THE EFFECT OF SUBSIDIES ON THE EVOLUTION OF MARKET STRUCTURE:

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Abstract

Within the European Union, Member States are not free to act at will with regard to State aid. There is a set of rules in place, limiting the autonomy of the Member States in this field, in order to ensure fair and effective competition within the single market. Nevertheless, considerable resources are still spent on subsidies, which constitute an important part of State aid measures. This paper empirically investigates the impact of subsidies on market shares and concentration. By means of tobit regression on a sample of over 13 000 Belgian firms we find a significant positive joint influence of all subsidies on market shares, acknowledging that this is not the objective of the subsidies. Firms receiving high amounts of subsidies seem to experience an increase in market power. This effect only becomes visible two years after the subsidy has been granted. Following these results, it is imperative to study possible influences on concentration at the industry level as the found competition effect of subsidies on market shares will turn out to be problematic, especially when it are the larger firms in an industry that are able to expand their market power at cost of their smaller rivals. Therefore, we study the evolution of seller concentration of 541 industries in Belgium. Regression results indicate that subsidies are positively correlated to the Herfindahl-Hirschmann index meaning that, even under a regulative system, industries receiving a substantial amount of subsidies, experience a change towards higher concentration (weakened competition). Under the current (European) legislation with regard to State aid, giving financial support to firms for a variety of reasons such as environmental objectives, training of employees, innovation and research and development does impact on market power of individual firms as well as on the concentration level of the industry as a whole and hence does not go without consequence for competition.

Keywords: State aid; industry dynamics; empirical

Introduction

Many governments grant State aid to their local industries. As explained amongst others by Quigley and Collins (2004), they do so for a variety of reasons: to encourage R&D, to support certain sectors or regions, to compensate for exceptional occurrences, to help national industries compete in the single European or global market, to provide goods or services where the market fails,… We could say that in general the reason behind State aid is to increase social welfare (Collie, 2000 and Friederiszick et al., 2006).

Within the European Union, the granting of State aid is subject to control of the European Commission because unrestrained State aid could jeopardize free competition and the well-functioning of the single market (Friederiszick et al., 2006). In principle, State aid is forbidden according to art 107 of the Treaty of the Functioning of the European Union.[2] Nevertheless, several exceptions exist and the amount of aid granted is still considerable. In 2009, € 427 366 million was spent on notified State aid by the 27 Member States, accounting for 3.6% of GDP. These figures exceed the trend levels of the last few years due to the financial crisis. Excluding crisis measures, € 73 225 million was spent, representing 0.6% of GDP.[3] The total amount of aid to firms is even higher, as several aid measures do not fall under the jurisdiction of the European Union such as measures not affecting trade between Member States.

The evaluation of State aid cases by the European Commission underwent quite some changes over the last few years. The most important one is probably the enhanced focus on competition effects. One of the questions asked in the new assessment is whether the aid distorts or threatens to distort competition and if so, whether the benefits of the measure outweigh this cost.[4] Next to rules set by the European Union, Member States also have national competition policies to improve and ensure real competition at a national level. These local policies do however not imply an assessment of State aid granted by local authorities. In the present paper we study the possibilities of existing subsidies, a specific State aid measure, to distort competition. In other words, we ask to what extent market shares or the evolution thereof (and ultimately entry and exit) within a sector are correlated to or explained by received financial support from government. Do existing subsidies, although it will not be their objective, indeed (or still) shift profits, alter market shares or even alter industry concentration levels within the same country, or is the impact not substantial under the present European regulations? We look at the situation within one country, Belgium. Thus, we do not focus on cross-border effects (in a sense that governments grant aid to certain sectors to give them an unfair advantage compared to their foreign competitors). We study all Belgian companies (listed as well as not listed) that filed 'extensive' annual accounts and investigate whether there exists a relationship between the amount of financial support received and (the evolution of) their market shares. Furthermore, building on the results from our analysis of market shares, we study whether there is also an impact on industry level. Thereto, we test for a possible relationship between the level of subsidies going to an industry and the evolution of the Herfindahl-Hirschman index.

[2] European Union, 2008.
[3] European Commission, 2010.
[4] European Commission, 2008.

The paper proceeds as follows: section I introduces the topic of State aid within the European Union and it provides an overview of all possible subsidies in Belgium. Next, we look at literature on the competition effects of State aid as well as on the determinants of seller concentration. Specification and data of our model examining a possible relationship between subsidies and market shares can be found in section III. Methodology and results are discussed in section IV. Building on the findings from section IV, specification and data to study the possible relationship between subsidies and seller concentration are provided in section V. The sixth section then reports and analyses the results on industry level. The last section concludes and discusses policy implications.

I. State aid in the EU-27 and Belgium

State aid takes an important place on the policy agenda of the EU. As mentioned in the introduction, each year considerable amounts of money are spent on State aid by national governments. The EU is trying to change policy in a number of ways, i.e. limiting the number of measures, enhancing transparency, reforming the evaluation procedures,… In this section we first take an introductory look at State aid spending in general and then focus on one country, Belgium, and one specific aid measure, subsidies.

First we look at data provided by the European Commission.[5] As mentioned above, Member States of the EU-27 spent € 427 366 million on State aid in 2009. This accounts for 3.6% of their aggregated GDP. When crisis measures are excluded, 0.6% of GDP was spent on State aid. We notice that the newer Member States spent relatively more than older members. Over the years relative expenditure on State aid has gone down significantly (not taking into account recent, exceptional crisis measures). In 1992, the EU Member States still spent 1.1% of their aggregated GDP on State aid. This decline in spending is in line with the State aid Action Plan[6] which strives for less and better targeted State aid. Most notified State aid falls under horizontal objectives.[7] Within this category, environment, regional aid and R&D are the most important spending categories.

As Belgium is the focus of the empirical part of this paper, we describe where it is positioned compared to the EU average. € 34 330 million was spent on State aid in 2009. This represents about 10.2% of GDP, which is extremely high compared to other EU Member States. However, when crisis measures are excluded, we see that € 1 990 million was spent, 0.6% of GDP. This is a quite sudden increase, mainly due to the financial crisis as Belgium was with 0.4% of GDP in 2007 and 0.5% in 2008 below the average of notified State aid spending of the EU, and was even below average spending of the oldest EU members. This is thus an interruption of a steady decrease in State aid spending. The decrease being in line with the State Aid Action Plan. In 1992, Belgium still spent 0.9% of GDP on State aid.[8]

[5] These State aid data from the European Commission only include aid measures when they fall under their jurisdiction. For a description of the relevant aid measures, see for example: Adriaanse (2006), Buyskes et al. (2005), Cini and McGowan (1998), Knaul and Flores (2007), Plender (2004), Quigley and Collins (2004) and Wish (2005).
[6] European Commission, 2005.
[7] European Commission, 2009.
[8] European Commission, 2010.

Belgian firms can obtain subsidies through different channels.[9] Firstly, the European Union has a number of subsidies available. The firm has to apply for the funds and has to meet certain conditions. Aid is granted for amongst others the following objectives: R&D, environment, regional development, business cooperation with Japan or Korea, job market and agriculture and fisheries. Next, the Belgian federal government awards subsidies for objectives such as internships and start ups. Next to these instruments, new aid schemes or other aid measures can be introduced by the federal government (after obtaining the permission of the European Commission), for example the aid to certain banks during the financial crisis in 2008-2010. Apart from the federal government, the three regional governments as well have the power to grant subsidies under several objectives such as employment, training of employees, research, innovation, start-up capital and growth. Most of the subsidies granted in Belgium are provided by the regional governments. The Flemish government for example has about 50 different kinds of subsidy instruments. These aid measures are administered by a department of the government itself or by an organization founded by the regional government. Last, financial support is awarded by private initiatives (for example within a certain industry) or can be obtained by winning one of the competitions that are organized for innovative ideas or young undertakings.

II. Literature

i. Literature on the competition effects of State aid

Many different aspects of State aid are discussed in the literature. Frequently treated subjects are international market share rivalry and efficiency of certain types of aid. However, the specific topic of competition effects has received relatively little attention, although more economists have recently picked up on the subject and overall understanding is growing. Here, we provide a short overview of the most important work on competition effects.

Katsoulacos (2005) lists possible competition effects of State aid to R&D. He mentions that this kind of aid has an impact on entry and exit decisions as well as on R&D performance of existing firms and in this way alters competition intensity. Jegers and Buts (2008) analytically study the competition effects of State aid in the case of perfect competition and for a Bertrand-Nash duopoly. For perfect competition, the effect of a subsidy depends on market characteristics as size and cost structure as well as on the amount of the subsidy. In case of a Bertrand-Nash duopoly, subsidies lead to a more competitive market.

Important theoretical work has been done by Garcia and Neven (2005) and Mollgaard (2005). The former paper builds a model to look at competitive effects of three types of State aid: affecting the marginal cost, influencing entry and having an impact on vertical differentiation. The importance of the distortion of competition depends on market characteristics. Overall, higher concentration leads to more severe price distortions for both domestic and foreign firms. Also in a more segmented market, State aid will cause a more important distortion (for domestic firms) compared to less segmented markets. As for rivalry, the magnitude of the competition distortion depends on the kind of aid. The latter paper considers State aid in both Bertrand and Cournot oligopolies. In contrast to Garcia and Neven (2005), Mollgaard (2005) studies State aid that lowers the cost of capital and

[9] Agentschap Ondernemen, 2009. Measures such as loans and tax reductions are not included in this overview.

captures in this way competitive effects even if they do not results in price fluctuations. This kind of subsidy can have seriously distorting consequences on competition, in markets where investment is necessary to raise demand, in a way that the receiving firm is able to boost the quality of its products. High enough amounts of aid can even become predatory.

A study by London Economics (2004) looks at the impact of rescue and restructuring aid on international competitiveness. Results of their five case studies reveal that all but one increased fixed assets after the aid. Three companies saw a considerable increase of their EU market share. Another company expanded sales to the rest of the world, but noticed a decline in its EU market share.

ii. Literature on the determinants of concentration

In this section we give a brief overview of literature on possible determinants, beside of random growth effects, of seller concentration (needed for the second part of the empirical analysis). Several more extensive overviews exist such as the one provided by Lipczynski et al. (2009).

First of all, the current level of concentration is one of the determinants of its future value and change. Marcus (1969) explains that a large concentration increase is more difficult when initial concentration is already high. Also, small companies will find it relatively more easy to expand their market share by means of a price reduction than larger firms, which tend to be more careful as they are more easily observed by competitors. Also according to Caves and Porter's (1980) study on the evolution of seller concentration between 1954 and 1972, concentration rose more in smaller total markets or lesser concentrated industries. Secondly, several characteristics at the firm level such as capacity to innovate and to adapt can be considered as drivers of industry dynamics as is explained by Lipczynski et al. (2009). Next, as entry and exit influence the number of firms within an industry and thereby possibly alter the configuration of market shares, they will also impact on concentration. Geroski (1991) explains for example that entry is an important driver for the evolution of an industry. Entry is highly dependent on the profit possibilities in an industry and on a number of entry barriers such as economies of scale (Miller, 2010), sunk costs (Martin, 2002), certain advantages such as acquired knowledge of production technology or cheap access to credit (Lipczynski et al., 2009), type of product and differentiation possibilities (Lipczynski et al., 2009), legal barriers (Klapper et al., 2006) and the intensity of advertising in the industry (Marcus, 1969; Mueller and Rogers, 1980 and Ornstein and Lustgarten, 1978)[10]. Last, the phase in the industry life cycle and, often related to this, industry growth are considered to be determinants of seller concentration. Concentration is usually quite low in early phases of the life cycle whereas it becomes more concentrated in later stages. Quickly growing industries make it more difficult for the leading companies (in terms of market share) to keep up the same pace of growth as the industry as is explained by Nelson (1960) and Shepherd (1964).

To the best of our knowledge, neither the direct impact of subsidies on market shares, nor the impact of subsidies on concentration has yet been studied.

[10] For the influence of advertising intensity on concentration, different findings are reported in the literature. The above mentioned papers report that concentration increases with advertising intensity. However, a study by Asch (1979) does not find a significant influence of advertising on concentration. Lynk (1981) finds decreasing levels of concentration when advertising becomes more intense.

III. Specification and data: the effect of subsidies on market shares

We study the impact of subsidies on market shares of Belgian firms. We include all firms (listed as well as not listed) that submitted 'extensive' annual accounts (in the definition of the Belgian accounting regulation)[11] from 2005 to 2008 leading to a sample of over 13 000 firms. We focus on all subsidies to companies as explained in section 1 and study their joint influence. In one sense, this is a wider definition of State aid than the one used by the European Commission as we include for example aid below € 200 000 (over three years) as well as block exempted measures. Otherwise, this approach is narrower as we only include financial grants and do not account for other measures such as a guarantee for a loan or time credit. Thus, subsidies for very different objectives are included. However, we do not attempt to evaluate whether or not the subsidies were effective. The purpose is to investigate whether or not they jointly impact on market shares (and on the evolution thereof) which is not their primary objective.

In our analysis, market shares are evaluated at two moments in time, as the impact of subsidies on market shares, if any, is probably lagged one or several years. Therefore, we tested multiple time frames.[12] Our dependent variable is the firm's market share in year t (2008). We calculate this market share by dividing the total assets of the company by the total assets of the whole sector. To determine the size of the chosen sectors, we use the NACE (Nomenclature générale des activités économiques dans les communautés Européennes) classification scheme of the European Commission as described in Lipczynski et al. (2009). For Belgium, this system translates into NACEBEL codes[13].

We hypothesize that the market share in year t is positively influenced by the amount of subsidies received by the firm in year t-I (i=1,2). We test the influence of subsidies in year 2006 on market shares of 2008 in function of, amongst others variables, the total subsidies going to a firm in 2006. As explained in section I, different authorities grant subsidies in Belgium. There are however no aggregated data available per firm of all received subsidies and we experienced that certain authorities are not keen on providing detailed information on to whom they grant subsidies and how much. Therefore we decided to derive the received subsidies from the annual accounts following a formula proposed by Jegers and Theunisse (2007). These annual accounts are published each year by the National Bank of Belgium. The first independent variable thus is the subsidy in year t-2. The firms in our sample receive over € 2 billion in financial grants according our operationalization from the governments or from an institution founded by a government and acting on its behalf. This figure does not include the subsidies going to firms that file a shorter version of their annual accounts, nor tax reductions or any other kind of supportive measure. Out of the 13 450 firms in the sample[14], 1907 received a subsidy in 2006.

[11] In Belgium, 'large' firms have to disclose 'extensive' annual accounts. They are published every year by the National Bank of Belgium. Their format is prescribed by the Belgian accounting law, and should be used by firms exceeding two of the three thresholds (50 FTE employees, € 7.3 million total assets, € 3.65 million sales (excluding VAT)) or employing more than 100 FTE employees.

[12] No effects were found one year after the subsidies had been granted (Buts and Jegers, 2010). Effects were found two years after the subsidies have been granted. These results will be reported.

[13] FOD, (2009).

[14] All firms that submitted extensive annual accounts, excluding the financial sectors.

As subsidies are obviously not the only force affecting a market share, we add the following set of independent variables: First of all, the market share at time t-i is expected to be correlated with the firm's market share of year t. Second, we expect profits to have a positive influence on market share. Also, the level of investment in year t-i could positively impact on market shares. Next, we include two financial ratios: return on assets and leverage. Also size and growth are expected to have an effect on market shares. Furthermore, being part of a group might have an influence. However, the direction of this influence is not obvious. Work by amongst others Buysschaert et al (2008) points out positive as well as negative effects. Group affiliation is included by means of a dummy variable, taking on the value of one when the firm is part of a group, zero otherwise. Furthermore, dummy variables per type of industry are included as the influence of State aid depends on market characteristics, as shown by Garcia and Neven (2005) and Jegers and Buts (2008).

Taking the above considerations into account, leads to the following regression equation (i=2):

$$\text{Market share}_t = \alpha + \beta_1 \text{sub}_{t-i} + \beta_2 \text{market share}_{t-i} + \beta_3 \text{profit} + \beta_4 \text{invest} + \beta_5 \text{ROA} + \beta_6 \text{leverage} + \beta_7 \text{logsize} + \beta_8 \text{growth} + \beta_9 \text{group} + \beta_{10} \text{industry} + \varepsilon$$

IV. Methodology and results: the effect of subsidies on market shares

The dependent variable market share can only take a limited number of values, more specifically it ranges from zero, which means no market share at all, to one when the firm is the only active one in the industry. Therefore, classical OLS regression is not a fit technique. We opt for a tobit regression, i.e. a limited dependent variable model fit for this kind of censored data. We thus include a lower limit of 0 in the tobit command as well as an upper limit of 1. Results of tobit regression can be found in table 1. [15]

Table 1: Results: the effect of subsidies on market shares. [16,17]

	Explaining market share 2008
Market share 2006	0.9116***
Subsidy	2.61e-10***
Growth	0.0001***
(Log) Size	0.0018***
Return on assets	5.18e-07
Leverage	1.38e-06

[15] In a similar way we tested the effect of subsidies on the change in market share, providing similar results. (Buts and Jegers, 2010).
[16] Industry dummies were included but are not reported here.
[17] Financial sectors (firms having a NACEBEL code starting with 64, 65 or 66) are not included here. Adding them increases the number of observations by 1728. A difference is that the dummy for group affiliation becomes positive and significant at the 10% level. Profit however loses its significance. Also, a test with only companies that did receive subsidies gives comparable results.

Investment	1.13e-11***
Profit	1.64e-11***
Group affiliation	0.0009
Number of observations	13450
Prob<chi2	0.0000
Pseudo R2	-1.2111

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

From table 1 we conclude that the amount of subsidies has a significant and positive influence on a firm's market share, but only two years after the subsidy was granted. We did not find similar results after one year, indicating that it takes more than one year for the subsidies to have an effect, at least on market share. This seems logical as time is needed for example to wisely invest the money and to adjust plans to a larger budget. However, evaluating the size of the effect should be done carefully. If market share were not censored, subsidies of about € 10 million would be necessary to have a 0.2% increase in the market share of an average company after two years. Of course, € 10 million is a very large amount. On the other hand, this kind of amount (and even more) is granted to several companies in our sample. It is also important to keep in mind that a 0.2% increase in market share is quite substantial as the average market share in our sample is 2.6%. In order to account for the fact that data are censored, we calculate marginal effects for further evaluation of the results and come to a similar interpretation. An example: for a firm that receives subsidies of € 50 000, an increase of € 100 000 leads to an additional 0.02% market share.

As expected we find a positive influence of the previous market share. Logically, market shares are high when they were already high in a previous year. Also for growth and size we find a positive and significant influence. Furthermore, profit as well as the level of investment contributes to obtaining a large share of the market. Otherwise, the financial ratios do not have a significant impact. The same goes for group affiliation[18].

We test whether no basic statistical assumptions are violated. In checking for observations that have a potential great influence on the results, we find few outliers. Nevertheless, we analyze the data with as well as without these observations to make sure that they do not change the results. Furthermore, no problems with regard to multicollinearity are found. In order to avoid model specification problems in a way that irrelevant variables have an impact on the results we also checked the regression outcome after stepwise elimination of non-significant variables. However, we do not find any substantial differences. Therefore, original results are reported here and can be considered robust.[19]

[18] The group affiliation dummy has a significant positive influence (at the 10% level) once we include the financial sectors in the sample.
[19] All other results can be obtained from the authors.

The amount of subsidy seems to have a positive influence on a firm's market share. As we took into account all kinds of financial grants, we can conclude that despite the strict regulations on State aid that are currently in order in the EU, the total sum of several measures does still impact on a company's market share keeping in mind that this is not the goal of most subsidies. However, studying whether subsidies also influence industry concentration ratios, should point to the real meaning of the effect. On the one hand, an influence on market shares could be problematic in case large firms are able to expand their market power. In this case concentration increases and competition is weakened. On the other hand, such competition concerns do not arise when it are the small firms in an industry that can increase their market share. Therefore, the next sections study the influence of subsidies on concentration to get a clearer view of the extent of the possible competition distortions.

V. Specification and data: the effect of subsidies on concentration

From the literature we learn that seller concentration is, a. o., influenced by firm characteristics, entry and exit and industry growth . We also observe that, for example, policy choices with regard to patents, monopoly rights, licensing and certain tax measures can make it more difficult to set up a new firm as starting costs are increased to meet regulatory conditions (Klapper et al., 2006). In this sense, policy choices can constitute a barrier to entry and can thus influence concentration levels. The central policy instrument to be studied here are subsidies, which are an important part of competition policy. Do they impact on the level of concentration in an industry? And if this is the case, in what way? From the previous sections, it is clear that subsidies are positively correlated to market shares. Therefore, firms receiving high subsidies will be able to translate these resources into a more powerful position on the market. This may or may not be problematic for competition depending on the overall effect of concentration. If more subsidies are awarded to the largest firms, the concentration level might increase which could be problematic as competition is decreased. However, if subsidies are awarded to smaller firms competition might increase. If subsidies are awarded to all firms in some balanced way, there might be no impact on concentration at all. To verify this, concentration in industries for 2008 is calculated by means of the Hefindahl-Hirschmann index, i.e. the sum of the squared market shares of all firms belonging to the industry[20] :

$$H = \sum_{i=1}^{N} s_i^2$$

Should there be N firms making up the industry, then it can easily be proved that the H-index ranges from 1/N for equal firm sizes to 1 in case of a monopoly.

To be able to estimate industry concentration, we must first define the relevant market. As in the previous sections, we rely on the NACEBEL codes. The sample contains 541 industries (representing 15 178 firms including financial sectors)[21] with NACEBEL codes specified up to five digits. By confining

[20] A considerable amount of variables exists to measure concentration. A recent overview of concentration measures is provided by Lipczynski et al. (2009). We decided to use the Herfindahl-Hirschman index, which is closely related to the Hannah-Kay index, and which is one of the most commonly used concentration indices. It includes more information than for example the n-firm concentration ratio and is therefore more comprehensive.

[21] Including or excluding the financial sectors does not alter the results.

our sample to Belgian firms, we realize that we are partly neglecting effects from international trade on concentration. Again, we included all Belgian firms that submitted extensive annual accounts and with the market shares obtained in the previous sections, we proceeded to estimate the Herfindahl-Hirschman index for each industry.

The central independent variable is the amount of subsidies going to the industry. We account for subsidies granted in 2006 as we know from the previous sections that the impact of subsidies on market shares only becomes visible after two years. Subsidies were calculated first for each firm as explained above. Then the subsidies were aggregated per industry. Furthermore, differences between the sum of subsidies of the firms above total assets median in the industry and the sum of subsidies of the firms below total assets median in the industry was calculated and used as an independent variable. The amount of subsidies granted to each industry varies quite substantially. About 35% of all industries do not get any subsidies. For the other industries, the amount of subsidies can go up to a maximum of € 670 million, with a mean of € 3 716 338. The average subsidy per firm has a maximum value of almost € 50 million and a mean of € 177 103.

Starting from what we learned from the literature review, several control variables are included. We first consider previous concentration. Next, we include performance and behavioural measures at the firm level such as leverage, return on assets (roa), profit and investments. When the variable subsidy changes to measure the difference between the largest and smallest firms, as defined above, also the performance and behavioural measures switch to this form. Furthermore, we include a specialization index. This variable is calculated as the number of digits in the NACEBEL code and is introduced to capture industry specific effects. The specification index always shows up as significant. However, we decided to run regressions (and report results) without this index after careful study of this variable as it reached its maximum value for 93% of the observations. What happens is that, after including the specialization index, the constant term is larger (as specialization shows up with a negative sign) and significant. To capture possible other industry specific effects we include industry dummies. The specialization index together with the industry dummies capture characteristics such as minimum efficient scale, economies of scale, required sunk costs and phase of the industry life cycle.[22]

VI. Methodology and results: the effect of subsidies on concentration

To test whether subsidies influence concentration, we ran several classical OLS regressions.[23] Results are reported in Table 2. Only significant variables are included with their original coefficients.[24]

As indicated in the first row of the table and as explained above, the independent variable *subsidies* takes two different forms: total sum of subsidies granted to firms in the industry and the difference

[22] There are no concerns about multicollinearity as correlations between the independent variables are very low.
[23] The dependent variable, the HH concentration index, takes the value of one in case of monopoly and falls below one with decreasing concentration, zero being a lower bound. This means that the dependent variable is limited. Therefore, we also ran a tobit regression which did not result in meaningful differences. Results available upon request.
[24] Proceeding by stepwise elimination of least significant variables does not change the findings. Industry dummies are included but not reported here. As mentioned above, the financial and banking sector is often considered to be a special case, regressions were run with and without these industries. This does not change the results.

between the sum of subsidies going to the largest firms in the industry and the sum of subsidies going to the smallest firms (above and below median total assets respectively. For both these forms, we ran two regressions. The first one containing all industries.[25] The second regression only takes into account the industries with at least ten observations. [26]

Table 2: Results: the effect of subsidies on concentration

HH08	Sum subsidies		Δ sum subsidies	
	All	≥10	All	≥10
HH06	0.85***	0.92***	0.85***	0.92***
Subsidies	3.32e-10***	2.65e-10***	3.43e-10***	2.74e-10***
Profit	5.24e-10**	ns	5.25e-10**	ns
C	0.01	0.03	0.01	0.03
Obs	539	279	539	279
R^2	0.84***	0.88***	0.84***	0.88***

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

It is obvious that the concentration in 2006 explains a large part of the one in 2008. There is a positive correlation, significant at the 1% level for all eight regressions. The higher the concentration in 2006, the higher the concentration in 2008.

For subsidies we also find a systematic positive and significant correlation. It can thus be concluded that there is a robust mechanism at work. As the variable has multiple 'identities', the interpretation also has several facets. First, the sum of all subsidies per industry is significantly and positively correlated to concentration. This means that more subsidies to a certain industry will result in higher levels of concentration and thus weaker competition. As the former level of concentration is accounted for as an independent variable in the regressions, we can also say that a rise in concentration will be higher in industries that receive more subsidies. Under the present set of competition rules and the surveillance of the European Commission, it thus remains possible that, at the national level, governments keep spending on subsidies for a variety of reasons to the extent that competition is lessened. This effect is as strong when we account for all industries as for industries with at least ten firms that filed extensive annual accounts. To quantify the effect: a rise in total subsidies with € 100 million, increases concentration with 0.03. Remembering that the maximum subsidy in our dataset was € 670 million and the average concentration 0.15, makes the result quite substantial.

If we then look at the next two regressions, we see, maybe a more obvious result, that concentration rises more in industries were more subsidies are granted to larger firms than to the smaller firms.

[25] Except for the industries with only one observation.
[26] Also other specifications were tested such as average subsidies and difference in average subsidies, providing similar results, but significant at the 5% level. (Buts and Jegers, 2011).

Also, we can conclude that absolute values of subsidies drive the effect on concentration as both specifications of the variable subsidies are significant. Furthermore, relative forms such as subsidies/assets did not provide significant results.[27] Nevertheless, it seems to be that in most cases high subsidies in the absolute and relative form coincide. Why relative subsidies are not significant in the regressions awaits further research.

As for the other independent variables we find limited results. Nevertheless, we find positive significant results for the variable profit, but only when all industries are included in the regression.

VII. Conclusion and policy implications

The EU has a strict system of State aid control. However, considerable amounts of aid are still granted by the national governments. This is also the case for Belgium. We studied whether the subsidies granted in Belgium within the boundaries of the EU State aid control system influence the evolution of market shares. We find no significant influence of subsidies on market share one year after they have been granted. However, we do find an effect after two years. Two remarks need to be made. First of all, it is important to keep in mind that we studied market shares (and their evolution) of Belgian companies and we did not account for foreign firms. However, the focus was on the joint effect of all kinds of subsidies (i.e. effect of Belgian subsidies on Belgian firms) and not to compare them against the policy of other countries. Secondly, given our result that subsidies have an effect on market shares when looking at Belgian firms, we can expect that this effect is also present on larger markets, such as the European market. As this might imply that important market effects of notified State aid are either ignored or not captured by the European Commission, a thorough analysis of EC evaluation procedures might be warranted.

To study the extent of the competition distortions, the second part of the paper looks at the effect of subsidies on industry concentration. Regression results show that it are indeed the larger firms in an industry that are able to transform their subsidies into an increased market share as, concentration increases in industries receiving substantial subsidies. Several specifications were tested, so we can infer that the effect of subsidies on concentration is robust. The mechanism found is an 'absolute' one in the sense that subsidies are measured in absolute terms and not in a relative form, e.g. scaled by the firm's assets. Industries receiving high subsidies in absolute terms, mostly also receive high subsidies in relative terms. Nevertheless, only the absolute variables show significance in the regressions. This finding awaits further research. Probably also a small firm (even if it is 'large' in its industry) needs a large amount of money (in absolute terms) to be able to translate it into a noticeable effect on concentration. An important qualification is also here in order. Explaining concentration within an industry is not an easy task. Multiple factors are known to influence concentration and it is not possible to quantify all of them. For this reason, we are aware of the fact that our model does not capture all influences on concentration and that some proxies used do not always perfectly represent reality. Furthermore, there could also be random mechanisms determining concentration levels (Cabral and Mata, 2003) in the random growth hypothesis. Nevertheless, the explanatory variables capture an important part of reality and the results can thus be considered as a good indicator of the impact of subsidies on concentration.

[27] Results available upon request.

Moreover, the quantitative effect is quite substantial and in any case too big to be ignored by competition authorities, thus supporting our plea for an analysis of current policy. With regard to State aid, there is an EU framework of rules to be followed by Member States. This is only to be applied when trade between Member States is affected. Our results indicate that some form of control at the national level would be desirable. More specifically, a call is made for more economic analysis at the national level.

It is not the aim of subsidies to increase industry concentration. Combining this with the fact that there exists an incentive for politicians to grant subsidies in order to gain electoral support, as can be concluded from Buts et al.(2010), definitely shows that there is a need to better analyse and control the competition distortions caused by certain types of State aid. Following the opinion of Buendia and Smulders (2008) that the Commission's main task is to prevent subsidy wars, the task of more reviewing the possible competition effects should be primarily done by the Member States themselves. National Competition Authorities (NCA's) can start from the framework concerning the more refined economic approach and current practices of the Commission (for example search for less distorting alternatives and reviewing whether the aid is kept to a minimum) and combine this with other and more recent work determining the impact of State aid on competition, to study in advance the effects of proposed aid measures. It is important that NCA's thus extend their role to control possible consequences of State aid before measures are put into effect.

The combined effect of all subsidies is not minor at all looking at concentration changes. Furthermore, often the small amounts are not able to target a significant market failure, resulting in a waste of funds. This is in line with the findings of Nitsche and Heidhues (2006) that there should be more focus on significant market failures and the relevant aid measures. According to them, low amounts of aid are more likely to be targeted to projects with large private advantages instead of ameliorating a market failure or contributing to social or equity objectives.

In a way this leads to a suggestion that either the de minimis threshold should be abolished or that national governments need to refrain themselves from granting low amounts of aid. However, Nitsche and Heidhues (2006) do suggest that it could be possible to maintain a limit. These limits however need to be specific for the different aid instruments and objectives. In order to set this kind of boundaries, more research is needed to identify thresholds of effects for each of them, a difficult endeavor if one wants the upper limit to be useful (i.e. not too high in order to capture harming aid measures nor ridiculously low) for State aid policy.

As Blauberger (2009) mentions, the Commission has succeeded to implement a quite extensive State aid policy and to go further than the Treaty provisions. It has not only controlled State aid, but has spread a notion of what it considers good and what not so good types of aid measures. It can be a powerful policy tool if the Commission wishes to pursue and further develop this. Here, it could then be incorporated or suggested that a finer analysis is needed at the Member State level. On the one hand, this strategy of creating a common notion, observed by all Member States and more or less integrated in their policies, is of course a wise contribution to further integration of the single market. On the other hand, it is clear that this is not yet enough. Important evolutionary steps have been taken in the development of a sound State aid policy for example in light of the State aid Action Plan. However, Rome was not built in one day and neither is State aid control.

The first possibility is that, as discussed earlier, Member States develop a section within their National Competition Authorities to evaluate thoroughly the consequences of the envisaged aid measures. This body should, as any other legal body, be sufficiently independent from political institutions. The analyses carried out should comprise an evaluation of both the effects on competition and the appropriateness of the aid to solve the market failure or to contribute to social or equity objectives. The refined economic approach currently used by the Commission can serve as a starting point. The balancing test could partly be used by the designers of the aid or the authority controlling them. If the balance turns out to be negative, they could themselves first try to remedy in order to later notify a better measure to the European Commission (or put into effect more balanced measures in case notification is not necessary). As currently used by the European Commission (2008) and depending on the case at hand, possible remedies could include on the one hand for example a reduction of the amount of aid or of the selectivity of the scheme. On the other hand, competition concerns might be weakened if there is, for example, a reduction in production capacity.

The other possibility is that the European Commission takes one more step and goes further in its investigations to incorporate more evaluation of proposed aid measures and also look into smaller aid schemes that today fall for example under the de minimis threshold. In this case, the Commission will again expand its jurisdiction further in the field of State aid. It then would go beyond the original objective of avoiding subsidy races in building the refined economic approach and communicating desired policy objectives to Member States. Further developing methods of analysis could be next and necessarily asks for an enlargement of the State aid team at the Directorate General of Competition. Some general rules can be put in place, but most cases do need individual analysis.

Both options, an enhanced role for DG competition and/or for national competition authorities, have advantages and disadvantages. Creating an enlarged unit under DG comp would increase the independence of the analysis from national or regional politics. Expanding national competition authorities would put the financial burden on Member States themselves, in a way punishing those with many State aid measures to put in place a considerable staff to cope with all the propositions. This might then create an incentive for Member States to try and keep the aid to a minimum as desired by the European Commission. The fact that several aid measures do not have a 'Community dimension' is a difficult and probably sensitive issue. Many will argue that the Commission has no jurisdiction over these policies. However, we do see that resources are wasted on ineffective subsidies and that competition is distorted at the national level, mostly favouring large firms, leading to a further increase of their market power. Therefore, in any case a redefinition of National Competition Authorities competences with regard to aid measures is recommended and, a. o., preliminary analysis of proposed aid schemes (without Community dimension) should be included before they are put into practice. The question then remains whether State aid that does affect trade between Member States needs to be analysed by the NCA's as well. Here, the answer appears quite simple. The practices of the European Commission have now started to develop, including a refined economic approach. It will be almost impossible to take steps back. Therefore, the only way forward is to keep on refining the techniques and evaluation methods in a way that aid measures are strictly filtered, only allowing ones that have minor influences on competition and where benefits indeed outweigh the costs. In other words, the Commission is already analysing aid measures, thus it must do so in the best possible way. It is crucial that a sound communication be set up between the enlarged national unit and DG comp in order to join resource efforts in developing sound screening methods, keeping in mind that case by case analysis should remain a priority. The NCA could perform

a first check on measures with community dimension before they go to the Commission, but should foremost be responsible for the analysis of other measures falling outside the jurisdiction of DG Comp. Both bodies will need to work complementary.

It should always be kept in mind that the development of State aid control is a 'stand alone' issue. With this we mean that it should not primarily be based on other policy tools such as the ones from merger control. Literature has asked for more economic analysis such as is the case with merger control. To a certain extent, this is true. We do need more sophisticated methods to screen aid measures (on a national and supranational level) because the competition consequences as was well as the wasted resources are too large at this moment. Ahlborn and Berg (2004) draw attention to some similarities between State aid and antitrust. More recent, Buendia and Smulders (2008) stress the different natures of the two policies. On the one hand, the development of more sophisticated methods should be carried out at least partly independently of merger control as in their roots the policies have other objectives. On the other hand, to analyse the consequences on competition, there could be a dialogue between the two on certain topics, but any parallels should be drawn extremely carefully in order to respect the specific character of the State aid framework.

In any case, an extremely interesting challenge lies ahead both for policy makers and for researchers. Further research on the consequences of State aid is necessary, empirical as well as theoretical. Combining this with knowledge gathered from existing cases and providing an enhanced role for analysis at the national level will lead to an improved State aid policy and an increase in total welfare.

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