and Crafts industries, the market analysis in the previous section showed that external trade is an important characteristic of the sector. The competitiveness of EU producers on the global market can be assessed on the basis of EU external trade. This is trade of EU member states with non-EU "third countries". We focus on export and import of the EU as a whole with respect to third countries.

This section focuses explicitly on a thorough description of international competitiveness of the affected industry. We assess competitiveness by considering developments in:

- EU exports and imports;
- Unit values;
- Revealed Comparative Advantage (RCA) of the EU industry; and
- Intra-EU trade versus extra-EU trade.

3.3.1 *Data source and classification correspondence to our industry definition*

The analysis of EU exports, imports and external competitiveness is performed based on trade data from UN COMTRADE. The reason why UN COMTRADE was used instead of COMEXT is because the UN COMTRADE database incorporates exports and imports from non-EU countries and this information is important to assess the competitive position of EU producers on these selected products vis-à-vis the rest of the world.

COMTRADE data are classified according to the HS classification. HS codes for the affected industry align well to the Prodcom and NACE codes discussed earlier in defining the affected industry.

The product codes selected to describe the Games and toys sector belong to four 4-digit HS categories:

- 9501 "*Wheeled toys designed to be ridden by children* ";
- 9502 "*Dolls representing only human beings*";
- 9503 "*Other toys; reduced-size (scale) models and similar recreational models, working or not; puzzle of all kind*";
- 9504 "*Articles for funfair, table or parlour games, including pintables billiard, special tables for casino games, and automatic bowling alley equipment*".

The Art and Crafts products affected by the regulation are summarized in the following 4-digit HS codes:

- 3213 '*Artists', students' or signboard painters' colours, modifying tints, amusement colours and the like, in tablets, tubes, jars, bottles, pans or in similar forms or packings*'.
- 9609 '*Pencils (other than pencils of heading 96.08), crayons, pencil leads, pastels, drawing charcoals, writing or drawing chalks and tailors' chalks*'.

The data analysis described below combines the underlying 6-digit HS codes. Data are in denominated in US $, which is the denomination used in the COMTRADE database. For the sake of comparing shares and revealing comparative advantages, the choice of currency denomination is of no concern.

3.3.2 *The position of the EU in global trade in the affected industry*

The EU is an important world player in Arts and Crafts industry. Although, the EU position has slightly weakened over the period analysed, EU exporters still supply around 18% of global import. China is the top world exporter accounting for more than half of global import. Other important producers such as the US, Japan and Korea have seen a reduction in their shares of global trade as well, following the rise of China on the global market.

In absolute terms, EU exports have grown by $US 70 million over the last decade, in contrast with the US and Japan whose exports have declined.

Table 8. Share of global trade in Arts and Crafts (excluding intra-EU trade), by source country.

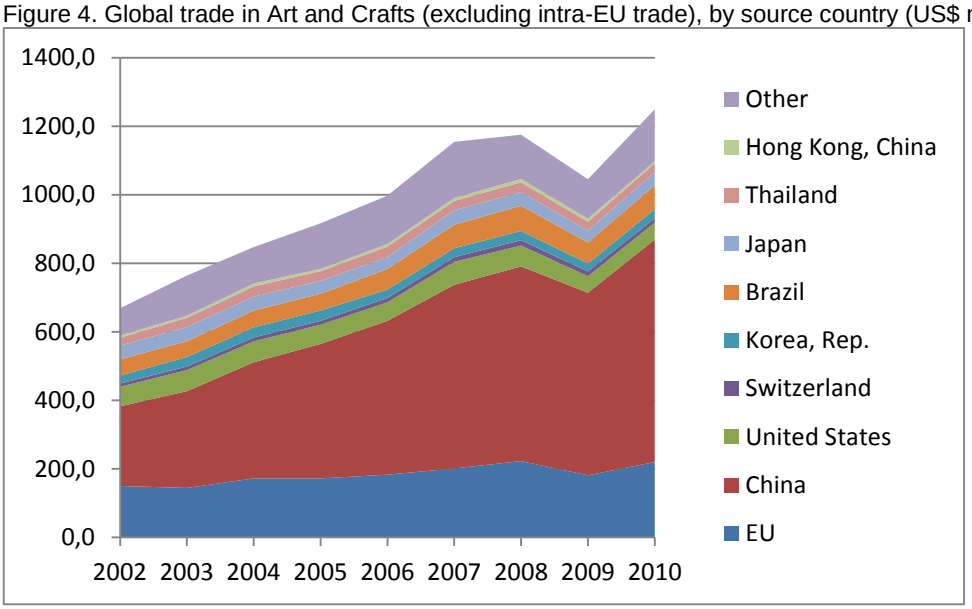
	2002	2003	2004	2005	2006	2007	2008	2009	2010
EU	22.4%	18.9%	20.3%	18.8%	18.4%	17.5%	19.0%	17.3%	17.6%
China	34.8%	37.0%	40.0%	42.8%	45.0%	46.4%	48.3%	51.0%	52.0%
US	8.5%	8.0%	7.2%	6.1%	5.4%	5.8%	5.2%	4.6%	3.9%
Switzerland	1.4%	1.4%	1.3%	1.2%	1.3%	1.2%	1.3%	1.3%	1.0%
Korea. Rep.	3.5%	3.6%	3.5%	3.3%	2.5%	2.3%	2.3%	2.2%	2.1%
Brazil	7.1%	6.0%	5.8%	5.4%	6.0%	6.0%	6.3%	5.9%	5.6%
Japan	5.9%	5.5%	4.7%	4.1%	3.5%	3.6%	3.4%	3.3%	3.1%

Thailand	3.5%	3.5%	3.6%	3.1%	3.1%	2.4%	2.4%	2.5%	2.1%

Source: UN COMTRADE

Figure 4 visualizes the development of global trade in Art and Crafts products over recent years, clearly showing the sharp rise of China as exporter in this sector. The EU is the second largest supplier on the global market.[14]

Figure 4. Global trade in Art and Crafts (excluding intra-EU trade), by source country (US$ million)



Source: UN COMTRADE

The dominant position of Chinese exporters is more prominent in the Games and toys sector. Chinese exporters have a market share of 63%. The second largest world exporter is the EU with 10%. In this sector, China had already developed the leading position in the beginning of the period. The increase in market share of China is even more impressive if one realizes that global trade in this sector has increased by 108%.

Table 9. Share of global trade in Games and toys (excluding intra-EU trade), by source country.

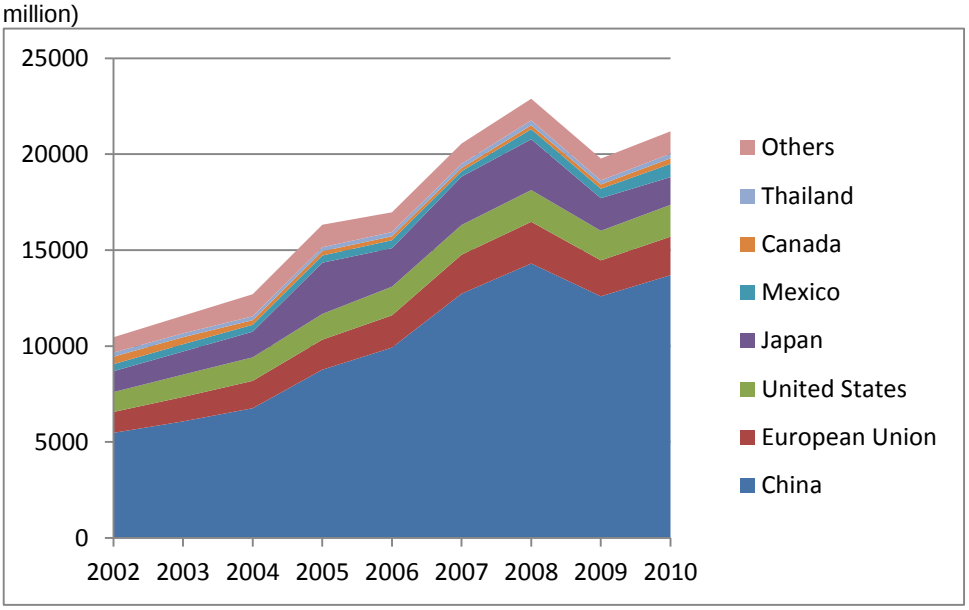
	2002	2003	2004	2005	2006	2007	2008	2009	2010
China	52.4%	52.5%	51.7%	52.6%	57.2%	60.7%	61.5%	62.2%	63.0%
EU	10.4%	11.0%	10.9%	9.4%	9.7%	9.7%	9.3%	9.3%	9.2%
US	9.9%	10.1%	9.4%	8.0%	8.6%	7.4%	7.1%	7.6%	7.6%
Japan	10.4%	10.4%	10.2%	16.0%	11.6%	12.0%	11.4%	8.4%	6.6%
Mexico	3.5%	3.3%	2.8%	2.2%	2.4%	1.3%	2.3%	2.4%	3.2%
Canada	3.7%	3.2%	1.8%	1.3%	1.2%	0.8%	0.9%	1.1%	1.3%
Thailand	2.1%	1.7%	1.5%	1.2%	1.3%	1.0%	1.1%	1.0%	1.1%

Source: UN COMTRADE

The dominance of China in this sector is shown even more vividly in the Figure below. One of the reasons for the rise of China is the substantial offshoring of production from the EU and other OECD countries to locations with cheap labour in both affected industries over recent decades. Interviews with industry associations and the EC survey confirmed the importance of offshoring, which is relatively most important for the Games and toys industry.

[14] Keep in mind that the global market is defined here on the basis of international trade flows between large economic players, or (country-)blocs. Intra-bloc trade flows are not included.The US, Japan and the EU are examples of such major blocs.

Figure 5. Global trade in Games and toys (excluding intra-EU trade), by source country (US$ million)



Source: UN COMTRADE

EU exporters have maintained their share in global trade. Although there is a slight decrease between 2002 and 2010 for both segments, other OECD economies have suffered a larger decrease in market share.

EU exports have grown in absolute terms in both industries. Growth rates over the whole period considered were 47% (Art and Crafts) and 84% (Games and toys). Extra-EU export volumes for Games and toys are much larger than exports in Art and Crafts. For comparison, Art and Crafts exports equal around 10% of exports in Games and toys.

Table 10. Extra-EU exports in the affected industry

	Exports in selected writing materials (US$ million)	Exports in toys and games (US$ million)	Share of Art and Crafts relative to Games and toys
2002	150.1	1089	14%
2003	143.9	1272.9	11%
2004	172.3	1425.3	12%
2005	172.2	1565	11%
2006	183.3	1680.8	11%
2007	201.5	2030.3	10%
2008	221.4	2170.8	10%
2009	182.5	1872.9	10%
2010	220.2	2006.4	11%

Source: COMTRADE

3.3.3 Main markets for EU exports

The main destinations for EU exports of Art and Crafts products over the past years have been the US, Russia, Switzerland, Mexico and Norway. In 2010, Germany (34%), the United Kingdom (22%), France (16%), and the Netherlands (6%) are the most important exporters to third countries within the EU. The list of suppliers to the global market is more or less in line with evidence on the main producers based on Prodcom, which we presented in Section 3.2. Countries such as the Netherlands are new in the list. The role of the Netherlands in re-exports of EU products to third countries may play a role in accounting for the share in extra-EU exports.

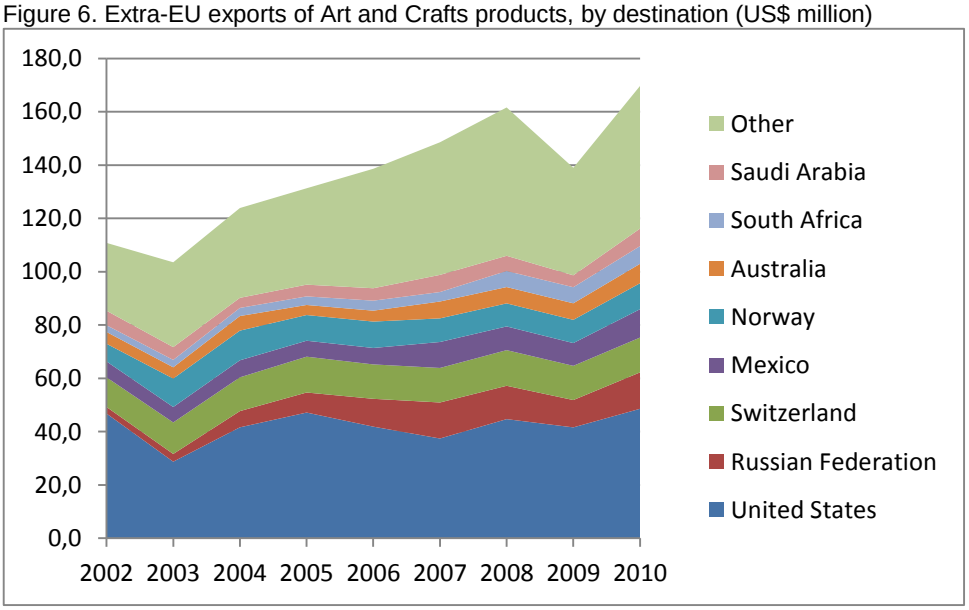
Table 11. Share in extra-EU exports of Art and Crafts products, by main destination countries

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010
US	31.2%	20.0%	24.1%	27.4%	22.8%	18.6%	20.2%	22.8%	22.0%
Russia	1.6%	2.0%	3.5%	4.4%	5.7%	6.7%	5.7%	5.6%	6.2%
Switzerland	7.4%	8.2%	7.4%	7.8%	7.0%	6.4%	6.0%	7.0%	5.9%
Mexico	4.0%	4.0%	3.7%	3.5%	3.4%	4.8%	4.0%	4.7%	4.8%
Norway	4.4%	7.4%	6.5%	5.6%	5.4%	4.4%	3.9%	4.8%	4.4%
Australia	3.0%	2.9%	3.2%	2.2%	2.2%	3.1%	2.8%	3.4%	3.3%
South Africa	1.7%	1.9%	1.8%	1.9%	2.0%	1.8%	2.7%	3.3%	3.0%
Saudi Arabia	3.6%	3.3%	2.2%	2.6%	2.5%	3.2%	2.6%	2.4%	3.0%

Source: COMTRADE

Although the effects of the economic downturn are noticeable, EU exports have returned to the level of 2008 by 2010.

Figure 6. Extra-EU exports of Art and Crafts products, by destination (US$ million)



Source: COMTRADE

The US is the most important destination for EU export of Games and toys, followed by Switzerland, Russia, Norway and Australia. The effects of the economic downturn are more visible than for the Art and Crafts industry. EU exports have not fully recovered from the crisis. In 2010, the most important European exporters were Denmark (21%), Germany (18%), Czech Republic (17%), and the United Kingdom (8%).

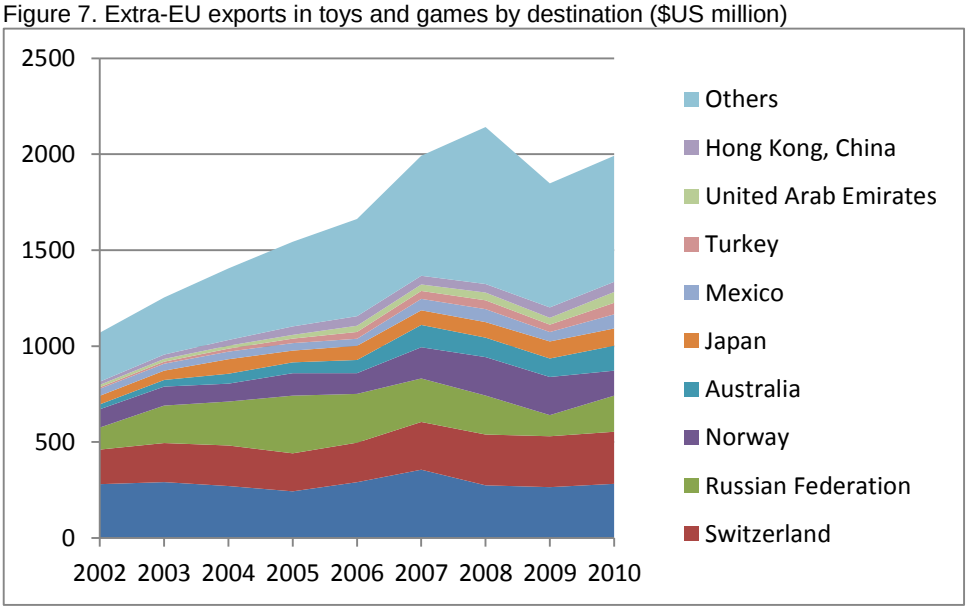
Table 12. Share in extra-EU exports of Games and toys, by main destination countries

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010
US	26.2%	23.3%	19.3%	15.8%	17.5%	17.9%	12.8%	14.4%	14.2%
Switzerland	16.8%	16.2%	15.0%	12.8%	12.4%	12.5%	12.4%	14.3%	13.6%
Russia	10.7%	15.6%	16.3%	19.5%	15.3%	11.4%	9.5%	6.0%	9.4%
Norway	8.9%	7.9%	6.6%	7.6%	6.5%	8.2%	9.4%	10.8%	6.5%
Australia	2.4%	2.8%	3.7%	3.7%	4.1%	5.8%	4.7%	5.2%	6.5%
Japan	4.2%	3.9%	5.4%	4.0%	4.4%	3.8%	3.8%	4.8%	4.5%
Mexico	3.4%	2.9%	2.8%	2.5%	2.2%	3.0%	3.2%	2.6%	3.7%
Turkey	0.7%	0.8%	1.1%	1.5%	2.1%	2.1%	2.2%	2.1%	3.0%

Source: COMTRADE

Though export of Games and toys has grown more over the last decade, it also suffered more from the economic recession of 2008-2009. Trade growth flattened in 2008 and slumped in 2009, when the banking crisis hit the EU and turned into a global economic recession.

Figure 7. Extra-EU exports in toys and games by destination ($US million)



Source: COMTRADE

The US Market

The US Government has also regulated lead content for toys. The behavior of US imports of Art and Crafts products can be used as example for the possible effects of the EU regulation on imports from third countries.

The US is the most important market for EU export. Although experiencing a slight decrease in relative terms, the US market still accounts for 22% of EU exports of Art and Crafts materials. In absolute value the exports between 2002 and 2010 remained constant.

Over the period 2002-2010, US imports have grown by 47%. However, the share of EU export in the US market has been reduced by 6%-points, reaching 12% in 2010. On the other hand, China has increased its total exports of writing materials by almost US$ 100 million, reaching a market share of 50% in 2010.

Tightening of regulation on lead migration does not necessarily imply a decline in an ongoing trend of offshoring and competition from low-cost suppliers.

3.3.4 Main suppliers to the EU market

In the period of 2002 and 2010, EU imports of Art and Crafts products and Games and toys have grown at a Compound Annual Growth Rate (CAGR) of 9% and 10%, respectively. The level of imports in 2010 was US$ 256 million for Art and Crafts and US$ 10,498 million for Games and toys.

China is the most important supplier of EU imports in both industries. In 2010, China supplied more than 75% of EU imports in Art and Crafts and 81% for Games and toys.

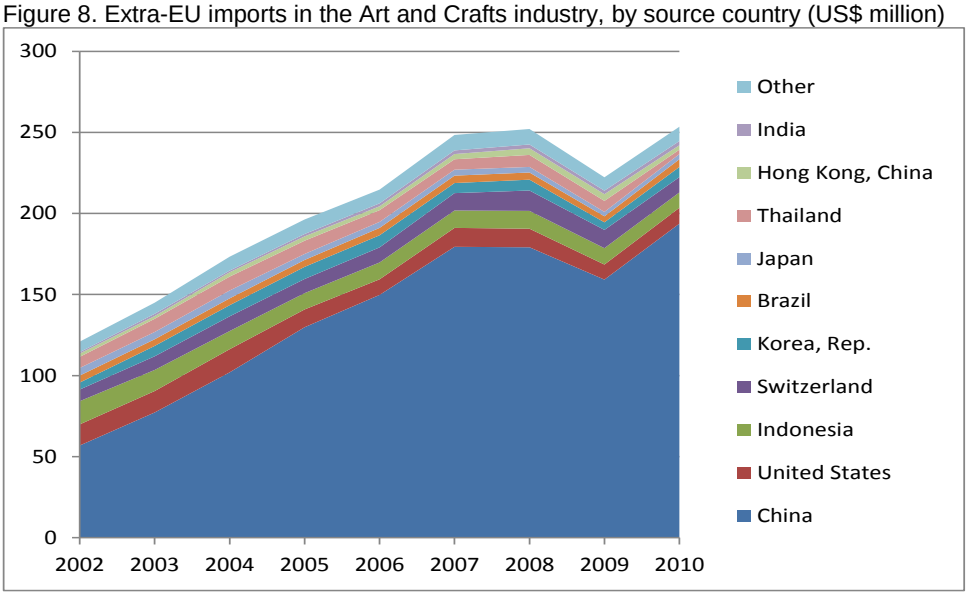
Table 13. Share in extra-EU imports in Art and Crafts, by main source country

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010
China	43.6%	49.9%	55.9%	63.2%	68.5%	70.8%	70.0%	70.8%	75.8%
US	10.0%	8.5%	7.8%	5.3%	4.4%	4.6%	4.5%	4.1%	3.8%
Indonesia	11.0%	8.4%	6.1%	4.9%	4.8%	4.2%	4.3%	4.5%	3.7%
Switzerland	5.5%	5.4%	5.0%	4.3%	4.3%	4.2%	4.9%	5.0%	3.7%
S. Korea	3.3%	4.1%	3.8%	3.6%	3.4%	2.5%	2.6%	2.1%	2.5%

Source: COMTRADE

The main development in extra-EU imports over the last decade has been the rapid expansion of China's leading position. The position of China in EU imports of Art and Crafts products is now comparable to the position in the Games and toys sector.

Figure 8. Extra-EU imports in the Art and Crafts industry, by source country (US$ million)



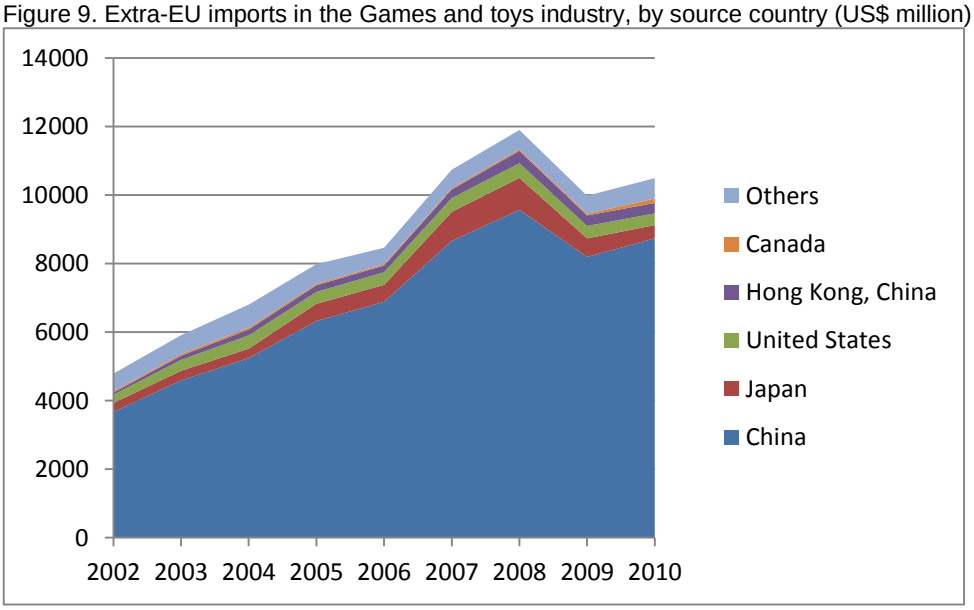
Source: COMTRADE

Table 14. Share in extra-EU import of Games and toys, by main source country

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010
China	75.4%	76.5%	75.7%	77.8%	80.3%	79.4%	79.1%	80.7%	81.7%
Japan	5.4%	4.7%	4.0%	6.2%	5.8%	7.8%	7.7%	5.3%	3.6%
US	4.9%	5.3%	5.6%	4.3%	4.3%	3.7%	3.6%	3.6%	3.2%
Hong Kong	1.3%	2.0%	2.5%	2.4%	2.3%	2.3%	3.0%	3.0%	2.8%

Source: COMTRADE

Figure 9. Extra-EU imports in the Games and toys industry, by source country (US$ million)

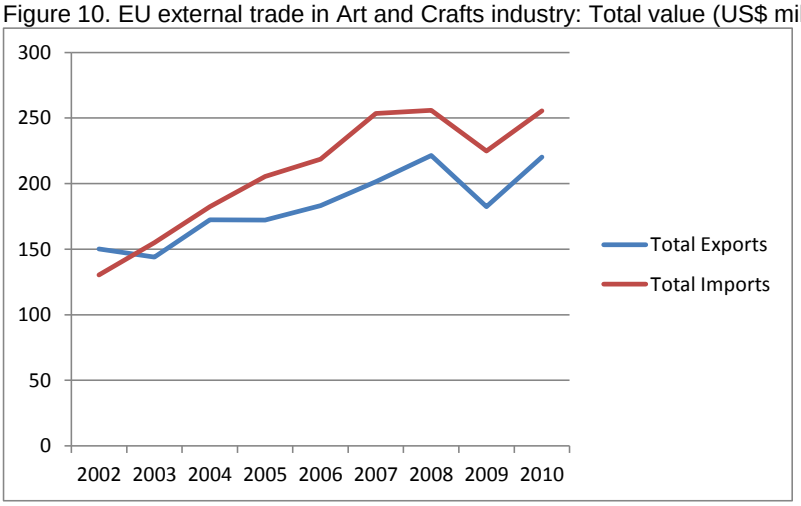


Source: COMTRADE

Chinese imports have become more and more important for EU consumption in the affected industry. Taking intra-EU trade as the benchmark, Chinese imports represent half of the EU internal trade in Art and Crafts materials and 83% for Games and toys.

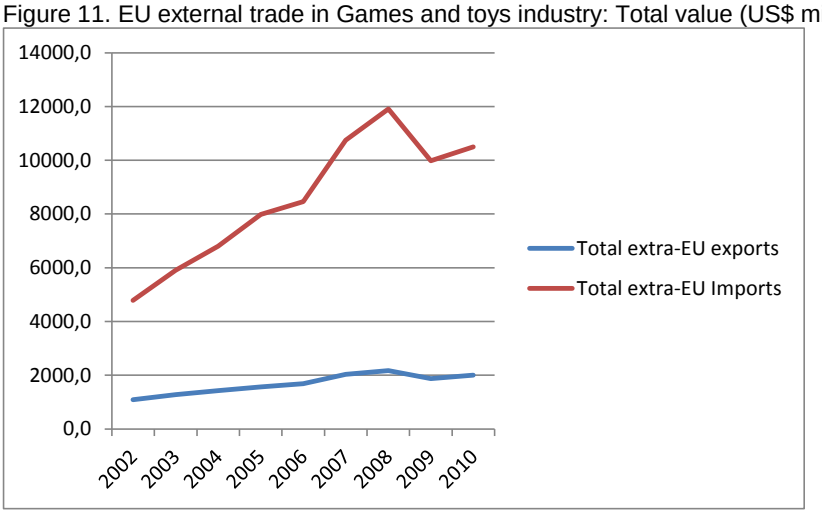
The evolution of Chinese exports into the EU has contributed to the deterioration of the trade balance between the EU and the rest of the world in the affected industry. Imports are larger than exports and the overall trade deficit has increased during the period. The trade deficit in Art and Crafts materials is much smaller than for Games and toys; see Figure 10 and Figure 11 below. This further substantiates our findings for the EU market based on Prodcom data in Section 3.2.

Figure 10. EU external trade in Art and Crafts industry: Total value (US$ million)



Source: COMTRADE

Figure 11. EU external trade in Games and toys industry: Total value (US$ million)



Source: COMTRADE

Table 15. Extra-EU trade in the affected industry: an overview

	Art and Crafts industry				Games and toys industry			
Year	EU Exports	EU Imports	Growth rate EU Exports	Growth rate EU Imports	EU Exports	EU Imports	Growth rate EU Exports	Growth rate EU Imports
2002	150	130	.	.	1,089	4,787	.	.
2003	144	155	-4%	19%	1,273	5,909	17%	23%
2004	172	182	20%	18%	1,425	6,801	12%	15%
2005	172	206	0%	13%	1,565	7,981	10%	17%
2006	183	219	6%	6%	1,681	8,461	7%	6%
2007	202	253	10%	16%	2,030	10,743	21%	27%
2008	221	256	10%	1%	2,171	11,905	7%	11%
2009	183	225	-18%	-12%	1,873	9,986	-14%	-16%
2010	220	256	21%	14%	2,006	10,498	7%	5%
CAGR	4.9%	8.85%			7.95%	10.35%		

Source: COMTRADE

3.4 Unit values

The evolution of unit values is an important indicator of the competitiveness of the industry. Yet countries may export the same products with different qualities and therefore aim at different market segments. Trade statistics report an aggregate combination of different tariff lines at the 6-digit level. Within these aggregates, products with different qualities are included under the same definition. In addition, as trade is measured in current dollars an increase in unit value also reflects the effects of inflation and movement of exchange rates against the dollar.

The analysis of unit values was done for Art and Crafts products. In the case of toys and games the values in quantities were reported unevenly in different units i.e. Kg, items and NQ for different countries. In the case of Art and Crafts products, the majority of the information on quantities exported by countries was reported in Kg, such that a comparison is possible.

Table 16. Average unit value (US$/Kg), for Art and Crafts materials

Trade/Kg	2002	2003	2004	2005	2006	2007	2008	2009	2010
Global average	3.8	3.6	3.7	3.6	3.8	4.0	4.4	4.3	4.0
Brazil	6.9	6.7	6.8	6.8	6.9	7.0	7.4	7.6	7.6
China	1.8	1.8	2.0	2.1	2.3	2.4	2.8	2.9	2.9
EU	6.2	7.1	7.4	8.2	8.2	9.3	10.4	9.9	9.6
Hong Kong	2.4	2.1	2.1	2.8	2.5	2.7	6.8	4.2	1.3
Japan	27.8	30.5	32.1	21.6	29.6	33.4	35.0	35.1	38.6
Korea	5.5	4.8	4.8	5.2	5.2	5.4	5.5	5.5	5.5
Switzerland	14.4	17.3	19.8	20.7	21.7	23.8	26.7	28.9	29.3
Thailand	2.8	2.9	3.0	3.3	3.3	3.5	3.8	4.1	3.9
US	6.6	7.0	7.6	5.1	7.2	7.5	9.0	8.4	7.9

Source: COMTRADE. Note: Trade value for all countries is calculated excluding intra-EU trade. In addition, trade values and quantities are calculated as exports for each country to the rest of the world.

Unit values are much higher in Japan compared with the EU, the US and China. In this regard, Japan and Switzerland clearly appear to be specializing in high-end Art and Crafts products. The EU and the US maintain a similar trend in relation to unit values, which are above the world average. The world average is highly influenced by Chinese exports, which have the lowest unit value. This low unit value has helped Chinese producers to enter into foreign markets and rapidly increase the share of world exports, but may also indicate relative specialization in lower end product niches.

3.5 Revealed Comparative Advantage

The definition of RCA is the following:

'The RCA index of country i for product j is measured by the product's share in the country's exports in relation to its share in world trade:

$RCA_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt})$

Where x_{ij} and x_{wj} are the values of country i's exports of product j and world exports of product j and where X_{it} and X_{wt} refer to the country's total exports and world total exports. A value of less than unity implies that the country has a revealed comparative disadvantage in the product. Similarly, if the index exceeds unity, the country is said to have a revealed comparative advantage in the product' (WITS, 2011)

The average RCA index score for the Art and Crafts industry exceeds the threshold value of one for the whole period, indicating that the EU has a revealed comparative advantage in exporting these products. This implies that the EU has maintained a healthy competitive position on the global market throughout the period considered.

In addition, as we previously discussed, the EU unit values of writing materials are higher than the world average. The combination of these two factors highlights the ability of EU producers of Art and Crafts products to produce relatively high value-added products while maintaining its share of world exports.

Table 17. Revealed Comparative Advantage in the affected industry

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colours, in sets	1.09	0.89	0.88	0.82	0.95	1.03	0.97	0.68	0.83
Colours, not in sets	1.99	1.61	1.92	1.91	1.95	1.78	1.99	1.85	1.97
Pencils and crayons	0.93	0.88	0.84	0.83	0.94	0.85	0.90	0.78	0.85
Pencil leads	1.22	1.36	1.31	1.43	1.45	1.64	1.81	1.56	1.57
Pastels, chalks	1.29	1.21	1.11	0.96	0.97	0.93	0.93	0.78	0.79
Art and Crafts average	1.30	1.19	1.21	1.19	1.25	1.24	1.32	1.13	1.20
Games and toys	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.7

Note: RCA is based on EU external trade, i.e. counting the EU as a whole against the rest of the world to avoid double counting internal trade. The RCA values for Art and Crafts and Games and toys are computed as a simple arithmetic average of individual product scores. Source: UN COMTRADE

The RCA for Games and toys shows a different trend. The RCA index score for the Games and toys sector is lower than unity during the analysed period, indicating that the EU has a revealed comparative disadvantage in the production (trade) of toys. However, the RCA shows a positive trend with improvements in competitiveness, reflected in the relatively high growth in EU exports.

China has a dominant position in the international trade of toys and Art and Crafts products. The RCA for China in both industries reflects this position. China has a strong revealed comparative advantage in these sectors.

Table 18. EU and China Revealed Comparative Advantage in the affected industry

	Art and Crafts		Games and toys	
	EU RCA	China RCA	EU RCA	China RCA
2002	1.3	3.0	0.5	3.8
2003	1.19	2.8	0.5	3.5
2004	1.21	2.8	0.5	3.3
2005	1.19	2.9	0.6	3.3
2006	1.25	2.8	0.6	3.3
2007	1.24	2.6	0.7	2.5
2008	1.32	2.5	0.7	2.6
2009	1.13	2.7	0.7	2.5
2010	1.2	2.9	0.7	2.5

Source: UN COMTRADE

3.6 Intra-EU trade versus extra-EU trade

In this section, we compare the value of the EU internal trade (i.e., trade between EU MS) and EU exports to the rest of the world. The regulation under consideration will affect the technical requirements for the EU market. Therefore EU and non-EU producers will have to conform to the new standards.

Intra-EU trade is significantly higher and increasing over time compared to EU external trade in the Art and Crafts industry. Intra-EU trade approached a value of US$ 360 million (and was close to US$ 400 million in 2008), while EU external exports was approximately US$ 220 million.

The importance of the EU internal market has been growing over time. Intra-EU trade has grown by 77% while EU exports to third countries have increased by 47%. In 2010, the difference between the internal market and what EU companies export to non-EU countries is close to US$ 140 million and the EU internal market represented more than 60% of total trade by EU MS in the Art and

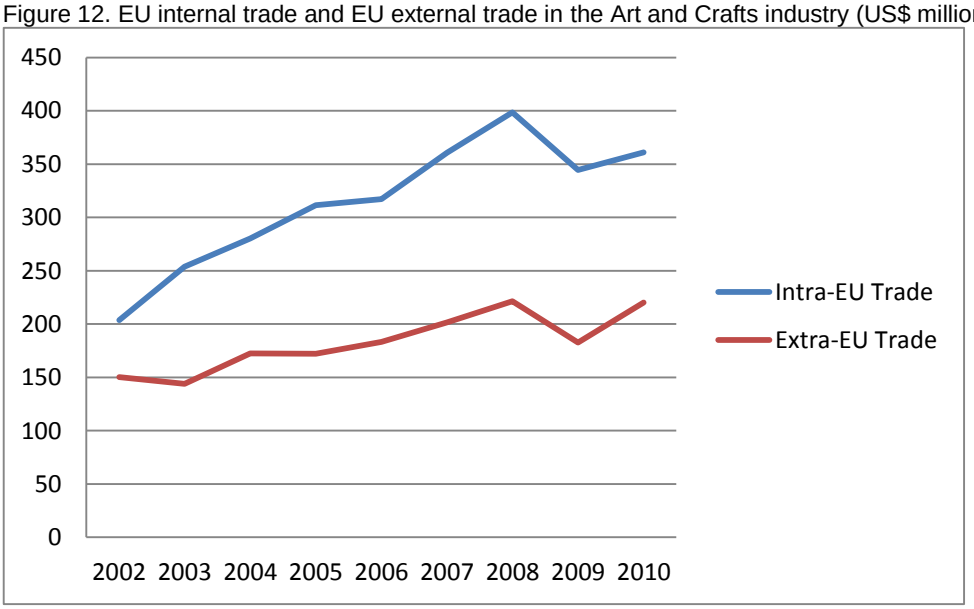
Crafts industry. The European market is 1.6 times bigger than EU exports to non-EU countries. Thus, the regulation will directly affect the majority of EU total production.

Table 19. Intra-EU Exports and extra-EU Exports in Art and Crafts (US$ million)

Year	Intra-EU Trade	Extra-EU Trade	Difference	Total Trade	Share of internal market
2002	204	150	54	354	58%
2003	254	144	110	398	64%
2004	280	172	108	453	62%
2005	312	172	139	484	64%
2006	317	183	134	501	63%
2007	361	202	159	562	64%
2008	398	221	177	620	64%
2009	344	183	162	527	65%
2010	361	220	141	581	62%

Source: UN COMTRADE

Figure 12. EU internal trade and EU external trade in the Art and Crafts industry (US$ million)



Source: UN COMTRADE

EU internal trade does not include the EU production of goods and services that is consumed and produced within the same country. Therefore, the figure above shows the increasing relevance of the EU internal market for EU producers, compared to their domestic markets and the global market.

Internal EU export is about 60% higher than export to third countries. Combined with the domestic trade in each EU MS, this implies that the new regulation will directly affect the vast majority of the market outlet for EU producers. It is therefore very likely that producers will need to adapt all their production processes to meet new standards, due to economies of scale in production and the fixed nature of many of the compliance costs (i.e., analytical and developmental costs).

Chinese exports into the EU represent half of intra-EU trade by European producers. From the trade data alone, it is not possible to identify the extent to which the rise of extra-EU imports reflects the entry of (for example) Chinese “own design” products into the EU market or is a reflection of the relocation of manufacturing activities of EU producers to China and other low cost Asian production

location. In case of offshoring, some “European” value added is still incorporated in each Chinese export to the European market. For example, profit income may still end up in the EU.

As Chinese exports have lower unit value, fixed costs associated to higher standards may affect costs and relative prices of Chinese products more than for EU products. This may imply that regulation could increase competitiveness of EU producers versus low-cost locations.

The EU has an above average unit value and a comparative advantage in Art and Crafts products. The combination of these two factors highlights the positive performance of the industry in terms of international competitiveness.

4 Assessment of the policy options

The assessment of the policy options is based on primary information from the public survey consultation among firms, interviews with industry associations, combined with secondary data from publicly available data sources.[15]

A qualitative assessment will be presented, followed by a tentative quantitative assessment of impacts where possible.

4.1 Qualitative assessment

4.1.1 The baseline

The **baseline situation for the industry** is the regulatory **situation in force before TSD 2009** is implemented and enforced. The industry description and supplementary evidence from interviews shows that the Games and Toys sector and the Art and Crafts toy industry have **average performance** in labour productivity; the **prevalence of SMEs** may be higher than average for some segments of the toy sector, especially **Art and Craft** writing and drawing toys (pencils, crayons, pastels, chalks).

International **competitiveness of EU industry is better for Art and Craft toys**, in terms of serving the EU market and exporting to third countries. However, also for **Games and toys** international competitiveness shows **improvement over recent years**. The main source of **competition** on the EU market is in the relatively cheap toys segment, from industrializing Asia and particularly **China**.

The industry does not invest less in **R&D and innovation** than other sectors in the economy. Innovativeness is re-enforced by competition of other OECD countries in high-end product quality and design, and by low prices from emerging imports into the EU. Therefore, the industry is capable and used to adapt to changing circumstances, also in the regulatory context. The performance of SME firms in this sector is remarkable, also in this light. Despite competition from abroad, offshoring and economies of scale, **SMEs continue to play a role** in providing high-quality products to the EU toy market. Local market orientation and specialization imply that SME **may be more vulnerable** to competition and product regulation, though.

4.1.2 Impact of a revision of lead migration limits in TSD

Against this context, the **introduction of TSD 2009** in production processes seems to have **started already**, also concerning migration limits of chemical elements including lead. As indicated by the survey, costs of compliance have increased. This has led to an increase in total production costs. The **cost** appears **higher for the Art and Crafts toys** than for Other toys (see Table 20).

Table 20. Average and extreme values for cost increase of regulation.

	TSD 2009	Further tightening
Average cost increase (%)[1]		
Art and Crafts toys	32	32
Games and toys	9	11

[15] The questionnaire used in the interviews with EWIMA and TIE and a summary of the answers provided is presented in Annex III.

	TSD 2009	Further tightening
Minimum cost increase (%)[1]		
Art and Crafts toys	15	10
Games and toys	5	5
Maximum cost increase (%)		
Art and Crafts toys	80	100
Games and toys	20	25

Notes: Figures based on the survey response (*N*=36) available at the time of study. [1]: Values reflect those firms that report a cost increase. For instance, if one counts the firms that report that costs do not increase, the minimum value would be zero.

Further tightening stands to cause **further cost increase**, both for Art and Crafts toys and for Other toys. The impact on costs for **small firms** is somewhat **higher** than for medium and large firms, both for TSD 2009 and for further tightening. However, there **may be more at stake for Art and Crafts toys**. Due to the high reliance on natural materials in writing, painting, modelling and drawing toys (according to EWIMA, sometimes up to 80% of the toy content), migration limits are more difficult to meet. The raw materials involved also determine many of the product's technical or functional qualities.

Three **types of costs are important**, according to the EC survey and EWIMA statements on behalf of their members:

- **Raw material** costs: search for higher quality raw materials (in terms of lead content by average level and stability). As limits get tighter under TSD 2009, the scope of raw material that is of sufficient natural quality shrinks. These more rare materials are more expensive as well;
- **Analytical costs**: quality control procedures for the production process and final product, involving the testing of raw materials and ultimately the toy material itself. Testing can be done in house or externally. Such testing faces various difficulties and becomes complex and more costly as lead limits are reduced. First, higher quality raw material does not necessarily ensure lower migration limits in toy material. This increases risk of non-compliance even for high quality ingredients. Second, migration limits for other chemical elements must be met as well. Some raw material sources that contain less lead appear to be more contaminated by other chemical elements.
- **Developmental costs**: development of toys that can meet the limits and retain their technical function. Reformulation of products by use of substitute materials, such as artificial pigments, may impair the quality of use of the product.

Some of these costs, such as search costs for suitable raw materials, are mostly one-time adaptation costs. Other costs, such as more expensive raw materials and more complex testing, are recurrent costs. Even training costs to adapt to more complex testing procedures and costs for new equipment will be recurrent, as human and physical capital need to be replaced over time. While testing costs are fixed production costs per product in the toy catalogue, they are recurrent over time for quality control and monitoring reasons. Material costs are variable costs of production.

Throughout the qualitative and quantitative assessment of impacts, we will assume that the evidence on production costs impacts (based on the survey response available at the time of analysis) refers to recurrent unit costs of production. Fixed and variable costs have to be recovered from turnover revenue. The prevalence of search costs for suitable raw materials implies that short run costs may exceed long term costs. Stakeholder interviews (see Annex III) indicate that most of the search has already been done to meet the upcoming TSD 2009 limits (and is reflected in the cost impact of Option 0). On the other hand, search for suitable raw materials will continue to be

part of product development (and hence recur over time rather than be purely one-time, though less intense perhaps).

The **Art and Crafts industry** has indicated to be able to **comply with TSD 2009** by investing in raw materials and product quality (e.g., see the interview report in Annex III). Within the scope of available natural raw materials and reformulation of products, some further steps can be made without compromising product quality (in terms of colour range, and accuracy in use).

According to EWIMA and some producers, **further tightening** as proposed in **Option 1** may reach the technical limits of substituting artificial materials and natural qualities of some raw materials (notably natural pigments and kaolin).[16] Substitutes such as synthetic oxide pigments, refined clays, polymers, high quality glass powder and high quality organic pigments are mentioned; some of these materials, however, may contain other heavy metals or dioxines in higher levels. Together with possibly more adverse functional characteristics, this can put the **ability to market Art and Crafts materials as toys** or the **functional quality** of the products **at risk**. This is why the EC considers partial **exemption**, as indicated in **Option 2**. Moreover, EWIMA proposes an intermediate option, by tightening the limits **selectively and less rigorously** than proposed in Option 1 (see Section 1.1). This would lead to **Option 3**, which producers can still meet without impairing functioning of the toys and would allow marketing of products as toys. According to EWIMA, the limits proposed in Option 3 reflect standards that the industry can more readily meet. In particular, limits for liquid or sticky toys are not tightened beyond TSD 2009 and limits for dry and brittle toys are set roughly halfway between TSD 2009 and the level proposed by the EC. This reflects the industry opinion that for these categories of toys, further tightening leads to problems with available raw materials and functional performance. For scraped-off toy material, the limits proposed by the industry are almost at the level proposed by the EC; toys face less difficulty to meet limits for this source of migration.

Confronted with Option 1, firms in the Art and Crafts industry report that they see three major **threats to their competitive position** of further tightening beyond TSD 2009:

- Increase in production costs;
- Reduction in the product range in the toys segment. Difficulty to continue to market products as toys includes the possible de-facto banning of some product from the toys catalogue;
- Poorer quality or performance of some toys (e.g., range of colours; abrasion characteristics).

Product innovation is essential for the EU Art and Crafts industry, which operates in the high end of product quality and attaches high value to the reputation and quality of its products, according to the industry associations interviewed (see Annex III). Migration limits regulation directly affects the capacity to innovate for the industry. The progressive development of lead migration limits implies that reformulation and new product and process development are needed to comply with regulation and maintain successful products in the Art and Crafts toys segment. However, as indicated by EWIMA, the impact on developmental costs and analytical costs of TSD 2009 and further tightening is substantial. As long as limits can be met, new products will face higher analytical costs due to more sophisticated testing needs. Reformulation of products will be needed to meet the limits while maintaining good performance. This implies higher developmental costs for Art and Crafts toys. Furthermore, higher testing and reformulation costs for the existing product range put pressure on budgets for new product development. While the need for innovation increases, the capacity to innovate (in terms of the costs of research and development involved) is put under pressure.

[16] Based on statements during the interview with stakeholder associations (see Annex III) and response to the survey consultation.

On the upside, higher health and safety standards offer **opportunities for marketing** Art and Crafts toys by referring to enhanced safety for small children (combined with their educative role). This could also be an asset on the global market, where consumer safety regulation is often less strict. Although evidence related to toy safety is not available, evidence for ecolabelling suggests that US consumers may be willing to pay 10% higher prices for ecolabelled wood products; European consumers (UK and Norway) appear willing to pay a price premium as well, although it appeared smaller (about 1-2%).[17] A more recent study finds evidence that the price premium that consumers are willing to pay has increased in these European countries to between 2-16%.[18] In terms of demand, ecolabelled wooden cutting boards were chosen by a majority of consumers in a stated preference study for Denmark, over non-labelled boards (Ladenburg, 2010, p. 11). Providing information on the conditions in the labelling scheme may help to increase this share (Ladenburg, 2010, p.11). The translation of stated preference evidence to actual purchase behaviour is not one-to-one, though. The Eurobarometer survey of 2008 shows that while 75% of consumers are willing to pay a bit more for environmentally labelled products, only 17% have recently bought such a labelled product (as referred to in Brécard et al., 2009). The market share of labelled products is rising, but remains relatively small (often about 1% at most, see UNEP, 2005). Labelling or marketing that focuses on the advantages to health safety thus can help increase tolerance for a cost induced increase in prices, and limit the decline in demand.

Product and process **innovation triggered by TSD** revision may provide EU industry with an **early mover advantage** on global markets. It is in the line of expectations that regulation in the US and other OECD countries will follow, as the focus on consumer safety aspects over employment and production costs may tend to increase with income levels.

Many **competitiveness effects** depend on the extent to which **non-EU producers** will decide to **change their production process** and products to meet EU regulation. The share of the EU market in their supply is smaller than for EU producers, so they may decide to focus on the non-EU market and/or not adapt processes in all of their factories. The same may hold for EU based firms that are engaged in offshore production. If export to third countries is important in turnover, firms may decide not to adjust all of their production or production facilities. Their focus may shift away from the EU market. This decreases competition on the EU market, but may increase competition on third country markets with lower standards. However, it is unlikely for EU based firms at least to move away from EU sales markets. Due to economies of scale and the use of different raw material specifications, maintaining different production processes would be costly. Production would not be at the most efficient scale level, and the use of different raw material specifications implies more logistics costs and higher input prices. For EU producers, it would only be realistic if they produce at different facilities and have substantial sales outside of the EU, such that some facilities can be retained to produce efficiently for the non-EU market. For the largest producers, spreading production across multiple facilities keeps supply lines short and spreads sales risks. However, it is likely that regulation in the US and other OECD countries will follow the trend of tightening of norms witnessed in the EU. Investing in different production lines would be less effective over time in such a scenario.

Higher compliance costs may provide further **incentives for offshoring** production, in order to **save on labour costs** and keep price increases in check. **However**, because of increased need for quality control and **complexity of product testing**, offshoring production to extra-EU locations may become more costly. According to the industry associations interviewed (see Annex III), further

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17 The results from Vlosky et al. (1999); Ozanne and Vlosky (2003), and Aguilar and Vlosky (2007) for the US and Veisten (2002) for Norway and the UK, as referred to in Ladenburg (2010, p. 3).

18 Veisten (2007), as referred to in Ladenburg (2010).

tightening does not provide an explicit incentive to offshore production, because all firms that want to sell toys on the EU market have to comply with the regulation. The trade-off between various cost elements that is driving location choice will not change substantially. So far, production in the EU concentrates mostly in core economies, which may be related to high **SME prevalence** in some segments combined with testing infrastructure. As the share of intra-EU trade has recently increased relative to extra-EU exports, the focus on the EU market implies that production processes will probably need to be adapted across the board to meet EU standards.

The **costs of complying** with revised lead migration limits are **higher for SME** Art and Crafts firms. Particularly for small firms, more complex testing procedures and more costly search for suitable raw materials, combined with a smaller range and scale of product lines, increase unit costs more. This is also confirmed by the consultation survey; the response available at the time of the analysis indicates that the impact on small firms is about 1.5 times the cost impact for large firms, on average, both for TSD 2009 and for further tightening according to Option 1. Furthermore, SME firms are more focused on local markets, rather than exports to third countries. This may limit the marketing advantage of child safety to SMEs. Next to this, additional marketing and product development costs will put a bigger strain on SME resources, being fixed costs. **On the positive side**, SMEs stand to benefit more if TSD lowers competition on the EU market and loose less if competition increases on export markets.

Small firms are not less likely to **pass on a cost increase into prices**, according to the survey. This can reflect that they occupy a niche in a monopolistically competitive market. If this niche is mostly local, relatively sheltered from price competition, pass-on of costs is possible. Free entry and high competition may lead to zero profits in the long run. Costs then will be passed on into prices via the mechanism of entry and exit of firms. Prices would need to increase to reflect cost increases; demand would fall and fewer firms survive.

4.1.3 (In)direct effects in and outside the value chain

According to the information retrieved in the interviews of stakeholder organizations TIE and EWIMA (see Annex III), sectors upstream in the value chain are not affected much by TSD regulation. The toy industry is a small client to mining companies that provide the raw materials. They are not impacted by the change in regulation because they provide several qualities to large industrial clients across various sectors. Mining firms do not market their materials, such as kaolin and clay, specifically for toys producers. Producers of Art and Crafts materials choose a suitable material from the available product range as price takers. For similar reasons, changes in toys regulation also hardly affect the manufacturers of pigments and colorants.

Testing facilities will see an increase in demand from manufacturers of toy products as a result of the changes in regulation. Toy producers will need to test different qualities of raw materials and intermediates to assess whether they meet the set of requirements on chemical elements, including lead. Testing facilities face problems to assess materials against the proposed migration limits. They need more sophisticated equipment to reach the required accuracy and reliability, particularly for liquid toys such as paints). Because many testing laboratories would need to make additional investments specifically for analysis of toys, the number of facilities that will continue to offer services to toy producers will decline, and the price level of external testing will increase.

Downstream in the value chain, wholesale and retail providers are not likely to be very much affected. Apart from small and specialized retail shops that specialize in Art and Crafts materials, retailers offer a wide spectrum of toy and art and crafts products. Consumers are likely to shift their expenditure to other toys and games, at least partly.

Outside the value chain, some substitution of expenditure will take place. Apart from substitution effects, a price increase also leads to an income effect, a loss in purchasing power and productivity. Depending on the flexibility and functioning of markets for products and labour, and the substitutability of production factors between sectors, part of the loss in employment will be compensated by increased demand for labour in other sectors. This will reflect substitution in expenditure and a fall in wages to restore equilibrium across markets. Particularly in the current economic situation, labour markets are characterized by involuntary unemployment. Therefore, a loss of jobs in the toy industry would not be fully compensated by new jobs elsewhere.

The valuation of the loss of production and employment in the toy industry has to take into account that part of the direct effect on production and employment will be compensated by substitution. The direct "cost" in terms of production value lost in the toy industry faces an indirect "opportunity benefit": the value of production generated by employing the production factors released by the toy industry elsewhere. Valuation of opportunity costs and prices can be done using shadow prices (or accounting prices).

As most of the output movements (at least in the short run) will be caused by a shift in labour inputs, the shadow wage formula from the guidelines for cost-benefit analysis of the EC (2008, p. 216) can be used to derive "opportunity benefits". We can apply the so-called conversion factor to the value of production loss, for an estimate of the value that is compensated by additional employment in other (sub-)sectors of the economy.[19] The conversion factor would be equal to one if labour markets (and markets for other production factors and products) would be characterized by perfect competition and absence of frictions. All output loss would be compensated by output (and employment) gain in other sectors.[20] The conversion factor falls below the value one as the unemployment rate and labour income tax rises.[21] We can apply this conversion factor to estimate the value of production that will be shifted to other sectors rather than lost. This opportunity benefit reduces the actual costs of jobs and production lost in the affected toys segments; it is higher if unemployment is low.

Using an average 36% implicit tax rate on labour and 10% unemployment rate for the EU 27 (see Eurostat tables), the conversion factor would equal 0.58. This implies that only 42% of the production loss would not be compensated via substitution elsewhere in the economy. We have to keep in mind, though, that this calculation shortcut provides only an approximation for opportunity benefits (given data limitations), and does not take into account the loss caused by the income or productivity effects of the price increase. As the quantitative assessment below already reports ranges for the impact of the various policy options, this correction for substitution may be interpreted as falling within the reported range. Moreover, the focus of the analysis is on the impact

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19 Following EC (2008, p. 216), the shadow wage conversion factor (*CF*) equals: $CF = (1-u)\cdot(1-t)$, where *u* stands for the unemployment rate (between 0 and 1) and *t* stands for the rate of social security payments and relevant taxes. With an implicit tax rate on labour that hovers around 36% for the EU-27 and unemployment at about 10% in 2011 (see Eurostat), the conversion factor would currently equal about 0.58.

20 This would still leave the income or productivity effect of the change in regulation. The same amount of toys is produced using more inputs, or (in case of a de-facto ban) the consumer and producer surplus on the market are lost. To assess welfare effects using measures such as equivalent variation goes beyond the scope of this study, as it requires a full fledged cost-benefit analysis. The toys would also have different health safety characteristics, which could be seen as a welfare gain, or (in case of a de-facto ban) the health damage revealed by new scientific evidence should be subtracted from the total surplus that was realized on the market before the change in regulation.

21 The conversion factor is below the value of one because of involuntary unemployment. Part of job loss leads to involuntary unemployment, reducing the value of the best alternative (opportunity benefits). If all unemployment would be voluntary, the conversion factor would reflect the reservation wage, which equals the value of leisure (plus unemployment benefit). The marginal worker would be indifferent between being unemployed and accepting a job at the current net wage rate. The conversion factor would then only reflect the wedge between gross and net wage due to the rate of income taxes and social premiums.

on the directly affected industry. Still, we provide estimates that take these indirect effects explicitly into account in Section 4.2.3.

4.1.4 Policy assessment

In the baseline, the **Art and Crafts** segment appears to be rather robust and competitive, both on the EU market and on the global market. Therefore, it has **capacity to absorb product regulation** to improve consumer safety further. Such capacity, in terms of profit rates and resources to meet investments in compliance, has probably decreased during the economic recession of 2008-2009 and the sluggish economic recovery afterwards, though.

Given that successive tightening appears to meet limits in naturally contaminated raw materials that are important in the value chain, there is **concern about technical feasibility** of further tightening. In this light, **Option 1 has a downside risk** in causing a de-facto ban on certain art and crafts products in the toys market.

The EC has formulated an alternative option, Option 2, which exempts materials naturally contaminated by lead from the tighter limits. This would meet the concerns of the Art and Crafts industry concerning the costs and possibility to meet the limits proposed.

Some **problems** exist concerning the ability to **implement Option 2**. First, the testing of toy material for lead migration involves the final product. It could be **difficult to isolate** lead originating in exempted materials (such as Kaolin, certain natural pigments, clays) from other **sources of lead** (metal alloys, water) in certain toys. An alternative could be to **exempt final product lines** from the new migration limits. This could lead to **discriminatory effects**, as now the exemption is not directly linked to the production process (specifically, raw materials) anymore.

Though it is beyond the scope of the competitiveness proofing, Option 2 could also imply that most of the sources of lead migration via mouthing behaviour are excluded. Art and Crafts toys pose a higher risk than toys containing metal alloys, where scraped-off material is the main source of migration. The **cost of Option 2** relative to the baseline would be **comparable to Option 0** (no further tightening beyond TSD 2009), as the expected costs of further tightening for only the sector Games and Toys is expected to be relatively modest, but the **gains** in terms of consumer health **may be small as well**.

Option 3, an intermediate tightening of migration limits, as proposed by EWIMA, has the advantage that no part of the affected industry is exempted. Regulation, as does Option 1, still implies **differential impact** on the competitiveness of **Art and Crafts toys**, compared to Other toys. However, the difference is **likely to be smaller**. Migration **limits** for dry and brittle toy material are tightened and can still be **technically met** by the industry.

Though we will have a **closer look at the possible, tentative range for quantitative effects**, Option 3 is so far preferred over Option 2. If Option 1 would turn out to be too risky and would not be recommended as policy option, the EC can take into consideration that **migration limits** for **scraped-off material** proposed in Option 1 did not appear a major source of concern (interviews with EWIMA, TIE). Hence, the EC may decide to **stick to** the limits proposed in Option 1 for scraped-off material.

4.2 Quantitative assessment

We make use of the stakeholder survey outcomes, the interviews with industry associations TIE and EWIMA, and Eurostat data as inputs in a quantitative assessment of the impact of the policy options on production and employment in the affected industry. These inputs are in terms of:

- The cost increase of TSD 2009 and further tightening;
- The pass-on of cost increase into prices;
- The impact on competitive marketing of art and crafts toys;
- The share of the toys segment in the Art and Crafts industry;
- The share of exports to third countries;
- The differential impact on SMEs.

4.2.1 Overview of the baseline and key assumptions in the policy impact simulations

As discussed in Section 2, the baseline year is defined as 2007. The table below presents the baseline overview of the affected industry, based on SBS and Prodcom. The estimation procedure that we already followed in Section 3 to assess the size of the affected Art and Crafts industry for 2008 provides the baseline figures for the Art and Crafts materials industry.

The size of production and employment in the relevant industries differs somewhat compared to the overview for 2008 that we presented in Section 3. All impacts of policy options on production and employment are expressed in terms of changes to the situation in the baseline year 2007. Still, relative changes caused by a price increase apply to later years as well.

Table 21. Overview of the baseline for the affected industry

	Games and Toys:[1]	Art and crafts/ writing instruments:				
	Manufacture of games and toys	**Amusement colours (sets)**	**Amusement colours (exc. sets)**	**Pencils and crayons**	**Pencil leads**	**Pastels, drawing charcoals, chalks**
NACE rev 2	**3240**	**2030**	**2030**	**3299**	**3299**	**3299**
NACE rev 1.1	**3650**	**2430**	**2430**	**3663**	**3663**	**3663**
Prodcom 2010	**-**	**20.30.23.50**	**20.30.23.70**	**32.99.15.10**	**32.99.15.30**	**32.99.15.50**
Prodcom 2007	**-**	**24.30.23.50**	**24.30.23.70**	**36.63.24.10**	**36.63.24.30**	**36.63.24.50**
Production, 2007 (million euro)	6,641	123	165	117	10	28
Production share in NACE rev 1.1 2007	-	0.29%	0.39%	0.77%	0.06%	0.19%
Employment NACE rev 1.1 2007 ('000 persons employed)[2]	57	174		181		
Employment NACE rev 2, 2008 ('000 persons employed)	43	164		143		
Estimated employment, 2007 (jobs)[3]	57,100	511	685	1387	117	337
Estimated employment toy-segment (jobs)	57,100	256	342	693	59	168

Notes: All figures are for the year 2007, unless otherwise indicated. [1] For Manufacture of games and toys, production at EU-27 level is unavailable in SBS. Reported is the sum across all countries that report production; [2] We define employment as Persons employed; [3] Data for employment are not available at Prodcom code level. We assume equal labour productivity within each NACE class (4-digit level) to estimate employment. To estimate jobs related directly to the toys segment, we take a 50% share of toys in total production value (based on survey and interviews, as explained in Section 3.1). We use the term “job” instead of “employment” to underline that direct impacts assessed at this industry level do not translate directly into aggregate employment effects.

For the quantitative competitiveness proofing, we make use of a set of assumptions:

- The employment share in the relevant NACE class is proportional to the production share for each detailed toy category;
- Profit margins and the net operating rates derived from them are based on the total harmonized EU-27 IO table for 2007, at the level of 2-digit NACE rev. 1.1 divisions.
- We assume a rather competitive market, with downward sloping firm specific demand (e.g., monopolistic competition). Responsiveness of profit margins (cost-price pass on): partial pass-on in relative terms (profit rate falls) but full pass-on in absolute terms (profit per unit of output remains constant). This implies that we set the cost pass-on parameter η equal to -1;
- The cost increase for Other toys (Manufacture of Games and toys) requires an additional step, to reflect that not all toys in this sector are affected. For example, an increase in total production costs of 0.42% in the medium scenario for Option 1 (see below) is derived from:
  - The average cost increase reported in the survey for firms in Other toys segment (in total 21% for TSD 2009 and further tightening combined);
  - The share of those firms reporting a price increase (roughly 50%); and
  - The 4% share of constructional and metal toys in total available production value of toys and games for the EU-27 (assumed to be affected due to presence of metal alloys).[22]
- We assume that firms set the same producer's price on the domestic and international market. This is in line with economic models of imperfect competition and trade (e.g., Feenstra, 2005: chapter 5).
- To estimate the effect of an increase in price on demand, we make use of linear extrapolation using a value for demand elasticities for domestic (EU) and foreign (extra-EU) market demand. The elasticity of domestic market demand is set to -1, based on a comprehensive study by Seale and Regmi (2006).[23] This implies that people spend roughly the same amount of money on specific toys after a price increase.[24] For third-country export markets, though, we assume more sensitive demand due to greater substitutability between imported products in preferences of consumers. We assume a price elasticity of demand of -2 for exports.
- For very high cost increases, using simple extrapolation based on the elasticity of demand is not accurate. Using PRODCOM statistics on production value and price (unit value), and IO data on export shares, we estimate demand functions for domestic and export markets in order to compute percentage changes in demand.[25] We define constant-elasticity demand functions, using the values of price elasticities of market demand explained above,[26] For the EU market and the third country market, we use the elasticity values as indicated before and estimate the scale parameters based on data for 2007.
- Output effects are equal to total demand effects;

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[22] Estimate based on SBS figures for division 36.50 and Prodcom statistics for Construction sets and constructional toys (excluding of wood or plastics, scale model assembly kits) and Toy die-cast miniature models of metal (NACE rev. 1.1; Prodcom 2007, production annual sold).

[23] Estimates for price elasticities of demand for the products concerned are not explicitly available. From the study of Seale and Regmi, we make use of the category Other products, where market elasticities are in between -0.8 and -1.2; also Recreation may be comparable. A value of up to -1.2 would be reasonable for the EU as a whole in these products. However, we take the value of -1, which takes a middle ground. This reflects that demand may over time respond less, due to marketing efforts that can make use of improved health and safety aspects of toys following the stricter TSD. A larger elasticity would imply higher substitution in expenditure, but this would result in creation of more jobs elsewhere (where the money is spent instead), probably other toys. Overall effects on jobs in the toys industry would arguably not be much larger.

[24] Note that firm-specific demand may be much more responsive. The elasticity of demand faced by an individual firm may be anywhere between (but not including) -1 and -∞.

[25] We cannot consistently use PRODCOM export figures (based on COMEXT), as they are missing or at times exceeded production figures (either in quantity or value terms). The latter relates to data inconsistencies and to the role of re-exports. See Williams (2008) Europroms User Guide: PRODCOM data, at the website of Eurostat. Hence, we settled for the second-best solution to use 2-digit NACE export shares in the EU domestic harmonized IO table.

[26] The general equation for the constant price elasticity demand function is: $c = a \cdot p^{-\beta}$, where: *c* stands for demand volume; *p* is the price; *β* is the price elasticity of demand; and *a* is a scale parameter.

- Employment (in terms of jobs in the directly affected sectors) impacts of policy options are proportional to production impacts. This reflects the scope of the quantitative analysis: we focus at the impact on the directly affected industry, so effects in terms of jobs do not imply economy-wide employment effects.[27] As indicated in Section 4.1.3, the use of a shadow wage conversion factor would be a way to take economy wide substitution into account. As we develop different scenarios that result in a range for the possible impacts of the policy options, substitution effects can also be seen as captured in the reported range for quantitative impacts.

4.2.2 Scenario's for cost- and price competitiveness impacts

We construct a low, medium and high cost-impact scenario for the impact of each of the policy options identified in Section 1. The cost scenarios are based on a range from low to high responses in the survey to the question of the cost increase of TSD 2009 and further tightening (Option 1). Cost increases for Option 2 and Option 3 are not directly taken from the survey, but based on the specific elements in each of the options (e.g., exemption, or intermediate tightening of standards). All the other assumptions (listed above) remain constant across policy options and scenarios. We refer to Annex I for a detailed description of the scenarios and explanation at some of the assumptions for the quantitative assessment.

The cost increase is translated into a price increase based on our price setting equation (see Annex IV). In words, the equation defines how the percentage price change can be derived (as a weighted sum) from the unit cost change and the unit profit change. The weights are the shares of costs and profits (net operating rate) in the price.

The quantitative assessment does not distinguish between types of firms (small, medium, or large enterprise). The survey evidence available at the time of study indicates a higher average cost effect for small firms (ca. 30%), compared to medium-sized or large firms (ca. 20%) for both regulation changes. Small firms were also more likely to pass on the cost increase (also see Table 22). This implies that small firms tend to be more affected in terms of output and employment, based on self-reported evidence. This has to be kept in mind in the interpretation of the outcomes for the assessment.

Table 22. Percentage average cost impact and the extent of pass-on into prices.

	Large enterprise (more than 250 employees)	Medium sized enterprise (50-249 employees)	Small sized enterprise (10-49 employees)
Average cost increase (%)[1]			
TSD 2009	20	23	30
Further tightening	21	22	33
Pass-on of cost increase (% of respondents):			
Don't know	0	13	11
Fully	0	13	33
Not at all	38	63	22
Partly	63	13	33

Notes: Figures based on the survey response (*N*=36) available at the time of study. [1]: Values reflect those firms that report a cost increase.

[27] Social cost-benefit analysis, in a situation with perfectly competitive labour markets without search costs would only compare the impact on marginal costs of toy production (compliance costs) to the externality of toy production in terms of consumer health. Employment effects for the economy would be absent. If the increase in marginal private costs of toys production due to regulation matches the externality, social marginal costs equal private marginal costs and the regulation provides socially optimal private incentives to producers and consumers.

The table below shows the cost- and price impacts for each of the policy options under the three scenarios.

Table 23. Scenarios, policy options and the impact on cost- and price competitiveness.

		Percentage change in total production costs[1]			Percentage change in price [2]		
Art and Crafts	Amusement colours						
	Net operating rate: 10%						
	Scenario:	Low	Medium	High*	Low	Medium	High*
	Option 0: TSD 2009	5	24	80	5	22	72
	Option 1: Tighten	17	56	180	15	51	162
	Option 2: Partly exempt	5	24	80	5	22	72
	Option 3: Intermediate tightening	17	36	92	15	32	83
Art and Crafts	Pencils, crayons, chalks						
	Net operating rate: 8%						
	Scenario:	Low	Medium	High*	Low	Medium	High*
	Option 0: TSD 2009	5	24	80	5	22	74
	Option 1: Tighten	17	56	180	16	52	166
	Option 2: Partly exempt	5	24	80	5	22	74
	Option 3: Intermediate tightening	17	36	92	16	33	85

Notes: Cost and price increase are relative to the baseline (pre-TSD 2009). Net operating rates are used in the cost-price pass-on equation. The table does not include Manufacture of games and toys. Cost increase for affected products in this sector is set at 0% for the Low scenario's. In the medium scenario, it is 10% for TSD 2009 (Option 0), 21% for Option 1 and Option 2, and 15% for Option 3. Since only a small fraction of Other toys is affected, the average cost increase for the whole sector, used in our estimates, is much lower. The high scenario is constructed to be an upper boundary to cost effects in this sector, respectively: 20% (Option 0), 50%, 50% and 35%. Estimates of price changes were derived from the reported cost changes. They are based in part on assumptions on price pass-on and on aggregate available data on profit margins. Because of uncertainty surrounding assumptions and data limitations, the outcomes should be regarded as orders of magnitude and interpreted cautiously.

[1] Based on survey responses available at the time of the analysis and the scenario's based on them. Production costs defined to include intermediate consumption, labour costs and capital depreciation.

[2] Change in price computed from change in costs, assuming partial pass-on of cost increase into prices (based on survey responses). We assume partial pass-on such that profit per unit stays constant while the profit rate falls. Information on profit rate (net operating rate) from harmonised EU-27 input-output table published by Eurostat (for 2007).

* Option 1 includes the possibility of a complete or partial de-facto ban of Art and Crafts toys, as a variant to the high cost scenario presented here. Cost and price change are prohibitive in case of a de-facto ban of art and crafts toys affected by new lead migration limits. In fact, in the survey, one instance of a 500% cost increase was recorded; this has been interpreted as indicating a de-facto ban (otherwise, this value is considered as an outlier).

The cost increase of TSD 2009 ranges between 5%, a medium of 24%, and 80% for Art and Crafts toys. These values are used in the different scenarios analysed. A majority of respondent firms active in this industry reported a cost increase. Further tightening (Option 1) leads to cost increase in each scenario for almost all firms in the segment, on top of the effects of TSD 2009, ranging between an additional 12%, via 32% extra in the medium scenario, to 100%. Option 3 leads to an additional 12% on top of TSD 2009, by assumption. This is the low range value from the survey on Option 1.

Even for firms not involved in Art and Crafts toys, and not using raw materials containing lead in their own production process, almost half report a cost increase of TSD 2009 lead limits. This should mainly be related to metal alloy intermediate parts (interviews: EWIMA, TIE). The cost increase reported by individual firms in Games and toys on average equals 10%. Values between 0% and 20% are used in various scenarios for Option 0 (i.e., TSD 2009). The high values used are not so much representative of survey responses, but a way to deal with uncertainty about the affected segment in the Games and toys sector. Further tightening (Option 1 and Option 2) results in an additional cost increase that ranges between 0% in the low scenario, via 11% to 30% in the high scenario. Option 3 assumes intermediate cost increases, varying between an additional 0% (low scenario) to an extra 15% cost increase in the high scenario.

The impact on price competitiveness is computed for all policy options and scenario's, based on the assumption of partial cost pass-on. Net operating rates for the respective 2-digit NACE divisions are used for this purpose. Price increases for Art and Craft toys vary between 5% and 166%, depending on the product segment and the scenario analysed.

4.2.3 Quantitative competitiveness impacts: output and employment effects

The consequences of the three policy options for the low, medium, and high cost scenario are summarized in Table 24. Here, we show relative effects for production and employment in the toys segment of Art and Crafts materials and in the Games and toys sector. Table 25 provides a complete overview of the absolute production and employment effects estimated for the industry sub-sectors involved.[28]

We will briefly discuss the quantitative simulations for each of the three policy options in terms of production value and employment impacts. We present the modal (most likely) impact scenario and the worst case impact scenario for each policy option in Table 26. These impact scenarios are based on an assessment of the likelihood of the low, medium and high cost scenarios for the industry sub-sectors under each of the policy options and their respective impacts on production and employment. The assessment of likelihood reflects consultants' qualitative judgement.

It is likely that the policy would affect SME more than large, multiproduct firms. Risk appears to peek for small firms, according to cost estimates provided in the survey results (see Section 4.2.2).

[28] The absolute effects are presented in millions of euro and number of jobs. These figures are intended to present the order of magnitude for possible impacts. Particularly employment effects are surrounded by too much uncertainty to be taken as precise to the level of individual jobs. The results therefore have to be treated as orders of magnitude for comparison of policy options, and interpreted cautiously.

Table 24. Overview of impacts on toys segments of industry relative to baseline (in %)

Relative impact of policy options on EU toys production and jobs (%)					
Art and Crafts	Scenario:	Low	Medium	High	Ban
	Option 0: TSD 2009	-5	-20	-47	-
	Option 1: Tighten	-19	-38	-67	-100
	Option 2: Partly exempt	-5	-20	-47	-
	Option 3: Intermediate tightening	-5	-29	-51	-
Games & Toys	Scenario:	Low	Medium	High	Ban
	Option 0: TSD 2009	0	-0.1	-0.4	-
	Option 1: Tighten	0	-0.3	-1	-
	Option 2: Partly exempt	0	-0.3	-1	-
	Option 3: Intermediate tightening	0	-0.3	-0.7	-

Notes: The share of toys in the Art and Crafts materials industry is assumed to equal 50%, as explained in Section 3.1. Estimates of production and employment changes were derived from estimated price impacts and are based in part on assumptions on price sensitivity of demand and linear proportionality between production and employment. Because of uncertainty surrounding assumptions and data limitations, the outcomes should be regarded as orders of magnitude and interpreted cautiously.

TSD 2009 (Option 0)

The low scenario is most likely to reflect the impact of TSD 2009 (Option 0) on the Art and Crafts toys segment. For Games and toys, the medium scenario seems plausible for Option 0. If we consider the table below, this implies that some 12 million euro production value and 82 jobs are lost in the Art and Crafts industry, compared to the baseline. In total (including Games and toys), the estimated order of magnitude of the most likely impact on production and jobs of a loss in competitiveness on the domestic and global market becomes: **26 million euro** and **202 jobs** in EU production of toys. Given our assumptions, partly based on the EC survey of industry, the impact of TSD 2009 on both industries involved is comparable.

In the **worst case impact scenario**, the total impact could amount to **132 million euro** production value and **956 jobs** according to the simulation results presented here. The majority of this effect would be in the Art and Crafts industry, which carries a higher downside risk of the policy change. This scenario seems not very likely on the basis of only TSD 2009.

Further tightening (Option 1)

For the Art and Crafts industry, the impact most likely falls in between the low and medium scenario, as this would mean a decline in the toy segment of between 20%-40%. This is a substantial effect. This implies production loss of around 60 million euro and job displacement in the order of 410 jobs. The medium scenario remains most likely for the Games and toys sector. The estimated total impact would amount to **89 million euro** of production value and **662 jobs**. Further tightening as proposed in Option 1 would multiply the impact of TSD 2009 by more than a factor 3.

The **worst case impact scenario** would be a **de-facto ban** of some of the Art and Crafts toys. The industry points at the problem that natural materials cannot consistently meet the lead migration limits (at least not without violating some other regulation on chemical elements) and substitutes are not readily available (based on the survey and interviews).

The ban may lead to further loss of production up to a total displacement of Art and Crafts toys in the EU. If all toys production in the Art and Crafts industry is lost and the Games and toys sector also face their worst case scenario, this would imply a loss of in total **290 million euro** and **2112 jobs**.

Exemption of Art and Crafts toys (Option 2)

Option 2 implies that the Art and Crafts sector faces TSD 2009 and the remaining impact of further tightening only affects the Games and toys sector and will be similar to Option 1. This results in an impact on production and employment of **41 million euro** and about **331 jobs**, respectively.

The **worst case impact scenario** of Option 2 would imply a loss of **173 million euro** and **1308 jobs**.

Intermediate tightening (Option 3)

This option does not carry the risk of a de-facto ban, like Option 1. A scenario close to the low scenario appears likely for the **Art and Crafts industry**, as the option has been suggested by the industry itself. Production lost could be around **50 million euro** and jobs displaced would be in the order of **344 jobs**.

The medium scenario remains most likely for the Games and toys sector. Due to lower limits, losses to this sector would be somewhat smaller. The estimated total impact would amount to **71 million euro** of production value and **525 jobs**. The most likely impact of Option 3 amounts to about 80% of the modal impact scenario for Option 1. However, the worst case risks in Option 1 may be substantial, such that the expected impact of that option would exceed the modal impact more substantially.

In the **worst case scenario** based on the simulations, Option 3 could result in **160 million euro** production value and **1183 jobs** lost.

Table 25. Impact on competitiveness: output and employment effects of price changes due to lead migration limits

		Change in Production value (million euro)[1]				Change in Jobs (persons employed)[1]			
Art and Crafts	Baseline (pre-TSD 2009)	442				3,037			
	Scenario:	Low	Medium	High	Ban[2]	Low	Medium	High	Ban[2]
	Option 0: TSD 2009	-12	-46	-104	-	-82	-316	-715	-
	Option 1: Tighten	-41	-85	-148	-221	-282	-584	-1,017	-1,519
	Option 2: Partly exempt	-12	-46	-104	-	-82	-316	-715	-
	Option 3: Intermediate tightening[3]	-41	-63	-112	-	-282	-433	-770	-
Games & Toys	Baseline (pre-TSD 2009)	6,641				57,100			
	Scenario:	Low	Medium	High	Ban	Low	Medium	High	Ban
	Option 0: TSD 2009	0	-14	-28	-	0	-120	-241	-
	Option 1: Tighten	0	-29	-69	-	0	-249	-593	-
	Option 2: Partly exempt	0	-29	-69	-	0	-249	-593	-
	Option 3: Intermediate tightening[3]	0	-21	-48	-	-	-181	-413	-

Notes: Estimates of production and employment changes were derived from estimated price impacts and are based in part on assumptions on price sensitivity of demand and linear proportionality between production and employment. Because of uncertainty surrounding assumptions and data limitations, the outcomes should be regarded as orders of magnitude and interpreted cautiously.

[1] Values for the baseline show the level of production and employment for the Art and Crafts / Writing instruments industry, and for the Manufacture of games and toys. For the Art and Crafts industry, this includes activities in the toy segment and all other segments. The Art and Crafts industry is defined only to include the Prodcom codes that are affected by lead migration limits. [2] We assume a toys segment of 50% in production and employment in the Arts and Crafts / Writing instruments industry, as explained in Section 3.1. A ban would mean no products can be marketed as toys on the EU market. The simulation presented assumes that scale economies imply that no EU production for the toys segment will remain in this case. [3] For Art and Crafts toys, the cost change for Option 3, with intermediate new migration limits, are set equal to various TSD 2009 scenario's plus the low scenario of further tightening. For Games and Toys, we assume that the cost change ends up half way between Option 0 and Option 1.

Impact scenarios

To judge the policy options based on our quantitative estimates, the table below provides an overview of the modal and worst case impacts.

Table 26. Overview of quantitative impact of the policy options

	Modal impact scenario				Worst case impact scenario	
	Production (million €)	Jobs	Valuation of production (million €)[1]	Valuation of jobs (€ per job)[2]	Production (million €)	Jobs
Option 0: TSD 2009	-26	-202	-11	12,434	-132	-956
Option 1: Tighten	-89	-662	-37	12,987	-290	-2112
Option 2: Partly exempt	-41	-331	-17	11,966	-173	-1308
Option 3: Intermediate tightening	-71	-525	-30	13,064	-160	-1183

Notes: The worst case impact scenario of Option 1 includes a full ban of toys in the Art and Crafts industry. Estimates of production and employment changes were derived from estimated price impacts and are based in part on assumptions on price sensitivity of demand and linear proportionality between production and employment. Because of uncertainty surrounding assumptions and data limitations, the outcomes should be regarded as orders of magnitude and interpreted cautiously. [1]: Valuation of production uses the shadow wage factor (0.58) to estimate indirect effects via substitution of production to other sectors (see Section 4.1.3). Subtracting substitution gives the net loss to society (excluding the income effect involved). [2]: Valuation of jobs lost is an alternative to the net valuation of production loss. This figure is only based on wage costs and has been expressed as a value per job lost. The share of personnel costs in production (0.23) is used to compute wage costs. This share is approximately equal for the NACE classes 32.40 and 32.99 (source: Eurostat, for 2008).

Looking at the most likely (i.e., modal) impact scenarios, the estimates from policy simulations suggest that the **additional impact** of further tightening (**Option 1**) **exceeds** that of Option 0, which would only implement **TSD 2009**. Option 3, suggested by EWIMA, would lead to lower job displacement and output loss than Option 1. However, the alternative option communicated by the EC, **Option 2**, would perform substantially **better in terms of jobs and production value**. This option would exempt the Art and Crafts industry from further tightening.

Option 3 proposes intermediate tightening of lead migration limits, compared to TSD 2009 and the limits proposed in Option 1. The **main advantage** of this Option in terms of quantitative impact is the **prevention of the downside risk to the Art and Crafts industry**, of a de-facto ban of some of the toys from their product lines. A partial ban would be likely, according to the industry itself. Furthermore, Option 3 also slightly outperforms Option 2 (exemption of Art and Crafts) in terms of worst case scenario, as the limits imposed on the Games and toys sector are not as tight.

All in all, changing lead migration regulation compared to TSD 2009 will cause further economic costs in terms of loss in competitive position on the EU and global market. Higher prices lead to declining demand and output and a loss of jobs in the affected industry. Instead of using the direct effects in terms of production and employment, we can alternatively consider indirect substitution effects as well. Therefore, Table 26 includes two estimates for the net impact (in the modal scenario) of each policy option. First, the net output loss is estimated using the shadow wage

conversion factor, as explained in Section 4.1.3. Second, an estimate for the valuation of net job loss involved is provided. The substitution logic is the same, but not all economic costs are included (i.e., the production value not related to labour). However, this formulation stays more close to the original shadow wage approach. The wage rate is approximated by multiplication of production value and the share of personnel costs for the aggregate sectors involved. The valuation of employment impacts is presented in terms of economic loss per job that is displaced. The slight differences across policy options are within margins of uncertainty, and are caused by composition effects. The options have different impacts on the two sub-sectors, and these sectors have somewhat different labour intensities while a uniform cost share of labour is used in the calculations.

Option 1, which would be most stringent across the board in terms of regulation, does not appear to lead to much higher impacts than intermediate regulation in the most likely scenario. However, it leads to substantially higher economic costs than Option 0 and Option 2. Moreover, it suffers from a **downside risk** of a partial ban of toys in the **Art and Crafts industry**.

5 Conclusions and policy recommendations

This competitiveness proofing can only provide tentative insight into the economic costs and benefits related to the new regulation in as far as it relates to the directly affected industry. It is not a full-fledged socio-economic cost-benefit analysis. Moreover, significant data limitations arise at the high level of sector detail that the analysis needed to zoom into; the need for making assumptions to be able to use the data for the purpose of quantification of impacts further adds to the uncertainty. We have offered ranges of effects across different scenarios to take these uncertainties into account. However, we cannot precisely quantify the range of uncertainty around outcomes. This implies the estimated impacts have to be dealt with cautiously. They provide orders of magnitude at best, and allow tentative ranking of the different policy options. Based on the tentative competitiveness proofing analysis, combining qualitative and quantitative evidence, we can draw some conclusions from the analysis, and derive some recommendations regarding the various policy options that are proposed.

5.1 Conclusions

Compared to the baseline, tighter lead migration limits become effective in all policy options considered by the EC. As TSD 2009 is the minimum regulation change that will occur, the economic effects of this option have to be born.

In general, tighter regulation implies a loss of competitiveness of the directly affected industry. Higher costs of compliance (mostly raw materials, developmental and testing costs) lead to a loss of cost competitiveness.

Innovation is affected in two ways. The need to innovate increases, as regulatory compliance needs to go hand in hand with good product performance. The importance of product quality and reputation and the possibility to gain a lead position in product safety over extra-EU markets will increase the incentive to innovate. The capacity to innovate, however, is put under pressure for several reasons. First, the costs of testing and product reformulation and development will increase and budgets for innovation are under further pressure due to the rise in raw materials costs. Second, the possibility to satisfy migration limits for a range of chemical elements and maintain product performance may reach its limits for several types of Art and Crafts toys, according to industry stakeholders. Marketing such products as toys will become more difficult.

As the EU market is more important to EU producers, scale economies in production may imply all their production will need to be produced meeting the higher EU standards, resulting in loss of competitiveness on the extra-EU market.

Given the prevalence of SME in the sector, a rather competitive market structure is likely in most of the segments of the affected industry. Higher costs imply higher prices to maintain normal profitability. Both at the EU market and on global markets, demand will fall as a result, even though competitiveness relative to non-EU producers will not fall at the EU market. The loss of internal competitiveness is cost induced, while the loss of external competitiveness is both cost- and relative price induced. Consumers in third countries will buy fewer EU produced toys that are affected by the regulation, and will switch to foreign suppliers. Consumers in the EU market will switch to toys that are not affected or to other goods.

Analysis of current competitiveness reveals that the EU producers are in a good position on global markets, despite increasing competition from Chinese products mostly. The EU has revealed comparative advantage in Art and Crafts toys, and is improving its competitiveness in Other toys. The EU products appear to be concentrated in the higher product range, as shown by comparison of unit values. This range faces competition mainly from Japan and Switzerland in Art and Crafts materials. These may not all be toy products, though, but more related to professional and office supplies. Given the position on the world market, we assume a relatively low responsiveness of foreign demand to higher prices. Still the relative impact on foreign demand will be larger than for EU demand. In absolute terms, the internal EU market remains by far the largest market for EU Art and Crafts toys.

Lower internal and external competitiveness reduces EU production and employment in the affected industry. Variety on the market will also be reduced, as output loss will drive firms out of the market and some products may not be able to meet the limits. This is particularly relevant for tightening beyond TSD 2009.
Based on interviews and the EC survey consultation of the industry, there are no signs that further tightening of EU standards provides increased incentives to offshore production outside of the EU. The policy does not discriminate between EU and third-country suppliers, and the importance of the EU market as well as the need for more complex testing infrastructure further imply that EU limits must be met in any case.

Quantitative estimates show that the effects on output and jobs in the affected industry may be large. This particularly applies to the Art and Crafts industry, producing toys such as colour pencils, wax crayons, pastels, paint tablets, and drawing chalks. This sector is affected most in relative terms. A loss of jobs does not necessarily lead to unemployment. For example, substitution of expenditure within the toys sector may take place. If substitution in expenditure is strong, this will result in more substantial loss of existing production and jobs in traditional art and crafts toys.

The medium term impact on price competitiveness is likely larger than the near term effect. In the short run, producers may decide not to pass on costs in prices. The impact would then be limited to possible ban of part of the affected toys. Over time, prices will need to rise and restructuring of the industry will take place. As tightening of lead migration limits will probably involve a transition period beyond the scheduled implementation of TDS 2009 lead limits in 2013 before being implemented, adjustment and price pass on may follow shortly after implementation, or perhaps even partly before. In this case, the full impact on price competitiveness will materialize almost directly upon implementation.

Product marketing of safety and quality aspects of EU toys may help to limit the negative effects of price increases on demand in the long run, though. In this sense, regulation may improve innovation capacity in the sector over time and cause competitive advantages in the long run. Regulation can provide the industry with a head start in improving toy safety and the quality of production processes. The EU has kept its position in high-value toys among other reasons due to better testing facilities, both in-house (skilled labour) and in available external labs. Stronger emphasis on this aspect of production process quality may lead to a competitive edge. Initial problems with product quality due to shifting away from long-standing natural raw materials may turn into a leading position in analytics and product quality development.

The position of SMEs is least favourable, both in terms of the cost impact, profitability and concerning potential competitive gain in the long run. Especially small firms face higher self-reported cost of regulation. These firms will face more difficulty with analytical and product development costs that require up front fixed investments, as stated in interviews with two

stakeholder associations (see Annex III). Regulation may reduce product variety if SME is adversely affected, as these firms have more difficulty to adapt to worst case scenarios. However, larger firms may be more likely not to market affected toys in the EU as a result of the regulation, because they have more outside options.

The impact of the policy options on individual firms depends on the extent to which they depend on affected products in their product range as well. For the Art and Crafts materials producers, the share of affected toys in turnover may typically vary between 10-35% and is up to 70% for SMEs in Italy and Germany, two of the largest producers (based on product range according to the interview with EWIMA, see Annex III). Based on replies to the survey, the share in turnover of Art and Crafts materials may vary between 23-63% on average. We have assumed a share of 50% of affected toys in turnover for Arts and Crafts materials to reflect these figures in the quantification of impacts.

The extent of impact, for example relative to total production, thus varies substantially for individual firms, while the quantification presented in this report provides estimates for the impact at the level of sub-sectors. This also may affect how firms respond to the regulation, at least in the short run. If affected toys are only a small share of turnover, a firm may decide not to market toy products anymore instead of investing resources in compliance. The operational impact on these firms is limited. At the scale of the industry as a whole, though, these firms increase the overall impact, as they choose to cancel these toy products from the product range.

If toys represent a large share of production, the incentive to invest in compliance costs (part of which are recurrent, variable or fixed costs, part are more incidental, sunk search costs) increases. These firms are more at risk in terms of survival, though, in the high- and worst case scenarios described in the analysis.

If export to third countries is important in turnover, a firm may also decide not to adjust all of its production facilities. Although the survey shows that the importance of third country markets may vary between 5-95% of sales, the share of the internal and even local market in sales is high, especially for SMEs. As a typical example, about one third of sales would be domestic, one third to the rest of the EU, and one third to third countries.[29] Due to economies of scale, splitting production according to different specifications would be costly. Production would not be at the most efficient scale level, and the use of different raw material specifications implies more logistics costs and higher input prices. For EU producers, it would only be realistic if they produce at different facilities and have substantial sales outside of the EU. This option increases the capacity to deal with worst case scenarios (such as a de-facto ban for the EU market) for firms of larger size, and pinpoints the vulnerability of SMEs. In the long run, regulation outside the EU is likely to be tightened on the basis of scientific evidence on health effects as well. Investing in different production lines would be less effective over time in such a scenario.

5.2 Policy recommendations

To choose either of the policy options depends on careful consideration of health benefits as well. This is beyond the scope of this analysis. The competitiveness proofing leads to the following policy recommendations:

- **Option 0** is preferable if **economic costs** need to be **minimized**. TSD 2009 regulation in the EU will already lead to products standards ahead of most of the world. Innovative capacity is high in the sector and will be sufficiently stimulated.

[29] Based on the interview with EWIMA, see Annex III.

- If **health benefits** of further tightening are high, **Option 3 is recommended**. Economic costs can be overseen better, even in worst case scenarios, compared to Option 1 and Option 2. The latter would lead to lower costs in the most likely scenario, but may also substantially reduce health benefits and lead to practical problems and discriminatory effects in implementation. Introducing tighter limits to the entire toys sector will also promote product development and restructuring in all affected segments. Moving limits gradually appears to have no adverse effects on benefits, compared to partial exemption, and may facilitate future transformation towards sustained improvements in toy safety at fewer economic costs. Eventually, product standards in the rest of the world are likely to follow scientific insights. Early adaptation of standards could then lead to early mover advantage later on.
- If **SME impacts** need to be minimized, **Option 2 is preferred**. Some health gains are realized, but the Art and Crafts industry only needs to meet TSD 2009. This industry is most SME intensive. This solution would give more time to the Art and Crafts industry to implement TSD 2009 and prepare for further tightening by gradually investing resources in product development. Given the impact of the recent economic crisis, and the vulnerability of SME and related jobs, this option could be well defended, especially in the short term, provided that practical problems in implementation are not too big. Otherwise, Option 3 would be second-best from the point of view of SME.
- **Option 1**, which would be most stringent across the board in terms of regulation, is not preferred from the point of view of the impact on competitiveness. Although it does not appear to lead to much higher impacts than intermediate regulation (Option 3) in the most likely scenario, it leads to substantially higher economic costs than Option 0 and Option 2. Moreover, it suffers from a **downside risk** of a partial ban of toys in the **Art and Crafts industry**. This risk is very real according to industry.
- Beyond the scope of this competitiveness proofing, a **further consideration** would be the following. If scientific evidence shows that lead effects on health do not show **threshold effects**, migration limits may not be the first-best solution. Limits that are based on scientific research and can be implemented and enforced in practical testing are a sensible and efficient approach to make use of the best information in case of clear threshold health effects. If these effects do not exist, less lead is still arguably less risky to health than more lead. If threshold effects are scientifically questioned (see SCHER, 2010), risk scenarios (likelihood of various toy material intake scenarios, probability of IQ loss) may be more effective in influencing consumer behaviour and re-assessment of their marginal benefits of consumption than limits. An alternative policy option would then be to **introduce toy-labelling**, pointing out health risk scenarios, to nudge consumer behaviour and producer behaviour in the right direction without using artificially precise migration limits. Migration limit ranges would lead to a classification system of toys. Such a policy is already in place in CO_2 labelling for cars for example. This policy may be economically more efficient if regulation by migration limits causes costs to industry that stand in no direct relation to the marginal externality involved, and may even result in non-marginal effects (like a de-facto ban). Labelling would leave to the consumer to assess the risk and internalize the externality. Consumer loyalty may be strengthened if product labelling can stress these health and safety aspects, and nudge behavioural change of consumers to associate price increase with product enhancement. An obvious downside of this solution is the reliance on consumer cognitive capabilities and on the idea that providing full information is possible and will lead to correct internal judgement by consumers. Targeted labelling is an alternative that would provided clear-cut information and help to avoid some of the health risks. A label indicating the appropriate age (as well as the health risk involved) for use of the toys could be targeted at avoiding use by toddlers, who have most risk of ingestion and exposure to lead by mouthing behaviour. This option would restrict the market for some of the colouring toys, but would retain the product for children of preschool age and older.

Annex I. Detailed description of quantitative scenarios

Development of market shares reflects the main impact of the policy options on competitiveness of the affected industry. Such developments are triggered by changes in cost- and price competitiveness, and in product quality and marketing that result from the changes in regulation.

The change in regulation may impact on competitiveness of EU producers in the internal EU market and in third country export markets. Several considerations are important for assessment of these impacts:

- The policy options affect both EU production as well as products imported into the EU market from third countries. As such, it is a non-discriminatory policy with respect to the EU internal market. Therefore, we focus on estimating the impact on production and employment of EU industry, based on reported cost increase and potential pass on into prices by EU industry;
- On the third country market, competitiveness may be affected if scale economies lead EU producers to change production processes for all markets, in response to the EU regulation. Alternatively, offshoring may become more attractive as well as reorientation to non-EU sales markets. On third country markets, the impact of a cost increase therefore may have a larger effect on output of EU industry. This will be reflected in our assumptions on price sensitivity of demand.

A quantitative assessment of the impact on turnover and production is possible, though a very rough estimate only. This should be seen as an indication of possible effects, in terms of order of magnitude, and under a set of restrictive assumptions. Still, by making use of self-reported evidence by industry, two in-depth interviews with key industry associations, and the most detailed publicly available statistics, we believe that such an assessment can be useful for comparing policy options.

We make use of the methodology described in Section 2. The key equation we use to combine the pieces of the puzzle of cost- and price competitiveness is (see Annex IV):

$$\dot{p} = \dot{c} \cdot \left[\frac{c}{p} + \frac{p-c}{p} \cdot (1+\eta) \right].$$

In words, the equation defines how the percentage price change can be derived (as a weighted sum) from the unit cost change and the unit profit change. The weights are the shares of costs and profits (net operating rate) in the price.

The change in the profit mark-up over unit cost that results from pass-on of the cost change is governed by the parameter η. It represents the sensitivity of the profit margin (expressed as a ratio to unit cost) to a cost change (i.e., price pass-on). We have to assume a certain value for this parameter, based on market structure and economic theory.

- If the profit margin sensitivity parameter has value zero, the cost increase is fully passed-on and the mark-up percentage on top of costs stays constant. The net operating rate remains constant in this case. This can occur in a situation of imperfect competition, so possibly in a monopolistically competitive market, but is more likely for oligopolistic markets.
- If the parameter has value -1, the cost increase is partly passed-on into the price, in the sense that the profit margin falls. Since normal profits are not included in costs but in profits, this is partly semantics. The actual increase in the unit costs (excluding normal profits) is fully

translated into an equal increase in price, even if per unit profits stay constant. This situation can occur in a situation of perfect or imperfect competition alike.

- If the parameter is in absolute terms larger than -1, the per unit profits fall. Eventually, price would stay constant, such that it is not possible at all to pass-on cost increases. This situation is mostly relevant in the short run in competitive market structures. It can be sustained in oligopolistic or monopolistic markets as well, even in the long run, because excess profits exist. At a net operating rate of 8%, the value of η that implies the absence of cost pass-on equals -11.5.

To estimate the impact on cost- and price competitiveness and resulting effects on production and employment in the industry, we make use of the following information and assumptions:

- We use data for the last pre-crisis year, 2007. Most recent PRODCOM data are for 2010, but the years 2008-2010 are heavily affected by the banking crisis, the ensuing economic crisis and the current EU sovereign debt crisis. Moreover, it is unclear how much of the cost increase of TSD 2009 has already materialized in 2009-2010. Officially it only becomes effective as of July 2013 (for lead migration), but survey and interviews suggest that most adaptation has already taken place by 2011-12. The figures for 2007 are consistent with the EU-27 IO tables (2007) that we need to compute net operating rates and export shares for use in the quantitative simulation analysis.
- Given the structure of the market, being dominated by SME, and the low market elasticity of demand, a competitive market structure is realistic for the EU market. Monopolistic competition seems most appropriate, but the assumption of perfect competition would not change the analysis. Given the size of the EU in world trade of toys, we choose to retain our assumption of monopolistic competition and downward sloping demand for the third country market as well.
- Based on the survey results, we consider partial pass-on of costs into prices. We therefore assume the value of η to equal -1, which allows per unit profits to stay constant.
- The scenario of 'no pass-on', though conceivable in competitive markets at the level of the individual firm facing a flat marginal revenue (demand), would not hold for the EU market as a whole. Costs increase for all suppliers (though more for small firms), and excess profits are zero to start with in competitive markets. Failure to pass-on cost increases would lead to exit of firms, reduction of supply and excess demand at the going price. Price would then go up, which contradicts the assumed scenario.
- There are three options for the policy change, as described in Section 1. Option 1 and 3 affect the art and crafts toys and other toys. Option 2 only affects the other toys.
- We assume that the toy segment for the art and crafts industry is 50%. EWIMA indicated that the share of affected toys in turnover may typically vary between 10-35% and is up to 70% for SMEs in Italy and Germany, two of the largest producers (based on product range, see Annex III). Based on replies to the survey availably at the time of the analysis, the toy market share in turnover of Art and Crafts materials may vary between 23-63% on average.
- The effect on total production costs is based on the survey results and supplemented by insights from the interviews with TIE and EWIMA. For Option 1 (that was studied in the survey), we define a low scenario, a medium scenario and a high scenario. Option 2 is similar to Option 1, but excludes the Art and Crafts toys. For Option 3, which was suggested by EWIMA as technically possible, we make use of the low values of tightening costs for the art and crafts industry, on top of TSD 2009. For other toys, we assume that this option does not increase cost any further beyond an estimated TSD 2009 impact of 10%.
  - Low scenario:

    - For art and crafts toys: a total cost increase of 5% (based on low-end assessment of the effect of TSD 2009) plus 12% for further tightening, so 17% combined[30];
    - For other toys: no cost increase of either TSD 2009 or further tightening. Although roughly half of the respondents reports cost increases, only a small fraction of the Toys and games sector is expected to be affected. The interview with EWIMA further mentioned that paints and alloys, as long as they are coated, do not suffer from bioaccessibility of material containing lead. Meeting the proposed limits for scraped off materials would not pose major problems (TIE and EWIMA interviews).
- Medium scenario:
    - For art and crafts toys: a total cost increase of 24% (TSD 2009) plus 32% (further tightening), so in total 56%;
    - For other toys: an increase in total production costs of 0.42%. This is loosely based on the average cost increase reported in the survey (in total 21% for both changes in lead migration combined), the share of the sample reporting a price increase (roughly 50%) and the 4% share of constructional and metal toys in total available production value of toys and games for the EU-27.[31]
- High scenario:
    - For art and crafts toys: a total cost increase of 80% (TSD) plus 100%, so in total 180% (based on high-end survey responses).
    - Alternatively, we address a ban of art and crafts toys considered in the analysis. We assume the toy segment share to equal to 50%, to give a conservative assessment of the potential cost to industry. If EU production for all geographical markets is adjusted according to the new EU regulation, 50% of production value is lost. If we take into account some 15% - 30% exports of toys to third countries that may not be affected, between 35% - 43% of production value may be lost in the relevant EU industry in case of a ban. For simplicity, though, we assume all production of art and crafts toys will be lost in case of a ban (i.e., 50% of the total production value).
    - For other toys: we double the cost increase to the industry compared to the medium scenario, to 1% in total. This can be motivated by the fact that more product lines within toys and games may be affected by lead migration limits.

[30] More precisely, the total increase in production costs would be (1.05*1.12 – 1), but given the qualitative nature of the cost evidence, we abstain from these second order effects.

[31] Estimate based on SBS figures for division 36.50 and Prodcom statistics for Construction sets and constructional toys (excluding of wood or plastics, scale model assembly kits) and Toy die-cast miniature models of metal (NACE rev. 1.1; Prodcom 2007, production annual sold).

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Annex III Summary of interviews

This Annex contains the list of questions that were discussed during the interviews with EWIMA and TIE, the two European trade associations in the affected industry that have been consulted for this study. Below, we summarize the information provided in the interviews.

1. Defining the (in)directly affected sectors and the impact of the amendment of lead migration limits in the value chain:

   EWIMA: Sectors upstream in the value chain are not affected much. Mining companies that provide the raw materials are not impacted by the toy industry as they provide several qualities to large industrial clients across various sectors. Their qualities of materials such as kaolin and clay are not marketed explicitly for the toys producers. A relatively small client industry such as the art and crafts toy materials chooses a suitable material from the product range. The same applies to manufacturers of pigments and colorants; they are also hardly affected by changes in the toys industry.

   Technical testing and analysis laboratories will probably receive more orders from manufacturers of toy products following the amendments, to test different material qualities for suitability.

   The main problems for the directly affected sector (notably art and craft toys) are twofold. First, the limited availability of natural raw materials with very low lead content; second, the limited applicability of man-made substitutes. The impact of stricter migration limits would be to increase the costs of raw materials, the marketability of dry and liquid art and craft products as toys, and the developmental costs of these toys in order to test and reformulate products and find suitable raw materials.

   TIE: For writing instruments, art and crafts toys, TIE referred to EWIMA, ETAD and CEPE for information. We have interviewed EWIMA.

2. The TSD of 2009 that will be of effect for chemical ingredients from July 2013 includes lead migration limits on toys of 13.5 mg/kg in dry, brittle, powder-like or pliable toy material, 3.4 mg/kg in liquid or sticky toy material and 160 mg/kg in scraped-off toy material. What are the effects on EU producers of the current limits in terms of products affected and production costs?

   EWIMA: The cost effect of TSD 2009 spans developmental and production costs. The developmental costs include analytical costs of testing and analysis of a range of raw materials (of different qualities and possible substitutes) to select suitable raw materials, and reformulation of toys (such pencil leads, chalks, crayons) to ensure functional performance of the products. Production costs increase because of the need to use raw materials at the high end of the quality range. These are available from mining deposits in more limited quantity only and are more expensive as a result.

   TIE: The industry is able to meet the current limits (as of TSD 2009). Most follow the guidelines for adhering to EU standard EN71-3 (on migration of heavy elements). Where possible, toy manufacturers try to avoid the materials from natural sources that naturally contain lead. This involves testing costs and costs for re-specification of the raw materials used in production, as well as higher prices for more rare specifications of raw materials.

3. The new regulation initiative proposes stricter lead migration limits in the toy industry of 4 mg/kg in dry, brittle, powder-like or pliable toy material, 1 mg/kg in liquid or sticky toy material and 47 mg/kg in scraped-off toy material. Which toy products are most affected by the new regulation? Across the product range produced by your industry association members, how large is the toy market segment that is directly affected by the new regulation?

EWIMA: Most affected are: toys of materials that intend to leave a trace, such as coloured pencils, chalks, crayons, water colour tablets; modelling material; pasteous or viscous liquid colours such as finger paints, liquid opaque paints. These toys are affected when based on ingredients from natural sources. With the proposed tighter limits (Option 1), the availability of raw materials of sufficient and consistent quality for toys to pass the migration test is doubtful. The search for suitable materials and reformulation of products has already been taking place in the wake of implementation of TSD 2009, and the limit of natural possibilities has been reached. Also the technical functioning of the toys is increasingly at stake. Marketability of these toy products is at risk. Such a problem does not exist with respect to migration limits for scraped off toy material (such as for toys with metal parts and painted toys). The limits for scraped off material in TSD 2009 could be comfortably met. EWIMA proposed an alternative set of migration limits that could be met by industry (Option 3). Overall, this alternative is intermediate between TSD 2009 and Option 1. For liquid toys, no further tightening is deemed possible compared to TSD 2009; for scraped-off materials, the proposed limits are close to those in the proposed further tightening (Option 1).

The share of toys in the total market of art and crafts products is not available from statistics at the European level. On average, about 6.5% of toy sales in the EU are art and crafts toys (according to TIE statistics). Manufacturers of art and crafts materials are part of the writing instruments or paint industry. They produce products for hobby and artistic use and for schools, offices and other professional use. Part of their production is intended as toys. Based on product range offered by producers, the share of toys in total product sales would range between 10% and 35%, with exceptions in Germany and Italy exceeding 50% (up to 70%).

TIE: Liquid toys are most affected. Marketing of liquid paints, poster paints, and finger paints as toys is at risk. The reason is that titanium dioxide (pigment) and kaolin (extender) are naturally contaminated with traces of lead. For dry and brittle toys such as chalks, powder paints and crayon, the same problem applies, as they make use of the same naturally contaminated raw materials. For toys that are not liquid or brittle, scraped off material may be contaminated with traces of lead. The limits proposed for this category of migration normally do not pose problems for most toy materials (such as plastic, textile, and coated paints or metals). Scraped off materials for metal alloy components used in toys (such as bushings, washers and screws, and parts of writing instruments) can be a problem.

The toy industry is rather fragmented, as about 80% of the firms are SMEs. Information on the share of affected toys is not available, as it differs by type of firm and toys segment. For such information for the most affected toys segment listed earlier, refer to EWIMA and the public consultation.

4. Which types of costs are most affected by the new regulation (e.g., compliance costs, such as testing of materials used in production; costs of raw materials used in production)?

EWIMA: Both raw material and testing costs will rise. The costs of such laboratories are very high due to sophisticated equipment. Several of them do not analyse for toy use. The value of extra costs and the percentage compared to total costs varies between firms of different size in terms of product range and volume. Ability for in-house analytical competence also varies. As the industry consists for a substantial part of SMEs, more precise information could not be provided and is not collected by EWIMA.

TIE: The biggest cost would be that several important products for the toy market can no longer comply with the limits, as listed under the previous item. Naturally occurring raw materials will not be able to meet the requirements. Second to that are the additional costs related to testing. The accuracy and reliability of existing testing procedures (notably migration tests under standard EN71-3) is not sufficient to deal with the tighter limits. Reliability and uniformity in testing procedures are problematic, particularly for liquid toys such as paints). More sophisticated equipment and extra training of testing staff are needed. This raises costs of testing significantly.

5. In 2004, a study reported estimated the likely increase in production cost following modifications to the TSD that related to CE marking and packaging of toys, hazard analysis (involving testing) and labelling.[32] The reported range for cost increases was 0-9% of production costs. How do the costs of implementing the current lead migration limits compare to this range? And what about the effect of the new regulation initiative?

   EWIMA: Precise information on cost percentages could not be provided, and EWIMA referred to the survey consultation that was ongoing. The task of finding suitable raw materials that comply with TSD 2009 is already sophisticated; concerning further tightening, EWIMA had been signalled by manufacturers that they will decrease the range of products considered as toys because several products will never comply. A complicating factor in finding raw materials is that natural sources may contain up to 90 chemical elements. Nineteen (19) of these elements have been limited for purposes of toy safety. Not rarely, samples that meet some requirements (such as lead migration limits) may fail to meet others.

   TIE: Precise information on the relative extent to which various costs increase could not be provided, as cost information is sensitive. TIE does not have sufficient insight into these costs. Firms now have to invest more in testing and staff to deal with administrative burden. Self-assessment is obliged (either in-house or via notified bodies), also for chemicals. With further tightening of the limits, these facilities and further investment may not suffice, as feasible limits to the natural and functional properties of several toys would be passed.

6. An option considered by the EC is to exempt natural ingredients such as clay, kaolin and pigment from the new regulation. Which toy products are no longer affected substantially by the reduction of lead migration limits if this exemption applies? How large would you estimate the share of these products in total production for the product range of your industry association members?

   EWIMA: This would refer to the range of products discussed earlier, basically the art and crafts toys. Judging by the total product range that the manufacturers provides, the share of these toys in total production may vary between 10% - 35%, with exceptions in Germany and Italy exceeding 50% (up to 70%).

   TIE: This would solve the problem for the liquid and brittle or dry toys that would otherwise pass limits of natural and technical properties, as mentioned at previous items. A problem would be how to administer the exemption, as the final product has to comply to migration limits rather than the ingredients.

7. An option considered by the EC is to exempt natural ingredients such as clay, kaolin and pigment from the new regulation. Which inputs into production will in this case still be subject to stricter limits?

   EWIMA: Artificial materials are no real alternative to raw materials from natural sources, because their properties cannot ensure sufficient technical performance of the products.

   TIE: It is difficult to judge which other raw materials or ingredients are subject to the limits, as the relevant regulation refers to toy material as such. Alloys of metals, such as brass, are an example.

8. One of the potential consequences of changes to the TSD is the effect on cost competitiveness of EU production relative to offshoring or competitors from outside the EU. How large would you estimate the current share of low-cost imports to be in EU consumption of toy products within your industry (earlier estimates for the toy industry were in the range of >75% or even >95% of

[32] Study on the Impact of the Revision of the Council Directive 88/378/EEC on the Safety of Toys, final report prepared for EC DG Enterprise, RPA October 2004.

consumption)?[33] Do you expect that the new regulation will lead to more offshoring and imports from low-cost producers, or would low-cost imports decline as these products cannot meet stricter standards or would face a relatively larger increase in cost and prices?

EWIMA: The writing instruments industry is different from the toy industry. The share of imports into the EU would be smaller that 70%. Production in the EU has some advantages over offshore production and imports, notably lower logistic costs; more options for product testing, and better access to relevant information (compared to non-EU based firms) such that compliance is less costly. Some European countries (such as Germany, Italy, UK, France, Netherlands, and Czech Republic) have a vivid writing instruments industry producing locally. In these markets, local products are still relevant. As an example, German producers would on average produce about 30% for their home market and export 70%, half of which would be for the EU internal market.

The regulation and lead migration limits are the same for all producers, whether they are EU based or not. Offshoring is motivated mostly by lower labour cost, which is not an issue here. As such, there is no further incentive for offshore production from tightening of EU lead migration limits. Non-complying products may reach the EU market, but when signalled, these products are listed in the EU Rapid Alert System (RAPEX) to help inform distributors and the public.

TIE: According to the industry, up to 80%-90% of toys on the EU market are imported from the Far East. Many of these products are produced offshore by EU-based companies. These producers uphold high quality for the most part. Testing facilities have also been installed locally, and may even be able to do testing at lower cost. The new regulation would not be expected to change much in this pattern of production facilities. Cost advantages have been realized, and production patterns reflect the trade off between different costs and benefits of location choice. All producers that aim to sell in the EU have to comply with regulation, so it is not directly an issue in the choice of production location.

9. What will be the effect of reduced lead limits on innovation by EU producers? You may think of process innovations (substituting inputs) or product innovations (safer or better product characteristics). Are there opportunities for strengthening product niches via such innovations, either in the EU or abroad?

EWIMA: European producers are in the higher-end of art and crafts toys. They produce high quality, mostly branded products. Reputation and product safety are important motivations for producers of branded products, especially for SMEs still producing in Europe. Innovation to improve products is a core element in their strategy. The increase in raw material costs and the need for analytical testing that follow from TSD 2009 reduce the budget for R&D and increase its costs. Further tightening can imply a de-facto ban for products, especially liquid and brittle or powder like toys for manual colouring. If a safe (i.e., complying) product and good performance cannot be combined, it will not be produced and marketed as a toy.

TIE: All producers that aim to sell at the EU market will be in the same position. Incentives are to specify products such that they can comply, if at all possible. The costs for additional and more sophisticated testing and analytics in product development will increase if lead migration limits will become more strict.

10. In what ways do the current migration limits and the new regulation affect the position of SME producers in the EU? How does this compare to the effects on large producers?

EWIMA: Almost all firms in the art and crafts industry are SME, many of which are small. For the two largest EU producers (Germany and Italy), more than 50% of the turnover of SMEs in the industry is toy related. Small and medium sized producers are more affected by the changes in lead migration limits. The rise in costs for raw materials will be a higher burden, as prices for ingredients often depend on volume

[33] Study on the Impact of the Revision of the Council Directive 88/378/EEC on the Safety of Toys, final report prepared for EC DG Enterprise, RPA October 2004, page 89.

purchased. Human resources needed for testing analytics and administrative burden related to the new TSD constitute a bottleneck for SMEs compared to larger firms with in-house testing.

TIE: The lower limits increase complexity of testing further. New equipment will be needed, as well as additional training to operate this equipment. Due to the need for these investments specifically for toys, fewer testing houses will (be able to) offer services to toy producers, and costs for external testing will increase. This will affect SMEs most, due to their smaller production volumes. Large firms are also affected, for a different reason. The level of investments in testing equipment and staff may not be justified for in-house testing facilities. More testing would have to be outsourced to external test facilities and the usefulness and cost advantage of in-house testing would decline.

Annex IV Mathematical Appendix

The size of the EU market in the affected industry

The EU market for the relevant sectors is defined by the value of consumption. Because direct information on this variable is not available, we estimate the volume of the market by defining consumption as the sum value of production and imports, subtracting exports.

In mathematical terms, the equation to estimate the size of the EU market based on publicly available statistics, is as follows:

$$C_i = Q_i + M_i - E_i\,, \tag{0}$$

where *C* is consumption; *Q* is EU production; *M* stands for imports into the EU and *E* represents EU exports for industry *i*.

Main equation for use in quantification of impacts: from cost change to price change

We conclude this section by presenting the main equation used in the quantitative analysis, which derives price changes from underlying changes in costs and assumptions about cost pass-on.

Starting from a definition equation:

$$p = c + \left(p - c\right), \tag{0}$$

where *p* stands for the price of a product, and *c* for unit costs, and defining the cost pass-on parameter *η* as the elasticity of the price-cost mark-up to a change in cost:

$$\eta = \frac{d\left(\frac{p-c}{c}\right)\Big/\left(\frac{p-c}{c}\right)}{dc/c} = \frac{d\left(\frac{p-c}{c}\right)}{dc} \cdot \frac{c}{\left(p-c\right)/c}\,, \tag{0}$$

we arrive at the following expression that links an increase in price to an increase in unit costs:

$$\dot{p} = \dot{c} \cdot \left[\frac{c}{p} + \frac{p-c}{p} \cdot \left(1+\eta\right)\right]. \tag{0}$$

The variables with a dot on top indicate percentage growth rates. The equation uses the rules for (percentage) growth rate that states:

- The growth rate of a sum equals the weighted sum of the growth rates of its composite parts, or:

$$\dot{p} = \frac{c}{p} \cdot \dot{c} + \frac{p-c}{p} \cdot \left(\dot{\pi}\right), \text{where } \pi \equiv p - c \tag{0}$$

In words: inflation equals the weighted sum of the growth in unit costs and unit profits. Weights are, respectively, the cost share in price and the net operating rate.

Note that the quantitative impact analysis is mainly based on the response of EU and extra-EU demand to a change in costs and prices. The supply side of the market (behaviour of EU producers) only enters via assumptions on the extent to which a cost increase is translated into prices (the value of η in equation (3)). The outcome of equation (3) is based on information on the cost increase from the survey, assumptions on cost pass-on that are based on the survey and economic theory on market structure, and assessment of the relevant market structure based on available data.

P.O. Box 4175
3006 AD Rotterdam
The Netherlands

Watermanweg 44
3067 GG Rotterdam
The Netherlands

T +31 (0)10 453 88 00
F +31 (0)10 453 07 68
E netherlands@ecorys.com

W www.ecorys.nl

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