

Impact of **the VAT reform** on Swedish restaurants

– a synthetic control group approach

In 2012, Sweden implemented a reform reducing VAT for restaurant and catering services aiming to increase long-term employment. In this study we investigate the impact of the reform and find that it has had several positive and significant effects on the restaurant industry.

Our ref: 2011/312

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Foreword

Swedish Agency for Growth Policy Analysis, Growth Analysis, was commissioned by the Swedish Government to evaluate the reduction in VAT for restaurant and catering services, which was implemented in 2012. Growth Analysis has focused on the effects of the reform from the perspective of firms in terms of e.g. turnover, employment, entry of firms, survival rates and profit margins.

This memo comprises development and application of a method called synthetic control group approach. In our view, this method is suitable for estimating effects of the reform. This is a methodological challenge since all companies in the restaurant industry are treated, and we lack good control groups. The present report serves as a foundation to the final report in our commission *Reduced VAT on restaurant and catering services – final report*.

This report was written by Acting Director Björn Falkenhall (project leader), Sofia Tano, analyst at Growth Analysis, and Associate Professor Jonas Månsson at Linnaeus University.

We would like to thank the participants in the peer-review group and attendants at the seminar at Linnaeus University for valuable comments.

Östersund, December 2015

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Förord

Myndigheten för tillväxtpolitiska utvärderingar och analyser, Tillväxtanalys, har haft i uppdrag av regeringen att utvärdera sänkningen av restaurangmomsen 2012. Tillväxtanalys ska följa upp effekter gällande företagande i olika dimensioner, exempelvis omsättning, anställningar, nyföretagande, överlevnadsgrad och vinstmarginaler.

Föreliggande PM behandlar metodutveckling och tillämpning av en metodansats som använder så kallade syntetiska kontrollgrupper. Vi har bedömt denna metod som lämplig för att kunna uppskatta effekter av reformen. Detta är metodologiskt utmanade då alla företag i restaurangbranschen omfattas av momssänkningen och det saknas bra jämförelsegrupper eller branscher. Studien utgör underlag till slutrapporten i uppdraget *Sänkt moms på restaurang- och cateringtjänster – slutrapport* (Rapport 2015:10).

Studien har författats av en projektgrupp bestående av avdelningschef Björn Falkenhall (projektledare), Sofia Tano, analytiker vid Tillväxtanalys, samt docent Jonas Månsson vid Linnéuniversitet.

Arbetet har förankrats i en referensgrupp och har även presenterats på ett seminarium på Linnéuniversitetet. Vi vill tacka de medverkande i referensgruppen samt seminariedeltagarna för värdefulla kommentarer.

Östersund, december 2015

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Summary

Our analysis of the reduction in VAT for restaurant and catering services shows positive effects on turnover, employments, total wages, gross profit margins and net entry of firms. It is clear that the firms have used the VAT reduction in more ways than lowering prices.

In this study we investigate the impact of the VAT reform for restaurant and catering services that took place in Sweden on January 1, 2012. The aim of this reform was to increase long-term employment in Sweden. Growth Analysis was commissioned to evaluate the effects of this reform from the perspective of firms. This PM serves as a foundation for this commission's final report *Reduced VAT on restaurant and catering services – final report*.

Evaluating the effects of a VAT reduction that includes all firms in an industry is a challenge and difficult methodologically due to the lack of a counterfactual outcome. In this study, 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 in the profit function and also influence entry and exit in the market. We do the analysis on industry level by aggregating firm level data.

The VAT reduction had a positive and significant effect on turnover, profit margins and net entry of firms. The average yearly effect is estimated to be 5.6, 1.25 and 1.6 percentage points respectively. These results are significant at the 5 % level. The average yearly effect on total wages and employment lies at 4.9 and 5.0 percentage points respectively and is significant at the 10 % level. The effects tend to decline over time, with exception for net entry of firms.

Although estimating the exact effects of a reform remains difficult, our results are robust to sensitivity analyses. Overall, our results point to better performance for the restaurant industry compared to what it would have been in the absence of the reform.

Sammanfattning

Vår analys av den sänkta restaurangmomsen visar på positiva effekter på lönesumma, omsättning, anställningar, rörelsemarginaler och företagsstocken. Resultaten visar tydligt att företagen har valt att använda momssänkningen på fler sätt än till att sänka priserna.

I denna studie undersöker vi sänkningen av mervärdesskattesatsen på restaurang- och cateringtjänster som skedde 2012. Syftet med momssänkningen var att öka den varaktiga sysselsättningen. Tillväxtanalys fick i uppdrag att utvärdera effekterna gällande företagande. Detta PM syftar som underlag till Tillväxtanalys slutrapport i uppdraget *Sänkt moms på restaurang- och cateringtjänster – slutrapport* (Rapport 2015:10).

En reform som omfattar samtliga företag i en bransch är svårt metodologiskt att utvärdera då ett kontrafaktiskt utfall saknas. I denna studie använder vi matchning med syntetisk kontrollgrupp för att skapa det kontrafaktiska utfallet. Denna metod är datadriven och förlitar sig endast på ett fåtal subjektiva val. Vår analys utgår från att reformen kan påverka komponenterna i vinstfunktionen. Vi analyserar effekterna på branschnivå genom att aggregera data på företagsnivå.

Momssänkningen har positiva och signifikanta effekter på både omsättning, rörelsemarginal och företagsstocken. Den genomsnittliga årliga effekten uppskattas till 5,6 respektive 1,25 och 1,6 procentenheter. Dessa resultat är signifikanta på 5-procentsnivån. Den genomsnittliga årliga effekten på lönesummor och anställningar är 4,9 respektive 5,0 procentenheter och är signifikanta på 10-procentsnivån. Effekterna tenderar att klinga av över tid, med undantag för nettotillskotten av företag.

Även om problemet kring att exakt estimerar effekter av en reform kvarstår, är dessa resultat robusta för känslighetsanalyser. Sammanfattningsvis pekar resultaten klart mot en positiv effekt för restaurangbranschen, som utvecklats bättre än vad som skulle ha varit fallet utan reformen.

1 Introduction

A reform that targets a whole country, sector, or region, such as the VAT reduction for Swedish restaurants, will in general be impossible to evaluate because no counterfactual situation occurs – all will be treated. Previous studies have either constructed 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. To improve on previous research, we make use of a synthetic control group (SCG) approach. 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.

In this study, we adopt a firm perspective on the VAT reform. By using the SCG and 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 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 into the impact 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, and in section 7 we present our conclusions.

2 The reform

On January 1, 2012, the VAT rate for restaurants and catering services in Sweden was reduced from 25 per cent 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 is still taxed at 25 per cent. The main aim of the reform was to increase long-term employment through a greater supply of labour and 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. It is the business owner who provides the goods and services and who 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%. There is no upper boundary to this tax rate. The member states are permitted to reduce their VAT for a maximum of two groups 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 can pay 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 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 a greater labour supply and 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 climate in the restaurant sector.

There was no transition period or phasing-in of the VAT reform. The tax cut decreased the costs for business 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. 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

	January 2011	December 2011	January 2012	December 2012
VAT per firm	48,608	120,470	40,771	91,824
VAT 25% per firm	36,526	94,858	16,202	53,391
VAT 12% per firm	11,759	24,970	23,832	37,763
Total VAT payments (MSEK)	895	2,680	776	2,083
Number of firms	18,416	22,286	19,030	21,964

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 for car sales but pays 75% of the tax 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 as the Swedish reform 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 per cent 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, which includes 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.¹

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 in this manuscript 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 the possibility that other sectors will be affected to some degree by the treatment and this bias needs to be accounted for.

¹ The same reform, using the same methodological framework as in O'Connor (2013), has also been studied by Deloitte (2013).

4 The theoretical perspective of the outcome

As in Månsson and Quoreshi (2014), we use a firm perspective for the evaluation. The starting point is the standard profit function

$$\pi(p+t_i, y) = py(p+t_i) - c(w, r, y(L, K)) - t_i y$$

where p is the price excluding VAT, $t =$ VAT rate, and $i = 0,1$ indicating before or after the reform, respectively. In our case, $t_0 > t_1$, i.e. the tax rate before the reform is higher than after. $y(p)$ is the output demanded, and $c(\cdot)$ is the cost function that is assumed to be dependent on labour cost (w), cost of capital (r), and the factors of production, labour (L) and capital (K).

The outcome that previous research has mainly targeted is the price pass-through to the consumer, i.e. how much of the price reduction is distributed further along to the consumer. However, the size of the price pass-through is dependent on both the elasticity of demand and the level of competition in the market. In the following section, two cases of this are used as illustration.

Case one – competitive market and elastic demand

In this case price will fall and demand will increase, which implies an increase in turnover. To meet the new demand, the firm needs to produce additional output. If efficiency is assumed, this implies that the amount of labour and/or capital needs to be increased. If capital is assumed to be fixed in the short term, then the total increase in output is reflected in an increase in labour. However, if there is less than perfect competition, some of the excess profits can be allocated to an increase in wages or in profits.

Finally, if the industry is competitive, if there are limited barriers to entry, and if there is a non-increasing return to scale technology, then an increase in profits will result in an increase in the number of firms entering the market. The expectation is that the net number of firms (inflow + stock – outflow) will increase in this scenario.

Case two – monopoly

If we assume a monopoly, as would be the case in many sparsely populated areas in Sweden with low demand, we can expect that most of the cost reduction will be allocated to increased profits. The reason is that there are few incentives for restaurant owners to reduce their prices. However, because there are low barriers to entry relating to technology, we might have a situation where entry exceeds exit even in these cases.

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, if not impossible, 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 different industries and applying different weights that are dependent on the similarity of the selected industry to the treated industry prior to the reform. This is done by using information of pre-treatment characteristics of the industries in a donor pool of other industries. The weight of each non-treated industry is set such that it minimizes the difference between the pre-treatment variables of the treated industry and the synthetic industry. The weights associated to each non-treated industry range from 0 to 1 and in total sum up to 1. The post-treatment outcome of the treated industry is thereafter compared to the post-treatment outcome of the SCG. The difference between the observed industry development and the development of the synthetic restaurant industry is interpreted as the effect of a reform targeting areas, or countries. A short review of previous studies using the SCG approach is presented in the appendix. Most studies use a donor pool from other countries (Billmeier & Nannicini, 2013; Abadie et al., 2015; Karlsson and Pichler, 2015; Smith, 2015, Castañeda and 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.² These two databases provide annual information about the entire population of firms and individuals registered in Sweden. 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 codings 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 robust on this level and less sensitive to changes in classification, while at the same time we can still maximize the amount of information available. The treated industry is restaurant and 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. From the classification of restaurants and catering services,

² For further explanation of the data, see: <http://www.scb.se/foretagsregistret-en> and http://www.scb.se/en_/Services/Guidance-for-researchers-and-universities/SCB-Data/Longitudinal-integration-database-for-health-insurance-and-labour-market-studies-LISA-by-Swedish-acronym/

catering for canteens and for hospitals is excluded³ because they are not market driven operations. To avoid comparing industries close in similarity to the restaurant industry, we also exclude all categories of hotels and all other accommodations without restaurants 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. No other sector or industry was assumed to be directly affected by this reform, and thus all were included in the potential comparison group. 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 market 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”.

Yearly data are available from 2003, giving nine years of data prior to the reform.⁴ Because we measure the change between two years, one observation is lost resulting in eight pre-reform observations from 2004 to 2011. For *Change in total wage*, *Profit margin*, and *Difference in entry/exit*, two observations of post-treatment are available. For *Change in total wages* and *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

³ 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>

⁴ 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.

dependent variables presented above, are used as matching variables for the construction of the synthetic control industry:

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.

Change in average wages – The percentage change in average wages in the industry. This reflects the development of the wages in the industry.

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

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.⁵ This is also the case in this study. We have tried to minimise such problems by conducting an extensive number of sensitivity analyses varying both the industries included in the donor pool and the specifications used in matching.

⁵ 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.

6 Results

Matching results

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 the matching variables differ by 1% between the treated industry and the SCG prior to the reform. 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.⁶ Pre-treatment characteristics and RMSPE values for the different outcomes are presented in Table 2.

Table 2 Pre-treatment characteristics for the outcome variables

	Change in total wages		Change in turnover		Employment		Profit Margin		Entry/Exit	
	T	S	T	S	T	S	T	S	T	S
<i>Share wages/total costs</i>	0.27	0.27	0.27	0.26	0.27	0.27	0.27	0.24	0.27	0.20
<i>Change in turnover</i>	0.05	0.05			0.05	0.05	0.05	0.04	0.05	0.06
<i>Change in total wages</i>			0.06	0.059						
<i>Change in average</i>	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02		
<i>Average wages</i>									-182.2	-184.9
<i>Per cent aged 18–26</i>	0.34	0.28	0.34	0.32	0.34	0.29	0.34	0.30	0.34	0.22
<i>Per cent low educated</i>	0.28	0.29	0.28	0.24	0.28	0.25	0.28	0.28		
<i>Per cent max high school degree</i>									0.84	0.8
<i>Y2004</i>	0.03	0.03	0.05	0.05	0.00	0.00				
<i>Y2005</i>							5.08	5.09		
<i>Y2007</i>	0.13	0.13	0.10	0.10	0.07	0.07	4.12	4.13	0.02	0.02
<i>Y2009</i>	0.00	0.00	-0.02	-0.02	-0.00	-0.00	5.53	5.46	0.01	0.01
<i>Y2011</i>	0.07	0.07	0.06	0.06	0.06	0.06	3.59	3.60	0.02	0.02
<i>RMSPE</i>	0.013		0.005		0.016		0.184		0.002	

Note: T: Treated, S: Synthetic. All variables except when years are specified are averaged over 2004 to 2011.

⁶ 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.

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 2.⁷ Retail, cleaning activities, and call centres are industries that make up a large part of the various SCGs.

Table 3 Industry weights for the synthetic control groups

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

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.

⁷ The types of industries that are included in the synthetic industry remain fairly stable across specifications, and only the weights tend to differ.

Impacts of reduced VAT

The results from the SCG method are presented in Figures 1–5 for each of the outcome variables of interest. Figures 1–5 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.

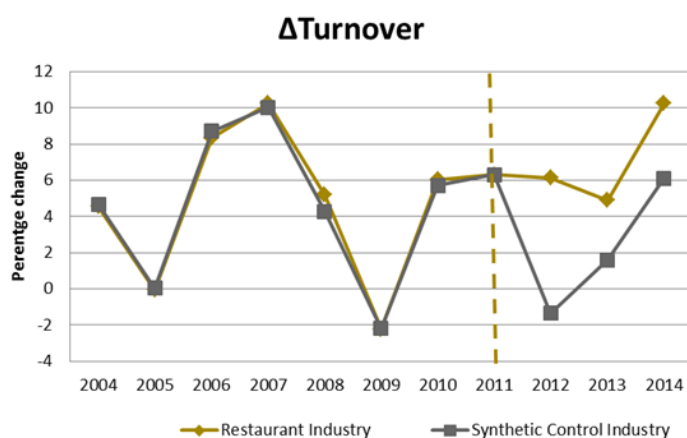


Figure 1 Change in turnover, RMSPE: 0.0048



Figure 2 Change in total wages, RMSPE: 0.0126



Figure 3 Change in employment, RMSPE: 0.0156

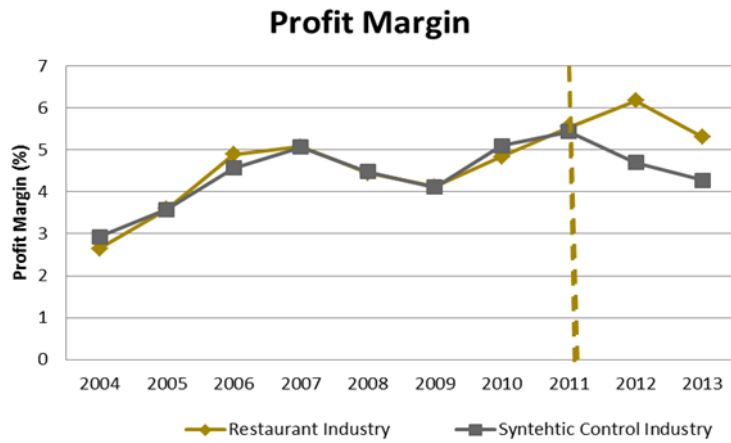


Figure 4 Gross profit margin, RMSPE: 0.1839



Figure 5 Difference in entry and exits of firms, RMSPE: 0.0023

Figures 1–5 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 deviation between the restaurant industry and the synthetic control industry, and as shown the RMSPE is small for all but profit margins. In general, the deviation is less than 1.5%; however, for profit margins the deviation is 18%. Thus, there is in general a good fit between the two groups prior to the reform.

Impacts are represented by the development after the reform, where the reform is indicated by the vertical dotted line. In Figure 1, 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 in the absence of the reform. A similar pattern can be seen for the percentage change in total labour cost presented in Figure 2. 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 a yearly impact equal to +4.9 percentage points. A similar pattern is seen for the change in employment, as illustrated in Figure 3. 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 4 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 more than for the synthetic industry. Finally, the net entry (entry – exit) is presented in Figure 5. 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 Conclusions and concluding remarks

This study investigates the impact of the VAT reform directed towards restaurants and catering services in Sweden 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 can 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 economic theory since a full price pass-through did not occur.⁸ 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 with theory and expectations since the price pass-through diminishes over time. The exception to this trend is for net entry of firms, where the effect is larger in the second year. This can be explained by a (temporarily) higher profit margin 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 positive impact for the restaurant and catering industry. However, there are some impacts, such as increased profit margins, that were not expressed in 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. Because the results point towards rather large average effects, it is plausible to believe that there will be long-lasting effects on e.g. employment. However, at present we cannot say anything about the sizes of these effects.

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. Because the effect is positive for all outcomes, including a few treated industries in the group of untreated industries will result in a downward bias of the effects. That is, the reported impact estimates will be a lower bound.

⁸ The price pass-through is estimated to be 50 %, see Konjunkturinstitutet (2015).

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Appendix 1 The use of the synthetic control group approach – a review

The synthetic control group (SCG) approach has garnered much interest in recent years. Until the early 2000s, a reform that took place on an aggregate level – such as in a certain city, region, or country – was considered to be almost impossible to evaluate. The development of the SCG approach has made it possible to evaluate these kinds of aggregate reforms. The SCG approach has been used in several studies and in a variety of fields, and this section gives an overview of the studies that as of today have used the SCG approach.

The SCG approach was first introduced by Abadie & Gardeazabal (2003) who studies the economic cost of conflicts in the Basque regions. The donor pool for constructing the control group was made up of other Spanish regions. The result of their investigations points to a negative impact of the terrorist conflict and that the gap in gross domestic product (GDP) between the region and the SCG increased with the intensity of the conflict. Even though this is the first study to use the SCG approach, the most frequently cited work is an evaluation of the California tobacco control program, or Proposition 99 (Abadie et al. 2010). The treatment in this study is a reform that targeted tobacco use and was implemented in California. The donor pool for the control group consists of other states within the US, and in the study the authors could show large impacts on smoking in California.

Hankins (2014) investigates a change in the legislative structure on government spending in Nebraska. As in Abadie et al. (2010), the donor pool for constructing the control group – or the synthetic Nebraska – a weighted average of other US states. Even though Hankins (2014) finds decreased spending, placebo tests shows that the observed impact is not unambiguous.

Munasib & Rickman (2015) investigate the impact of increased exploration of oil and gas production from shale formations on local economies. The treatment states, i.e. those exposed to unconventional drilling methods, are Arkansas, North Dakota, and Pennsylvania. The donor pool for the SCG is constructed from a weighted average of the aggregate non-metropolitan proportion of the states that were not exposed of unconventional drilling. The results of the study are mixed. Large impacts on almost all outcomes were found in North Dakota, positive impacts were found for four outcomes in Arkansas, and no impacts could be identified for Pennsylvania.

Ando (2015) studies how the establishment of a nuclear plant impacts the per capita income in Japan. The treatment group consists of eight municipalities where nuclear plants were established. The donor pool for the control group consists of other coastal municipalities within the same regions, excluding neighbouring municipalities. They found that the establishment of nuclear plants had a positive impact on the local income level in most municipalities.

Bauhoff (2014) investigates the impact of a school diet program on dietary intake and overweight. The treatment group consisted of pupils in schools located in the Los Angeles unified school districts, and the donor pool for the SCG is other schools in California. The results reported shows no significant impact on BMI and overweight but some impact on self-reported intake of soda and fried foods.

Coffman & Noy (2011) investigate the long-term impact of the 1992 hurricane Iniki that hit the Hawaiian island of Kauai. The donor pool is constructed from other islands in

Hawaii. The study showed that the long-term effect on the island of Kauai was a reduction in economic and employment growth.

Billmeister & Nannicini (2013) study the impact of economic liberalization. The data cover 180 countries that had gone through economic liberalization to different extents. By using an index of liberalization, the countries are divided into two groups. The treatment group consists of countries with a high degree of liberalization according to the index, and the donor pool for the SCG consists of countries that have not gone through economic liberalization to a great extent. The outcome for the study is per capita income. The conclusion in the study is that economic liberalization has a positive impact on per capita income.

Abadie et al. (2015) use the German reunification to illustrate the use of the SCG approach. The treatment group is West Germany, and the donor pool is the 23 OECD countries. Certain countries are excluded due to things like internal shocks within their economies. This paper is designed more to illustrate the use of an SCG and to guide in methodological matters rather than to measure impacts.

Leight (2010) investigates the impact of earned income tax credits (EITC) with a variety of approaches, one being the SCG approach. The treatment group consists of states in the US that had a program for EITC, and the control group is constructed of other states that never had an EITC. The result of the study points in the direction that low income / low skilled households, especially those without children, were heavily and negatively affected by EITC.

At present, we have only identified one Swedish study that uses an SCG approach. Dietrichson & Ellegård (2015) investigate the impact of conditional bailouts in a number of Swedish municipalities. The treated group is municipalities that received additional financial support from the Swedish government, and the donor pool consisted of municipalities that did not receive such support. The result of the study was that participation in this type of program did not have any negative impacts on financial discipline. In contrast, participation could even have increased economic awareness among the treated municipalities.

Bassok et al. (2012) investigate if government-financed childcare might crowd out private provision of childcare. The treated groups are the states of Georgia and Oklahoma. Georgia introduced a universal preschool policy, while Oklahoma used a voucher related to the children. The SCG is made up of the weighted average of other states in the US. The results point to an increase in formal childcare in both states, and while there is no crowding out in Oklahoma there is some evidence of crowding out in Georgia.

Bohn et al (2011, 2015) investigate the impact of changes in legislation directed towards unauthorized immigrants in Arizona. In Bohn (2011), the focus is on the impact on the population of unauthorized immigrants, and in Bohn (2015) the focus is on the effect on legal immigrants. In both studies, an SCG approach is used and the donor pool is made up of other US states. In Bohn (2011), it is reported that the change in the legislation reduced the number of unauthorized immigrants. In Bohn (2015), it is reported that in addition to the reduction in unauthorized immigrants there is a significant negative impact of the reform on legal low-skilled workers in Arizona.

Chan et al. (2015) investigate the research productivity among scholars who have received awards and honours. The treated group is persons that received the John Bates Clark Medal or the Fellowship of the Econometric Society. The donor pool consisted of a weighted

average of other scholars who did not receive either of these awards. The result of the investigation reveals a significantly higher productivity in terms of publication and citations among those who received the awards.

Dorsett (2013) investigates the economic impact of the conflict in Northern Ireland. The donor pool for the SCG is made up of other regions in UK that were considered to be unaffected by the conflict. The result of the investigation points to a negative 10% impact on GDP for Northern Ireland.

Karlsson & Pichler (2015) investigate the impact of HIV on demographic outcomes in the three sub-Saharan countries of South Africa, Zimbabwe, and Mozambique. The donor pool was made up of countries that – according to the UNAIDS estimates – were considered to be mildly affected by the epidemic. The result of the investigation points to a large effect on life expectancy and mortality in South Africa and Zimbabwe – and a small and insignificant effect on birth rates – while the impact of the pandemic was heterogeneous.

Smith (2015) investigates the discovery of natural resources on growth. The treatment group consists of 17 countries in which natural resources are discovered for the first time in the period from 1950 to 2008. The donor pool consists of untreated countries, i.e. those where no such discoveries were made. The study identified persistent and long-term positive impacts for developing countries, but no such impacts were seen for developed countries.

Castañeda and Vargas (2012) investigate what they refer to as landmark events in the domestic conflict in Colombia. The outcome of interest in this study is the perception of sovereign risk measured as price fluctuations in Colombian bonds. As the donor pool for the investigation, the authors use other Latin American countries. The finding is that the perception of sovereign risk is sizable but also heterogeneous and dependent of the context of the landmark event.

To summarize previous studies that use an SCG approach, with the exception of Chan et al. (2015), all use another geographical region as the donor pool. These are countries, municipalities, school districts, states, etc. The research also reports significant as well as insignificant results. As pointed out in Hankins (2014), relevant tests have to be performed in order to confirm the results of these studies.

The Swedish Agency for Growth Policy Analysis (Growth Analysis) is a cross-border organisation with 60 employees. The main office is located in Östersund, Sweden, but activities are also conducted in Stockholm, Brasilia, New Delhi, Beijing, Tokyo and Washington, D.C.

Growth Analysis is responsible for growth policy evaluations and analyses and thereby contributes to:

- stronger Swedish competitiveness and the establishment of conditions for job creation in more and growing companies
- development capacity throughout Sweden with stronger local and regional competitiveness, sustainable growth and sustainable regional development.

The premise is to form a policy where growth and sustainable development go hand in hand. The primary mission is specified in the Government directives and appropriations documents. These state that the Agency shall:

- work with market awareness and policy intelligence and spread knowledge regarding trends and growth policy
- conduct analyses and evaluations that contribute to removing barriers to growth
- conduct system evaluations that facilitate prioritisation and efficiency enhancement of the emphasis and design of growth policy
- be responsible for the production, development and distribution of official statistics, facts from databases and accessibility analyses.

About the Memorandum series: some examples of publications in the series are method reasoning, interim reports and evidential reports.

Other series:

Report series – Growth Analysis' main channels for publications. reasoning, interim reports and evidential reports.

Statistics series – continuous statistical production.

Svar Direkt [Direct Response] – assignments that are to be presented on short notice.

PM [Memorandum series] – some examples of publications in the series are method reasoning, interim reports and evidential reports.