Impact of the VAT Reform on Swedish Restaurants – a Synthetic Control Group Approach

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Abstract:
In this study we have investigated the impact of the VAT reform that took place in Sweden on January 1, 2012, on restaurant and catering services in Sweden. We constructed our counterfactual using a synthetic control group (SCG) approach, which is a data-driven approach that only relies to a small extent on subjective choices. Unlike previous studies, we assume that the VAT reform can affect each part of the profit function and can also influence entry and exit in the market. Our analysis shows that the VAT reduction had a positive and significant effect on turnover, profit margins, and net entry of firms. The effect on total wages and employment was positive and significant at the 10% level. Overall, our results point to better performance for the restaurant industry compared to what it would have been in the absence of the reform.

JEL: D4; D22; H25; H71
1 Introduction

In this study, we adopt a firm perspective on the VAT reduction for Swedish restaurants. By using register data on firms in Sweden we investigate the effect of the VAT reform on different components of a firm’s profit function. The research questions we attempt to answer are: What are the effects of the reform in terms of turnover, total wages, employment and gross profit margin in the restaurant sector? Is there an increase in net entry of firms in the industry? The impact on prices is omitted in the analysis since another study has estimated the price pass through to roughly 50 per cent.\(^1\) Given this effect on prices, we expect also an impact on the above mentioned components via increased demand for restaurant services.

A reform that targets a whole country, sector, or region, such as the VAT reform, will in general be very difficult to evaluate because no counterfactual situation occurs – all will be treated. Previous studies have solved this by either constructing a control group using a selection of other countries or regions (see e.g. Harju & Kosonen, 2014; Doyle & Samphantharak, 2008 and Marion & Muhlegger, 2011) or constructed a comparison group consisting of a selection of industries (Kosonen, 2015) or all industries except the treated industry (e.g. Carbonnier, 2007; O’Connor, 2013; Houel, 2011). However, in all these studies the identification can be questioned based on this selection. Another contribution to previous research is to make a new application, we make use of a synthetic control group (SCG) approach to analyse effects on the targeted industry.. This approach allows us to construct a hypothetical, or synthetic, restaurant industry based on the weighted average of other industries in Sweden. The choice of constructing the SCG with other industries in Sweden that were not affected by the reform rather than with restaurants in other countries is mainly due to two reasons. First, the institutions, economies, inflation rates, and other cultural aspects differ across countries making it difficult to find suitable country matches. Second, the available micro data from other countries, e.g. in the EU or other Nordic countries, is limited and difficult to get access to.

\(^1\) Konjunkturinstitutet, 2015
The study is organised as follows. In section 2, we present the Swedish VAT reform and its expected outcome. In section 3, we present previous empirical investigations of the impact of VAT reductions. In section 4, we give a brief motivation of the outcomes used in this evaluation based on a theoretical discussion. In Section 5, we discuss identification, the data, the model, and its limitations. In section 6 we present the results, while section 7 concludes.

2 The reform

On January 1, 2012, the VAT rate for restaurant and catering services in Sweden was reduced from 25 to 12 per cent, making the VAT for restaurant and catering services to be at the same level as take-out food and groceries. Alcohol was not affected by this reform and continues to be taxed at 25 per cent. The main aim of the reform was to increase the long-term employment rate through an increased demand for restaurant and catering services as a result of lower prices to consumers. Further, the regulatory burden and administrative costs in the restaurant industry was expected to also decrease through a harmonized VAT rate on all forms of food provision.

VAT is aimed at the consumption of goods and services. The business owner who provides the goods and services also pays the VAT to the state, and thus the tax burden of the business owner is passed on to the consumers. The rules regarding the Swedish VAT are set within the EU (2006/11/EG), and according to Article 96 in the EU directive the lowest normal VAT rate that member states of the EU can apply is 15%. According to the directive, the member states are permitted to apply a reduced VAT for a number of goods and services, and this lower VAT must be at least 5%. From June 2009, restaurants and catering services are accepted by the EU as a sector that member states can apply this lower VAT rate.

Reducing the VAT for restaurants and catering was part of the former Swedish government’s long-term goal to maintain a permanently high employment rate in the country. A public inquiry stated in a
Swedish Government Report (SOU 2011:24), the expected effects of the reform were to increase the employment rate and increase the efficiency of the labour market. The employment rate was expected to increase through an increased demand for restaurant and catering services as a result of lower prices to consumers. In total, the reduction of the VAT was expected to create around 6,000 new jobs in a sector that before the reform employed around 130,000 people. These numbers rely on the assumption that the tax decrease will fully fall on the consumers, which is based on a fairly good competition in the restaurant sector.

There was no transition period or phasing-in of the VAT reform. The tax cut decreased the costs for businesses in two ways. First, the firms now pay less tax on the goods and services they provide. Second, the administrative costs have decreased because the firms now only need to handle one tax rate compared to two rates prior to the reform, except for restaurants that also serve alcoholic beverages. The decrease in costs for the firms started in January 2012, and it was not beneficial for the firms to decrease prices in advance or in any way change their behaviour prior to this date. To illustrate how VAT payments for firms in the restaurant and catering industry have changed, Table 1 shows the VAT payments before and after the reform. Because the VAT paid in December is generally much higher than in January, the table also shows the VAT in January before the reform (January 2011) and December after the reform (December 2012).

Table 1. VAT payments, in SEK.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VAT per firm</td>
<td>48,608</td>
<td>120,470</td>
<td>40,771</td>
<td>91,824</td>
</tr>
<tr>
<td>VAT 25% per firm</td>
<td>36,526</td>
<td>94,858</td>
<td>16,202</td>
<td>53,391</td>
</tr>
<tr>
<td>VAT 12% per firm</td>
<td>11,759</td>
<td>24,970</td>
<td>23,832</td>
<td>37,763</td>
</tr>
<tr>
<td>Total VAT payments</td>
<td>895</td>
<td>2,680</td>
<td>776</td>
<td>2,083</td>
</tr>
<tr>
<td>(MSEK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of firms</td>
<td>18,416</td>
<td>22,286</td>
<td>19,030</td>
<td>21,964</td>
</tr>
</tbody>
</table>

Source: GIN-Skatt (Monthly tax register for firms). The restaurant industry is defined as all catering and restaurants including hotels with restaurants. School and hospital restaurants are excluded.
Table 1 reveals that the total amount of VAT paid by the firms is much lower after the reform. The average VAT per firm also follows the same pattern. Splitting up the tax rates into 25% and 12%, Table 1 shows that the firms paid a significantly larger amount of VAT at 25% the month before the reform compared to the month immediately after. These numbers indicate that the firms did not delay their VAT payments or change their sales behaviour before the reform took place.

3. Previous studies

Even though the theoretical foundations for changes in indirect and direct taxes are solid and well documented, there are surprisingly few empirical studies that target changes in VAT. Carbonnier (2007) investigates the price effects of the VAT cut for cars and house repair services in France and finds that there is a difference depending on the industry. The consumer pays 50% of the tax cut for car sales but pays 75% of the tax cut for house repair services. The comparison group consists of all industries except the treated industries, and a separate price index is constructed for the two groups. Both Doyle & Samphantharak (2008) and Marion & Muhlegger (2011) investigate the impacts of reduction in fuel taxation in the US. Both authors use between state variations to identify the impacts on price pass-through. Marion & Muhlegger (2011) also use information about inventory levels and refinery capacity to explain the variation in pass-through. In a recent study by Kosonen (2015), the author investigates the impact of a VAT reduction on hair-cutting services in Finland. The author uses a difference-in-difference approach in which the counterfactual is made up of industries that are also labour intensive. The result indicates only a 50% pass-through and hardly any adjustment in output. However, there was a significant impact on the profits of the firms.

There are only a few studies on VAT reforms and the restaurant industry. A similar reform to the one in Sweden was enacted in Finland in 2010. The reduction in the restaurant VAT was 9 percentage-points, from 22% to 13%. Harju & Kosonen (2014) uses a difference-in-difference approach where Finnish restaurants are the treated group and the restaurant industry in Sweden, Norway, and Estonia constitute the counterfactual. The results from their analysis show an average price reduction of 2.2%,
but no employment or turnover effects were identified. Houel (2011) investigates the impact of a 14.1 percentage point reduction of the VAT in the French restaurant industry by comparing the restaurant industry to the total French economy. That investigation reports a price effect of 2.5% and an increase in turnover for the sector of 2.75%, and an employment effect of around 20,000 new jobs. O’Connor (2013) investigates the impact of a temporary VAT reduction on labour-intensive goods and services in the tourism sector (including restaurants) in Ireland. The counterfactual situation is made up of a composite index of other industries in Ireland, and the study shows positive impacts on employment and a reduction in prices.²

To summarise, previous studies have either constructed the control group from a selection of other countries or regions (see e.g. Doyle & Samphantharak, 2008 and Marion & Muhlegger, 2011; Harju & Kosonen, 2014) or by constructing a comparison group consisting of a selection of other industries (Kosonen, 2015) or all sectors except for the treated sector (e.g. Carbonnier, 2007; Houel, 2011; O’Connor, 2013). We argue that selecting the counterfactual the way it was done in previous research can create problems when interpreting the results. Using a selection of other countries or regions with contextual differences raises questions about what would have been the result if the selection of countries or regions were altered. As for using a comparison with a composite index of the rest of the economy, there is a possibility that other sectors will be affected to some degree by the treatment which will create a bias. Another potential problem is the weighting of industries in such index.

4. The theoretical perspective of the outcome

Previous research on reduction in VAT have mainly focused price passing through for the consumers. We will, however, focus on the effects for firms.³ A firm on a competitive market is assumed to maximise profits which is determined by the revenue and cost for the firm. To discuss expected outcome of the

² The same reform, using the same methodological framework as in O’Connor (2013), has also been studied by Deloitte (2013).

³ See e.g. Stiglitz (1988) for a general discussion, Christiansen (2011) for a discussion relating to the restaurant industry or the National institute of economic research (2015) for an analysis of price passing through for the Swedish restaurant market.
reform we make use of the profit function and its components. The components of the profit function is price, quantity (sold and produced) and inputs prices. It should be made clear that those companies that are affected by the reform are free to allocate the result by them-self. Because of this situation there are several outcomes of a vat reduction that needs to be covered and the theory gives a number of scenarios where the expected outcome is determined by market conditions.

On a competitive market it can be assumed that some firms are trying to gain market shares. One way of doing that is to lower the consumer prices which will increase sales. If the demand is elastic, which can be assumed for the restaurant industry, this will result in a higher turnover for the firm. A first possible outcome will therefore be effects on total turnover. To meet the increased demand production has to be increased. Assuming efficient production, this can only be done by increasing inputs, i.e. labour, capital or combinations thereof.\(^4\) Since the political expectations before the reform related to employment aspects our study focuses this factor of production. An increase in employment can take different forms. One way is that the number of employed increases. Another way is that those already employed are working more hours. A problem with official Swedish statistics is that it not cover worked hour. However the total wage cost for the firm will be an indication of increased employment. To measure the effect on employment we therefore use both the number of employed as well as the total wage cost.\(^5\)

The discussion so far has assumed a competitive market, an assumption that can be invalid, especially for some local markets. According to Christensen (2011) the major part of the Swedish restaurant markets can be characterised by the market form monopolistic competition. An outcome for firms in such market, or local market with weak competition, could be increased profits since there would be few incentives not to adjust prices even if the VAT is reduced. As a fact, in the monopoly case it would be possible that the whole VAT reduction of 12 percent is turned into increased profits.

\(^4\) We will assume fixed capital and will not cover changes in the capital stock in the empirical part.

\(^5\) A problem with using the total wage cost for the firm is that it also can contain increased wages above the negotiated contracts. This means that the impact on the total wage cost to some extent could be slightly upward biased.
The reform can also have more dynamic effects. If profits are increased and if the barriers to entry is low it could be expected that new firms will enter and fewer firms will leave the market after the reform. A consequence of the reform could therefore be that the net number of firms within the market increases.\(^6\)

To summarise the theoretical discussion there are a number of possible effects that all are related to the profit function of the firm. In our study we have chooses to cover, turnover, number of employed, total wage cost and development of the profits. We also investigate the impact on the net number of firms.

### 5. Identification, data, and limitations

As mentioned in the introduction, changes in policy that affect all individuals/firms/organisations have until now been considered extremely difficult, to evaluate with a decent amount of precision. This problem arises because the outcome for the treated industry and for all industries not affected by the reform can be observed, but not the outcome for the treated industry in the absence of the reform. This implies that to evaluate the reform an industry that mirrors the treated one as closely as possible has to be identified or constructed. The construction of the SCG consists of identifying industries and applying different weights that are dependent on the similarity of the selected industry to the treated industry prior to the reform.\(^7\)

\(^6\) However, in the long run we would expect that the number of new firms and firms leaving the market will equalise. This will happen when a new equilibrium is obtained and profits has returned into normal profits.

\(^7\) A number of sensitivity checks have been performed using various individual sectors as controls in a difference-in-difference setting, see appendix. However, such attempts fail to meet the parallel path assumption that are essential for a DID approach. Further, the results obtained are highly sensitive to the sectors selected to be the control sector. By using SCG we manage to meet the pre-treatment parallel path assumption and also avoid subjectivity when choosing control sector/s.
Formally, assume $S_s$, $s = 1, 2, \ldots, S$ sectors and that the intervention take place at time $t_0$.

The sectors are observed both before and after treatment. Denote $s_T$ the treated sector and $s_{NT}$ the untreated sectors, where $T \neq NT$. Further, let $y_{s_T}$ denote the outcome in case of treated sector and $y_{s_{NT}}$ is the outcome in absence of treatment. The treatment effect for industry $s$ is defined as $TE = y_{s_T} - y_{s_{NT}}, t > t_0$. The problem faced is that the outcome for the treated industry in absence of treatment $y_{s_{NT}}, t > t_0$ is unknown. If we assume this can be expressed as a linear function

$$y_{s_T} = \alpha_t + \beta_t X_s + \gamma_t Z_s + \epsilon_{st},$$

where $\alpha_t$ is a time dependent factor, $X_s$ is a vector of observed covariates, $Z_s$ is a vector of unknown covariates, or factors, $\beta_t$ and $\gamma_t$ are unknown vectors of parameters and $\epsilon_{st}$ is unobserved sector heterogeneous shocks, e.g. other treatments or business cycle related shocks. In this case $\gamma_t Z_s$ is the response to unobserved factors that needs to be addressed. The idea with the synthetic control group approach is to use information before treatment to match on pre-treatment outcomes and observed pre-treatment characteristics in a way that allows identification of $\gamma_t Z_s$.

To do so, let $w$ be a vector of weights used for the non-treated sector ($w_{s,T} \in [0,1], \sum_{s \in T, s_T} w_s = 1$) and suppose that we can choose these weights is a way such that

$$\sum_{s \in T, s_T} w_s X_s = X, \sum_{s \in T, s_T} w_s y_s = y, t < t_0$$

then, in absence of large $\epsilon_{st}$, and if the two equations hold

$$y_{s_T} - \sum_{s \in T, s_T} w_s y_{s_{NT}}, t > t_0$$

will be an approximate unbiased estimator of $TE$.

That is, the effect of the VAT reduction is computed as the difference in the development of a specific outcome in the

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8 This section builds on the presentation found in Robbins et al. (2015)

9 Bold indicate vectors.

10 A step-by-step description on how the synthetic control groups are constructed is presented in the Appendix.
restaurant industry compared to the development of the same outcome in the synthetic restaurant industry. The SCG approach is completely data driven non-parametric and to choose the weights we seek to minimize the distance between the pre-treatment variables used in the matching between treated and untreated sectors. There are various selection criterias but the most common is to select the control group that minimizes the mean square prediction error, i.e. the pre-treatment deviance between the synthetic control group and the treated sector. Most studies use a donor pool from other countries (Billmeier & Nannicici, 2013; Abadie et al., 2015; Karlsson & Pichler, 2015; Smith, 2015, Castañeda & Vargas 2012), other regions within the same country (Abadie & Gardeazabal, 2003; Abadie et al., 2010; Hankins, 2014; Munasib & Rickman, 2015; Ando, 2015; Coffman & Noy, 2011; Leight, 2010; Dierichtson & Ellegård, 2015; Bassok et al., 2012; Bohn et al. 2011 & 2015; Dorsett, 2013), or other districts within a region (Bauhoff, 2014). One study uses a donor pool consisting of other persons (Chan et al., 2015). However, as far as we know other industries within the same country have never been used.

5.1. Study design and limitations

The data used in this study is from Statistics Sweden’s business register and its longitudinal register data on individuals.11 These two databases provide annual information about the entire population of firms and individuals registered in Sweden. Variables include e.g. turnover, number of employees, investments, profits and wages. The synthetic control method has a panel data structure, where an industry is a unit of observation. The variables on the firm level are aggregated up to the industry level, which implies that each variable is calculated as the aggregate of all firms in a particular industry. The industry coding are based on the Swedish Standard Industrial Classification (SNI-codes) where industries are defined on a three out of five-digit level, and amounts to 221 industries in the donor pool and 1 treated industry. We chose the three-digit level because the data are more stable on this level and less sensitive to changes in reclassification. The treated industry is restaurant and

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catering services and consists of all firms registered in the following categories: *restaurants and mobile food service activities, event catering activities, catering for transports, and hotels with restaurants*. Catering for schools, welfare and other institutions, and catering for hospitals are excluded\(^{12}\) since they are not market driven operations, i.e. the demand is not affected by the VAT-reduction. To avoid comparing industries close in similarity to the restaurant industry or partly treated, we also exclude all categories of hotels and other accommodations from the donor pool. The wholesale food industry might be indirectly affected due to an increase in demand for their products that might result from the VAT reform. It is impossible to know if this might have a large effect on the results, so for comparison these types of businesses were excluded to see whether they impacted the main results.\(^{13}\) No other sector or industry was directly affected by this reform, and thus are all included in the potential comparison group.\(^{14}\) We try to keep subjective choices to a minimum. Further, we only include firms that have a yearly turnover of at least 500,000 SEK and have at least 1 employee, and the group includes all types of companies.

*Outcomes*

The outcome variables derived from the profit function and from business dynamics are:

- *Change in turnover* - the yearly real percentage change in turnover for the industry.
- *Change in total wages* - the yearly real percentage change in total wages for the industry.
- *Change in employment* - the yearly percentage change in number of employees for the industry.
- *Profit margin* – Gross profit as a share of turnover. This variable measures the average gross profit margin for the firms in the industry.
- *Difference in entry/exit* – the difference in the number of entries and exits of firms in a given year. This difference is expressed as a percentage of all firms in the industry for that particular year. If this variable is positive, it means that more firms are “created” than “dissolved”.

\(^{12}\) These are all under subgroup 55 and 56 in the SNI-classification system. For the full classification of sectors, see: [http://www.sni2007.scb.se/snisokeng.asp](http://www.sni2007.scb.se/snisokeng.asp)

\(^{13}\) These results can be found in appendix.

\(^{14}\) Whether other sectors were indirectly affected, we test in our sensitivity analysis, see appendix.
Yearly data are available from 2003, giving nine years of data prior to the reform.\textsuperscript{15} Because we measure the change between two years, one observation is lost resulting in eight pre-reform observations from 2004 to 2011. For \textit{Change in employment}, \textit{Profit margin}, and \textit{Difference in entry/exit}, two observations of post-treatment are available (2012 and 2013). For \textit{Change in total wages} and \textit{Change in turnover}, data up to 2014 are available from the Swedish tax register (GIN-Skatt) resulting in three observations after the reform for these two variables. Because there is a difference in size between industries (e.g. in number of firms), we use the annual change of the variables. This means that industries with similar developments over time are compared rather than the levels of the variables. Further, we ignore individual firm effects because the focus of this study is the impact on industry level as a whole.

5.2. Predictors

The aim of the SCG method is to construct a comparison unit that is as close as possible to the restaurant industry given a set of predictors for the outcome variable of interest. The variables chosen to reproduce the restaurant industry need to correctly describe the characteristics of the industry. The variables described below, combined with the dependent variables presented above, are used as matching variables for the construction of the synthetic control industry:

\textit{Share wages/costs} – the average share of the firms’ total cost in a specific industry that are labour costs. This reflects how labour intense the industry is.

\textit{Change in average wages} – The percentage change in average wages in the industry. This reflects the development of the wages in the industry.

\textit{Per cent aged 18–26} – The percentage of the work force in the industry that is between 18 and 26 years old. The payroll tax in Sweden is lower for this age group making them relatively “cheaper” to employ.

\textsuperscript{15} This is due to a change of industry classification in 2002. The studied time period already covers one change in 2007. This change led to combinations of some industries on the 3-digit level due to the problems in separating them.
Per cent low educated – The percentage of the work force that only has compulsory schooling. This indicates the education level of the work force and is somewhat of a proxy of the specialization of the work force. An alternate definition of education level measured as the percentage with a maximum of a high school degree generally gave a poorer match.

The matching of the synthetic industry to the restaurant industry is done using the average of the variables between 2004 and 2011. Following the suggestions in Kaul et al. (2015), we only match on a few observations of the dependent variables prior to the reform. This is to make sure that the development of the outcome variable is similar between the two industries. The reason for not including all previous observations of the dependent variable as a predictor is, according to Kaul et al. (2015), that it will render all other predictors irrelevant.

It has to be made clear that the SCG approach does not compensate for the fact that a counterfactual does not exist. However, it is an approach that lets the evaluator come close to seeing the true impacts. In most cases there will be an overlap of untreated industries that will indirectly be exposed to the treatment to some extent. This is also the case in this study. We have tried to investigate the extension of such problems by conducting an extensive number of sensitivity analyses varying both the industries included in the donor pool, the year of the reform and the specifications used in matching.

6. Results

Matching results

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16 For example, in Abadie et al. (2010) one can suspect that if smoking is banned in California some individuals who are not smokers will move to the state, while others who smoke will move out from the state. Therefore, the result should be interpreted as less smoking in California rather than less smoking among individuals in California. However, the number of people who move for the reasons presented above will probably be small, and the average ‘state’ effect might not be that far away from the individual treatment effect.

17 For results from the sensitivity analysis, see appendix.
Table 2 presents the pre-treatment variables for the synthetic industry and the treated industry. The specifications presented in Table 2 are from the regressions with the lowest root mean square prediction error (RMSPE) for each of the five outcome variables. A low RMSPE indicates a small difference between the treated industry and the SCG in terms of the predictors in the matching estimator. The “best fit” is selected based on the smallest RMSPE. An RMSPE of 0.01 implies that prior to the reform, the predictors of the treated industry and the SCG industry on average differ 1%.

To answer the question of whether the observed changes are due to the reform or just by coincidence, a placebo test is performed. For the placebo test, an SCG is constructed for each of the 221 industries in the donor pool. The size of the placebo effects is then compared with the effects for the restaurant industry. If similar or greater effects in magnitude are shown for other industries, it is not possible to conclude that the observed effect for the restaurant industry is significant. The size of the effects is determined by comparing the pre-RMSPE with the post-RMSPE for the outcome variables.

The effects in the restaurant industry are then compared with the distribution of the effects from the placebo tests in order to compute a $p$-value of significance. For example, for turnover there is a probability of 7 in 222 that the magnitude of pre/post RMSPE is larger than the one estimated for the restaurant industry. From this we calculate a $p$-value $7/222 = 0.031$. This can be interpreted as a 3.1% probability that we will find effects of the same magnitude for the restaurant industry. In a similar way, we can calculate p-values for the other outcome variables as well. See e.g. Abadie et al (2010) for an explanation of the placebo test. Pre-treatment characteristics and RMSPE values for the different outcomes are presented in Table 2.

18 The placebo test relies on the i.i.d assumption and if this assumption holds could of course be questioned. There is research on its way looking at other ways to assess inference in a synthetic control group setting (see e.g. Ando & Sävje, 2013). However, as of today and until other alternatives are available we have to assume that this assumption holds.
Table 2. Pre-treatment characteristics.

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Change in total wages</th>
<th>Change in turnover</th>
<th>Employment</th>
<th>Profit margin</th>
<th>Entry/exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>S</td>
<td>T</td>
<td>S</td>
<td>T</td>
<td>S</td>
</tr>
<tr>
<td>Share wages/total costs*</td>
<td>0.27 0.27</td>
<td>0.27 0.26</td>
<td>0.27 0.27</td>
<td>0.27 0.24</td>
<td>0.27 0.20</td>
</tr>
<tr>
<td>Change in turnover*</td>
<td>0.05 0.05</td>
<td>0.06 0.059</td>
<td>0.05 0.05</td>
<td>0.05 0.04</td>
<td>0.05 0.06</td>
</tr>
<tr>
<td>Change in total wages*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in average wages*</td>
<td>0.01 0.01</td>
<td>0.01 0.01</td>
<td>0.01 0.00</td>
<td>0.01 0.02</td>
<td></td>
</tr>
<tr>
<td>Average wages*</td>
<td></td>
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</tr>
<tr>
<td>Per cent aged 18–26*</td>
<td>0.34 0.28</td>
<td>0.34 0.32</td>
<td>0.34 0.29</td>
<td>0.34 0.30</td>
<td>0.34 0.22</td>
</tr>
<tr>
<td>Per cent low educated*</td>
<td>0.28 0.29</td>
<td>0.28 0.24</td>
<td>0.28 0.25</td>
<td>0.28 0.28</td>
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<tr>
<td>Per cent max high school degree*</td>
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<td>$Y_{2004}$</td>
<td>0.03 0.03</td>
<td>0.05 0.05</td>
<td>0.00 0.00</td>
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<td></td>
</tr>
<tr>
<td>$Y_{2005}$</td>
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<td></td>
<td></td>
<td>5.08 5.09</td>
<td></td>
</tr>
<tr>
<td>$Y_{2007}$</td>
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<td>0.07 0.07</td>
<td>4.12 4.13</td>
<td>0.02 0.02</td>
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<tr>
<td>$Y_{2009}$</td>
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<td>−0.02 −0.02</td>
<td>−0.00 −0.00</td>
<td>5.53 5.46</td>
<td>0.01 0.01</td>
</tr>
<tr>
<td>$Y_{2011}$</td>
<td>0.07 0.07</td>
<td>0.06 0.06</td>
<td>0.06 0.06</td>
<td>3.59 3.60</td>
<td>0.02 0.02</td>
</tr>
<tr>
<td>RMSPE</td>
<td>0.013 0.005</td>
<td>0.016</td>
<td>0.184</td>
<td>0.002</td>
<td></td>
</tr>
</tbody>
</table>

Note: T: Treated, S: Synthetic. * The variables are averaged over 2004 to 2011. $Y_{20XX}$ refers to the respective outcome variable for that specific year.

Table 3 shows the industries and their associated weights in the synthetic control industry for the five outcome variables. These weights are based on the same specification as in Table 2. Retail, cleaning activities, and call centres are industries that make up a large part of the various SCGs. These are all, as the restaurant industry, labour intense industries.

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19 The types of industries that are included in the synthetic industry remain fairly stable across specifications, and only the weights tend to differ.
Table 3. Industry weights for the synthetic control groups.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total Wages</th>
<th>Turnover</th>
<th>Employment</th>
<th>Entry-Exit</th>
<th>Profit Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering of wild growing non-wood products</td>
<td>0</td>
<td>0</td>
<td>0.003</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fishing</td>
<td>0.005</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.047</td>
</tr>
<tr>
<td>Mining of non-ferrous metal ores</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.018</td>
<td>0.026</td>
</tr>
<tr>
<td>Support activities for petroleum and natural gas extraction</td>
<td>0</td>
<td>0</td>
<td>0.006</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Manufacturing of footwear</td>
<td>0.078</td>
<td>0.085</td>
<td>0</td>
<td>0</td>
<td>0.164</td>
</tr>
<tr>
<td>Retail sale in non-specialised stores</td>
<td>0.596</td>
<td>0.627</td>
<td>0.591</td>
<td>0.333</td>
<td>0.581</td>
</tr>
<tr>
<td>Retail sale of food, beverages and tobacco in specialised stores</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.174</td>
<td>0</td>
</tr>
<tr>
<td>Retail sale of automotive fuel in specialised stores</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.001</td>
<td>0</td>
</tr>
<tr>
<td>Retail sale via stalls and markets</td>
<td>0.026</td>
<td>0.005</td>
<td>0.048</td>
<td>0.316</td>
<td>0</td>
</tr>
<tr>
<td>Other telecommunications activities</td>
<td>0</td>
<td>0</td>
<td>0.075</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Temporary employment agency activities</td>
<td>0</td>
<td>0.092</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Investigation activities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.041</td>
<td>0</td>
</tr>
<tr>
<td>Cleaning activities</td>
<td>0.203</td>
<td>0.018</td>
<td>0.107</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Activities of call centres</td>
<td>0.071</td>
<td>0.151</td>
<td>0.156</td>
<td>0</td>
<td>0.167</td>
</tr>
<tr>
<td>Business support service activities n.e.c.</td>
<td>0</td>
<td>0.008</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Activities of trade unions</td>
<td>0.021</td>
<td>0.013</td>
<td>0.011</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other personal service activities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.116</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The weights sum to 1 for each outcome variable; other industries have zero weight and are thus omitted from the table.

The robustness of the results is tested by successively excluding and including industries in the donor pool as well as by altering the matching specification. The general finding of these sensitivity analyses is that the alternatives give a higher RMSPE but with very similar results concerning reform impacts.

For the impact estimates, the specification with the lowest RMSPE is used.

Impacts of reduced VAT

The results from the SCG method are presented in Figures 1a–1e for each of the outcome variables of interest. Figures 1a–1e illustrate the development of the outcome variables over the years before and after the reform. The dotted line in each figure represents the development in the synthetic industry and the solid line represents the development in the restaurant industry. The vertical dotted line marks the time of the reform. The difference between the dotted line and the solid line after 2012 is
interpreted as the effect of the reform for the different outcomes, and the total effect of the reform is represented by the total area between the lines after the reform.
Figure 1a. Change in turnover, RMSPE: 0.0048

Figure 1b. Change in total wages, RMSPE: 0.0126

Figure 1c. Change in Employment, RMSPE: 0.0156

Figure 1d. Gross profit margin, RMSPE: 0.1839
Figure 1e. Difference in entry and exit of firms, RMSPE: 0.0023

Figures 1a–1e illustrate the development of the outcome variables that are derived from the profit function. Overall, there is a good fit between the restaurant industry and the synthetic control industry prior to the reform. Recall that the interpretation of the RMSPE is the average deviation of the matching variables between the restaurant industry and the synthetic control industry prior to the reform, and as shown the RMSPE is small for all but profit margins. In general, the average difference is smaller than 1.5%; however, for profit margins it is 18%. Thus, in general there is a good fit between the synthetic restaurant industry and the real restaurant industry prior to the reform. Impacts are represented by the development after the reform. Table 4 presents the average yearly effects of the reform for the five outcome variables:

Table 4. Average yearly effects for the outcome variables

<table>
<thead>
<tr>
<th>Outcome Variables</th>
<th>Turnover</th>
<th>Total Wages</th>
<th>Employment</th>
<th>Profit</th>
<th>Difference in entry/exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average yearly effects (%)</td>
<td>5.6</td>
<td>4.9</td>
<td>5.0</td>
<td>1.25</td>
<td>1.6</td>
</tr>
<tr>
<td>P-value from the placebo tests</td>
<td>0.032**</td>
<td>0.090*</td>
<td>0.095*</td>
<td>0.022**</td>
<td>0.027**</td>
</tr>
</tbody>
</table>

Note: The effects ***, **, * gives significance on 1-, 5- and 10-percent level respectively.

In 2011 the Swedish economy went into a recession that culminated in 2012. During this time the National Institute for Economic Research recorded a drop in the business cycle index from 117.1 to 84.7 where 100 is the normal steady state (http://statistik.konj.se/PXWeb/pxweb/sv/KonjBar/KonjBar__indikatorer/Indikatorm.px/).
Recall that the p-values for the placebo test is computed as the share of sectors that have shown equal or larger differences after the reform, in absence of the treatment. In Figure 1a, the development in change in turnover is illustrated. The change in turnover for the two industries follows an almost identical pattern before the reform. After the reform, the percentage change in turnover remains fairly the same for the restaurant industry while the turnover in the synthetic industry decreases. The difference in 2012 was close to 8 percentage points. This difference decreases across the years but remains positive. The average effect across the three years after the reform is 5.6 percentage points, and this is significant at the 5% level. This means that on average the restaurant industry increased its yearly turnover by 5.6 percentage points more than it would have done in the absence of the reform. A similar pattern can be seen for the percentage change in total labour cost presented in Figure 1b.

Before the reform, the change in total labour cost follows an almost identical pattern. However, after the reform the percentage increase of total wages in the restaurant industry is between 4 and 7.5 percentage points higher than the synthetic industry. The difference is largest the first year after the reform and then diminishes. The point estimate for the average change in the total wage cost indicates an impact equal to +4.9 percentage points. A similar pattern is seen for the change in employment, as illustrated in Figure 1c. There is an initial effect of almost 7 percentage points in 2012, and this difference decreases to approximately 3 percentage points in 2013. The cumulative average employment effect over two years is approximately 5 percentage points. Both the effect on changes in total wage cost and changes in employment are significant at the 10% level. Figure 1d shows that the effect on firms’ profit margin is 1.5 percentage points in 2012 and that this decreases to 1 percentage point in 2013. The point estimate for average profit margins is 1.25 and is significant at the 5% level. That is, the restaurant industry’s profit margins have on average grown 1.25 percentage points.

\[ \text{21 From the study made by Konjunkturinstitutet (2015) they find that the largest share of new employees (66 percent) come from unemployment, indicating that it is not only a spillover effect from other sectors.} \]
points more than for the synthetic industry. Finally, the net entry (entry – exit) is presented in Figure 1e. In contrast to the other outcome variables, a larger effect is found for the second year after the reform, which is expected since an increased profit margin attracts new firms. The effect increases from 1 percentage point in 2012 to just over 2 percentage points in 2013. On average, we find a positive effect of 1.6 percentage points on net entry into the industry, and this difference is significant at the 5% level.

7. Conclusion and concluding remarks

This study investigates the impact of the VAT reform directed towards restaurants and catering services that took place in Sweden in January 2012. The VAT was reduced from 25% to 12%. To investigate the impacts of the reform, we make use of an SCG approach. We consider firms that received the VAT reduction as the treated industry, and the donor pool for the SCGs is chosen such that they are not directly affected by the reform. Unlike previous studies, we assume that the VAT reform can affect each part in the profit function and also influence entries and exits of firms in the market. The analysis shows that the VAT reduction increased turnover, profit margins, and the net entry of firms, and all of these effects are significant at the 5% level. For the outcomes relating to employment, and total wages, the impact estimates are positive and significant at the 10% level. These results are consistent with the discussion in section 4 since a full price pass-through did not occur. We also find that the reform seems to have a quite large direct impact, but the effects tend to decrease over time. This development is also consistent expectations since the price pass-through increases over time.22 The exception of this trend is for net entry of firms, where the effect is larger in the second year. This can be explained by the (temporarily) higher profit margins attracting new firms. The results presented here are also robust in our sensitivity analysis of changing predictors and the donor pool. Our results point to an overall better performance for the restaurant industry compared to what it would have been in the absence of the reform. Our conclusion is thus that reducing the VAT has had a

22 The price effect is larger first year after the reform (4 per cent) and decreases the second year (1.5 per cent), however the total price pass through increases over time, see Konjunkturinstitutet (2015).
positive impact for the restaurant and catering industry. However, there are some impacts, such as increased profit margins, that were not expressed in the report by the public inquiry. On the other hand, this is most likely not a permanent effect. The higher profit margins will attract entry until long-term equilibrium profits are established, which may not be the case yet. The results presented here should be considered as short-term effects since our follow-up period is only two or three years after the reform.

We took an SCG approach in this study, and we consider this approach to be the most appropriate given the circumstances for the implementation of the reform. However, the SCG approach is far from being free of problems. One of the fundamental problems is that there could be some indirect effects of the VAT reform that would make the suggested untreated industries treated, and this would bias the effects of the reform.

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Appendix

Step-by-step description of the construction of the synthetic control group

The matching procedure:

1. All variables are aggregated to industry level.
2. A panel data set with years and industries is constructed.
3. For the variables (except where years are specified) we match on the average of the variables the years before the reform.
4. We construct the synthetic control group for each outcome variable respectively by matching on the variables listed in table 2, pre-treatment.
5. The specification with the smallest RMSPE is used.
6. The effects are calculated as the difference between these two industries the years after the reform.