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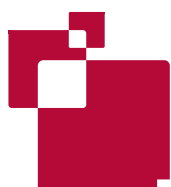
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# ANTITRUST RISK IN EU MANUFACTURING: A SECTOR-LEVEL RANKING

MARCO ANTONIELLI AND MARIO MARINIELLO

## Highlights

- Based on a dataset of manufacturing sectors from five major European economies (France, Germany, Italy, Spain and the United Kingdom) between 2000 and 2011, we identify a number of key sector-level features that, according to established economic research, have a positive impact on the likelihood of collusion. Each feature is proxied by an 'Antitrust Risk Indicator' (ARI).
- We rank the sectors according to their ARI scores. At 2-digit level, sectors that appear more exposed to collusion risk are those that tend to score high in most of the ARIs: Tobacco, Pharmaceuticals, Beverages, Chemicals. The 4-digit analysis suggests higher anticompetitive risk in Tobacco products, Spirits, Sugar, Railway Locomotives and Aircraft (high concentration and fixed costs), Coating of Metals and Printing (low import penetration), Tobacco products, Meat products, Footwear and Clothing (high market stability), Plastic products and Spinning/Weaving of textiles (high symmetry of market leaders).
- We then rank sectors according to the distribution of antitrust intervention by the European Commission between 2000 and 2013, in terms of merger control and anti-cartel enforcement. Tobacco, Paper and paper products, Pharmaceuticals and Food products are the sectors for which a notified merger has a greater likelihood of being deemed problematic by the Commission. There has been a greater incidence of anti-cartel action in Chemicals, Tobacco, Beverages, Electric equipment and Rubber and plastic.
- Antitrust investigations are based on the identification of narrow product markets. The characteristics of these markets are not necessarily well represented by average measures at sector level. Nevertheless, a simple comparison exercise shows that the European Commission's interventions have been largely consistent with sector rankings based on market concentration.

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The object of this paper is twofold: to provide a broad descriptive analysis of the risk of collusive behaviour throughout Europe in the manufacturing sector; and to identify those manufacturing sectors in which the European Commission has been more active in the past in its capacity of antitrust authority.

This paper is close in spirit to industry and market studies, although our target is wider and encompasses the whole manufacturing sector in Europe, as explained further below. Our methodology resembles Ilzkovitz *et al* (2008), in which the authors couple a variety of product market indicators to measures of antitrust enforcement to determine whether an economic sector is characterised by weak competition. In the manufacturing sector they identify Basic metals and Motor vehicles as the sectors in which competition issues are more likely to arise. Symeonidis (2003) asks in which United Kingdom manufacturing industries collusion is more likely, finding no clear link with industry concentration (industries where collusion had a higher incidence were Basic metals, Building materials and Electrical engineering). Yet Symeonidis's (2003) analysis is based on observed collusive agreements that were considered lawful during the period of observation<sup>1</sup>. Our aim instead is to investigate potential infringements of competition law that could be pursued by an antitrust authority. During our observation period, collusion is illegal and therefore participating to a cartel is risky: the inability to coordinate in an explicit and transparent manner between market players and the threat of antitrust intervention make collusion instable. We are looking after market characteristics that help counterbalancing those effects and make collusion more likely in this context.

The exercise that we propose in this paper, ranking economic sectors according to their predisposition to collusion, has an intrinsic limitation. The antitrust definition of a market (our theoretical subject of study – referred to in this paper as 'antitrust market') is conventionally based on tests, such as the SSNIP test<sup>2</sup>, that identify the boundaries of a market by measuring the degree of competition that different products exert on each other. If two products are very good substitutes – such that a significant proportion of demand and/or of supply would shift to one product if the price of the other is changed - then the products are considered to belong to the same market. This often leads to markets the boundaries of which are much narrower than those captured by product classification at sector level.

However, macroscopic analysis such as the one proposed in this paper, is necessarily based on sector data: that is, data that aggregate information from multiple markets that are grouped together for statistical purposes. In fact, we are only able to capture an imperfect link between antitrust markets and the observable average performance of the sectors they belong to. Previous research has been confronted with the same challenge (see, for example, Griffith *et al*, 2010, on the effect of the EU Single Market Programme on mark-ups and productivity).

To partially mitigate that problem, we focus on market characteristics that we presume could be shared by the majority of products within the same statistical sector. This would be the case if, for example, antitrust product markets within a certain sector share regulatory features (eg similar barriers to

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<sup>1</sup> Symeonidis (2003) uses agreements between competitors that were formally registered in compliance with UK Restrictive Trade Practice Act of 1956 as indication of an industry's propensity to collusion; those agreements were at the time considered lawful.

<sup>2</sup> See Amelio and Donath, 2009.

entry), production features (eg similar levels of economies of scale) or demand characteristics (eg a customer base which is largely the same).

To rank sectors according to their predisposition to collusion we follow the common wisdom in economic literature concerning the role of market's structural features (see, for an exhaustive overview: Ivaldi *et al*, 2003, or Motta, 2004). The general intuition is that the more concentrated, stable and transparent markets are, the easier is for players to coordinate on a collusive price and stick to it without yielding to the temptation of undercutting the rivals and break the cartel agreement.

On the basis of the available data (see Section 2 below), we are able to measure proxies and account for the following factors: (1) market concentration; (2) likelihood of entry; (3) stability of demand and supply; (4) market symmetry<sup>3</sup>. The treatment and measurement of each factor is described in the next Section.

In the second part of our analysis we look at antitrust intervention by the European Commission. We look specifically at merger investigations and cartel infringement decisions. Both types of competition policy interventions give insights about the treatment of collusion likelihood by a competition authority. Regarding merger control, a merger has a higher chance to be considered 'problematic' from a competition policy perspective if it occurs in an already malfunctioning market where concentration levels are high, likelihood of entry is low, and supply and demand are relatively inelastic. A crucial determinant of a merger decision is, moreover, whether a merger has 'coordinated effects' ie whether the merger will make future collusion more likely.

Finally we propose and discuss a simple comparison exercise: the European Commission's antitrust action is matched with the ranking of manufacturing sectors according to their collusion risk. Gual and Mas (2011) have an approach broadly similar to ours. They focus on Commission antitrust investigations only (ie they do not look at merger decisions), between 1999 and 2004 and check whether the probability of dropping the investigation is lower when industry characteristics suggest a lower likelihood of antitrust infringement. They find positive and weakly significant links consistent with theoretical prediction. For example, higher industry concentration rates are positively correlated with the probability of antitrust sanctioning.

It is important to stress that this exercise suffers from the fundamental limitation described above: that sector data does not necessarily convey information for antitrust product markets. Therefore, while the exercise can provide for an interesting consistency check between antitrust action and status of competition at sector level and deliver suggestions for follow-up inquiries, it should not in itself be used in a normative fashion to judge the quality of antitrust intervention. An ad-hoc case-by-case ex-post analysis should instead be performed for that purpose (see Neven and Zenger, 2008, for a good overview of the literature).

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<sup>3</sup> There are other factors which may be relevant to explain the likelihood of collusion in a certain market: for example, the existence of cross-ownership links between players or the frequency of their multi-market contacts. However, to our knowledge those factors are not available at sector level and are therefore excluded from our analysis.

The paper is organised as follows. We first provide an illustration of the Antitrust Risk Indicators. We then describe our data sample in Section 2. Section 3 reports the sectors' rankings and discusses the results. Section 4 concludes.

## 1. The Antitrust Risk Indicators

Below we report and explain the construction of the Antitrust Risk Indicators (ARIs) used to rank sectors' predisposition to collusion. A good summary of the underlying economic theory can be found in Motta (2004). Note that the indicators are computed at European wide level (ie they are cross-country averages) and on a 10 years-wide time period (with two exceptions described below). We are in fact interested in capturing the probability of potential cartels with boundaries that are wider than national, to identify true 'European' issues<sup>4</sup>. Moreover the time period of observation has to be sufficiently long as anti-competitive behaviours are usually put in place for years (for example: the average duration of an international cartel is between 6 and 14 years – See Mariniello, 2013). We note that market structures are generally stable over time; in other words, to give an example: the average market performance within the tobacco sector during the period 2000 and 2011 is a good proxy of the performance of the tobacco sector at any point of time during that period. Again, this is the case if, despite changes prompted by regulatory intervention, sectors tend to preserve their key structural features over time, at least in relative terms if compared with other sectors of the economy. The literature reports consistent findings<sup>5</sup>.

### (1) *Market concentration*

A higher degree of market concentration is associated with higher likelihood of collusion. It is easier to coordinate and reach a collusive agreement within a smaller group of players. Also, if concentration is high, deviation from a collusive equilibrium is less profitable: the remaining slice of the market a player would grab by undercutting rivals is smaller if compared to a market where many players are active. This means that cartels are generally more stable when markets are more concentrated.

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<sup>4</sup> We presume that the average markets' performance across the 5 countries reported in our dataset is a good approximation of the average performance of a cross-border market within the European Union. For the sake of illustration, consider the following example: we assume that averaging out the concentration ratio within the tobacco sector in UK, France, Germany, Italy and Spain yields a good approximation of the average concentration ratio of a market within the tobacco sector that has an international dimension (that is: it is not confined to just one European country and therefore falls in the competence of the European Commission). The validity of this presumption crucially depends on the degree of commonality that sectors have across countries in Europe. If the tobacco sector is very open to competition in UK while little competition in the same sector occurs in Italy, then the cross-country average may bear little indication as to the level of competition of a hypothetical tobacco market affecting Italy and UK. Instead, if cross-country variability is limited, this would suggest that sectors have intrinsic characteristics that, despite idiosyncratic country characteristics (such as domestic regulatory policy) are conducive to similar market structures. For example: a production process typically implemented in a certain sector may give rise to sector-specific economies of scale, resulting in more concentrated markets. Strong and highly significant pairwise correlations between EU-wide and national indicators in our dataset support such presumption. Confirmations are also found in the empirical literature. Hollis (2003) for example finds that concentration ratios in 82 sectors are very similar across five European economies (Belgium, France, Germany, Italy and the UK), the US and Japan.

<sup>5</sup> Veugelers (2004) analyses 67 manufacturing sectors in the EU15, finding that concentration ratios tend to be quite stable over time. Persistency checks ran on our database point to strong and highly significant cross-year correlations for price-cost margins, import penetration and firm size.

We use three measures to proxy the average level of market concentration within a sector: the average price-cost margin for the period 2000 – 2011, the industry concentration ratio for 2010 and the Herfindal-Hirschman Index (HHI) for 2010.

Price-cost margins have been widely used in the literature to proxy the degree of market concentration [See Griffith *et al*, 2010], as the companies' ability to extract rents and increase the gap between marginal costs and prices is decreasing in the level of competition in the market. They are, however, imperfect indicators: margins may be high, for example, because companies are more efficient or because they benefit from economies of scale, but calculating exact firm-level marginal cost is an extremely difficult exercise affected by other limitations [see Altomonte *et al*, 2010, for an example of such an exercise]. We resort to use sector-wide production value and average variable costs as proxy of marginal costs; that is: we use the sum of the costs of labour, capital and all intermediate inputs as in Griffith *et al* (2010)<sup>6</sup>.

In order to accommodate for the limitations of price-cost margins measures, we complement that indicator with industry concentration ratios and HHI indexes, calculated respectively as the simple sum of companies' market shares and the sum of the square of companies' market shares. These are also widely used measures of concentration [see Ilzkovitz *et al*, 2007], even if they are possibly even more subject to the fundamental limitation that affect macro-analysis as described above: market shares at sector level are not necessarily a good proxy of market shares at market level. In our case, moreover, market shares are available only for the biggest 4 companies in the sector and only for year 2010. We construct the indicators accordingly: C4 is the sum of the market shares of the four biggest companies in the sector in 2010; HHI4 is the sum of the square of the market shares of the four biggest companies in the sector in 2010.

## *(2) Entry*

Entry has a disruptive effect on collusive behaviour. The mere threat of entry makes collusion less sustainable: when effective entry is likely, incumbent players may find it difficult to maintain high prices in the market without risking sudden loss of customers. Moreover, a high firms' turnover implies that coordination is less likely: instability in the identity and in the number of counterparts make collusive agreements more difficult to reach. Sectors where entry is more likely should therefore *ceteris paribus* be associated with lower probability of collusion.

Our dataset does not contain information that can directly help measuring the likelihood of entry; likewise, it does not contain information on the pattern of actual entries by new companies that occurred in the period of observation. The data report just the change in number of companies and do not disentangle entry from exit. Low growth rates may therefore mean low entry rates or high entry rates accompanied by equally high exit rates. The change in the number of companies cannot therefore be used to proxy entry. We nevertheless can exploit the information available in our dataset to measure proxies that provides indications on the degree of a sector's openness to outside competitive pressure.

To do so, we build 2 indicators: (a) firms' size and (b) import penetration. Firms' size is computed as the average size of companies within the sector during the period of observation (2000-2011).

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<sup>6</sup> We implement Griffith's methodology except that we do not subtract for the capital costs because of data availability.

Relatively bigger sizes imply the existence of economies of scale, possibly due to higher fixed costs and barriers to entry. Bigger average size should therefore imply lower likelihood of entry<sup>7</sup>.

Import penetration is the yearly average of sector imports divided by sector production. This indicator is again computed over the period 2000-2011. A high ratio of imports over total production suggests that the sector tends to have relatively lower barriers to entry to foreign competitors. Moreover, it is reasonable to assume that reaching a collusive agreement with exporters is comparatively more difficult: exporters, for example, tend to be exposed to different costs shocks. Therefore it would be more difficult for local producers to explain price changes by exporters and detect potential deviation from collusive outcomes that may not be justified by change in production costs.

### *(3) Market stability*

Stable markets are more predisposed to collusion. Collusive agreements crucially rely on players' ability to capture other players' deviation from the agreed price. When markets are subject to frequent and unpredictable demand or supply shocks, attributing a change in price to a deviation is more difficult, therefore collusion is less stable.

We compute two indicators to capture markets' stability: (a) variance in market size and (b) variance in import penetration. Variance in market size is computed as the variance of the yearly growth rate of production values in nominal terms. Variance in import penetration is the variance of the yearly growth rate of the ratio of imports over total production. The two variables are calculated over the full period of observation 2000-2011. High variance levels are presumed to indicate lower market predictability and lower likelihood of collusion.

### *(4) Market symmetry*

The last dimension of analysis is market symmetry. Symmetric markets where players hold similar market shares tend to be more predisposed to collusion. Symmetry aligns players' incentive to stick to a cartel agreement. Conversely, if a company is much smaller than the others, it may have a relatively higher incentive to deviate, undercut its rivals and enjoy all market's profits. To test for symmetry we compute an Asymmetry Indicator based on Gini's coefficient<sup>8</sup>. In our case we employ it on the distribution of the production shares of the top four companies in each sector for year 2010. If the asymmetry indicator is 0, that indicates that the four observed companies have identical production shares ie the market is perfectly symmetric. When the indicator instead approaches 100 that means

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<sup>7</sup> Alternative measures could be used to proxy entry (such as 'business' churn rate' ie the sum of firms' birth and date rate) using Eurostat and OECD datasets. However, we believe that using average firm size as an indication of barriers to entry is a better option. First, because the data on firm size are reported at a higher level of disaggregation (up to 4-digit in our dataset, while business' churn rate is limited to 2-digit in the Eurostat/OECD dataset). Second, because the number of companies that enter or exit a sector is less informative about the disruptive power that those firms can exert on potential collusive agreements. A high number of small firms entering small markets within a sector affect positively the sector's business' churn rate, but this is unlikely to represent a threat to collusive agreements between bigger companies in wider markets. An extended discussion on alternative indicators to measure entry likelihood is reported in the Appendix.

<sup>8</sup> The Gini index expresses inequality among values of a frequency distribution and ranges from 0 (complete equality) to 100 (extreme inequality).

that there exists a huge gap between the market share held by the biggest company and the one held by the smaller ones<sup>9</sup>.

## 2. The Dataset

Our dataset contains a number of widely-used data for European manufacturing sectors from 2000 to 2011 for 5 European countries: France, Germany, Italy, Spain and UK. The 5 economies together represent 71 percent of the EU GDP<sup>10</sup>, in 2011, while the manufacturing sector in the five countries observed represents on average 12.5 percent of a country's GDP<sup>11</sup>. The primary sources for data are National Accounts, Structural Business Statistics and International Trade databases. The aggregate statistics were compiled by Euromonitor<sup>12</sup>. The market features variables contained in our database are: total production, value added, gross operating surplus, market size, imports, exports, production and number of firms by employment size, production value and production shares of up to five top companies (all monetary data is recorded in euro)<sup>13</sup>. Using Eurostat NACE 2-digit classification<sup>14</sup>, the manufacturing sector can be split in 22 categories: Food products, Tobacco, Textiles, Wearing apparel, Leather products, Wood and wood products, Paper and paper products, Reproduction of recorded media, Chemicals, Pharmaceuticals, Rubber and Plastics, Other non-metallic mineral products, Basic metals, Fabricated metal products, Computers and electronics, Electrical equipment, Machinery and equipment, Motor vehicles, Other transport equipment, Furniture, Other manufacturing<sup>15</sup>. The 4-digit disaggregation results in 92 sub-categories.

The below table provides an overview of the database with few key descriptive statistics relative to 2010 for 2-digit sectors aggregated across the five economies. As it can be noted the total manufacturing production for our database amounted to €3.5 trillion, with the Food, Motor vehicles and Fabricated metal sectors topping the list in terms of production and value added. As for the demand-side, the five economies consumed €3.9 trillion with the Food and Motor vehicles sectors again on the top 3 by market size, and Computers and electronics coming third. The latter sector is ranked first also in terms of imports. Noticeably, imports and exports are originally defined at country level and therefore these aggregates include intra-group trade. The smallest sectors are Tobacco, Electrical

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<sup>9</sup> Formally, we compute the Gini index as follows:  $\text{Index} = 1 - (7 \cdot x_4 + 5 \cdot x_3 + 3 \cdot x_2 + x_1)/4$ ; where  $x_1$  is the production share of the top company normalized to the production share of the four companies (or concentration ratio).

<sup>10</sup> Source: Eurostat.

<sup>11</sup> Source: The World Bank.

<sup>12</sup> Euromonitor International ([link](#)) is a research and data company that collects and aggregate data at sector level from official sources as well as through market research. The data obtained through market research in our dataset consists of production value and production shares for the year 2010 of up to five top companies for all manufacturing sectors in the 5 target economies for our analysis.

<sup>13</sup> Total production is the total revenue of all locally-registered companies, excluding taxes and subsidies on products like VAT; valued added equals total production minus intermediate consumption; the gross operating surplus equals value added minus labour costs and taxes less subsidies on production and therefore includes the remuneration of equity and the depreciation of capital; market size consists of the value of all goods and services sold, either from local or foreign producers and recorded at purchaser prices; imports consist of the value of goods delivered at the frontier and consumed in the country; exports consist of the value of goods shipped out of the country, excluding re-exports; the number of firms is made up by all locally-registered companies, including 0 employees enterprises and single-employed; production values and shares of top companies refer to the revenues made by companies from industry-specific products.

<sup>14</sup> [http://epp.eurostat.ec.europa.eu/portal/page/portal/nace\\_rev2/introduction](http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/introduction)

<sup>15</sup> Two 2-digit sectors – Coke and refined petroleum products, and Repair and installation of machinery and equipment – are left out of our analysis.

equipment and Wood<sup>16</sup> by either production or value added. The highest numbers of companies are in the Fabricated metal and Food sectors, with more than 180 thousands firms.

**TABLE 1 – Descriptive statistics for European manufacturing sectors**

NACE 2	Production	Value Added	Gross Operating Surplus	Market Size	Imports	Exports	Number of firms	Number of subsectors
Food products	491,936	112,495	37,742	554,727	133,812	86,468	185415	13
Beverages	77,128	20,042	9,896	112,571	25,380	25,099	15427	4
Tobacco	7,956	4,214	2,614	79,531	9,167	3,894	89	1
Textiles	39,459	12,655	3,071	51,177	21,410	13,981	21305	5
Wearing apparel	70,666	22,096	8,446	142,788	82,996	32,704	67158	3
Leather products	37,802	11,155	4,573	54,861	31,466	20,454	25211	3
Wood and wood products	60,815	19,742	6,532	68,076	16,657	9,052	79631	1
Paper and paper products	95,872	24,913	7,811	111,187	43,367	35,021	10775	3
Reproduction of recorded media	65,876	28,179	8,995	62,198	3,153	4,041	76721	2
Chemicals	251,938	61,003	22,296	268,221	146,554	129,309	12795	7
Pharmaceuticals	142,726	51,627	24,089	164,502	92,008	79,199	2679	1
Rubber and plastics	165,601	51,876	12,032	163,116	61,074	63,454	34204	2
Other non-metallic mineral products	140,121	47,778	15,333	137,964	24,436	26,036	57700	2
Basic metals	233,855	49,087	18,309	260,389	157,517	131,348	9864	3
Fabricated metal products	313,636	119,195	32,736	304,338	45,282	43,464	203199	8
Computers and electronics	227,083	77,920	24,156	362,904	242,249	129,764	78691	11
Electrical equipment	46,320	13,909	2,926	57,984	32,351	23,040	7563	3
Machinery and equipment n.e.c.	273,431	91,293	24,555	215,444	84,138	145,798	45850	11
Motor vehicles, trailers and semi trailers	486,466	93,957	15,572	462,649	223,608	250,210	10989	1
Other transport equipment	174,900	40,130	7,076	152,393	78,790	97,229	15624	4
Furnitures	80,721	26,427	7,329	100,547	25,683	15,720	80448	1
Other manufacturing	12,680	4,343	1,486	22,758	11,800	6,464	22659	3
Total	3,496,987	984,036	297,576	3,910,324	1,592,896	1,371,750	1,063,997	92

**Notes:** Monetary variables are recorded in millions of Euro. Imports and Exports include intra-EU5 trade. Number of firms is based on information available for 450 out of 460 subsectors-country pairs. Time=2010.

Supply-side metrics, i.e. Production, Value Added and Gross Operating Surplus, are based on the firms whose core activities fall under industry definition range. As such, these metrics are not immediately comparable with demand-side variables, i.e. Market Size, Imports and Exports, which are based on the industry specific goods and services. Demand-side metrics have been corrected for re-exports and trade margins.

Source: Bruegel based on Euromonitor.

<sup>16</sup> The great difference between market size and production for the Tobacco sector is given by secondary production, i.e. production of Tobacco products made by companies falling in other categories.

TABLE 2: Sector ranking – Antitrust Risk Indicators (based on 2-digit data)

<b>Market Concentration</b>					
<b>NACE 2</b>	<b>Price Cost Margins</b>	<b>NACE 2</b>	<b>C4</b>	<b>NACE 2</b>	<b>HHI(4)</b>
Tobacco	31.03	Tobacco	84.83	Tobacco	3074
Pharmaceuticals	16.58	Other transport equipment	52.60	Other transport equipment	1340
Reproduction of recorded media	14.79	Beverages	46.19	Beverages	893
Beverages	13.67	Motor vehicles, trailers and semi trailers	45.61	Motor vehicles, trailers and semi trailers	842
Other non-metallic mineral products	12.33	Electrical equipment	43.43	Chemicals	629
Wood and wood products	12.11	Chemicals	38.36	Electrical equipment	603
Leather products	11.51	Pharmaceuticals	37.12	Pharmaceuticals	495
Other manufacturing	11.51	Basic metals	32.03	Basic metals	426
Wearing apparel	10.97	Other manufacturing	31.44	Computers and electronics	397
Fabricated metal products	10.72	Computers and electronics	28.38	Other manufacturing	369
Computers and electronics	10.00	Paper and paper products	26.92	Rubber and plastics	297
Furnitures	9.73	Food products	24.04	Paper and paper products	275
Paper and paper products	9.30	Machinery and equipment n.e.c.	19.61	Food products	231
Machinery and equipment n.e.c.	9.28	Other non-metallic mineral products	19.35	Machinery and equipment n.e.c.	210
Chemicals	9.20	Rubber and plastics	14.99	Fabricated metal products	150
Rubber and plastics	8.99	Leather products	11.66	Other non-metallic mineral products	141
Food products	8.39	Fabricated metal products	11.40	Leather products	99
Basic metals	8.06	Textiles	8.91	Textiles	41
Textiles	7.66	Furnitures	8.57	Furnitures	29
Electrical equipment	7.62	Wood and wood products	7.40	Wood and wood products	19
Other transport equipment	5.19	Reproduction of recorded media	3.95	Reproduction of recorded media	5
Motor vehicles, trailers and semi trailers	4.53	Wearing apparel	3.57	Wearing apparel	4

<b>Entry</b>			
<b>NACE 2</b>	<b>Firm size</b>	<b>NACE 2</b>	<b>Import Penetration (in %)</b>
Tobacco	159.72	Reproduction of recorded media	4.16
Motor vehicles, trailers and semi trailers	74.79	Tobacco	11.23
Other transport equipment	58.92	Fabricated metal products	12.29
Pharmaceuticals	50.19	Other non-metallic mineral products	15.37
Chemicals	42.18	Beverages	15.91
Basic metals	32.19	Food products	19.60
Paper and paper products	17.97	Furnitures	19.61
Food products	14.58	Wood and wood products	22.91
Electrical equipment	13.69	Rubber and plastics	30.73
Beverages	12.42	Paper and paper products	32.96
Machinery and equipment n.e.c.	10.66	Textiles	35.73
Computers and electronics	7.64	Machinery and equipment n.e.c.	37.76
Rubber and plastics	6.53	Leather products	40.11
Fabricated metal products	3.84	Other manufacturing	41.09
Textiles	3.13	Motor vehicles, trailers and semi trailers	43.74
Other non-metallic mineral products	3.00	Wearing apparel	43.89
Leather products	1.92	Electrical equipment	44.73
Furnitures	1.41	Other transport equipment	45.13
Wearing apparel	1.41	Chemicals	48.15
Reproduction of recorded media	1.12	Pharmaceuticals	51.42
Wood and wood products	1.00	Basic metals	51.61
Other manufacturing	0.81	Computers and electronics	57.15

**Notes:** Firm size is recorded in € millions. Import Penetration is recorded in percentage points.

### Market stability and symmetry

NACE 2	Market size variance	NACE 2	Import Pene- tration Vari- ance	NACE 2	Asymmetry index
Wearing apparel	23.51	Rubber and plastics	31.67	Rubber and plastics	16.35
Tobacco	26.37	Wearing apparel	43.94	Textiles	17.75
Food products	37.62	Electrical equipment	44.39	Electrical equipment	18.59
Beverages	39.68	Wood and wood products	49.81	Tobacco	19.73
Pharmaceuticals	42.87	Other non-metallic mineral products	50.84	Furnitures	20.31
Furnitures	44.54	Furnitures	55.36	Other non-metallic mineral products	21.20
Paper and paper products	52.14	Motor vehicles, trailers and semi trailers	58.09	Fabricated metal products	21.42
Rubber and plastics	52.81	Tobacco	75.13	Food products	21.46
Reproduction of recorded media	55.74	Food products	77.84	Reproduction of recorded media	22.50
Electrical equipment	61.74	Basic metals	91.16	Wood and wood products	22.72
Motor vehicles, trailers and semi trailers	71.15	Paper and paper products	93.45	Beverages	23.41
Wood and wood products	81.31	Leather products	128.64	Paper and paper products	24.83
Textiles	84.51	Computers and electronics	135.99	Chemicals	25.28
Leather products	89.76	Textiles	137.51	Pharmaceuticals	25.90
Other non-metallic mineral products	97.24	Pharmaceuticals	146.81	Machinery and equipment n.e.c.	26.15
Other manufacturing	105.26	Beverages	147.63	Basic metals	26.51
Fabricated metal products	136.18	Fabricated metal products	176.05	Other manufacturing	28.03
Chemicals	138.74	Machinery and equipment n.e.c.	197.65	Computers and electronics	28.09
Computers and electronics	163.12	Reproduction of recorded media	229.69	Wearing apparel	28.32
Machinery and equipment n.e.c.	169.94	Other manufacturing	232.93	Motor vehicles, trailers and semi trailers	30.13
Other transport equipment	246.72	Chemicals	260.91	Leather products	30.54
Basic metals	354.24	Other transport equipment	1096.22	Other transport equipment	42.73

Notes: Variability indicators are computed starting with annual growth rates in percentage points. Source: Bruegel based on Euromonitor.

**TABLE 3: Sector ranking – Antitrust Risk Indicators (based on 4-digit data)**

Market concentration					
NACE 2	Subcategory	Price Margins	Cost NACE 2	Subcategory	C4
Tobacco	Tobacco Products	35.76	Tobacco	Tobacco Products	85.94
Beverages	Spirits	19.67	Food products	Sugar	77.13
Pharmaceuticals	Pharmaceuticals	16.95	Other transport equipment	Railway and Tramway Locomotives and Rolling Stock	66.78
Computers and electronics	Medical and Surgical Equipment	16.50	Beverages	Beer	61.58
Reproduction of recorded media	Reproduction of Recorded Media	15.47	Electrical equipment	Accumulators, Primary Cells and Primary Batteries	58.12
Other manufacturing	Musical Instruments	15.24	Rubber and plastics	Rubber Products	55.74
Leather products	Luggage, Handbags and Saddlery	13.43	Chemicals	Pesticides and Other Agro-chemical Products	54.88
Fabricated metal products	Coating of Metals and Mechanical Engineering	13.14	Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	51.26
Food products	Bakery Products	12.53	Other manufacturing	Musical Instruments	48.84
Other non-metallic mineral products	Glass and Glass Products	12.20	Machinery and equipment n.e.c.	Engines and Turbines, Except Aircraft, Vehicle and Cycle Engines	47.68
Machinery and equipment n.e.c.	Lifting and Handling Equipment	11.60	Fabricated metal products	Weapons and Ammunition	46.76
Wood and wood products	Wood and Wood Products	11.59	Computers and electronics	Watches and Clocks	44.54
Chemicals	Pesticides and Other Agro-chemical Products	11.22	Basic metals	Basic Iron and Steel	37.68
Wearing apparel	Knitted and Crocheted Articles	10.82	Pharmaceuticals	Pharmaceuticals	36.68
Electrical equipment	Electric Lamps and Lighting Equipment	10.61	Paper and paper products	Pulp, Paper and Paperboard	34.58
Paper and paper products	Pulp, Paper and Paperboard	10.15	Other non-metallic mineral products	Glass and Glass Products	33.84
Textiles	Cordage, Rope, Twine and Netting	9.78	Leather products	Luggage, Handbags and Saddlery	30.32
Furnitures	Furniture	9.63	Textiles	Carpets and Rugs	28.40
Rubber and plastics	Plastic Products	9.21	Wearing apparel	Fur and Fur Articles	15.60
Other transport equipment	Motorcycles, Bicycles and Other Transport Equipment	8.66	Furnitures	Furniture	9.44
Basic metals	Basic Iron and Steel	8.58	Wood and wood products	Wood and Wood Products	7.34
Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	4.64	Reproduction of recorded media	Printing	3.74

**Market concentration (cont.)**

<b>NACE 2</b>	<b>Subcategory</b>	<b>HHI(4)</b>
Tobacco	Tobacco Products	3945.78
Food products	Sugar	2230.23
Other transport equipment	Aircraft and Spacecraft	1640.48
Rubber and plastics	Rubber Products	1429.13
Chemicals	Pesticides and Other Agro-chemical Products	1309.94
Beverages	Beer	1301.35
Fabricated metal products	Weapons and Ammunition	1259.42
Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	1230.65
Electrical equipment	Accumulators, Primary Cells and Primary Batteries	1223.76
Computers and electronics	Optical Instruments and Photographic Equipment	1144.19
Other manufacturing	Musical Instruments	1038.70
	Engines and Turbines, Except Aircraft, Vehicle and Cycle	
Machinery and equipment n.e.c.	Engines	978.65
Basic metals	Basic Iron and Steel	605.25
Paper and paper products	Pulp, Paper and Paperboard	506.47
Pharmaceuticals	Pharmaceuticals	492.25
Leather products	Luggage, Handbags and Saddlery	476.94
Other non-metallic mineral products	Glass and Glass Products	414.08
Textiles	Carpets and Rugs	318.54
Wearing apparel	Fur and Fur Articles	64.62
Furnitures	Furniture	35.60
Wood and wood products	Wood and Wood Products	20.75
Reproduction of recorded media	Printing	4.71

Entry					
NACE 2	Subcategory	Firm size	NACE 2	Subcategory	Import penetration
Food products	Sugar	146.19	Fabricated metal products	Coating of Metals and Mechanical Engineering	0.43
Tobacco	Tobacco Products	135.62	Reproduction of recorded media	Printing	4.07
Other transport equipment	Aircraft and Spacecraft	62.81	Basic metals	Casting of Metals	6.86
Pharmaceuticals	Pharmaceuticals	46.10	Food products	Bakery Products	7.40
Motor vehicles, trailers and semi-trailers	Motor Vehicles, Trailers and Semi-trailers	44.33	Beverages	Soft Drinks	9.42
Chemicals	Plastic in Primary Forms and Synthetic Rubber	41.77	Paper and paper products	Corrugated Paper, Paperboard and Containers	9.76
Basic metals	Basic Iron and Steel	35.50	Tobacco	Tobacco Products	11.89
Paper and paper products	Pulp, Paper and Paperboard	26.95	Other non-metallic mineral products	Cement, Stone and Ceramic Products	12.25
Machinery and equipment n.e.c.	Engines and Turbines, Except Aircraft, Vehicle and Cycle Engines	22.59	Other transport equipment	Railway and Tramway Locomotives and Rolling Stock	14.65
Electrical equipment	Accumulators, Primary Cells and Primary Batteries	20.50	Furnitures	Furniture	21.52
Beverages	Soft Drinks	20.24	Chemicals	Paints and Varnishes	22.20
Fabricated metal products	Weapons and Ammunition	13.74	Machinery and equipment n.e.c.	Machinery for Metallurgy	23.09
Computers and electronics	Insulated Wire and Cable	11.41	Wood and wood products	Wood and Wood Products	23.57
Rubber and plastics	Rubber Products	10.08	Rubber and plastics	Plastic Products	27.10
Textiles	Carpets and Rugs	4.69	Textiles	Cordage, Rope, Twine and Netting	28.71
Other non-metallic mineral products	Glass and Glass Products	3.97	Computers and electronics	Industrial Process Control Equipment	37.52
Leather products	Tanning and Dressing of Leather	3.14	Other manufacturing	Jewellery and Related Articles	45.86
Wearing apparel	Knitted and Crocheted Articles	2.22	Wearing apparel	Fur and Fur Articles	46.05
Other manufacturing	Sports Goods	1.67	Electrical equipment	Domestic Appliances	47.34
Furnitures	Furniture	1.30	Motor vehicles, trailers and semi-trailers	Motor Vehicles, Trailers and Semi-trailers	53.21
Reproduction of recorded media	Reproduction of Recorded Media	1.26	Pharmaceuticals	Pharmaceuticals	54.06
Wood and wood products	Wood and Wood Products	0.93	Leather products	Footwear	54.18

## Market stability

NACE 2	Subcategory	Market size var.	NACE 2	Subcategory	Import penetration var.
Food products	Meat and Meat Products	15.03	Leather products	Footwear	21.42
Tobacco	Tobacco Products	21.03	Wearing apparel	Clothing	22.98
Wearing apparel	Clothing	25.29	Paper and paper products	Pulp, Paper and Paperboard	24.80
Beverages	Beer	29.59	Rubber and plastics	Plastic Products	26.76
Paper and paper products	Disposable Paper Products and Other Articles of Paper	34.03	Electrical equipment	Domestic Appliances	27.81
Leather products	Footwear	41.79	Computers and electronics	Watches and Clocks	31.31
Pharmaceuticals	Pharmaceuticals	43.29	Fabricated metal products	Coating of Metals and Mechanical Engineering	32.13
Electrical equipment	Domestic Appliances	43.96	Food products	Vegetable, Potato and Fruit Products	32.79
Textiles	Made-up Textile Articles	44.28	Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	34.59
Reproduction of recorded media	Printing	44.76	Chemicals	Household Cleaning and Personal Care Products	42.21
Chemicals	Household Cleaning and Personal Care Products	46.15	Basic metals	Basic Precious and Non-ferrous Metals	49.32
Rubber and plastics	Plastic Products	50.27	Other non-metallic mineral products	Glass and Glass Products	49.55
Furnitures	Furniture	51.16	Machinery and equipment n.e.c.	Pumps, Compressors, Taps and Valves	50.32
Computers and electronics	Toys and Games	56.56	Wood and wood products	Wood and Wood Products	50.89
Other non-metallic mineral products	Glass and Glass Products	76.13	Textiles	Spinning of Textile Fibres; Weaving of Textiles	51.02
Wood and wood products	Wood and Wood Products	84.30	Furnitures	Furniture	56.35
Machinery and equipment n.e.c.	Machinery for Food, Beverage and Tobacco Processing	89.85	Other manufacturing	Sports Goods	89.12
Fabricated metal products	Cutlery, Hand Tools and General Hardware	93.30	Tobacco	Tobacco Products	90.86
Other manufacturing	Sports Goods	93.55	Beverages	Soft Drinks	103.05
Other transport equipment	Motorcycles, Bicycles and Other Transport Equipment	99.08	Pharmaceuticals	Pharmaceuticals	128.76
Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	100.45	Other transport equipment	Motorcycles, Bicycles and Other Transport Equipment	154.16
Basic metals	Casting of Metals	117.95	Reproduction of recorded media	Printing	156.74

## Symmetry

NACE 2	Subcategory	Asymmetry index
Rubber and plastics	Plastic Products	10.21
Textiles	Spinning of Textile Fibres; Weaving of Textiles	11.26
Wearing apparel	Fur and Fur Articles	13.46
Chemicals	Household Cleaning and Personal Care Products	14.92
Basic metals	Basic Precious and Non-ferrous Metals	15.58
Fabricated metal products	Forging of metal and powder metallurgy	16.91
Computers and electronics	Electric Motors, Generators and Transformers	17.02
Machinery and equipment n.e.c.	Machine Tools	17.92
Electrical equipment	Electric Lamps and Lighting Equipment	18.35
Food products	Pet Food and Animal Feeds	18.76
Paper and paper products	Disposable Paper Products and Other Articles of Paper	19.36
Other non-metallic mineral products	Cement, Stone and Ceramic Products	19.65
Furnitures	Furniture	20.51
Beverages	Beer	22.61
Other manufacturing	Jewellery and Related Articles	24.31
Leather products	Footwear	24.61
Reproduction of recorded media	Printing	24.72
Wood and wood products	Wood and Wood Products	24.79
Pharmaceuticals	Pharmaceuticals	26.18
Tobacco	Tobacco Products	26.91
Other transport equipment	Railway and Tramway Locomotives and Rolling Stock	33.40
Motor vehicles, trailers and semi trailers	Motor Vehicles, Trailers and Semi-trailers	35.70

### 3. Results

#### 3.1 Sector ranking – Antitrust Risk Indicators

Table 2 and Table 3 above report the ranking of all sectors according to each of the ARI indicators (table 2 reports ranking based on 2-digit aggregation data, table 3 on 4-digit). In terms of market concentration, there is a general consistency between the three indicators, price-cost margins, C4 and HHI4, particularly in pointing to the most concentrated sectors: Tobacco, Beverages and Pharmaceuticals. Reproduction of recorded media and Chemicals, Motor vehicles and Electrical equipment score high respectively in terms of price cost margins and HHI(4) and C4. Divergences between indicators are possibly due to differences in cost structures (this should be the case for Motor vehicles and Other transport equipment for example)<sup>17</sup> or differences in the size of antitrust markets. For example, Reproduction of recorded media scores very low for HHI(4) and C4. That is possibly due to the fact that products in these sectors tend to be more heterogeneous and therefore less substitutable to each other. Therefore, even if several players are active in the sector (hence market shares at sector level are low), each player can still enjoy a certain degree of market power (hence price-cost margins are high), because the products sold may not have immediate close substitutes, or be perceived as such by customers. The opposite holds for Electrical equipment and Basic metals: if price-margins are relatively low despite high market shares, that may be due to a higher degree of substitutability between products.

Table 3 provides a more disaggregated insight by ranking 2-digit sectors according to the highest score reached by any of their 4-digit sub-sectors. No great difference is noted with the NACE-2 results. Tobacco, Pharmaceuticals and Beverages (Spirits and Beer) still rank high. Interestingly, Food climbs up the concentration ranking thanks to the low level of competition detected in the Sugar market. Other transport equipment (Locomotives and Aircrafts) scores high in terms of market share concentration.

Concerning entry, we note that, consistently with intuition, the firm size indicator is highly correlated with concentration. Tobacco, Motor Vehicles, Pharmaceutical, Chemicals, Beverages, Electric equipment, Basic metals are in the upper half of the ranking. This is not surprising given the relevance of research and development or high fixed entry costs and economy of scale featuring most of the products manufactured in these sectors. The NACE-4 analysis confirms Sugar (Food category) as a potentially problematic market, together with Tobacco, Aircraft and Spacecraft (Motor Vehicles), Plastic (Chemicals). The other entry indicator we use, “import penetration”, scores low for sectors where production tends to have a more narrow geographic scope (Reproduction of recorded media and in particular at 4-digit level, Printing) or has a stronger local dimension (Tobacco, Fabricated/Coated Metals, Other Non-metallic/Cement, Beverages/Soft drinks), while import penetration is high where multinational companies tend to be more present: Computer and electronics, Pharmaceuticals, Chemicals, Motor vehicles.

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<sup>17</sup> Profit margins are calculated with respect to estimation of marginal costs that includes intermediate goods and services. As explained above, this is a standard methodology in the literature, although alternative measures could rely on labour costs only – depending on what is considered a better approximation of total marginal costs. The methodology used in this paper therefore tends to bias downwards profit margins of sectors that rely heavily on intermediate goods and services, such as motor vehicles or other transport equipment.

In terms of market stability, Tobacco, Food, Beverages and Pharmaceutical are amongst the sectors where demand varied the least during the period of observation (beside Wearing apparel, a result driven by the stability of the Clothing sector, as the 4-digit analysis shows). Import penetration is stable the most in Rubber and plastics, Wearing apparel, Electrical equipment, Wood and wood products. The lack of overtime variability may be due to the relevance of products where demand is notoriously less elastic (Meat products, Clothing, Tobacco, Beer and Footwear, Clothing, Pulp, paper and paper board, Plastic products, respectively for market size and import penetration variance at 4-digit level). Finally, the least “asymmetric” sectors according to our Gini-indicator seem to be Rubber and plastic, Textile, Electrical equipment and Tobacco.

### 3.2 Sector ranking – European Commission Merger and Anti-Cartel Decisions

**TABLE 4: Sector ranking – European Commission’s Merger and Anti-Cartel Decisions**

<i>European Commission interventions - Merger investigations</i>					
<b>NACE 2</b>	<b>Mergers cleared in first phase with no conditions (A)</b>	<b>Mergers cleared in first phase with conditions (B)</b>	<b>Mergers that required a second phase investigation (C)</b>	<b>EC merger total (D)</b>	<b>"Problematic Merger" Likelihood (1-{A/D})</b>
Tobacco	3	3	0	6	0.500
Paper and paper products	50	9	8	67	0.254
Pharmaceuticals	60	19	1	80	0.250
Chemicals	220	20	19	259	0.151
Other manufacturing	41	4	3	48	0.146
Food products	137	15	7	159	0.138
Other transport equipment	76	6	6	88	0.136
Other non-metallic mineral products	73	4	6	83	0.120
Textiles	8	0	1	9	0.111
Beverages	35	4	0	39	0.103
Reproduction of recorded media	28	2	1	31	0.097
Machinery and equipment n.e.c.	124	4	9	137	0.095
Computers and electronics	86	6	3	95	0.095
Rubber and plastics	58	3	2	63	0.079
Fabricated metal products	73	5	1	79	0.076
Wood and wood products	14	0	1	15	0.067
Basic metals	100	3	4	107	0.065
Electrical equipment	101	3	4	108	0.065
Wearing apparel	17	1	0	18	0.056
Motor vehicles, trailers and semi trailers	157	0	3	160	0.019
Leather products	6	0	0	6	0.000
Furnitures	9	0	0	9	0.000
Total	1476	111	79	1666	0.114

### European Commission interventions - cartel investigations

NACE 2	Sanctioned cartels	Sanctioned cartels (weighted by market size)
Chemicals	27	16.47
Tobacco	1	14.47
Beverages	4	7.88
Electrical equipment	2	6.07
Other non-metallic mineral products	4	4.10
Wearing apparel	2	3.88
Rubber and plastics	4	3.55
Machinery and equipment n.e.c.	5	2.99
Textiles	1	2.96
Computers and electronics	4	2.46
Fabricated metal products	4	1.94
Paper and paper products	1	1.54
Basic metals	2	1.42
Pharmaceuticals	1	1.20
Motor vehicles, trailers and semi trailers	2	0.61
Food products	1	0.33
Leather products	0	0.00
Wood and wood products	0	0.00
Reproduction of recorded media	0	0.00
Other transport equipment	0	0.00
Furnitures	0	0.00
Other manufacturing	0	0.00
Total	65	NA

Source: Bruegel based on European Commission DG COMP

Table 4 above reports the ranking of manufacturing sectors on the basis of European Commission's merger and cartel investigations during the period 2000 - 2013.<sup>18</sup> The database was assembled downloading the decisions' record from the Commission's website and allocating them to sectors according to the reported economic classification. If more than one sector was reported, all indicated sectors were compiled as affected by the decision.

For merger investigations we collected three types of information: the number of mergers that were unconditionally cleared in 'first phase' ie after a preliminary inquiry usually requiring 1 month of investigation; the number of mergers that were cleared in first phase but did instead require the parties to commit to certain conditions; the number of mergers for which a deeper investigation ('second phase', usually lasting approximately 4 months) was deemed necessary. We define as 'potentially

<sup>18</sup> Data were retrieved from the website of the European Commission's Directorate-General of Competition through the case search tool: [link](#).

problematic' a merger that was deemed as such at the end of the first phase investigation by the European Commission either imposing conditions or requiring further scrutiny in second phase.<sup>19</sup> The ratio between potentially problematic mergers and the total number of scrutinised cases is the likelihood indicator used to rank sectors.

Sectors display a high heterogeneity in terms of incidence of merger control. The sector where merger scrutiny took place most often is Chemicals with an overall count of 259 decisions, while only 6 mergers were scrutinised in the Tobacco and the Leather sectors during the period of observation.

Since most of mergers are cleared without conditions, the likelihood that a merger is deemed potentially problematic by the European Commission is on average low (approximately 11 percent for the manufacturing sector as a whole). The index however varies substantially across sectors. Sectors where the index scores higher are Paper and paper products (25.4 percent), Pharmaceuticals (25 percent), Chemicals (15.1 percent), Other manufacturing (14.6 percent). At the other end, the risk of a finding of problematic merger by the European Commission is lower in Motor vehicles (1.9 percent), Wearing apparel (5.6 percent), Electric equipment (6.5 percent). Tobacco (50 percent) and Furniture and Leather (0 percent) are clearly outliers (these results are due to idiosyncratic factors and the small number of observations).

As for hard-core cartels, the Commission took decisions concerning 16 of the 22 sectors during the period of analysis. Chemicals account for the majority of rulings, 27 out of 65. Sectors with no uncovered cartels are Leather, Wood, Recorded media, Other transport equipment, Furniture and Other Manufacturing. To rank the sectors, we weighed the number of cartels to the size of the market as a share of total production in manufacturing. In the resulting ranking the sectors where the incidence of anti-cartel action was stronger in the period of observation are Chemicals, Beverages, Electrical equipment and Other non-metallic mineral products. Tobacco scores high as well, but again this might as well be due to the very small size of the sector compared to the other sectors, since just one cartel in Tobacco was sanctioned by the EC during the period of observation.

It is interesting to note that the likelihood that a merger is deemed problematic and the weighed incidence of anti-cartel enforcement are highly and significantly correlated: 51.5 percent (5 percent significance level). This provides comfort that economic sectors' features affecting the probability of collusion play a role in determining the outcome of merger decisions.

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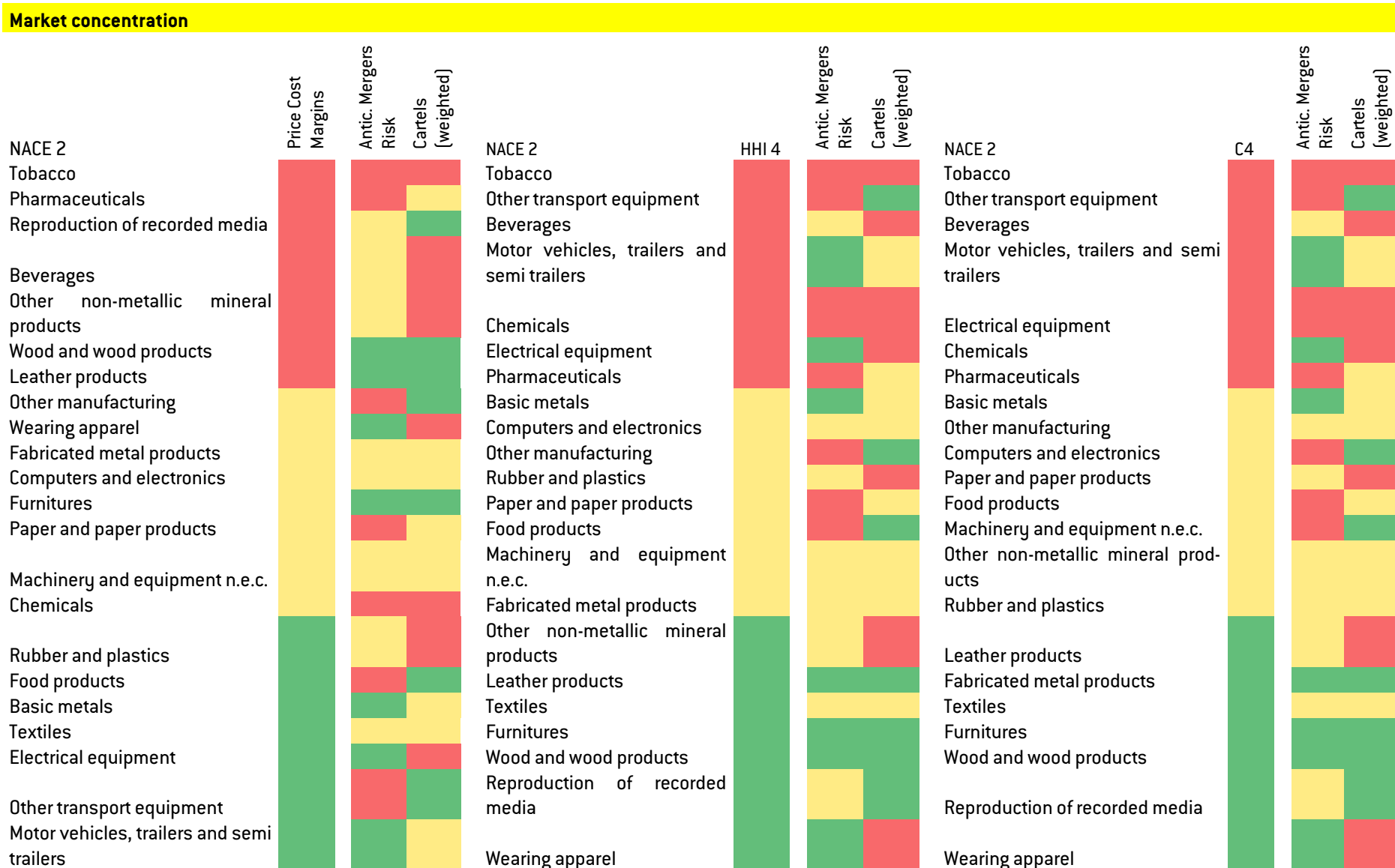
<sup>19</sup> We opted for this definition in order to guarantee the maximum degree of statistical compatibility between merger decisions, since the ones used for the indicators are taken all at the end of a first phase investigation. Alternative definitions could also be possible. For example it could be possible to further segment mergers that were investigated in 'second phase' in mergers cleared with conditions, mergers cleared with no conditions and blocked mergers. A problematic merger could then be defined as a merger for which conditions were imposed at the end of either first or second phase investigation or a blocked merger. However, this would have implied mixing decisions taken after different administrative processes and with different depth of scrutiny. It should be said in any case that the ranking of sectors is not affected by the choice between the two different definitions.

### 3.3 Sector ranking - comparative exercise

We now proceed with an illustrative comparative exercise. Figure 1 below attributes colours to sectors according to their performance with respect to the different computed indicators. The idea is to give a graphical glimpse of the consistency between Antitrust Risk Indicators and the action of the European Commission. As explained above, this exercise is useful to check whether antitrust intervention is more frequent where it is expected to according to from a macro-economic perspective. It is important to keep in mind, though, that this exercise cannot provide indications as regards the quality of antitrust intervention, given the fact that sector data are not disaggregated enough to capture the boundaries of product markets as defined in the course of antitrust investigations.

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FIGURE 1 – Title: Comparison tables: Antitrust Risk and the European Commission's Action



## Entry

	Firm size	Antic. Mergers Risk	Cartels (weighted)
NACE 2			
Tobacco			
Motor vehicles, trailers and semi trailers			
Other transport equipment			
Pharmaceuticals			
Chemicals			
Basic metals			
Paper and paper products			
Food products			
Electrical equipment			
Beverages			
Machinery and equipment n.e.c.			
Computers and electronics			
Rubber and plastics			
Fabricated metal products			
Textiles			
Other non-metallic mineral products			
Leather products			
Furnitures			
Wearing apparel			
Reproduction of recorded media			
Wood and wood products			
Other manufacturing			

	Import Penetration	Mergers Risk	Cartels (weighted)
NACE 2			
Reproduction of recorded media			
Tobacco			
Fabricated metal products			
Other non-metallic mineral products			
Beverages			
Food products			
Furnitures			
Wood and wood products			
Rubber and plastics			
Paper and paper products			
Textiles			
Machinery and equipment n.e.c.			
Leather products			
Other manufacturing			
Motor vehicles, trailers and semi trailers			
Wearing apparel			
Electrical equipment			
Other transport equipment			
Chemicals			
Pharmaceuticals			
Basic metals			
Computers and electronics			

## Market Stability

	Market size var.	Antic. Mergers Risk	Cartels (weighted)
NACE 2			
Wearing apparel			
Tobacco			
Food products			
Beverages			
Pharmaceuticals			
Furnitures			
Paper and paper products			
Rubber and plastics			
Reproduction of recorded media			
Electrical equipment			
Motor vehicles, trailers and semi trailers			
Wood and wood products			
Textiles			
Leather products			
Other non-metallic mineral prod- ucts			
Other manufacturing			
Fabricated metal products			
Chemicals			
Computers and electronics			
Machinery and equipment n.e.c.			
Other transport equipment			
Basic metals			

NACE 2
Rubber and plastics
Wearing apparel
Electrical equipment
Wood and wood products
Other non-metallic mineral prod- ucts
Furnitures
Motor vehicles, trailers and semi trailers
Tobacco
Food products
Basic metals
Paper and paper products
Leather products
Computers and electronics
Textiles
Pharmaceuticals
Beverages
Fabricated metal products
Machinery and equipment n.e.c.
Reproduction of recorded media
Other manufacturing
Chemicals
Other transport equipment

## Symmetry

	Import Pene- tration var.	Antic. Mergers Risk	Cartels (weighted)		Symmetry	Antic. Mergers Risk	Cartels (weighted)
NACE 2				NACE 2			
Rubber and plastics				Rubber and plastics			
Textiles				Textiles			
Electrical equipment				Electrical equipment			
Tobacco				Tobacco			
Furnitures				Furnitures			
Other non-metallic mineral products				Other non-metallic mineral products			
Fabricated metal products				Fabricated metal products			
Food products				Food products			
Reproduction of recorded me- dia				Reproduction of recorded me- dia			
Wood and wood products				Wood and wood products			
Beverages				Beverages			
Paper and paper products				Paper and paper products			
Chemicals				Chemicals			
Pharmaceuticals				Pharmaceuticals			
Machinery and equipment n.e.c.				Machinery and equipment n.e.c.			
Basic metals				Basic metals			
Other manufacturing				Other manufacturing			
Computers and electronics				Computers and electronics			
Wearing apparel				Wearing apparel			
Motor vehicles, trailers and semi trailers				Motor vehicles, trailers and semi trailers			
Leather products				Leather products			
Other transport equipment				Other transport equipment			

The coloured squares in figure 1 reflect the ranking of the sectors ordered according to their anticompetitive risk or the intensity of antitrust action: red corresponds to the seven sectors at the top, green to the seven sectors at the bottom, and yellow to the eight sectors in the middle. Red sectors in terms of “problematic merger risk” are, as described above: Tobacco, Pharmaceuticals, Chemical, Food and Paper; in terms of risk of cartel conviction, red sectors are: Tobacco, Beverages, Other non-metallic, Chemicals, Electric equipment, Rubber and plastic, Wearing apparel.

Figure 1 suggests a significant degree of consistency between European Commission’s action both in terms of merger control and anti-cartel enforcement and ARIs related to market concentration and firm’s average size (simple correlation analysis point to significant correlation coefficients between 45 percent and 75 percent). A much lower degree of consistency is observed as regards the other ARIs and correlation results are all not statistically significant. The variance of market size (a negative proxy of market stability) is however broadly consistent with merger decisions for what concerns negative decisions ie: sectors such as Tobacco, Food products, Pharmaceuticals, Paper and paper products are ranked top both in terms of lack of market variance and of probability of negative merger decision. Cartels discovery seems also overall consistent in the top ranking for what concern import penetration (Tobacco, Other non-metallic mineral products and Beverages), variance of market size (Wearing apparel, Tobacco and Beverages), variance of import penetration and market symmetry (Rubber and plastic, Wearing apparel, Electrical equipment and Other non-metallic mineral products).

#### 4. Conclusions

In this paper we have analysed features of European manufacturing sectors. We ranked sectors according to their performance based on indicators that economic wisdom suggests positively affect the likelihood of collusive behaviour by market players.

At 2-digit level, sectors that appear more exposed to collusion risk are Tobacco, Pharmaceuticals, Beverages, Chemicals. The 4-digit analysis suggests higher anticompetitive risk in Tobacco products, Spirits, Sugar, Railway Locomotives and Aircrafts (high concentration and fixed costs), Coating of Metals and Printing (low import penetration), Tobacco products, Meat products, Footwear and Clothing (high market stability), Plastic products and Spinning/Weaving of textiles (high symmetry of market leaders).

We also have ranked sectors according to the distribution of European’s Commission’s antitrust intervention between 2000 and 2013 in terms of merger control and anti-cartel enforcement. Tobacco, Paper and paper products, Pharmaceuticals, Food products, are the sectors in which a notified merger has a greater likelihood of being deemed problematic by the Commission. The incidence of anti-cartel action has been higher in Chemicals, Tobacco, Beverages, Electric equipment and Rubber and plastic.

We then checked the consistency of the European Commission’s action with the prediction of economic theory based on sector data, bearing in mind that sector data cannot provide for indications on the quality of antitrust intervention given the fact that antitrust investigations are based on very narrow product market definitions. The comparison exercise suggests that, by and large, both merger control and anti-cartel action have been focusing on sectors displaying a higher level of market concentrations and economic rents or economy of scale.

This paper has a descriptive nature and should be taken as a starting point for a deeper reflection on the choice of appropriate instruments to foster competition in European manufacturing sectors and the definition of intervention priorities. Without appropriate regulatory intervention, ex-ante monitoring by the antitrust authority is warranted. The action of the European Commission is sometimes considered to be too much 'case-driven'. Cartels are discovered through whistle-blowers, abuse of dominance or anti-competitive agreements' investigations are prompted by complaints. Because of such an approach, the restoration of normal competitive conditions that antitrust intervention is supposed to bring comes often with a significant delay with respect to the starting of the infringement. Uncovered cartels' duration, for example, fluctuates between 6 to 14 years (see Mariniello, 2013) from their commencement. During that time, cartels affect the economy through a higher burden on customers and ultimately on consumers. It would thus be more efficient to anticipate the breaking down of cartels by investing resources in uncovering cartels to monitor markets in which infringements are more likely. The European Commission already has the tools to perform such a job through so-called 'sector inquiries'; an appropriate use of those tools in the identified sectors could yield significant social benefit.

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## Appendix 1 – Alternative ways to measure likelihood of entry

In this paper we have used firm size as an indication of entry costs. Firms in sectors with higher barriers to entry are expected on average to be bigger in size. Another way to proxy likelihood of entry consists in measuring the actual number of enterprise births and deaths using the Business Demography datasets of Eurostat and the OECD<sup>20</sup>. A summary indicator for firms' turnover is the business churn, obtained as the sum of the birth rate and the death rate over the number of active enterprises in a given year. The higher is the churn rate, the easier is for firms to enter or exit a sector. Table A below reports the indicator used in this paper, firm size, and business churn in two separate columns at two-digits NACE 2.

**TABLE A – Barriers to entry in European manufacturing sectors**

	<b>Firm Size (in € millions)</b>	<b>Business churn (%)</b>	<b>R&amp;D (in %)</b>	<b>Capital intensity (%)</b>
Food products	14.58			16.01
Beverages	12.42	10.93	0.82	19.45
Tobacco	159.72		1.38	9.30
Textiles	3.13		1.88	10.19
Wearing apparel	1.41	17.94		5.51
Leather products	1.92	16.68	0.61	10.03
Wood and wood products	1.00	12.67	0.27	13.42
Paper and paper products	17.97		0.72	16.06
Reproduction of recorded media	1.12	13.30	0.14	11.68
Chemicals	42.18		6.96	17.03
Pharmaceuticals	50.19	10.92	25.53	11.07
Rubber and plastics	6.53	9.66	2.65	12.89
Other non-metallic mineral products	3.00	11.69	1.41	16.87
Basic metals	32.19		1.66	22.20
Fabricated metal products	3.84	11.21	0.73	10.51
Computers and electronics	7.64		15.70	9.84
Electrical equipment	13.69	12.06	5.31	9.07
Machinery and equipment n.e.c.	10.66	9.32	4.62	8.69
Motor vehicles, trailers and semi trailers	74.79		12.50	18.92
Other transport equipment	58.92	13.92	21.65	11.63
Furnitures	1.41			9.17
Other manufacturing	0.81	14.04	1.13	9.55
<b>Mean</b>	<b>23.60</b>	<b>12.64</b>	<b>5.56</b>	<b>12.69</b>
<b>Median</b>	<b>9.15</b>	<b>12.06</b>	<b>1.66</b>	<b>11.35</b>

Notes: Firm size - Source: Euromonitor. Years: 2000-2011. See below for full methodology. Business churn - Source: Eurostat. Years: 2008-2011. Countries: France, Germany, Italy, Spain, UK. Coverage varies. R&D intensity - Source: OECD. Years: 1999-2006. Countries: France, Germany, Italy, Spain, UK. Coverage varies. Capital intensity - Source: Eurostat. Years: 2008-2011. Countries: France, Germany, Italy, Spain, UK. Coverage varies.

<sup>20</sup> According to the Eurostat definition, "the enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources". Births and deaths account for the creation or dissolution of enterprise units, thus excluding mergers, break-ups or restructuring of a set of enterprises.

As it can be noted, the sectoral disaggregation of the two indicators differs. In particular, the Eurostat Business Demography/OECD dataset provides data at a more aggregated level than the level of analysis used in this paper. This makes the comparison between the two indicators difficult as sectors included in the same group in the Business Demography dataset may have very heterogeneous firms' size. For example, the Tobacco sector has the highest average firm size but Tobacco is aggregated with Food and Beverages in Eurostat and OECD datasets, which have average firm size about 10 times smaller. A rough comparison yields mixed results. Sectors with the highest business churn (ie Textiles, Wearing apparel, and Leather products) have very low firm sizes – consistently with the approach adopted in our analysis. However, sectors with higher firm sizes (eg Motor vehicles and Transport Equipment) also display relatively high churn rates. A possible explanation for this divergence is that high entry and exit rates may be due to high flows of small companies in narrow markets within a sector. If a high number of small companies enter or exit small markets in a sector, this significantly increases the sector's reported average churn rate. However, the 'disruptive' effect on collusion brought about by these companies can be very limited, given their small size. For that reason, we believe that using firm size is a better measure to indicate the exposure of the sector to external competition for the purposes of the analysis reported in this paper.

Another way to measure barriers to entry is to use sector capital and R&D intensity as in Gual and Mas (2011) and Symeonidis (2003). A high capital intensity, as measured by investment in tangible goods over value added, might imply that firms need to make expensive investments in order to operate at an efficient scale. Similarly, a high R&D intensity, as measures by R&D spending over value added, may point to high costs incurred to differentiate or improve their products. Thus, capital and R&D costs may represent fixed or sunk costs that reduce likelihood of entry. The two indicators are also displayed in Table A.

Again testing the similarity between these alternative measures and firm size is difficult due to the different level of aggregation of the sectors. Nevertheless, a rough comparison suggests a higher degree of consistency compared to what observed in the case of business churn rate. Excluding Tobacco, the correlations between capital intensity and firm size and between R&D intensity and firm size are respectively as high as 44 percent and 72 percent. Taking the sum of the capital and the R&D intensity the correlation with firm size reaches 89 percent.