OPTIMAL PRE-MERGER NOTIFICATION THRESHOLDS: A CONTRIBUTION TO THE ITALIAN DEBATE

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Abstract: This paper outlines a theoretical framework to define the optimal notification thresholds so as to minimize the sum of Type I and Type II error costs. Results suggest that, when the notification rule takes into account in a cumulative way both the aggregate turnover of the merging parties and their individual turnover, the optimal values of these turnovers are interdependent. The model is then applied to the Italian case. The value of the threshold for the aggregate turnover has been obtained by benchmarking the rules set in the EU Member States through a simple econometric exercise. The value of the threshold for the individual turnover is then calculated applying the theoretical framework and the estimated costs of Type I and Type II errors.

1. INTRODUCTION

The number of mergers that are undertaken each year across countries is extremely high: the Institute of Mergers, Acquisitions and Alliances estimates the total number of announced M&A worldwide to be between 30 and 40 thousands in 2014.1 A system where all merging parties need to file a pre-merger notification would be costly and inefficient. At the same time, if all mergers were to be approved without scrutiny, the probability of final consumers being exposed to anticompetitive effects would be very high.

To guarantee an effective and efficient merger review regime, international best practices recommend setting a pre-merger notification threshold (ICN, 2008). Thresholds artificially set a barrier below which undertakings are not obliged to file a notification and can thus decide to merge without any sort of approval by the competition authority, while the opposite is true above the threshold.

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Across countries, thresholds can vary. Some jurisdictions have adopted notification thresholds based on market shares. Although theoretically correct, being market shares the closest approximation of market power, relying on this kind of threshold can present some difficulties. First of all, the definition of market share depends on the definition of the relevant product and geographic markets. This definition can thus be biased, for example if merging parties do not have all the information to define the relevant product and geographic markets. Moreover, parties might not have sufficient information regarding their competitors to provide accurate estimates of their market share. Because of their subjectivity, notification rules based on market shares are usually considered unreliable.

Notification thresholds based on objective metrics tend to be preferred by international best practices (ICN, 2002). Estimates such as parties’ turnover or asset values do not require subjective calculations and are usually easily collected by the merging parties. When thresholds are based on these objective criteria, they can vary according to type of turnover required. Pre-merger notification thresholds can be based on the world-wide turnover of the merging parties, on the aggregate domestic turnover or both. Additionally, some countries further require that the turnover of the target firm, i.e. the acquired firm, must be above a certain threshold. Conditions can be cumulative, when all conditions must be fulfilled for the merger to be notified, or alternative, when only one condition needs to be fulfilled for the notification to become mandatory.

In this scenario, the actual level of the threshold becomes of crucial importance. On the one side, if thresholds are set too high, the risk is that a number of potentially anticompetitive mergers will not undergo a screening by the competition authority. This can demise consumer welfare, in the form of high prices, lower quality, and decreased innovation. On the other side, if thresholds are not high enough, there might be an excessive number of notifications, imposing unnecessary costs on both the merging parties and the competition authority for having to respectively file and review notifications.

Given the importance of merger notification thresholds, jurisdictions often revise both types and levels, for example to adjust to the current economic conditions. This has been the case in Italy, where at the beginning of 2013 the test for merger notification to the Italian Competition Authority (ICA) was reformed, in the spirit of efficiency, simplification and transparency. Today, roughly one year after this first amendment, the ICA is proposing to review the pre-merger notification thresholds once again.

In this context, the objective of this paper is to contribute to the current debate, by estimating the level of the optimal pre-merger notification thresholds, applicable to the Italian regime of merger control. The paper is organized as follows: section 2) introduces the reader to the Italian debate; section 3) elaborates the theoretical model on which the exercise builds.

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2 The aggregate turnover of the merging parties is defined as the turnover of all merging firms, that is the combined turnover of the acquiring group plus the turnover of the acquired firm.
upon; section 4) describes the data collection process; section 5) focuses on the analysis and presents the key findings; section 6) concludes.

2. AN OVERVIEW OF THE ITALIAN DEBATE

At the beginning of 2013, the Italian Parliament reformed the test for merger notification. Before 2013, a merger was subject to a notification obligation if the merging parties’ aggregate domestic turnover exceeded 474 million euros or the target company’s domestic turnover exceeded 47 million euros. The new test instead requires two cumulative conditions: (i) the merging parties’ aggregate domestic turnover must exceed 489 million euros and (ii) the target company’s domestic turnover must exceed 49 million euros.

In February 2014, roughly one year after the first reform, the Italian Competition Authority proposed some amendments to the 2013 system, with the objective of better tailoring the thresholds to the Italian production structure and bringing the merger regime one step closer the EU Member States’ practices. With this proposal, the ICA aims at lowering the domestic turnover threshold of the target company from 49 to 10 million euros and amending the second threshold, whereby it would refer to the turnover of each of at least two of the parties to the transaction (rather than the target’s turnover).

To support this proposal, the ICA has conducted an ex-ante simulation, which established that the number of notifications would rise from 59 to 109 if the pre-merger notification threshold of the target firm was fixed at 10 million.³ According to the ICA, more notifications would improve antitrust control, without adding a substantial burden in terms of additional costs on the economy. Further, a higher number of notified transactions could lead to a stronger vigilance function and to an increase of awareness by the Authority.

The proposal has generated a lively debate. In February 2014, the ICA held a public consultation and a number of law firms, professional associations, associations of undertakings and an enterprise, provided their view on the proposed reform.⁴ On the one hand, supporters of the ICA proposal agreed with it, and some pushed for an even lower threshold (for the target undertaking) to be set to 5 million euros. Some adherents launched ideas to improve the proposal, with the aim of complementing the measures outlined by the ICA. In this light, a number of law firms and institutions recommended the introduction of an ex-post evaluation on those operations that deserve particular care (e.g. transaction involving niches, local and new markets). Others suggested that for those mergers that do not apparently create antitrust issues, the merging parties could fill a simplified form, containing all the essential information about the transaction.

³ This translates into a 54% increase in the number of notified mergers. It should be noted that the notified mergers in 2012 were 451, or 764% of the 2013 level.

On the other hand, opponents of the proposal highlighted various arguments. Some argued that a one-year period is insufficient to assess accurately the effects of the revised thresholds. Others pinpointed that a threshold set to 10 million could constitute a serious barrier to entry to national and foreign investments, as it would imply higher costs for notifying candidate mergers. Further, some suggested the introduction of a worldwide turnover threshold, as it is common in other EU Member States. Finally, other entities considered revising both the aggregate turnover threshold (currently at 489 million euros) and the target firm’s threshold (currently at 49 million euros).

The current debate has mainly focused on the target entity’s turnover threshold, while neglecting any relationship between the latter and the aggregate turnover threshold. Moreover, the arguments brought about by discussants have been mainly qualitative. Departing from the ongoing discussion, in this paper we aim at defining an optimal rule to determine both the merging parties’ aggregate domestic turnover threshold as well as the target company’s domestic turnover threshold. This will be the focus of the next sections.

3. THE THEORETICAL MODEL

There are two costs that a jurisdiction should consider when establishing the pre-merger notification thresholds. First, it should take into account the costs imposed on the parties and on the competition authority of having to respectively file and review the notification. These costs amount to a wasteful use of scarce resources whenever a notified merger does not lead to any anticompetitive effect. We define this cost as the type I error. Type I error can only occur if the merger is notified that is, in the specific case of Italy, if the aggregate turnover of the parties and the turnover of the target firm are higher than the respective thresholds. The probability of type I error to occur decreases as both thresholds increase.

Second, jurisdictions should take into account the consumer welfare loss that results from non-notified mergers that are potentially anticompetitive. This error is defined as type II error. Type II error can only occur if the merger is not notified. Other things equal, the higher the thresholds, the higher the probability of type II error to occur.

To determine the optimal threshold(s), jurisdictions shall then minimize the sum of the expected cost of a notified merger not imposing anticompetitive restraints with the expected cost of a non-notified merger imposing anticompetitive restraints. Assuming

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5 In this paper, we ignore the claim that Italy should introduce a worldwide turnover threshold as a pre-merger notification rule. Indeed, when compared to other EU Member States, Italy’s average firm size is smaller (4.02 employees on average vs. 6.3) and the openness to trade index is lower than the EU28 average (58.5% of GDP vs. 124.4% of GDP). This suggests, as also stressed by Amatori et al. (2011), that the Italian economy is mainly domestic, hence introducing a worldwide turnover rule seems inappropriate.

6 This approach is in line with an influential literature suggesting that the substantive and procedural antitrust rules should be set with the aim of minimizing the sum of the expected costs of type I and type II errors – see, among others, Padilla and Evans (2004), Cooper et al. (2005), and Lear (2006).
all notified mergers that are anticompetitive are blocked, and defining \( n(x) \) as the fraction of mergers that are notified, the cost function is:

\[
(1) \quad C = n(x) \cdot EC_I + (1 - n(x)) \cdot EC_{II}
\]

where \( EC_I \) and \( EC_{II} \) are the expected cost of type I and type II errors. Solving the minimization problem we obtain:

\[
(2) \quad \frac{\partial n}{\partial x} (EC_I - EC_{II}) = 0
\]

or,

\[
(3) \quad EC_I = EC_{II}
\]

The theoretical model thus suggests that jurisdictions shall set the threshold levels such that, at the margins, the expected cost of type I error is equal to the expected cost of type II error.

Costs of type I include all costs that both the parties and the competition authority bear because of a notification operation. For the merging parties, these include the cost of the personnel notifying the merger as well as the fee of legal advisors. For the competition authority, they amount to the cost of the officials reviewing the notified merger.\(^8\) All in all,

\[
(4) \quad EC_I = p_I \cdot C_I
\]

where \( C_I \) is the marginal cost of a type I error given by the sum of the overall costs suffered by the parties and by the competition authority to notify and revise a merger and \( p_I \) is the probability of costs of type I to occur.\(^7\)

Moving on to \( EC_{II} \), it represents the expected marginal cost on final consumers, measured in terms of welfare loss, caused by a non-notified merger being anticompetitive. Let \( T \) be the aggregate turnover threshold of the merging parties, and \( t \) the turnover threshold of the target firm.\(^10\) In particular,

\[
(5) \quad EC_{II} = p_{II} \cdot \alpha \cdot T
\]

where \( p_{II} \) is the probability of costs of type II to occur;\(^11\) \((\alpha \cdot T)\) represents the consumer welfare loss, and specifically: \(\alpha = \frac{p_{t+1} - p_t}{p_t} \) is the percentage increase in price post-merger and \( T \) is the pre-merger parties’ aggregate turnover, or \( T = t + \tilde{t} \), where \( \tilde{t} \) is the combined turnover of the acquiring group.\(^12\)

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\(^7\) The fraction of the notified mergers \( n(x) \) depends both on the turnover threshold of the target firm as well as on the aggregate turnover threshold of the merging parties, as defined in the text.

\(^8\) For a detailed description of type I costs, see section 4.

\(^9\) In this case, \( p_I = 1 \) because, whenever a merger is notified, both the parties and the competition authority will suffer the estimated costs from notification with certainty.

\(^10\) We assume that the target firm is the one with the lowest turnover. This assumption does not imply any loss of generality as we can define the firm with the lowest turnover as the “target” firm independently of its actual role in the merger.

\(^11\) Type II error costs occur when a non-notified merger leads to anticompetitive effects; \( p_{II} \) can be thus thought as the conditional probability that the merger is anticompetitive given that it has not been notified.

\(^12\) Equation (5) assumes that, after the merger, only the merging parties will raise the price of their product or service. In reality, other firms in the industry might decide to raise prices following the merger, further increasing the consumer welfare loss. Therefore, the CWL as defined in (5) might be an underestimation of reality. At the same time, (5) assumes the elasticity of demand to be zero (i.e. \( \varepsilon = 0 \)), otherwise the consumer welfare loss would be \( CWL = TA \left( 1 - \frac{\alpha \xi}{\tilde{T}} \right) \), where \( \varepsilon \) is...
Calculating $p_{II}$ is extremely difficult; a useful approach is to estimate $p_{II}$ as the probability that a merger is forbidden, withdrawn or cleared with remedies, given that it has been notified. Hence $p_{II}$ will depend both on the aggregate turnover threshold $T$ and on the turnover threshold of the target firm $t$. Indeed, as $T$ and $t$ change, the overall number of notified mergers will change, and thus will the conditional probability $p_{II}$. In other words, $p_{II}$ is a function of $T$ and $t$. Assuming that $p_{II}$ increases as the distance between $T$ and $t$ decreases (see Figure 1), and further assuming that the ratio $\frac{t}{T}$ is a continuous random variable uniformly distributed on the interval $[0; 0.5]$, the probability function can be written:

$$1. \quad p_{II} = y \ M \ \sqrt{\frac{t}{T}}$$

where $M$ is the maximum value that $p_{II}$ can take, and $y$ is a constant.

the demand price elasticity; with respect to this, the consumer welfare loss as defined in (5) might be an overestimation of reality. The CWL as defined in equation (5) is thus an approximation of the actual consumer welfare loss, and it is based on the assumption that the under- and over-estimations described cancel each other out.

13 By assuming that $p_{II}$ increases as the distance between $T$ and $t$ decreases we are actually assuming that the probability of a merger being anticompetitive increases as the merging parties are similar in terms of turnover size.

14 Assuming that $\bar{t}$ is always greater than $t$, the ratio $\frac{t}{T}$ can take a minimum value of zero, typical when the turnover target firm is insignificantly small when compared to the combined turnover of the acquiring group, and a maximum value of 0.5, when $t = \bar{t}$.

Figure 1

This function has the following desirable properties: (i) the probability of a merger producing anticompetitive effects tends toward 0 as the turnover of the acquired undertaking approaches 0; (ii) the same probability increases, at a decreasing rate, as long as the turnover of the target firm increases; (iii) the probability of anticompetitive effects reaches a maximum when the acquiring party and the acquired party have the same size and, therefore, are more likely to be close competitors. Simple calculation shows that if $M$ is the maximum value that $p_{II}$ can take, we have that $y = \sqrt{2}$. The estimation of $M$ is described in section 4.

Having defined both $EC_I$ and $EC_{II}$, equation (5) can be rewritten as:

$$2. \quad C_i = \sqrt{2} \ M \ \sqrt{\frac{t}{T}} \ \alpha \ T$$

and, solving for $t$:

$$3. \quad t^* = \frac{C_i^2}{2 \ M^2 \alpha^2 \ T}$$

15 In particular, $p_{II} = M \iff \sqrt{\frac{t}{T}} = \frac{1}{y}$. Given that, by assumption, the probability is at its maximum when $\frac{t}{T} = 0.5$, $y = \sqrt{2}$. 

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Following the result obtained, the optimal notification thresholds $t^*$ and $T^*$ positively depend on $C_t$ and negatively on $EC_{II}$. This result is intuitive, in fact: (i) when type I error costs are high, the cost of notifying and reviewing a merger is high, hence the threshold should increase so that less mergers are notified; (ii) when type II error costs are high, the cost on consumers in terms of lost welfare is high, hence the threshold should be revised downwards so that more mergers are notified.

Further, the theoretical model outlined in this section suggests that, when the notification rule is cumulative, the optimal values $T^*$ and $t^*$ are interdependent. In particular, equation 3 describes an inverse relation between $T^*$ and $t^*$, whose sign can be described with an example. Suppose for instance that $T^*$ increases, while $t^*$ is kept constant. This would increase the probability of type II error to occur. Therefore, to balance this effect, $t^*$ should decrease, hence the inverse relation between the two thresholds. To conclude, the model described in this section suggests that, when deciding on the optimal turnover threshold for the target firm, the Competition Authority should take into account both thresholds.

4. DATA COLLECTION

The previous section outlined a theoretical model useful to estimate the optimal turnover thresholds $t^*$ and $T^*$. This section describes the data collection process that was undertaken to estimate the cost of type I and type II errors that apply to the Italian case-study.

As briefly described in section 3, the cost of a type I error includes all the costs incurred by the merging parties and by the competition authority to notify and review a merger. An undertaking filing a merger is subject to both internal as well as external costs. Internal costs amount to the time that employees devote to the notification, and can be calculated as the number of man-hours it takes on average to prepare a notification, multiplied by an appropriate unit cost. A study by PricewaterhouseCoopers (PwC, 2013) estimates that filing a merger requires 2.8 weeks of work by an average employee (or 112 man-hours). The cost incurred by an average Italian firm for a worker is 736 euros per week (or roughly 19 euros an hour). This amount was calculated summing the wage paid weekly to a worker (526 euros per week, or 13.15 euros an hour) with all the additional expenses incurred by the firm (210.4 euros per

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16 The same logic applies in the opposite case, i.e. if $T^*$ decreases and, as a consequence, the cost of type I error increases.

17 PwC (2013) finds that the median value needed by an average employee to file a merger, for a transaction with an average filing rate of five jurisdictions, is 14 person-weeks. The study further establishes that there are minimal cost savings from filing in multiple jurisdictions. In this paper we thus assume that, for the merging parties, it takes 2.8 man-weeks to file a merger.

18 According to the Italian Bureau of Statistics (ISTAT), on average office workers earn 2,209 euros a month (gross salary, 2012 estimates). The weekly salary was calculated considering that there were 253 working days in 2012 (or 21 working days a month). Data retrieved on 2 October 2014, available at http://www.istat.it/it/archivio/107568; statistical appendix available at http://www.istat.it/it/archivio/87184.
week, or 5.26 euros an hour). The internal cost paid by an average firm to notify a merger is thus estimated to be 2,062 euros.

External costs are mainly due to the costs for legal advice. To estimate this cost we sent a short questionnaire to the major law firms with an office in Italy. On the basis of the information collected we can estimate an average external cost of approximately 22,000 euros per notification. Overall, summing internal and external expenses, the estimated costs borne by an average firm to notify a merger amount to 24,062 euros.

Considering the costs borne by the competition authority, these can be similarly calculated, as the man-hours it takes, on average, to review a notification in its first stage multiplied by an appropriate unit cost. To estimate this value we interviewed a number of senior officials of the Italian Competition Authority. Based on the information collected we estimate that it takes, on average, 38.4 officials-hours and 3.4 directors-hours to review a merger notification. Each official entails an average cost of 84.71 euros an hour, while each director costs 188.96 euros an hour. The overall cost incurred by the Italian Competition Authority to review a merger was thus estimated to be 3,895 euros. Summing the costs imposed on the parties with those imposed on the competition authority, we estimate that the average cost of notifying and reviewing a merger that has not an anticompetitive effect is 27,957 euros.

Moving on to the cost of type II errors, we know from section 3 that

$$EC_{II} = \sqrt{2} M \frac{T}{\alpha} \alpha T.$$  

In order to calculate the type II error cost we need an estimate of $\alpha$, i.e. the percentage post-merger price increase (overcharge). The price overcharge was calculated by reviewing all the phase two AGCM’s decisions from 2000 to 2012, where some estimates of this value were available. According to the analysis conducted, the estimated average price overcharge imposed by the merging parties’ when the merger is likely to have anticompetitive effects is 5.9%.

Further, we need to assess the value of $M$, that is the maximum value that $p_{II}$ can take.

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19 On average, a firm bears additional costs per employee, equivalent to (roughly) 40% of the amount of the salary, see http://www.istat.it/it/archivio/37700, retrieved on 6 October 2014.

20 The questionnaire was sent to 32 law firms, i.e. to all the law firms that are members of the Associazione Italiana Antitrust (AAI). 10 law firms provided us with the information requested (rate of response of 31%) under a confidentiality obligation.

21 This value includes the professional fees and other expenses incurred for the notification. It is important to clarify that there is a significant dispersion around the average as the external cost varies significantly even within the same law firm according to the complexity of the merger to be notified.

22 Some variability exists among the various mergers depending on the complexity of their assessment.


24 It must be noted that this value reflects the ex-ante estimate of the likely effects of the merger performed, in a limited number of cases, during the in-depth investigation by the IGA.
Recalling from the previous section that $p_{ll}$ and $\frac{t}{T}$ are two continuous random variables and $\frac{t}{T}$ is assumed to be uniformly distributed and defined over the interval $[0, 0.5]$, the expected value of the measurable function $p_{ll}$ is:

$$4. \int_a^b p_{ll} \left( \frac{t}{T} \right) f \left( \frac{t}{T} \right) \, d \frac{t}{T} = \mu,$$

where $a = 0$ and $b = 0.5$ are the minimum and maximum value that the variable $\frac{t}{T}$ can take, $p_{ll} \left( \frac{t}{T} \right)$ is the probability that a notified merger is anticompetitive, and $f \left( \frac{t}{T} \right)$ is the probability density function of the continuous random variable $\frac{t}{T}$. Equation 4 shows that $M$ depends on $\mu$, i.e. the unconditional probability that a merger has anticompetitive effects. To estimate $\mu$, we computed the ratio between the number of mergers that were blocked, withdrawn or cleared with remedies over the overall number of notified mergers in Italy from 2000 to 2012. This calculation yields that $\mu$ is equal to 0.5%. Solving 4 for $M$, we obtain that $M$ is equal to 0.75%.

In this section we thus described how type I and type II errors were estimated. This allows us to re-write equation 3 as:

$$5. \quad t^* = \frac{27.957^2}{2 \cdot 0.75\%^2} \cdot \frac{1}{5.9\%^2 T^*}$$

### 5. Analysis and Results

The theoretical model outlined in section 3 and further specified in section 4 defines an inverse relation linking $T^*$ with $t^*$. Solutions to this model are infinite: for every value of $T^*$, corresponds one and only one value of $t^*$ [see equation 5]. In the following, to find the optimal values for $T$ and $t$, we set two objectives: the first one, to identify thresholds more consistent with those set by other EU Member States; the second one, to minimize the sum of type I and type II errors, in line with the theoretical model described in section 3. To fulfill the first goal, we exogenously calculate the optimal aggregate threshold by benchmarking the Italian threshold with those of other EU Member States. This is done using a very simple econometric model. To achieve the second objective we compute the optimal value $t^*$ by simply plugging $T^*$ in equation 5. The next subsection describes this approach in greater detail.

25 It must be noted that in Italy those mergers that meet the thresholds set in the EC Merger Control Regulation (Reg. EC No. 139/2004) are notified to the European Commission and therefore are not subject to a review by the ICA. Hence, in our model $\mu$ represents the unconditional probability that a merger is anticompetitive, provided that it does not have a Community dimension. Given this clarification the estimated value of $\mu$ seems reasonable. Nonetheless it has to be added the value of $\mu$ (0.5%) we obtain might be an underestimation, as it has been computed considering only the mergers that in the past have been notified to the ICA; therefore it does not take into account a possible deterrence effect, i.e. the discouragement from merging due to an anticipated active merger control activity (Sørgard, 2009). A growing literature shows that the higher the deterrence effect, the lower the overall number of notified merger. According to Clougherty et al. (2014), a 1% increase in the application of merger policy action in phase I, decreases merger activity in subsequent years by about 0.15%; a similar study has been carried out in the US by Clougherty and Seldeslachts (2013). Furthermore, it has become easier for the market to form priors about the outcome of an investigation, as shown by a recent empirical exercise by Duso et al. (2013).
5.1. Benchmark analysis

The first step to solve equation 5 is to set the aggregate notification threshold applicable to Italian undertakings. To calculate $T^*_{\text{Italy}}$ we benchmark it against the thresholds set in countries where similar conditions apply. Indeed, thresholds are expected to vary from country to country according to some local conditions. By estimating how the thresholds’ level varies according to some parameters, we can hence calculate the $T^*$ applicable to the Italian regime of merger control.

We thus estimate a regression model that includes some explanatory variables likely to affect the aggregate turnover threshold. The EU28 group was identified as the sample of countries where similar conditions to the Italian reality apply. Indeed, all EU28 states are subject to Communitarian thresholds on top of National ones. By construction, only those countries for which the aggregate domestic turnover threshold is specified were included in the analysis. These countries are: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.\(^{26}\) Subsequently, using the estimated coefficients, we calculate the Italian $T^*$ that reflects local conditions.

The explanatory variables included in the regression analysis are GDP and a dummy variable. GDP is expected to be positively correlated with the domestic turnover: as the size of the economy increases, markets are likely to be larger in monetary value, hence for an undertaking to hold a significant market share it needs to generate higher revenues.

Within the sample of countries considered for the regression analysis, some have different notification rules than those in force in Italy. In particular, in some jurisdictions undertakings have to file a merger when: (i) the pre-merger world-wide turnover of the merging parties is above a certain threshold, $T_w$, and (ii) the pre-merger aggregate domestic turnover of the merging parties is above a certain $T$. When this is the case, we would expect the level of the domestic aggregate turnover to be negatively correlated with the level of the worldwide turnover. To control for this effect, the regression includes a dummy variable that takes value zero when the worldwide turnovers are irrelevant to trigger a notification obligation and one otherwise. The model can be defined as follows:

$$\ln(y_T) = \alpha + \beta_1 \ln(GDP) + \beta_2 \text{dummy}_{T_w} + \epsilon$$

Table 1 shows the results of the regression analysis.

<table>
<thead>
<tr>
<th>Dependent variable Ln(T)</th>
<th></th>
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<tbody>
<tr>
<td>Ln(GDP)</td>
<td>0.62***</td>
</tr>
<tr>
<td></td>
<td>(5.74)</td>
</tr>
<tr>
<td>Dummy$_{T_w}$</td>
<td>-1.09**</td>
</tr>
<tr>
<td></td>
<td>(3.00)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.33**</td>
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<tr>
<td></td>
<td>(3.26)</td>
</tr>
<tr>
<td>R²</td>
<td>0.65</td>
</tr>
<tr>
<td>Observations</td>
<td>21</td>
</tr>
</tbody>
</table>

\(^{26}\) Italy was of course excluded from the EU28 group when running the regression analysis.
As expected, the regression analysis shows that the level of the combined turnover domestic threshold is positively correlated with GDP and negatively correlated with the dummy variable; both coefficients are statistically significant. When controlling for the presence of worldwide turnover thresholds, countries with larger economies have higher domestic notification thresholds. The analysis indeed suggests that, on average, a 1 percent increase in GDP increases the pre-merger aggregate turnover threshold by 0.62%. When controlling for GDP, countries with set worldwide turnover thresholds have lower domestic notification thresholds. Since \( \text{dummy}_{nw} \) is 1 for countries where \( T_{nw} \) is specified, holding GDP constant the difference in domestic aggregate turnover thresholds between countries with \( T_{nw} \) and those without is -1.09. This suggests that, for the same level of GDP, countries with worldwide turnover thresholds have lower domestic turnover thresholds, on average.

Applying the regression coefficients to Italian data yields an estimate of the aggregate turnover threshold, \( T_{\text{Italy}}^* \), equal to 234,158,229 euros.\(^{27}\) Having defined a value for \( T_{\text{Italy}}^* \) applicable to the Italian merger control regime, which is in line with aggregate domestic thresholds of other EU Member States, it is now possible to identify the optimal \( t^* \). Recalling equation 5, when \( T_{\text{Italy}}^* \) is 234,158,229 euros, the optimal \( t^* \) (i.e. the value that minimizes the expected costs of type I and type II errors) is 8,428,055 euros.

The result obtained so far depends on some variables that were estimated on the basis of limited information. In particular it depends on the value of \( \mu \), that is the unconditional probability that a merger has anticompetitive effects and on \( \alpha \), the average price overcharge of a merger with anticompetitive effects. Therefore it seems appropriate to perform a simple sensitivity analysis assuming different values for these two variables.

\( Table 2 \) illustrates the results of this analysis. It suggests that the definition of the optimal \( t^* \) is relatively sensitive to changes with respect to both variables. The base scenario considers \( \mu \) equal to 0.5% and \( \alpha \) equal to 5.9%. Everything else equal, an increase in \( \alpha \) decreases the optimal \( t^* \). This result seems reasonable: as the post-merger price overcharge increases, for the same level of \( T_{\text{Italy}}^* \), the turnover threshold of the target firm \( t^* \) should decrease in order to decrease the probability of type II error to occur.

\( Table 2 \) further suggests that results are quite sensitive to changes in the unconditional probability that a merger has anticompetitive effects, \( \mu \). As \( \mu \) increases by half percentage point, \( t^* \) decreases significantly, to the point

\(^{27}\) The aggregate turnover threshold is calculated as: \( \ln T = 6.33 + 0.62 \ln(\text{Italian GDP}) - 1.09 \) (0), where the value for the Italian GDP is drawn from the World Economic Outlook Database (IMF), available at http://www.imf.org/external/pubs/ft/weo/2014/01/weodata/index.aspx, retrieved on 8 October 2014.

\(^{28}\) We remember that \( \mu = 0.5 \) was estimated as the ratio between the number of mergers that were blocked, withdrawn or cleared with remedies over the overall number of notified mergers in Italy from 2000 to 2012. The price overcharge \( \alpha = 5.9\% \) was calculated by reviewing all the phase two ICA’s decisions from 2000 to 2012 (see section 4 for details). For other studies aiming to quantify price overcharge resulting from mergers, see Postema et al. (2006) and Kwoka (2013).
that having a cumulative rule for notification thresholds becomes sub-optimal.

\[ \text{Table 2: Sensitivity analysis} \]

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>0.5%</th>
<th>1%</th>
<th>1.5%</th>
<th>2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9%</td>
<td>€ 8,428,055</td>
<td>€ 2,130,889</td>
<td>€ 906,333</td>
<td>€ 532,722</td>
</tr>
<tr>
<td>7%</td>
<td>€ 6,055,204</td>
<td>€ 1,513,801</td>
<td>€ 643,866</td>
<td>€ 378,450</td>
</tr>
<tr>
<td>8%</td>
<td>€ 4,636,015</td>
<td>€ 1,159,004</td>
<td>€ 492,960</td>
<td>€ 289,751</td>
</tr>
</tbody>
</table>

6. CONCLUSION AND FINAL REMARKS

Setting optimal pre-merger notification thresholds is extremely important for jurisdictions: on the one side, if notification thresholds are set too high, the risk is that a number of potentially anticompetitive merger would not be scrutinized; on the other side, if thresholds are too low, the costs borne by undertakings and the competition authority might exceed the benefits from having an ex-ante merger control.

In this context, this paper explores the case study of Italy, where at the beginning of 2013, the Italian Parliament reformed the test for merger notification. In particular, the new test required two cumulative conditions: (i) the merging parties’ aggregate domestic turnover exceeds 489 million euros and (ii) the target company’s domestic turnover exceeds 49 million euros. The paper contributes to the lively debate that followed this reform, by estimating the optimal notification thresholds applicable to the Italian merger control regime.

To do so, we elaborated a theoretical framework aimed at identifying the thresholds that minimize the sum of the expected costs of type I and type II errors. This minimization requires that, at the margins, the expected cost of a notified merger not imposing anticompetitive restraints (type I error costs) is equal to the expected cost of a non-notified merger imposing anticompetitive restraints (type II error costs). In particular, type I error costs were defined as all the costs incurred by the merging parties and by the competition authority to respectively file and review a merger. Type II error costs were defined as the expected cost on final consumers, measured in term of welfare loss, caused by a non-notified merger being anticompetitive.

When the notification rule is cumulative, as in the case of Italy, the optimal values of the pre-merger aggregate turnover threshold ($T^*$) and of the pre-merger turnover threshold for the target undertaking ($t^*$) are interdependent. In particular, the model defined an inverse relation between the two thresholds: if $T^*$ increases, while no changes are imposed on $t^*$, the probability of type II error to occur would increase thus, to balance this effect, $t^*$ should decrease (and vice-versa). This implies that, when deciding on the optimal turnover threshold for the target firm, the Italian legislator should take into account both thresholds.

From a strictly mathematical point of view the model has infinite solutions. Hence, we calculate the optimal aggregate threshold $T^*$ by benchmarking the Italian threshold with those
of other EU Member States. This would allow the Italian merger control system to be consistent with the merger control systems set in the other EU Member States. This benchmarking was done using a simple econometric model that included some explanatory variables likely to affect the aggregate turnover threshold. Applying the regression coefficients to Italian data and further solving the model for the turnover of the target firm, we obtain a set of optimal thresholds \( T^* = 234,158,229 \) euros and \( t^* = 8,428,055 \) euros. These are the aggregate turnover and the individual firm’s turnover thresholds that are consistent with those set by the EU28 countries and such as to minimize the sum of the costs of Type I and Type II errors as estimated in the paper.
REFERENCES


Lear, 2006, The Cost of Inappropriate interventions/non interventions under Article 82. A report prepared for the OFT.


