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Abstract

The tax incidence of consumption taxes across various sectors of the economy is a key aspect when designing a tax structure. However, there are very few empirical findings on this subject. This paper studies the tax incidence of consumption taxes utilising a VAT reform targeted at labour-intensive services in Finland. The reform creates a natural experiment set-up, because the reduced VAT was targeted at hairdressers, whereas the normal tax treatment still applied to beauty salons. This experiment is exogenous to the economic conditions of hairdressers in Finland, since this group was selected in a European Commission Directive. I study the effects of the reform on prices and demand. The results suggest that barbers cut their prices only by half of what complete pass-through would have implied. Using the experiment as an instrument, I find little effect on demand. Thus, there does not seem to be any indication of a significant effect on labour demand.

Key words: Consumption tax incidence, VAT, labour intensive services

Tiivistelmä

Kulutusverotusta suunniteltaessa on tärkeää huomioida verojen erilainen kohtaanto eri hyödykkeillä. Empiirisesti kulutusverotuksen kohtaantoa erilaisilla hyödykkeillä on kuitenkin tutkittu vähän. Tässä tutkimuksessa selvitetään kulutusveron kohtaantoa hyödyntäen ALV-reformia, joka kohdistettiin työvoimavaltaisiin palvelualoihin. Reformi mahdollistaa luonnollisen koeasetelman käytön, koska alennettu ALV kohdistettiin partureihin, mutta normaalia ALV-kantaa sovellettiin edelleen kauneushoitoloihin. ALV:n alentaminen juuri partureille oli eksogeenista niiden taloudellisille olosuhteille, koska parturit olivat osa listatuista palveluista Euroopan komission direktiivissä. Keskityn tässä tutkimuksessa reformin hinta- ja kysyntävaikutuksiin. Tulokset osoittavat parturi-kampanojen alentaneen hintojaan noin puolella veronalennuksen määrästä. Kysyntäestimoinneissa reformia käytetään instrumenttina hinnan alentamiselle. Hyödyntäen tätä menetelmää, en löydä

mitään vaikutusta ALV:n alentamisesta hyödykkeiden kysyntään. Ilman vaikutusta hyödykkeiden kysyntään, ei alan työvoiman kysyntäkään näytä muuttuneen reformin vaikutuksesta.

Asiasanat: Kulutusverotuksen kohtaanto, ALV, työvoimavaltaiset palvelualat

1 Introduction

Consumption taxes are significant sources of tax revenue for governments. An important question in designing consumption taxes optimally is whether they should be uniform, or differ across commodities. According to economic theory they should differ when they have a differing impact on the level demanded (Ramsey 1927)¹. A good that has inelastic demand and small cross-elasticity with other goods should face a higher tax rate. The efficiency-related reason for this is that when there is little effect on the demand for a good from increasing the tax, there is little reduction in labour demand in the production of that good. Consequently, to set consumption taxes optimally across commodities, the demand elasticities of each good should be known.

This study estimates empirically how taxes shift to prices and their effect on demand. I utilise a tax reform in Finland introducing lower value added tax (VAT) rates for hairdressers. The reduced VAT is exogenous to the economic circumstances of hairdressers, since this group was selected in an European Commission Directive long before the experiment was implemented in Finland. There are natural control groups for hairdressers: beauty salons, day spas and masseurs. These are labour-intensive services like hairdressers, but do not benefit from the reduced VAT regime in Finland.

The results indicate that hairdressers cut their prices by half of what full pass-through would have implied. Turnover evaluated at consumer prices follows the direction of change in consumer prices, but not to the same extent. Finally, using the reform as an instrument for price changes does not result in a significant effect on demand due to the tax decrease. Any effect on employment in these services has to go through changes in demand for the services, suggesting that in this case there is no effect on labour demand. I estimate similar regressions on the monthly wage sums paid by hairdressers as on demand. The results confirm the intuition that there is no effect on labour demand.

¹Another school of thought claims that consumption taxes should not be uniform if different goods are complementary with leisure to a different extent (Atkinson and Stiglitz (1976) and Saez (2002)) or because of the equity reasons (Diamond and Mirrlees (1971)). Here the focus is on efficiency reasons which also need to be taken into consideration.

This study contributes to the literature studying the tax incidence of consumption taxes on prices. Doyle and Samphantharak (2008) study tax incidence on gasoline prices. They have a credible method for determining the effect of taxes from regional temporary tax repeals in certain regions of the USA. They find a 70 to 100 per cent pass-through on prices. The results are not directly comparable with this study due to the different product (gasoline) they study. Other studies (Poterba (1996), Besley and Rosen (1999) and Alm, Sennoga and Skidmore (2009)) focus on the tax incidence of the sales taxes of various products. These studies provide valuable information in a very understudied subject, although it is possible that the tax reforms they study are not completely exogenous to price changes.

The reduced VAT experiment in Finland offers several advantages in studying the tax incidence of VAT. First, since the reform is exogenous to the behaviour of firms, it is possible to use a natural experiment set-up in analysing the effects. The outcomes of the treatment and control groups can be compared before and after the change in the VAT regime. Figure A2 illustrates the main approach. It is evident that the assumptions needed for the differences-in-differences to be identified work in this case. Second, the data contains both turnover and prices for a sample of firms. Consequently, it is possible to establish the effect of the VAT on the demand for labour-intensive services using a credible natural experiment approach.

Section 2 describes the institutional background and discusses the anticipated effect of lowering VAT. Section 3 presents the approach used to analyse the effects of the reform. The data is presented in section 4. Section 5 presents and explains the results and section 6 concludes the study.

2 Design of the reform and anticipated effects

2.1 Institutional background

The European Union requires Member States to have a consumption tax system based on value added taxes (VAT). A certain degree of harmonisation is required of individual Member States in setting their VAT rates (EC

2006a). As an exception to their normal VAT rates, Member States are allowed to experiment with reduced VAT rates for certain labour-intensive services. The aim is to allow Member States to study the incidence on prices and employment as well as the effects on the shadow economy (EC 1999 and 2006b).

Finland joined the second round of the reduced VAT rate experiment. The VAT rate was lowered from 22 per cent to 8 per cent from the beginning of 2007 and the reduced rate is to remain in force until the end of 2010 (Finlex 2006). The original European Commission (EC 1999) Directive listed the services that are eligible for reduced VAT rates. This list includes some labour-intensive services, but leaves out others (such as beauty salons). The services selected by Finland from the EC list were hairdressers and small businesses that provide services such as repairing bicycles, shoes and leather goods and clothing and household linen.²

Since the lowered VAT rate was implemented according to the EC Directive, it is unlikely to have been driven by the specific economic circumstances of these services. This study concentrates on hairdressers, because there is a control group for them: beauty salons, day spas and masseurs. This control group resembles hairdressers in that it is labour-intensive, but the businesses do not benefit from lower VAT rates since they are not covered by the EC Directive. There is no mention in (EC 1999 or 2006b) why hairdressers were specifically identified as being appropriate for a VAT experiment, whilst the businesses in the control group in this study were excluded. The reasons given for selecting the target groups were on a more general level, such as “high anticipated effect on increasing employment”.

In Finland consumer prices announced in price tags include VAT. For this reason, it is possible that if firms do not reduce the consumer price in response to reduced VAT, consumers will not necessarily notice that anything has changed since the consumer price remains unchanged. Thus if consumers do not know of the experiment, they would not expect firms to lower their

²In Finland, household services also benefit from special tax treatments, but this was implemented under a different proposal starting from 1997 (Finlex 1997). Since then the tax reduction has been gradually increased.

prices. The reduced VAT rate was widely enough announced in the media around the time of the implementation of the reform. Thus large number of consumers ought to have known about the experiment and its likely effect on prices.

VAT is remitted to the Finnish tax authorities. Firms that are liable for VAT have to report it once a month to their tax authority as a sum of taxes remitted separately by tax rate. Thus in 2006 firms reported the amount of taxes remitted at the 22 per cent rate and in 2007 they reported taxes remitted at the 8 per cent rate on the same services. The chain feature of crediting VAT paid on inputs is seen in the same monthly tax report. The final amount of taxes a firm ends up paying each month is the difference between taxes charged on outputs and the taxes paid on inputs.

2.2 Predictions from economic theory

When a consumption tax is reduced, the standard economic model indicates that the degree of tax shifting to prices depends on the elasticities of demand and supply. If supply is much more elastic than demand, the reduced consumption tax should pass through to the consumer price (almost) completely. There should be no increase in (zero) profits if the firms are homogeneous and there are constant returns to scale such that no firm is able to extract any rents.

General equilibrium analysis takes into account the effects on equilibrium quantities and thereby on factor demand. These will also depend on the elasticities of other goods. These effects were analysed in the Ramsey (1927) model. In summary, if demand is inelastic and supply elastic, consumption taxes pass through to prices in full. However because the level of demand of a good that has inelastic demand will not change much, there will not be major effects on factor demand in the production of that good. In the case of small labour-intensive firms, labour is the major input. Thus, the greatest effect of increasing input demand is on labour. This study estimates empirically the extent to which demand for labour-intensive services is affected by reducing their value-added tax (VAT).

It is useful to consider the predictions of models with imperfect competition that may fit the empirical situation better. In an oligopoly model with Cournot competition Delipalla and Keen (1992), and in a model with Bertrand competition with differentiated products Anderson et al. (2001) study the effect of reducing ad valorem taxes on prices. Myles (1989) formulated a Ramsey-type model where part of the economy was imperfectly competitive. In these models the tax can over- or under-shift to the consumer price. In contrast to a fully competitive model, it is possible that the demand for a good is affected, even if prices react to the tax change. It remains a task for empirical research to find out how the price of a good reacts to a change in its tax and consequently, what happens to demand for the good.

Here I focus on what theory predicts will happen to the price of and demand for a good following a tax decrease. There are plenty of theoretical findings stating how consumption taxes should be set optimally. The aim of this paper is to find out empirically the price and demand effects of a reduction in the VAT rate for labour-intensive services. It is hoped that the parameters found will be of use in the theoretical literature studying the optimality of consumption tax rates. The parameters are likely to be most useful in the kind of model that takes into account the effects that taxes have on the production of the good in question.

2.3 What ought to happen?

In the VAT experiment for labour-intensive services the VAT was reduced from 22 % to 8 %. In this case full pass-through would imply that prices would be reduced by 11.5 per cent from the level before the experiment. This can be seen from the formula below that shows how the percentage of change can be calculated when the producer price (p) stays constant:

$$\frac{1.08 * p - 1.22 * p}{1.22 * p} * 100 = -11.475\% \quad (1)$$

The turnover or equilibrium quantity can be defined as the volume multiplied by the price it is evaluated at. Assuming no change in demand and

no change in consumer price, turnover evaluated at consumer prices would remain the same. If nothing happens to demand, but prices are reduced, turnover naturally declines. Therefore the effect on demand can be seen by studying turnover and price changes simultaneously in the same firm. If they change in opposite directions or to a different extent, this would be evidence that the demand for the service in question has changed in that firm.

3 Econometric method

The econometric method used in this study is difference-in-differences (DD) approach. The short-run effects of taxes on prices and turnover are compared between the treatment and control groups before and after the beginning of 2007. The treatment group consists of hairdressers and the control group consists of beauty salons, day spas and masseurs. I estimate the following equation for firm i and time t :

$$Y_{it} = \alpha + \beta_1 1(\text{haird})_i + \beta_2 1(\text{after})_t + \beta_3 1(\text{haird}_i * \text{after}_t) + \beta_4 X_{it} + \varepsilon_{it} \quad (2)$$

where $1(\text{haird})$ indicates a firm in the hairdresser group, $1(\text{after})$ indicates observations from the beginning of 2007 onwards. X is a vector of controls including flexible time trends in some specifications as well as other control variables describing the location and economic behaviour of a firm.

The DD approach should identify β_3 , the effect of a changing tax environment in the treatment group relative to the control group. This approach works well if the pre-treatment time trends between the two groups are parallel to each other, indicating that the treatment group would have behaved similarly to the control group in the absence of the reduced VAT rate. Figure A2, which compares prices in the treatment and control groups, indicates that this assumption seems to work well in this case. It would be problematic if there were anticipation effects before the reform. This could happen if firms in the treatment group started to react prior to the reform, for example when the reduced VAT rate was announced but had not yet taken effect.

Figure A2 again shows that prices do not show any such anticipation effects.

It is possible that there are other general equilibrium effects that would make the DD approach biased. These could include effects on entry to and exit from the treated industry. There could be effects on competition between industries in the treatment and control groups. However, the approach used identifies short-term effects. Looking at the effects in the monthly level data in particular it is difficult to believe that the general equilibrium effects mentioned above could take place in few months. Also, hairdressers are not substitutes for beauty salons, making competition between these two industries less intense.

In the second part of the analysis I am interested in how changes in prices can explain changes in turnover. Since the decision to reduce or not to reduce prices is made by the firm, a simple regression between these two would be biased. Hence I use an instrumental variable (IV) strategy. I use a two-stage least squares (2SLS) strategy, where the first stage is equation (2) of prices. Then in the second stage I explain the changes in turnover or wages by the first stage

$$CT_{it} = \zeta + \gamma_1 \hat{Y}_{it} + \gamma_2 X_{it} + \xi_{it}$$

where \hat{Y} is the instrumented price. The variable that is excluded is the interaction between the treatment and the after dummies. If the treatment used in the DD approach is exogenous to the economic circumstances of the targeted firms, using it as an instrument should be valid. The instrumentation handles the unobserved reasons for changing prices that could lead to changes in turnover. The coefficient of the instrumented price, γ_1 , shows the effect that price changes have on turnover evaluated at consumer prices after the effect of the treatment is taken out. Thus, if γ_1 is negative, reducing the price increases turnover, which means that demand increases.

4 Data and description

The main part of the data utilised in this study comes from the Finnish Tax Administration. Monthly data is available for the VAT remitted by each tax rate, the VAT paid on inputs as well as total monthly salaries paid to employees. The data covers the years from 2002 to 2008. In addition there are yearly observations for final turnover, various costs and profits made. The data obtained from the tax authority includes every firm that is liable for remitting VAT in Finland in the selected sectors.

The price observations come from two separate sources. Both of the data sets are survey data. One was conducted by Statistics Finland and consists of the data used to calculate the official Consumer Price Index. It contains time series observations from 2002 to mid-2009. There are only a few price variables, though. The other price data was collected by the Finnish Consumer Agency. It contains only two time-observations, one before and one after the reform. It contains the prices of every product of about 400 hairdressers.

Figure A1 shows the development of the mean of various prices in the treatment and control groups over time. The prices are shown in real terms expressed in euros. The prices in the hairdressing services category (treatment group) are haircut, hair dress, colour and highlights. The vertical line shows the first month of reduced VAT, January 2007. Based on the figure it seems that there is a response in treatment group prices and none in control group prices. With a long time series, it is possible to take into account possible differences in the time trends of prices. Table A1 gives the overall statistics of the same prices seen in figure A1.

The DD approach used in this paper requires the pre-treatment trends to be similar in the treatment and control groups. To check this, figure A2 presents composite mean prices for both groups and the confidence intervals for them. The indices are calculated by adding together prices in the same group and normalising the mean of that group to 100 at the end of 2006. It is clear from the figure that the pre-treatment trends follow each other fairly well and that the confidence intervals overlap. Consequently, it seems

that the treatment and control groups resemble each other well enough. In January 2007, marked by the vertical line, the cut in VAT for the treatment group takes place. The consequent drop in mean prices can be seen for the treatment group, but not for the control group. The difference seems tentatively significant based on the confidence intervals in the figure.

Table A2 presents descriptive statistics by firm type from the administrative data set. The table is divided by firm type and shows in each case the mean, standard error and number of observations. The number of observations is large, because it is a monthly data set. Some of the variables are on an annual level, though.

Two further figures describe the conditions in the data and check whether it looks as if the assumptions required in the DD approach are met. Figure A3 presents some of the key variables over time. The tax variable is the one from which turnover is calculated. The drop in taxes remitted by the treatment group in January 2007 highlights the loss in average tax revenues when the reduced VAT was implemented. It is reassuring that there is no drop in the control group at the same time. The variable labeled “input” denotes VAT paid on all inputs by the firm. Since there is no increase in this variable for hairdressers, there does not seem to be an increase in demand for their products. If the volume of services sold by a firm increased substantially, it would eventually need to buy more inputs to produce the increased output.

Figure A4 presents the development of turnover evaluated at consumer prices over time by firm type. This variable is interesting, since it is later used as a dependent variable in the regressions. Turnover measured in this way should stay constant if there is no change in the demand for or the price of the products. After the VAT cut, marked by the vertical line, there does not seem to be a marked effect on turnover in the treatment group. Although there could be some effect, since the consumer prices themselves indicate a drop, the effect is so small that it is difficult to see it from the figure. It is clear that Sole proprietors fulfill the DD assumption of similar pre-treatment trends better than other firm types. This fact is taken into account in the regression analysis by dividing the results by firm type.

5 Results

5.1 Tax incidence on prices

Table A3 presents the differences-in-differences (DD) estimates for prices. The dependent variable is a price that includes information from both surveys and from the treatment and control groups. It is the same variable which is described in figure A2. Column (1) contains all observations; in columns (2) to (4) the data is split according to firm type: corporations, sole proprietors and partnerships. The coefficient in the first row shows the DD estimate. The results can be read directly as percentages. For all firms, the effect of reducing VAT by 14 percentage points is -7.2%. Thus, compared to the theoretical full pass-through of -11.5%, the actual pass-through is slightly over half. The Wald test indicates that this result is significantly different from full pass-through. The heterogeneous response by firm type is evident when comparing the estimates in columns (2) to (4). Corporations respond the most, sole proprietors much less and the estimate for partnerships is not even significant. The result is most robust for sole proprietors, since they account for the bulk of the data.

Tables A4 and A5 present the results for the probability of lowering prices. The dependent variable is a dummy with a value of 1 if the price is lowered by the cut-off value or more. In table A4 the cut-off value is 0.5% and in table A5 5%. The columns present estimates for similar groups as in table A3. The probability of lowering the price at least a little is on average 0.55. This means that less than half of the firms in the treatment group did not lower prices. Measured this way there is not much difference in response by firm type. For firms that lowered prices by at least 5%, the probability overall is only 0.35. There is a slight (statistically insignificant) heterogeneity by firm type. Thus it seems that firms lowered prices by different amounts on average, but the proportion of firms that lowered prices is more even between firm types.

There are two samples of prices in the data set used. To summarise the changes in the data set obtained from the Consumer Agency, figure A5

presents the mean change in each price in the data set. Since there are only two points of time when prices are measured, and this data set does not include the prices of control group products, the differences-in-differences approach can not be used here. Instead, I just present the mean change and the confidence interval of this for each price. It is interesting to note that the average price change is only around -3%. Full pass-through of the tax cut would have implied a price change of -11.475%. There is also variation across products, so that it matters which hairdresser's product one is looking at when measuring the tax incidence on prices. The last two prices, prices number 53 and 54, are the mean and sum of all the other prices.

I estimated the probability of reducing a price by 1% or more and by 10% or more. The mean of those probabilities can be seen in figure A6. Interestingly, more than half of the sample did not react to the tax change at all, while only around 10% changed prices substantially. Again, there is variation in the response probabilities between prices. The mean and sum of other prices show that it is common for some of the prices to change a little, but it is not very common for all of the prices to change substantially. The prices that tended to be reduced are the prices of standard services like "Basic haircutting, 30 minutes".

The conclusion from all of the price results is that the overall pass-through in this industry is about half and that it was relatively uncommon for firms that did lower their prices to lower them by the amount of the tax reduction. There is heterogeneity by firm type and by product type, especially in the mean response.

5.2 Results for turnover

Table A6 shows the DD results for the turnover of the firms evaluated at consumer prices. Column (1) shows the effect for all firms without controls other than time. Column (2) adds firm-specific controls such as taxes paid on inputs and the area where the firm is located. Columns (3) to (5) again present the divided-sample results by firm type for corporations, sole proprietors and partnerships, respectively. The results indicate that the turnover of the firms

decreased modestly, which is consistent with the firms reducing consumer price, but there is no offsetting effect from increasing demand.

The result is most reliable for sole proprietors in column (4), since the DD assumptions are best met for them. The result indicates that turnover decreased by about 100 euros as a result of the reduced VAT. Just prior to implementing the reform, their mean turnover was about 3000 euros. Thus the result indicates a decrease of 3.3% from that mean level. The full response would have been -11.5%. This result could be explained by not having full pass-through to consumer prices and also that some turnover comes from other services for which VAT remained at the normal rate of 22%. None of the results are positive in a statistically significant way. Consequently, the results do not indicate that demand increased.

To provide more evidence about the link between price and turnover changes, I estimate the effect that price changes have on turnover. To estimate this, only that part of the data is used, where it was possible to link the price and turnover information to the same firm. This reduces the number of observations. The change in prices is instrumented with the differences-in-differences variable. If this estimate is negative, it means that lowering prices increased demand. Since instrumenting explains away the direct effect of price changes due to the tax reduction, if the coefficient is zero it indicates that there are no other changes in consumer-price turnover than the direct price change. In that case demand for the services is not affected.

Table A7 shows the IV results. The first stage shows the effect that the DD variable has on prices. According to the F-test the first stage is strong enough in most cases. The price variable shows the effect that the instrumented price has on consumer-price turnover. Since the coefficients are not significant, it means that there is no effect on demand for the services in question.

5.3 Results for other variables

Table A8 shows the results for other variables that might have been affected by the reduced VAT rate. These other variables come from tax declarations

and thus the variation in the variables is on an annual level. The interesting outcomes in this data are profits and net assets, since these can not be seen from the month-level data.

The only significant result in table A8 is the effect on turnover. The coefficient follows the direction of the monthly-level data and is consistent with the treatment group firms lowering their prices. It is interesting that there does not seem to be a significant increase in profits or net assets. It is possible that the profits are not significantly affected even if the entrepreneurs have benefited from the lower VAT by not lowering the consumer prices. The entrepreneurs might instead have increased their own wages or expenditures in the firm accounts.

To investigate the potential link between the tax change and labour demand, I estimated instrumental variables (IV) equation where the price changes explain the changes in the monthly wage sums paid by a firm. Table A9 shows the results that do not display any significant effects on the wage sum. The method here is similar to that used to analyse the link between prices and demand in table A7. Since there was no effect on demand, it is not surprising that there is no effect on the wage sum.

6 Conclusion

This paper studies the tax incidence of a reduced VAT rate on labour-intensive services. As part of EU legislation, Finland selected some industries for a reduced VAT experiment of 8% while other similar industries continued to be subject to the normal VAT rate of 22%. The experiment is exogenous to the economic conditions of firms because the treatment group was selected on the EU level and the control groups were left out quite randomly.

The results indicate that taxes passed through to prices at a level of around 50%. The results reveal some heterogeneity in tax incidence according to firm type and product type. Corporations cut their prices more than sole proprietors.

In the short run the effects of lower VAT on turnover should follow the price response if demand stays constant. If consumer prices do not change

and there is no change in demand, turnover stays constant. The results indicate that on average turnover decreased as a result of the tax reduction, but not by very much. There is heterogeneity across firm types, but not always in the same direction as for the price responses. This can be explained by the fact that corporations derive a large share of their turnover from services on which VAT was not reduced.

To analyse whether demand increased for services on which VAT was reduced, I estimated an instrumental variable model. There the change in turnover is explained by the change in prices. Since any pricing decision is made by the firm, there is possibly a selection problem if same firms select to lower their prices which demand is decreasing. To cope with this, the price change was instrumented. The results did not show any statistically significant effect of changed prices on turnover. Thus it is concluded that there was no significant increase in demand for the services, at least in the short term. A similar model was estimated for wages. The results do not show any effect either.

The results in this study showed that following a tax reduction there was only a partial price response and no effect on demand, and consequently no effect on labour demand. The Ramsey (1927) argument is that taxes that induce small changes in equilibrium quantities should be higher. According to this argument, therefore, the labour-intensive service sector should be taxed more than some other sectors. At least we learned that the reduced VAT rate was not particularly effective in creating employment through increased demand. Other justifications in theory for setting a tax rate are that the good is complement with labour (Saez 2002) and that there are equity reasons to do so (Diamond and Mirrlees 1971). Hairdressers are not clearly complement with the labour supply and hairdressing is to some extent a luxury good. Thus these are not robust arguments in favour of reducing the VAT on these services.

Consumers benefited from the lower taxes through prices that were lower by half of what the reduced tax implied. The rest of the tax benefited the targeted firms, probably in form of higher profits. The government lost about 4 million euros per month in tax revenues from hairdressers. Thus it seems the

reduced VAT regime is not particularly effective policy for labour-intensive services in terms of lower prices and higher employment. In this case, reducing VAT appears to have been a costly way of increasing employment.

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A Appendix

All the tables and figures are in this appendix.

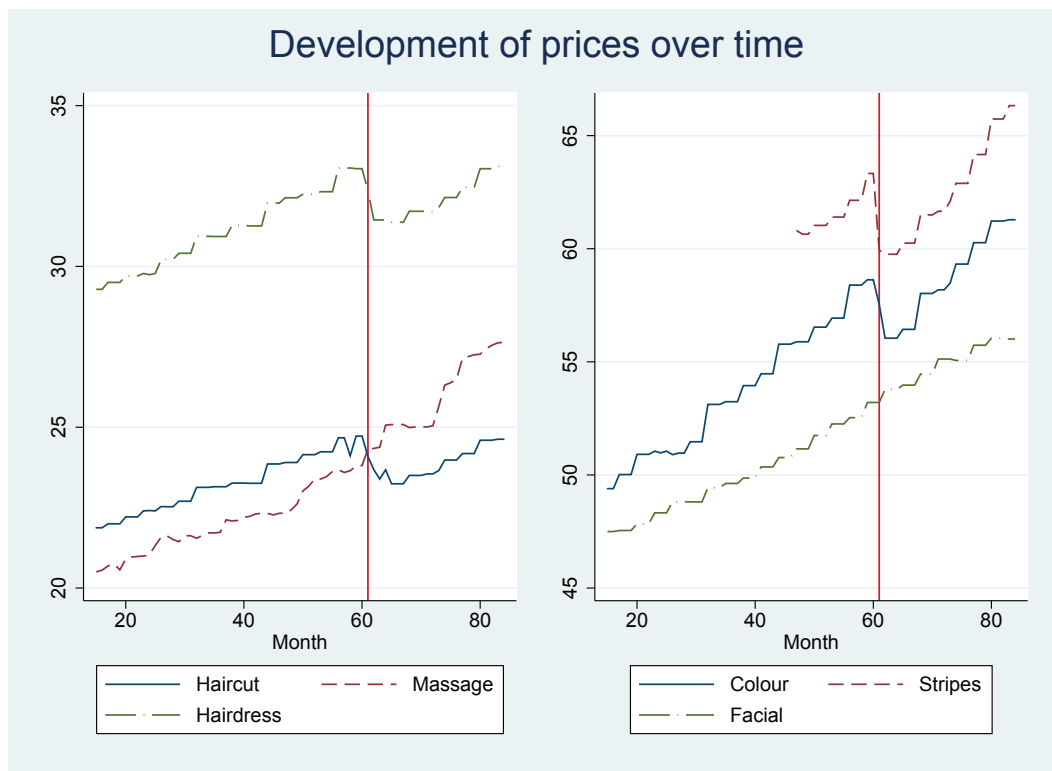


Figure A1: Comparison of development of prices in the control and treatment groups over time

Note: The prices for Haircut, Hair dress, Colour and Highlights fall within the treatment group and are prices of various services provided by hairdressers. The prices for Massage and Facial fall within the control group.

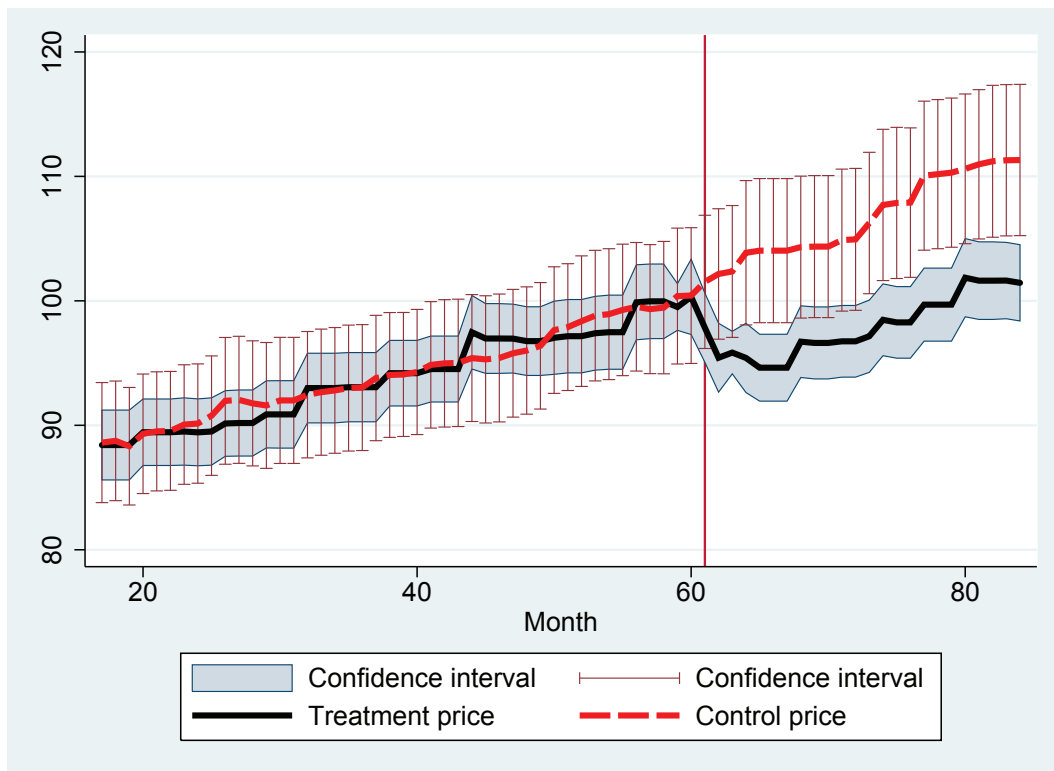


Figure A2: Prices in the control and treatment groups and their confidence intervals

Note: Comparison of the development of mean prices between the treatment and control groups over time. The prices are composite prices for both groups that are normalised to 100 at the end of 2006. The confidence intervals are calculated from the standard error of the mean.

stats	Haircut	Hair dress	Highlights	Colour	Massage	Facial
mean	24	32	63	56	23	51
sd	4.2	7.4	15	15	8.3	11
p50	23	30	62	53	21	50
max	48	58	115	115	67	95
min	11	15	29	23	10	20
N	12126	11806	2445	11811	4888	4889

Table A1: Statistics of price observations

Firm type		Mean	Sd	N
Corporation	Turnover	13527	24998	33095
	Share treat	0.459	0.498	40481
	Input tax	1820	14958	39903
	Earnings	10660	55589	40481
	Rents	80.5	2323	40481
	Wages	2691	8529	40481
Sole prop	Turnover	2651	2579	639294
	Share treat	0.734	0.442	691925
	Input tax	196	332	683116
	Earnings	4198	37235	691925
	Rents	16238	94896	691925
	Wages	0.432	57.1	691925
Small corp	Turnover	7137	9638	40249
	Share treat	0.719	0.449	43516
	Input tax	503	941	43122
	Earnings	5694	16383	43516
	Rents	3492	8789	43516
	Wages	432	3177	43516

Table A2: Descriptive statistics for the dependent and control variables by firm type

VARS	(1)	(2)	(3)	(4)
dd	-7.6*** (1.25)	-10.42*** (3.52)	-6.21*** (1.28)	-3.89 (3.16)
N	19244	4084	10385	2790
R^2	0.14	0.14	0.2	0.28
Controls	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A3: Effect of reducing VAT on mean prices

Note: The first column contains all price observations, column (2) is for corporations, column (3) for sole proprietors and column (4) for partnerships. The control variables include: a dummy for each month, a separate linear time trend for the treatment group and an indicator for each city in the sample.

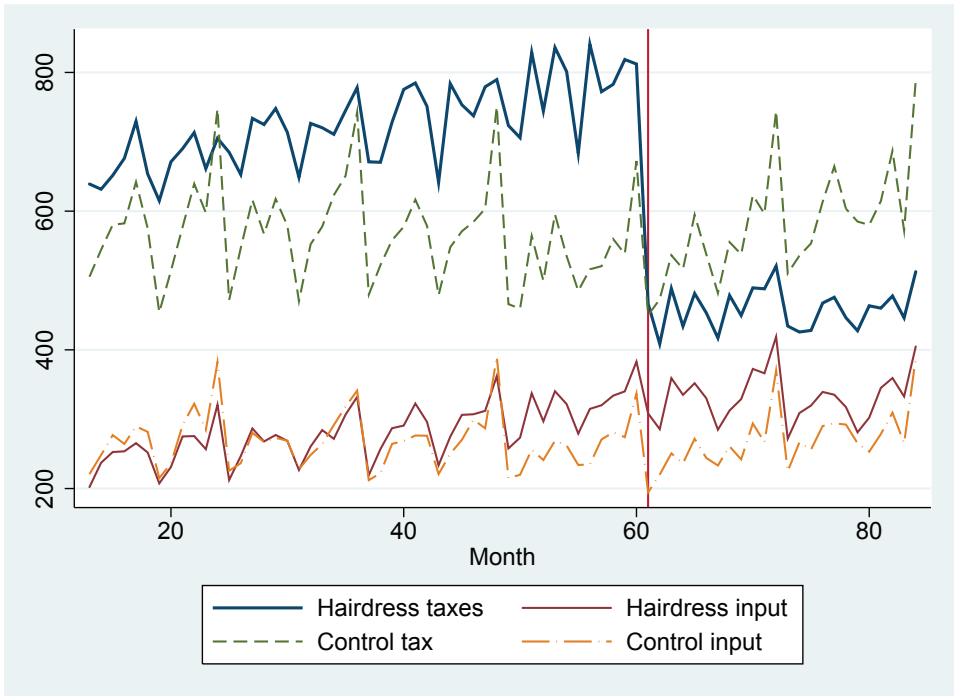


Figure A3: Descriptive over time

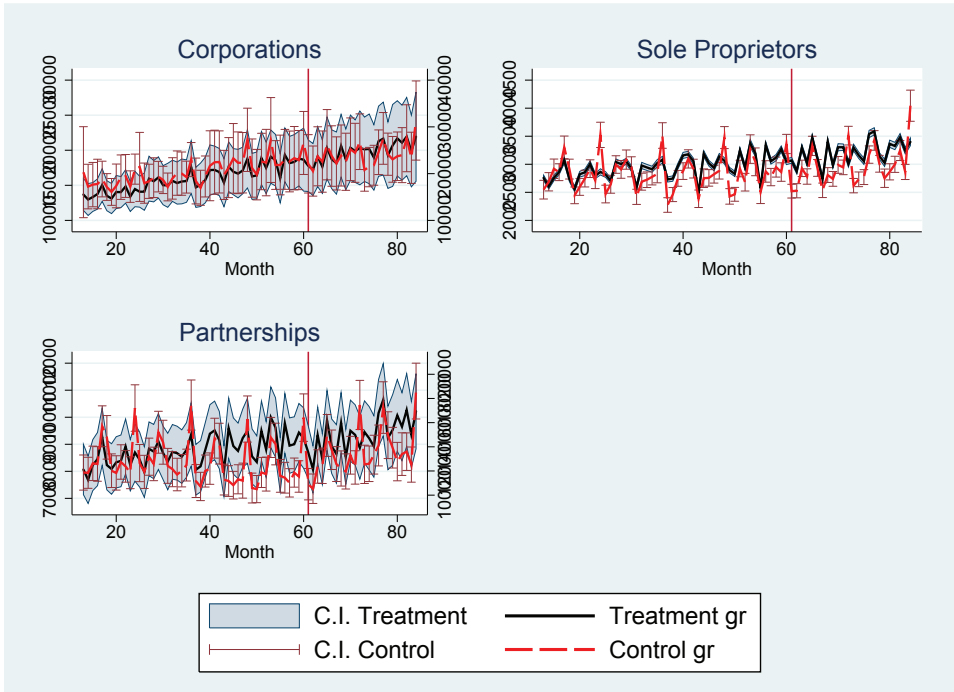


Figure A4: Turnover over time by firm type

VARIABLES	(1)	(2)	(3)	(4)
dd2	0.55*** (0.009)	0.62*** (0.016)	0.53*** (0.012)	0.57*** (0.024)
treat2	-0.018*** (0.006)	-0.028** (0.012)	-0.012 (0.009)	-0.048*** (0.018)
after2	0.057** (0.026)	0.11** (0.048)	0.04 (0.036)	-0.00 (0.065)
N	16686	3646	9313	2511
R^2	0.5	0.62	0.47	0.55

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: The effect of lowering VAT on the probability of lowering prices by at least 0.5%

Note: The first column contains all price observations, column (2) is for corporations, column (3) for sole proprietors and column (4) for partnerships. The control variables include: a dummy for each month, a separate linear time trend for the treatment group and an indicator for each city in the sample.

VARIABLES	(1)	(2)	(3)	(4)
dd2	0.35*** (0.008)	0.41*** (0.018)	0.38*** (0.012)	0.28*** (0.021)
treat2	-0.02** (0.01)	-0.04*** (0.01)	-0.01* (0.01)	-0.04*** (0.02)
after2	0.043* (0.03)	0.11** (0.05)	0.02 (0.03)	-0.02 (0.06)
N	16686	3646	9313	2511
R^2	0.33	0.44	0.35	0.37

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5: The effect of reducing VAT on the probability of lowering prices by at least 5%

Note: The first column contains all price observations, column (2) is for corporations, column (3) for sole proprietors and column (4) for partnerships. The control variables include: a dummy for each month, a separate linear time trend for the treatment group and an indicator for each city in the sample.

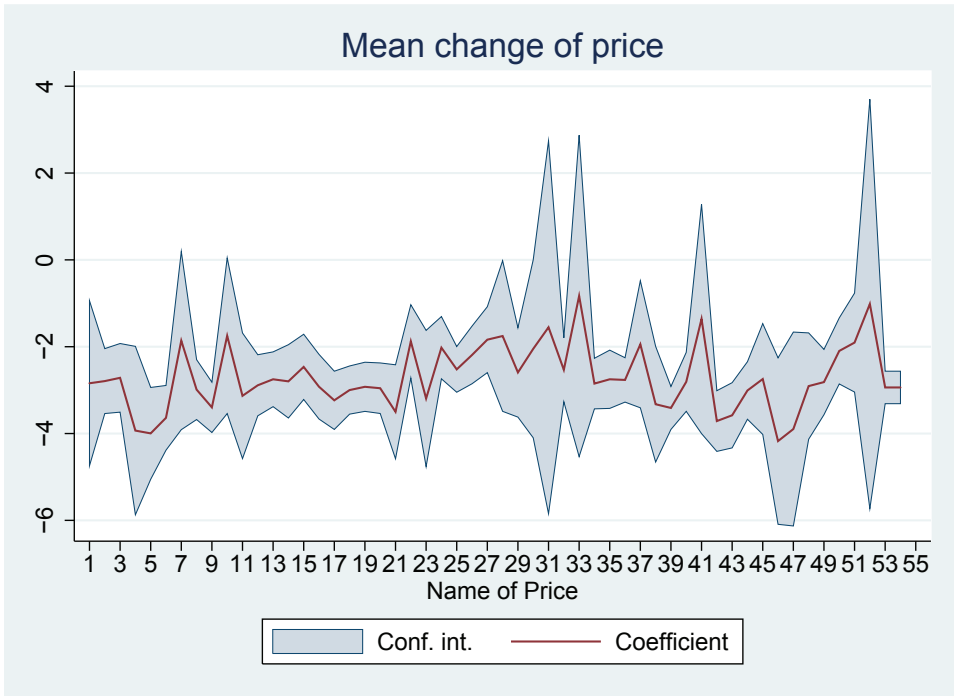


Figure A5: Mean change in prices

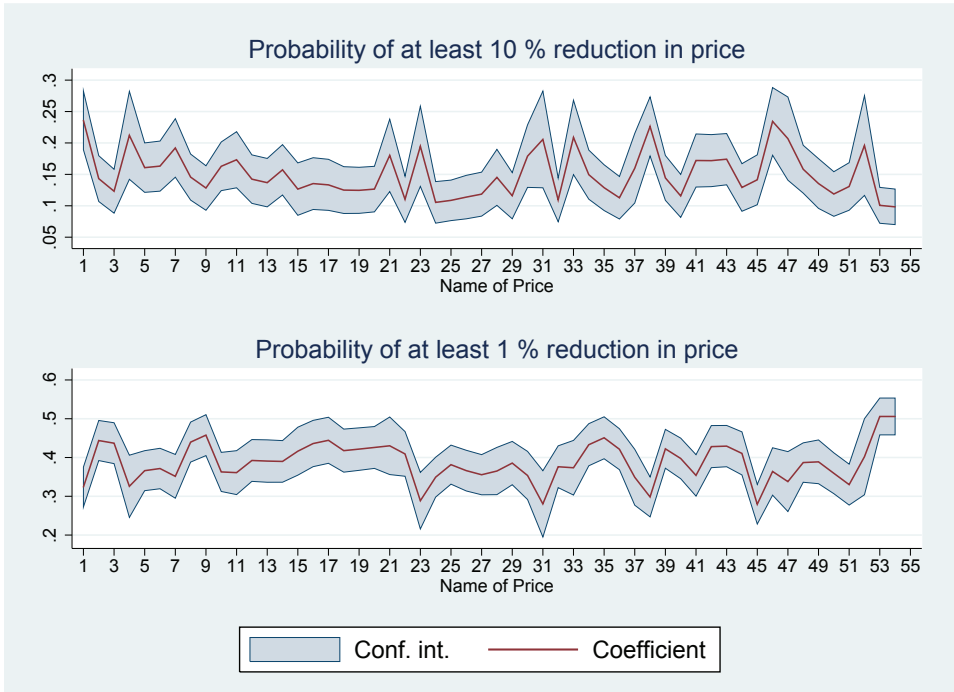


Figure A6: Probability of price changes

VARS	(1)	(2)	(3)	(4)	(5)
dd	-432.4** (201.7)	-151.4** (61.7)	546.7 (845.4)	-102.3*** (22.0)	-235.1 (224.8)
treat	-2,599.9*** (195.6)	-420.8*** (59.9)	-2,657.7*** (784)	332.1*** (21.8)	581.7*** (208.1)
after	1,228.5*** (343.4)	-165.3 (105.0)	-2,469.7* (1,481.4)	46.2 (37.1)	535.9 (394.4)
N	946216	946216	53941	822919	63155
R^2	0.00	0.91	0.92	0.47	0.68
Controls	No	Yes	Yes	Yes	Yes

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A6: The effect of reducing VAT on turnover

Note: The dependent variable pre-tax turnover is in nominal terms. Columns (1) and (2) are for all firms, column (3) for corporations, column (4) for sole proprietors and column (5) for partnerships. The control variables include: flexible time controls, use of inputs, amount of salaries paid and use of rents.

VARS	(1)	(2)	(3)	(4)
First stage	-6.80*** (1.42)	-10.38*** (3.5)	-7.2*** (1.51)	-3.11 (5.07)
F-test	22.83	8.80	22.66	0.38
Price (2 nd stage)	196.9 (408.5)	625.4 (1358)	14.91 (80.51)	-449.2 (1813)
Inputs	6.945*** (0.0217)	6.912*** (0.0626)	12.13*** (0.612)	10.07*** (2.824)
N	11893	2039	7875	1979
R^2	0.953	0.953	0.611	0.560

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A7: Turnover according to price reaction

Note: The dependent variable is consumer-price turnover. The price variable is instrumented in the first stage by the DD variable. The F-test is a test of strength of the first stage. Column (1) contains all firms that had price and turnover information linked in the data, column (2) corporations, column (3) sole proprietors and column (4) partnerships.

VARs	(1) Turnover	(2) Profit	(3) Net assets	(4) Wages	(5) Employees
dd	-1,727*** (505)	1,729 (3,319)	-2,633 (9,414)	1,248 (2,679)	0.17 (0.234)
N	50752	49537	48299	4472	4904
R^2	0.903	0.001	0.000	0.375	0.222
N of firms	13944	13662	13649	2116	2262

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A8: Fixed-effects regression results for other outcomes in the annual data

Note: The dependent variables are consumer price turnover, profits, net assets, annual wages and number of employees in one year. All regressions are fixed-effects regressions controlled for time and input use of the firm.

VARs	(1)	(2)	(3)	(4)
First stage	-6.61*** (1.66)	-5.91 (4.24)	-7.46*** (1.76)	-4.91 6.04
F-test	15.89	1.93	18.03	0.66
Price (2 nd stage)	-2687 (21341)	-18025 (114644)	1684 (3692)	-11084 (38620)
Inputs	36.43*** (0.944)	36.20*** (2.506)	245.1*** (26.74)	97.11 (74.05)
N	10146	1744	6743	1659
R^2	0.272	0.351	0.313	0.199

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A9: Wages according to price reaction

Note: The dependent variable is monthly wages. The price variable is instrumented in the first stage by the DD variable. The F-test is a test of strength of the first stage. Column (1) contains all firms that had price and turnover information linked in the data, column (2) corporations, column (3) sole proprietors and column (4) partnerships.

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