Distributional effects of environmental meat taxes in Sweden-

Can the poor still eat meat?

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Working Paper Series 2015:3
Uppsala 2015

ISSN 1401-4068
ISRN SLU-EKON-WPS-15/3-SE

Abstract

This paper looks at the distributional effect of an environmental tax on meat in Sweden, if such a tax was to be introduced. Welfare effects are measured as Compensation Variation (CV) for multiple price changes where Hicksian cross price elasticities, household expenditures and price changes are used in the calculations. Results show that taxes on meat are neutral over households when expenditures on meat are used as welfare indicators, and regressive if income is used. This can be explained as households use similar shares of total expenditures on meat. The households with the smallest income levels need to be compensated with 950 SEK per person and year to feel that utility is not lowered if taxes on meat are introduced, and the households with the highest income levels need to be compensated with 1176 SEK per person and year. This corresponds to 0.78% and 0.80% of total expenditures for the groups respectively. Compared to income levels this is 1.04% for the households with the smallest income levels and 0.52% for the households with the largest income.

Introduction

The environmental problems connected to livestock production were brought to the attention of a wider public when FAO released a report where they tried to map out the climate effects, nutrition leakages and other environmental damage that arise from livestock production (Steinfeld et al., 2006). As the world struggles to deal with climate change, the large share of total greenhouse gas emissions (GHG), 18%, (revised to 14.5% in Gerber et al., 2013) that FAO found came from livestock production, was brought into focus. Since then, others has identified the problem with meat and dairy production and the need for environmental policy implementation to curb consumption of these commodities (see for example UNEP, 2009; Cederberg et al., 2012; Wirsenius et al., 2011; Säll and Gren, 2015). In addition to GHG emissions, the importance of reducing nitrogen leakages from the agricultural sector, where livestock cause large emission levels, was pointed out by e.g. Galloway et al., (2008). Environmental taxes on meat as regulation method have been a topic in the Swedish public debate since the Board of Agriculture issued a report on sustainable meat consumption, the contribution of livestock to greenhouse gas emissions in Sweden and possible mitigation actions (Lööv et al., 2013). One of the suggested actions was a tax to reduce meat consumption, which has increased rapidly since the early 1980´s (for a discussion of regulation methods on meat in Sweden, see i.e. Lööv et al., 2013; Säll and Gren, 2015). In 2011, each Swede consumed 26.2 kilo of beef, 37.3 kilo of pork, 18.4 kilo of poultry and 5.4 kilo of other kinds of meat, such as sheep, horse and wild game. Since 1984 there has been an increase in meat consumption with almost 54% per person and per year (Swedish Board of Agriculture- statistical database 2014). Despite this large increase in consumption and the known environmental impact from livestock production, taxes on meat were, not surprisingly dismissed by politicians with one of the argument being that such a tax would be regressive. This paper aims to answer whether a tax on meat in Sweden would truly affect the households with the smallest income most.

At first glance, one can easily assume that environmental taxes in general are regressive (Kosonen, 2012 discusses whether this is a myth or reality). Unit taxes are certainly regressive if income levels are compared. However, the initial distribution (where one does not take into account how the collected tax revenues are recycled into the economy) of commodity taxes depend largely on whether current income or expenditures are used to compare tax incidences. Expenditure is argued to be a more reliable proxy for life time income, since households can borrow or use savings to smoothen consumption (see e.g. Poterba 1991). Income levels on the other hand can vary much over the years. Also, the distributional effects of a tax depend on who is the consumer. For example, carbon taxes in Sweden affect rural households in northern Sweden more than households in the larger cities in the southern parts of the country since rural households use a larger share of their total expenditures on heating and petrol, than do the urban population in the more southern regions (SOU, 2004).

Introducing environmental taxes on food is a topic on which there is little research. To the best of my knowledge, environmental taxes on meat and dairy have been analyzed only in Wirsenius et al., (2011), Edjabou and Smed, (2013) and Säll and Gren, (2015), and the distributional effects of such a tax has not been analyzed at all. However, Edjabou and Smed, (2013) look at the change in total consumer surplus when taxes are introduced to promote a more environmental friendly diet. Welfare effects/ health effects between income groups when taxes on unhealthy food, together with subsidies on healthy food are implemented have been studied to a small extent (see Chouinard et al., 2007, Smed et al., 2007, Nordström and Thuström, 2009 and2011). For example, Nordström and Thunström, (2011) use the percent change in tax payment, before and after VAT-reforms, as well as dietary improvements as measures of welfare changes.

The welfare effects in this paper are estimated using Compensating Variation (CV) for multiple price changes, (Huang, 1993). The method is based on Hicksian demand which excludes the income effects of price changes. Marshallian and income elasticities found in Säll and Gren, (2015) are used to calculate the Hicksian demand elasticities that are needed to carry out the calculations. The same paper gives estimates of tax levels that cover part of the marginal environmental damage cost from Swedish produced beef, pork and chicken. This paper calculates the distributional effects of those specific tax levels, thus extending the analysis of meat taxes in Sweden.

This paper is organized as follows. The first part of the paper is a brief discussion about the choice of model. In the second section, CV for multiple price changes is presented. This is followed by data presentation of Swedish household expenditures on meat, and all is followed by results and a discussion.

1. Choice of model. Food- and environmental taxes.

When measuring distributional effects of taxes, a large number of models are reported in the literature. One of the most common is the computable general equilibrium (CGE) model, developed from the multi-sectorial model of economic growth (Johansen, 1960). CGE models give a picture of the whole economy when policies are introduced.

Connected to food and agriculture policies, CGE is used mainly for large changes, such as new trade policies, (e.g) for studying the effects in developing countries when food prices change, or when aid is received (example.g Hertel, 1997; Laborde et al., 2011; Arndt and Tarp, 2001; Gelan, 2007). In developing countries large proportions of the population live in rural areas and agriculture is a main source of income. Policies that effect food prices and supply will therefore have a large effect of the total economy, thus a CGE approach is suitable.

For a country like Sweden however, the agricultural sector is only 0.5% of total GDP (Statistics Sweden 2013). Households use a small share of total expenditures on food, just above 16% and up to 2.5% of expenditures are used on meat (Vingren and Kruse, 2010). This implies that a CGE model is too large for estimating the effects of a tax on one type of food products. The small changes in demand (found in Säll and Gren, 2015) on meat, would bring consumption back to the beginning of the 21st century, and affect each Swede by little more than 100 SEK per month (equivalent to little more than Euro 10 per month). It is unlikely that this small decrease in demand would affect the Swedish economy to such a large extent, as to motivate a GCE approach.

Instead of an intersectorial model, a consumer welfare approach could be used. When related to food, this is often used in health economics (e.g Chouinard et al., 2007, Smed et al., 2007, Nordström and Thuström, 2011). The combination of price increases on unhealthy food together with a decrease in prices on healthy food has been looked upon together with welfare changes between income groups. For example Thunström and Nordström, (2011) estimated the welfare changes of a revenue- neutral food tax reform, as the change in tax payments, as well as health effects from an improved diet.

When estimating changes in consumer welfare from policy implementation, one could compare consumer surplus (CS) before and after changes. Or, in the case of price increases, willingness to accept (WTA) as compensation if the change happens (CV), or willingness to pay (WTP) for the change not to happen (equivalent variation, EV), and the other way round if the price decrease.

Consumer surplus has been criticized for inaccuracy. Instead of using price changes over the Marshallian demand curves for welfare estimations, the compensated Hicksian demand curves, with consumer utility held constant, is suggested as a valid proxy for welfare changes (e.g

Deaton and Muellbauer 1980a). Hausman (1981) derived CV from the indirect utility functions, showing that when prices increase, CV is the amount households need as compensation to stay on the initial utility level, which was reached before price changes. Early measures were only functioning for one price change at the time, without including cross price effects and thus limiting the possibility of analysis when several prices changes simultaneously. Huang (1993) developed the compensating variation for multiple price changes, using compensated cross price elasticities. It has been used in for example Azzam and Rettab (2012) and Huang and Huang (2000) as an elegant way to calculate consumer vulnerability to price changes in food products. This paper uses the same approach as Azzam and Rettab (2012) where total CV is divided into shares from each commodity and these shares are used as welfare weights to compare with initial expenditures. The approach is presented more fully in the next section.

2. Compensating Variation for multiple price changes.

In the case of price increases, CV is the amount consumers are willing to accept as compensation to be as well off as they were before the price increased. That is, to be able to change consumption bundles relative to new prices and stay at the initial utility level. In the case of one price that increases, CV is fairly easy to calculate, but when it comes to several prices on commodities with cross price effects it is somewhat more complicated.

Equation 1 shows CV as the difference in minimized expenditure functions before and after prices p changes, for a given utility level U^0. In this case, U^0 is the utility level that consumers received from their initial consumption bundle. Index $1 \dots n$ is for the different commodities and subscript $(0,1)$ is for before and after prices change.

$$CV = E(p_1^1, p_2^1, \dots, p_n^1, U^0) - E(p_1^0, p_2^0, \dots, p_n^0, U^0) \quad (1)$$

$E(.)$ is the expenditure function which is specified in equation 2) as the minimized costs for optimal demand q, of commodity i that gives the utility level U^0. Subscript H is for Hicksian demand where only the new relative prices and utility level affect consumption choices.

$$E = \sum_{i=1}^{n} p_i q_i^H(p_1, p_2, \dots, p_n, U^0) \quad (2)$$

Inserting equation 2) into equation 1) CV can be rewritten as equation 3) which is the change in expenditures needed to reach the initial utility.

$$CV = \sum_{i=1}^{n} (p_i^1 q_i^H - p_i^0 q_i^0) \quad (3)$$

q_i^0 is the initial demand of commodity i. In this point Hicksian and Marshallian demand are the same. The initial point is observable, while the new Hicksian demand q_i^H is not, due to subjective utility levels. To find q_i^H a number of steps have to be taken. First the changes in demand and prices are defined as in Huang, (1993), as $dq_i^H = q_i^H - q_i^0$ and $dp_i = p_i^1 - p_i^0$. Using the change in percent and rewriting, we get $dq_i^H/q_i^0 = (dq_i^H/q_i^0)(dp_j p_j^0/dp_j p_j^0)$ and with restructuring this becomes equation 4) where the change in demand is a function of price changes for commodity i with respect to commodity $j = 1 \dots m$ and Hicksian cross price elasticities $\varepsilon_{ij}^H = (dq_i^H/\, dp_j)(p_j^0/q_i^0)$.

$$\frac{dq_i^H}{q_i^0} = \sum_{j=1}^{m} \varepsilon_{ij}^H \frac{dp_j}{p_j^0} \quad (4)$$

Hicksian elasticities are calculated from the Slutsky equation where $\varepsilon_{ij}^H = \varepsilon_{ij}^M + \varepsilon_i^I s_j^0$. Subscript M is for Marshallian elasticities and I for income elasticities, s is for expenditure share of total expenditures X, on the commodity group thus $s_j^0 = p_j^0 q_j^0/X^0$. Marshallian- and income elasticities are observable and so are the initial consumption shares, which make it possible to calculate a value for the Hicksian demand.

Returning to equation 3), expanding the right hand side of the equation and restructuring, we can rewrite equation 3) as equation 5) where CV is described as a fraction of the initial expenditures and dq_i^H/q_i^0 is defined as in equation 4).

$$CV = \sum_{i=1}^{n} p_i^0 q_i^0 (\frac{dp_i}{p_i^0} + \frac{dq_i^H}{q_i^0} + \frac{dp_i}{p_i^0}\frac{dq_i^H}{q_i^0}) \quad (5)$$

Following Azzam and Rettab (2012), the parenthesis in equation 5) is used as a welfare weight w_i for each commodity, $\sum_i^n w_i = 1$. w_i is timed with initial expenditures for each household k on commodity i and a household specific CV can be defined as in equation 6).

$$CV_k = \sum_{i=1}^{n} p_{ki}^0 q_{ki}^0 w_i \quad (6)$$

Finally, the household specific CV is compared to total expenditures and income levels of households and a measure of total welfare change for each income group is found.

3. Taxes and household expenditures

3.1 Environmental meat taxes and Hicksian demand elasticities.

The meat taxes calculated by Säll and Gren, (2015) capture part of the marginal damage arising from one kilo of beef, pork and chicken in Sweden year 2009. Damage costs are estimated from the current carbon tax in Sweden together with abatement costs of nitrogen and phosphorus leakages that reach the Baltic Sea. Calculated tax levels increased the price on beef by 24.8% of the initial price, pork price increased with 4.4% and chicken with 2.5%. Tax levels were used together with estimated Marshallian demand elasticities and income elasticities to find how demand of meat and emissions levels could decrease with taxes. Elasticities were estimated using a two stage Almost Ideal Demand System (AIDS model) by Deaton and Muellbauer (1980b).

In this paper, The Hicksian elasitcities needed to calculate the welfare changes of meat taxes are calculated from the Marshallian and income elasticities of beef, pork and chicken found in Säll and Gren, (2015) by using the Slutsky equation showed in the previous section. The found elasticities are presented in Table 1.

Table 1: Hicksian elasticities for beef pork and chicken, in Sweden. Average values 1980-2012.

	Beef	Pork	Poultry
Beef	-0.289	0.257	0.202
Pork	0.149	0.018	-0.010
Chicken	0.434	-0.009	-0.218

Source: Calculated from Säll and Gren, (2015).

Elasticities are small and price changes do not affect compensated demand much. Beef and chicken own price elasticities are negative. The positive sign for pork price goes against theory, but can be explained by the large share of pork expenditures $\left(s_j^0\right)$ and the high income elasticity. In the Slutsky equation, this means that the second term is larger in real values, than the negative Marshallian price elasticity. While most cross price effects show substitutes between meats, the exception is the relation between pork and chicken which show complements.

3.2 Data on household expenditures of meat.

Data on meat expenditures for households are averages for 2007-2009 (Vingren and Kruse, 2010). Households are divided in to quintiles with increasing income levels. These are average levels, so there can be large differences within the groups. The number of people in each household increase with income and therefor all values are recalculated into per capita expenditures. For the households with the smallest income, expenditures are larger than income per person, which is covered by transfers, loans and savings.

Table 2: Household expenditures on meat in Sweden year 2009. Households are divided in quintiles. Values are in SEK

Household	Smallest income	Second smallest income	Middle income	Second highest income	Highest income
Average no people in the household	1,2	1,5	2	2,7	3,1
Average expenditure					
Per household	146780	188250	257190	338480	455200
Per person	122317	125500	128595	125363	146839
Average income					
Per household	109130	199580	287420	409480	697410
Per person	90942	133053	143710	151659	224971
Expenditure on beef					
Per household	350	580	790	1160	1800
Per person	292	387	395	430	**581**

Expenditure on pork					
Per household	1320	1820	2560	3180	3890
Per person	1100	1213	**1280**	1178	1255
Expenditure on chicken					
Per household	360	430	670	930	1190
Per person	300	287	335	344	**384**
Expenditure on mixed meat					
Per household	1280	1670	2270	2810	3340
Per person	1067	1113	**1135**	1041	1077
Tot meat expenditures					
Per household	3310	4500	6290	8080	10220
Per person	2759	3000	3145	2993	**3297**
% of total expenditure per person/households spent on meat	2,26	2,39	**2,45**	2,39	2,25
% of total income per person/ households spent on meat	**3,03**	2,25	2,19	1,97	1,47

Source: Vingren and Kruse, 2010

Beef is the most expensive meat and the highest income group spends almost twice as much per person on beef than the group with the lowest income. Expenditures on pork, chicken and mixed meats are fairly even across income groups. The richest households spend most money per person on chicken while the middle income group spends most on pork and mixed meats. In total, the households with the largest incomes spend most per person on meat. Compared to other protein sources, meat is expensive and thus it is not surprising that the households with the lowest income spend least per person on meat.

Mixed meat is the kind of meat that is not categorized, including charcuteries such as sausages, pates and similar. Most commonly this is pork based. Demand elasticities used in Säll and Gren (2015) are estimated on slaughter weight consumption of beef, pork and chicken due to the problems of relating emissions levels to mixed meats. Therefore, expenditures on mixed meats have to be included in the total expenditures of beef, pork and chicken. This is done by looking at the differences between slaughter weight consumption and final consumption. What is missing from each meat is assumed to be mixed meats and then weighted in to the expenditures of beef, pork and chicken. In Table 3, the differences between final consumption and total slaughter weight consumption per person are presented. Some of the differences are losses, thrown away at different stages of production and consumption. However, it is the weight that is of importance to determine how the expenditures of mixed meats can be divided between beef, pork and chicken.

Table 3: Consumption of beef, pork and chicken. Final consumption and slaughter weight consumption. Kilo per capita in Sweden 2009.

Kilo per capita	**Final consumption**	**Slaughter weight consumption**	**Diff**	**Share**
Beef	11.3	25	13.7	0.39
Pork	15,.8	36	20.2	0.57
Chicken	15.9	17.4	1.5	0.04
Mixed meat	23.1	0		
Total				1

Source: Swedish Board of Agriculture, statistical database.

As shown in Table 4, 39% of the expenditures on mixed meats are added to beef expenditures, 57% to pork expenditures and 4% are added to expenditures on chicken. The small share of mixed meat that could be wild game, horse and sheep meat is overlooked.

4. Consumer welfare effects of environmental taxes on meat in Sweden.

The final results of CV calculations are presented in Table 4 and Figure 1 and 2. Values show the burden of meat taxes, and say nothing about how tax revenues can be recycled into the economy. In Table 4, tax revenues, total CV from equation 5) and welfare weights, w_i from equation 6), are presented. Total CV should be larger than the consumer part of the tax revenues, showing that to keep consumers equally satisfied after a tax is introduced, you need to compensate them with the same amount as the tax incidence, and a bit more. The revenues presented in Table 4, are not divided between consumers and producers, they are simply the total governmental revenues, based on the amount of meat consumed after taxes. Total CV show only what the consumer side of the economy need to be compensated with, to reach the initial utility level U^0. Thus the result for beef does not imply a “free lunch” as would be suggested at first glance, it shows that the consumer side of the economy would not need all of revenues to be compensated, as with pork and chicken, where total revenues are not enough.

Table 4: Total CV in million SEK compared to tax revenues and final welfare weights.

Million SEK	Tax revenues	CV	CV Share (w_i)
Beef	4787	4452	0.57
Pork	1405	2281	0.29
Chicken	394	1054	0.14
Total	6586	7788	1

Tax revenues are calculated from Säll and Gren (2015)

In Figure 1, the household specific levels of CV (from equation 6)) are presented. Shares from Table 4 are weighted with expenditures on each kind of meat, for each income group.

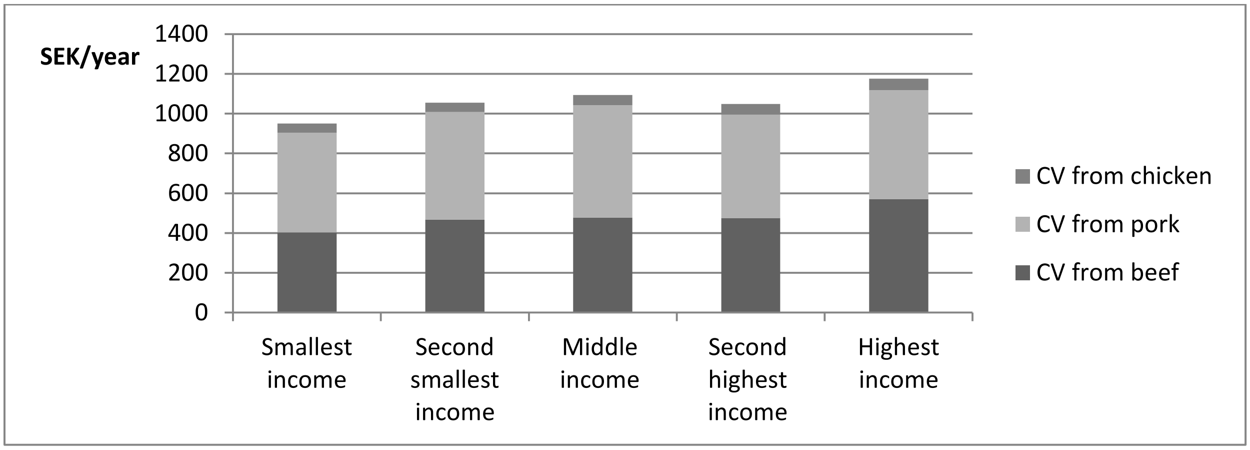

Figure 1: CV levels in SEK. Per income group and per sort of meat, after taxes are introduced. Per capita levels.

Levels that households would accept as compensation for meat taxes are between 950 SEK and 1176 SEK per person and year. The largest part is from pork taxes, followed by beef. Compared to income and expenditures, this corresponds to between 0.52% and 1.04% of income levels, and between 0.78% and 0.85% of expenditures, which is shown in Figure 2.

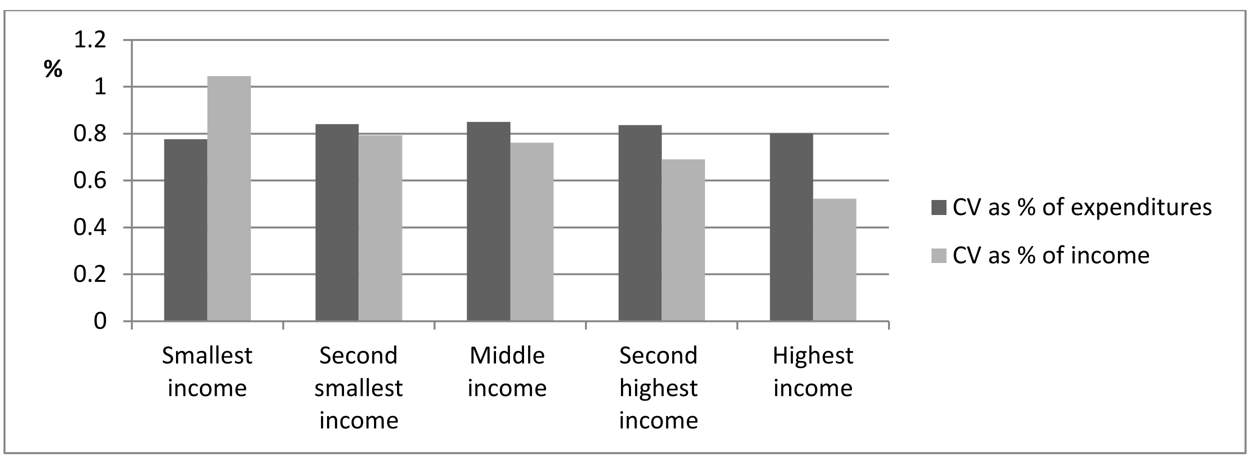

Figure 2: CV as percent of income and expenditure levels Sweden 2007-2009.

Compared to income levels, an environmental tax would indeed be regressive as Swedish politicians suggested. However, if expenditures are used, this is more or less a neutral tax with the almost the same effect on the households with the smallest income and the households with the largest income levels. The households with the smallest income levels are however, the least affected when comparing expenditure levels. If the weights were to be changed, it would have little effect on final results, since CV is measured as a proportion of total expenditures. The amount that is mixed meats might be spread a bit differently, but final results would vary little.

5. Summary and discussion.

In this paper, the distributional effect of an environmental tax on meat in Sweden was calculated. Tax levels on beef pork and poultry came from Säll and Gren, (2015) and capture some of the related environmental costs from Swedish meat production. The distributional effects were measured as the amount households are willing to accept as compensation for a tax to be introduced, if they were to keep the utility level they experienced before taxes. Households can be compensated in various ways, a decrease in income tax, decreases in other taxes or fees, or by using tax revenues in other areas in the economy which might give higher utility levels than before. However, the purpose of this paper was not to look at the recycling possibilities.

Willingness to accept as compensation was measured as the compensating variation (CV), depending on Hicksian demand and constant utility levels for consumers. When several taxes are introduced simultaneously, compensating variation for multiple price changes is an elegant method to calculate welfare changes in monetary terms, without doing intersectional modeling.

It was found that the households with the smallest income levels would need to be compensated with 950 SEK per person and year to be able to adjust their consumption bundles and reach the initial utility level received before taxes. The households with the highest income levels need to be compensated with 1176 SEK. This corresponds to 0.78% and 0.80% of total expenditures for the two income groups. Environmental meat taxes were almost neutral when expenditures was used as a comparison measure, with a peak for the middle income group where a compensation of 0.85% of total expenditures was needed not to lower utility levels. On the other hand, if compensations were related to current income levels, the tax was regressive. The lowest income group would then need compensation of 1.04% of income levels while the highest income group would need a compensation of 0.52%.

A limitation of this study has been the focus on only the consumer side of welfare changes from the environmental tax on meat. The supply side would most likely face welfare changes if demand on meat decrease. The change in demand is however very small due to inelastic demand and consumption would decrease little with taxes. If the decrease in consumption affects imported meat, the change in production in Sweden would be very small or even zero, and thus not have any effect on the production side. Nevertheless, this is a topic that would need to be looked into closer.

References

Arndt C, Tarp, F 2001. Who gets the goods? A general equilibrium perspective on food aid in Mozambique. Food Policy 26 (2001) pp 107-119.

Azzam, A. and B. Rettab. A welfare measure of consumer vulnerability to rising prices of food imports in the UAE. Food Policy 5(2012): 554-60.

Cederberg C, Hedenus F, Wirsenius S, Sunesson S, 2012. Trends in greenhouse gas emissions from consumption of animal food products- implications for long-term climate targets. Animal 2013 7:2 pp 330-340.

Chouinard H.H, Davis D.E, LaFrance J.T, Perloff J.M, 2007. Fat taxes: Big money for small change. Forum for Health Economics & Policy 10 (2) Article 2.

Deaton, A., Muellbauer, J. 1980a. Economics and consumer behaviour. Cambridge University Press 1980. Online ISBN:9780511805653

Deaton, A., Muellbauer, J. 1980b. An Almost Ideal Demand System. The American Economic Review 70: 312-326.

Edjabou L.D, Smed S, 2013. The effect of using consumption taxes on foods to promote climate friendly diets. The case of Denmark. Food policy 39 (2013) pp 84-96.

Galloway, J., Rownsend, A., Erisman, J., Bekunda, M., Cai, Z., Freney, J., Martinelli, L.,, Setizinger, S., Sutton, M., 2008. Transformation of the nitrogen cycle: recent trends, questions, and potential solutions. Science 320: 889-892

Gelan, A.U 2007. Does food aid have disincentive effects on local production? A general equilibrium perspective on food aid in Ethiopia. Food Policy 32 (2007) pp 436-458.

Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. 2013. Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO), Rome.

Hausman A. 1981. Exact Consumer's Surplus and Deadweight Loss. The American Economic Review Vol. 71, No. 4 (Sep., 1981), pp. 662-676

Hertel, T 1997. Global trade analysis: Modelling and applications. Cambridge, MA: Cambridge University Press

Huang K.S 1993, Measuring the effects of U.S meat trade on consumer´s welfare. Journal of Agriculture and Applied Economics 1993 pp 217-227.

Huang K.S, Huang S.W 2000. Consumer Welfare effects of trade reform in Taiwan´s meat industry. Academia Economic Papers 28: 3 pp 321-337.

Johansen L. 1960, A Multi-Sectoral Study of Economic Growth

Kosonen K, 2012. Regressivity of environmental taxation: Myth or reality? Taxation papers, working paper n.32-2012. European Union, 2012 ISBN 978-92-79-25026-2

Laborde D, Martin W, Van der Mensbrugghe D, 2011. Implications of the Doha Market Access - Proposals for Developing Countries. Policy Research Working Paper 5679, World Bank.

Lööv H, Andersson R, Ekman S, Wretling Clarin A, Frid G, Kättström H, Larsson B, Sjödahl M, 2013. Swedish Board of Agriculture Report 2013:1

Nordström, J., Thunström, L., 2009. The impact of tax reforms designed to encourage healthier grain consumption. Journal of Health Economics 29: 622-634.

Nordström J, Thunström L 2011. Can targeted food taxes and subsidies improve the diet? Distributional effects among income groups. Food Policy 36 (2011) 259–271

Poterba J M. Is the Gasoline tax regressive? Tax Policy and the Economy, Volume 5, pp 145 – 164, 1991

SOU, 2004. The Long-Term Survey of the Swedish Economy 2003/04. Swedish Government Official report 2004:19

Smed S, Jensen j.Dm Denver S, 2007. Socio-economic characteistics and the effect of taxation as a health policy instrument. Food Policy 32, pp 624-639.

Statistics Sweden 2013. Yearbook of agricultural statistic 2013.

Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, De Haan C, Livestock´s Long Shadow- environmental issues and options. FAO, Agriculture and Consumer protection Department. FAO 2006.

Swedish Board of Agriculture, statistical database. Latest access 17/3-2014.

Säll S, Gren I-M, 2015. Effects of an environmental tax on meat and dairy consumption in Sweden. Submitted to Food policy May 2014. Revise and submit to Food Policy January 2015.

UNEP 2009, Nellmann C, MacDevette M, Manders T, Eickhout B, Svihus B, Prins A G Katlenborn B P. The environmental food crisis- The environment´s role in averting future food crises. UNEP/ GRID- Arendal. ISBN: 978-82-7701-054-0.

Vingren M, Kruse D 2010, Household budget survey (HBS) 2007-2009. Expenditure and income report. ISSN: 1651-0550.

Wirsenius S, Hedenus F, Mohlin K, 2011. Greenhouse gas taxes on animal food products: Rationale, tax scheme and climate mitigation effects. Climate Change, 108(1-2) s. 159-184

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