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Firm formation- and employment effects from solar heating subsidies. A study in cooperation with the Jönköping county administrative board

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Abstract: **This study acts as an evaluation of the current level of the solar heating industry. What is being looked at more specifically is the relation between government subsidies and firm formation in order to develop a further analysis. Counties are also being compared in order to discern the relative success in firm start-ups. When this has been done, the employment effect of these firms is also being discussed.**

Key words: **Solar heating, subsidies, firm formation, Jönköping, employment**

Contents

1. Introduction

In order to reduce costs for consumers, subsidies have been given from the Swedish government to consumers in Sweden since the year of 2000 at the purchase of a solar heating unit.[1] Hence we have a directed effort towards promoting the increased usage of such units. The basic thought when introducing an environmentally friendly type of product into a market is usually that it will be beneficial for the environment per se. What also should be noted in this matter is that there are other segments of the society on which this might have an impact on as well, such as the firms involved in the industry and the employment within regions. Therefore the underlying hypothesis is that the promotion of the technology by using subsidies is creating a demand.

It is the understanding of the author that in order to promote environmentally friendly products, there must be overall incentives for policy makers and entrepreneurs to act. Information is then needed regarding what kind of impact the subsidies have, not only on the environment but on these other factors as well. This study is being conducted for the county administrative board of Jönköping in order to provide the institution with such an overview of the solar heating industry. The aim is first of all to provide a generic picture of what kind of impact the promotion of solar heating has had on start-ups within the southern part of Sweden. If there has been a significant impact, then this is fruitful for the dynamics of the industry and also for regions themselves.

Further we also have the above mentioned impact on employment. A relation between solar heating subsidies and firm formation might also be the foundation for a discussion regarding either the creation of new jobs or at least the prevention of loosing the old ones. What also ought to be of interest is a comparison between the counties in southern Sweden in regards to the number of firms created. This gives us a picture regarding which regions have been more or less successful.

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[1] *Bidrag till installation av solvärmeanläggning*, Boverket 2010.

1.1 Questions at issue

What we have in this scenario is hence a bundle of intertwining issues and aspects. This study then acts as an evaluation of the current level of the solar heating industry. What is being looked at more specifically is the relation between government subsidies and firm formation in order to develop a further analysis. Counties are also being compared in order to discern the relative success in firm start-ups. When this has been done, the employment effect of these firms is also being discussed. In clarity the questions of issue in this study are hence:

What is the relation between subsidies and firm formation within the solar heating industry?

Are there significant differences between different counties in regard to firm start-ups?

What employment effects can be derived from this relation?

1.2 Contribution

Since this study is being conducted for the Jönköping county administrative board, it is imperative that it conveys information which will benefit the department. First of all by establishing a clear context between subsidies and solar heating start-ups, one will get an idea regarding which policies aimed at creating incentives are beneficial in this context.

The second question in this study which deals with comparing counties to each other is beneficial since it gives the board information regarding if their endeavours have been successful. It should be denoted that relationships in a sense between counties ought not to be competitive, but rather collaborative in the endeavour of trying to find common solutions to generic issues. However this information should act as a progress report and furthermore give warning signs if there are other matters within this field which need to be attended to.

The third and final matter regarding employment is often a bit more difficult to discern causation from. However if a relation can be established, this will paint an image of the generic labor impact retained from solar heating subsidies. In a way when it comes to labor occupation within firms, it can often also be difficult to discern who is doing what if the firm is diversified in its occupation. Therefore such a conclusion would also aid the administrative board with the fact, that effects from directed incentives should not be dismissed so easily, since the effects might be hidden within firms, making it a problematic issue in the conduct of making a quantitative analysis.

1.3 Outline

So far the aim of the study as well as the usefulness of its contribution have been presented. What is next to come within this work, is a discussion regarding the geographical-, industry- and time limitation in order to narrow the scope to a workable field. This will be followed by a background orientation regarding the subject at hand. Such a background will include first of all the technical units connected to this study. It could be argued that since this is a study regarding economic development, a technical orientation is not necessary. However it is the understanding of the author of this study, that solar heating units are often mistaken for photovoltaic units; hence the reason for such an elaboration. Further the background section will also encompass information regarding the solar subsidies connected to this study, as well as a more generic discussion regarding the impact of subsidies within the industry of solar energy.

Next in line is a presentation regarding the sources used together with a short discussion regarding the range of the source material. This is followed by the method section, where the approach to the handling of the sources will be presented. It could be argued that some of the presentations made in either of these surrounding passages instead ought to be placed somewhere else, but for this study it has been found that the discussions being brought forth regarding source material and way of approach often are transcendent into other passages in such a way that a clear cut isolation of the discussion between the passages is not possible. The method section will be followed by a section regarding theoretical notions used in conjunction with the method approach. Some concerns have been given to the author of this study claiming it to be more appropriate to present theoretical concepts prior to the presentation of the actual practical approach. In other instances this would indeed be a valid claim. However this study somewhat differs from other forms of research in that it is aimed at being more practically oriented. This is the first pillar for the approach taken. The second one is that the author of this study is proposing a clear cut case structure for the study. Therefore it would not be suitable to present theories to back-up the practical approach before the actual approach has been presented itself.

The theory section is followed by the actual analysis per se. Here the analysis has been divided into distinct sections in order to fit each research question stated earlier. First of all a correlation will be made fitting the first question. Thereafter a regression will be made to go further into depth regarding possible causes for the findings in the first section. This is followed by a comparison between the different studies, which previously were analysed as aggregated will be conducted. The final part of the analysis will be a discussion regarding

employment effects. The analysis will be followed by a chapter where the findings of this study will be presented and put into a proper theoretical context. The material will then be connected to further research opportunities for other scholars to pick up on. Finally the sources and literature will be listed.

1.4 Limitations

When it comes to the geographical limitation, it will be containing the southern part of Sweden. More specifically the counties from which data will be analyzed will be Jönköping, Kronoberg, Halland, Kalmar, Blekinge, Skåne, Västra Götaland and Östergötland.

The industrial span will be limited to the solar heating industry. To clarify what is meant by this, the author is referring to energy harvested from solar products for the usage of warming houses and water reserves.

The time limitation can be seen from two perspectives. Data will be presented from 1981 and forwards in the analysis. The quantitative analysis per se will however cover the period of 2000 to 2008, since the prior was the year when solar heating subsidies were established. At some level there will be a discussion relating the results from the 2000 to 2008 period with earlier matters. This is done in order to develop the discussion regarding the studied period and to provide alternative explanations for the results.

1.5 Earlier research and background
1.5.1 Solar heating subsidies

The subsidies which are going to be analysed began being used in 2000 and have been in use until at least the current year of 2010. It will however only be investigated until 2008 due to reasons explained later on in this study. The amount of subsidies being payed out in total depends on a pre-determined level for each year which is dynamic. This means that if enough people already have applied for subsidies and been granted to a degree where the pre-determined pot runs out, then there will officially be no more granting of subsidies. In actual practice however there have been years where the actual amount payed supercedes the pre-determined value, but the breach has been marginal in relation to the pre-determined sum itself. Prerequisites for being able to be granted the subsidy is that the estate it's being used for is a personal living house or multi-apartment building, and that it's going to be used for

warm tap water and/or local heating. How much subsidies one receives for the unit purchased depends on the energy production of the unit.[2]

In 2006 Boverket published a report regarding the situation of solar heating subsidies, as well as background information regarding the initial determined necessity for it. There were 4 main reasons why the Swedish government, in conjunction with Boverket, put solar heating subsidies in action. The first reason was that there is an overall necessity to decrease the dependency on oil. The main substitute for oil in the Swedish society has largely been regarded as bio fuels. However there has been an increasing competition when it comes to bio fuels, and therefore there is a necessity to also look for other sources of power. What is not included in this report, but which the author of this study would like to comment on, is that there also exists the ethical notion of how much land area used for growing crops for consumption ought to be transferred to becoming sources of bio fuel. The second reason to provide solar heating subsidies was that it does not give of any pollution. The third reason is that in other countries within the European Union, there has been a strong development in solar heating units. This makes it allegeable for Sweden to join the development as well, since there might be for example cooperative efforts and leaps in technology which can be accumulated. The fourth and final political main reason for solar heating is that pro-active measures ought to be taken in developing environmentally friendly technologies of tomorrow. The report from Boverket further goes on by stating that if the endeavour of promoting solar heating in Sweden is going to be successful, then more efforts towards information and marketing are required.[3]

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[2] *Bidrag till installation av solvärmeanläggning*, Boverket 2010.
[3] *Ett fortsatt solvärmestöd*, Boverket 2006, p. 9.

Further on, the initial political movement towards solar heating subsidies began in 1997, when the political parties of Socialdemokraterna, Centerpartiet and Vänsterpartiet agreed on a proposition stating that:

> *"The goal of the Swedish politics of energy is to secure short term and*
> *long term access to electricity and other energy with means which will*
> *be world wide competitive. The politics of energy shall create the*
> *prerequisites for an efficient usage of energy and a cost effective Swedish*
> *energy supply with a low negative impact on health, environment, climate*
> *and also facilitate the changeover to an ecologically endurant Sweden.*
> *By those means a good economical- and social development is promoted*
> *in Sweden."*[4]

The proposition was further a response and aimed solution to the political agenda to shut down the nuclear power plant reactors in Barsebäck.[5] What hence also should be noticed is that the initial agenda of the government differs from the alignment of this study. The Swedish government had a more environmental- and energy directed goal, while I myself is putting the matter in a different light and discussion the impact on firm start-ups and employment.

1.5.2 Technical discussion
An important aspect in this study is that it aggregates data from firms involved in the solar heating industry and not the solar electricity industry. It is worthy to notice that even though they are both sun harvesters, the technologies used for these purposes tend to differ. When it comes to the solar cells themselves, generically speaking these are made out of an approximately 0.19 mm silicon layer with one side having a surplus of electrons, while the other side has a lack of electrons. What happens when the sun rays hit the plate is that a voltage is created that enables the electrons to move in a certain direction and in so doing creating electricity.[6]

  The solar heating unit on the other hand operates by sun rays heating up a copper pipe containing circulating fluid, which is surrounded by a heat absorbing layer. The

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[4] Prop.1996/97:84 [by the current author's translation], *Ett fortsatt solvärmestöd*, Boverket 2006, p. 11.
[5] *Ett fortsatt solvärmestöd*, Boverket 2006, p. 11-12.
[6] *Solceller - Informationsbroschyr om att producera el med hjälp av solceller*, Energimyndigheten 2009, p. 3.

fluid is then led down to a central water tank where the warm water is stored until it is needed for various heating purposes such as shower water and radiators. The central tank is mostly also connected to a boiler, which can burn for example wooden pellets.[7] The reason for having an extra boiler connected is due to the relatively lack of sun hours in Sweden. As a third backup in case the boiler for some reason should also fail, the tank can also be connected to the electrical grid. Understandably this ought to merely be used as a last resort due to the energy lost when one transfers electricity to heating.
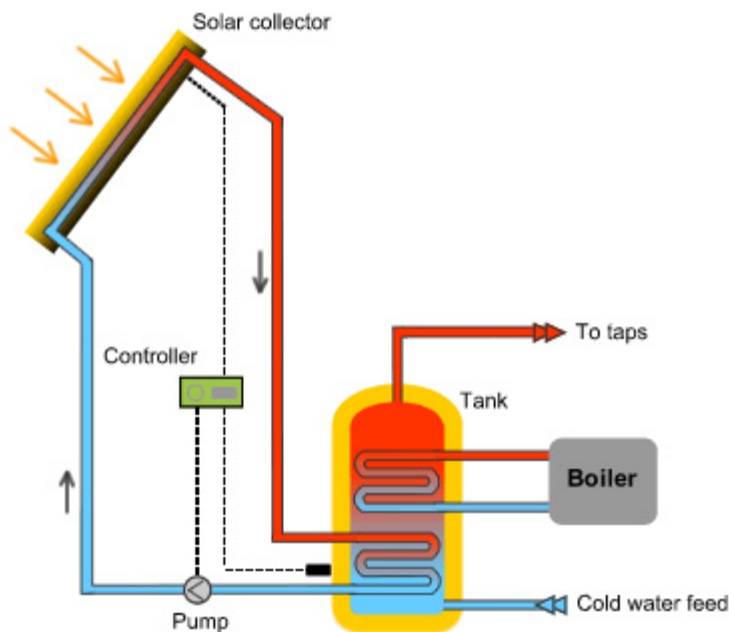

Fig. 1. Solar heating schematic as depicted by Go Green Plumbing and Heating Ltd.[8]

1.5.3 Generic solar subsidy discussion

In trying to put the discussion regarding subsidies and solar industry growth in a larger perspective, it is worthy to note that causations have been seen in other countries. Germany has traditionally been seen as a flagship when it comes to bolstering the photovoltaic industry, which to a great deal can be credited to subsidies and tariffs. In January 2010 it was announced that the tariffs for installing a photovoltaic project would be lowered by 10% by the end of the month. From this discussion it can further be discerned that such an announcement would increase demand for the current month, since projects would then be rushed instead of delayed to later months. However the time following ought to see less demand. There have also been some worries that the recently re-elected government of

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[7] *Solklart - solvärme!*, Energimyndigheten 2009, p. 5.
[8] *Go Green plumbing*, http://www.gogreenplumbing.co.uk/solar-heating.php 16/3-2010.

Angela Merkel would further impose on the solar industry subsidy and tariff funding. Such an announcement has however not come from the government.[9] What this situation tells us nevertheless is that funding for these projects has a significant importance for the development of the industry, at least in Germany. The question further lies in how much this situation can be paralleled with the situation in Jönköping county and the rest of southern Sweden. In Germany there are noticeable impacts among the prospects for development and growth, which can be accredited to the size of the market. The matter then becomes regarding if the market in southern Sweden is large enough, or whether subsidy- and tariff effects only can be said to have marginal impacts. As noted this background differs from this study in that they encompass different technologies within the solar industry. One should nevertheless keep in mind that even though the technologies differ, the energy source (trivially the sun) has the same geographical ratio of impact whether it is solar heating or solar electricity which is coming into question.

1.6 Sources

When it comes to the information regarding firms, as well as their start-up years and employment, this information has been looked up from the company One to One AB.[10] One to One AB gathers information regarding these aspects of firms from SCB and Bolagsverket. One to One's business strategy is to provide profit from advertising space in return for their software technology. One could argue that the author instead of gathering information from a third party, regarding these issues, could have instead found these figures directly at the SCB and Bolagsverket themselves. However in this study it has been more practical not to do so due to cost issues.

Further regarding the finding of these firms from the first place in order to retrieve any information regarding them, firm listings from exhibitions at A6 Energicentrum in Jönköping have been used.[11] A6 Energicentrum operates as local advisors in Jönköping regarding energy issues. An important aspect which the author of this study wishes to enlighten the reader about is that this gathering of firms for classification probably is the main weakness of this study. The author has gathered firms which, by the authors own classification, are used in this quantitative study. To an extent the selection then depends on where the author has found these firms, and which search criteria that has been used. As will

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[9] *Solar-power subsidies spur growth*, Petroleum Economist, January 2010.
[10] *One to One* AB, www.121.nu, 2/8-2010.
[11] *Energicentrum* A6, www.energicentrum.se, 8/2-2010.

be shown further in the method section of this study, the firms have also been classified into whether they are producers or retailers, installers as well as services for the solar units. Another aspect is that they are classified into whether they have the solar industry as their main occupation or not. First of all the producer firm have been listed. Secondly, the retailers, installers and service firms which are affiliated have been gathered. One retailer then might very well have the solar industry as relatively minor part of its occupation, depending on its generic size, while another one might have it as a relatively large part of its complementary occupation. Such a type of margin error has therefore been attempted to be avoided in this study, by putting a strong emphasis on increasing the number of firms used for the quantitative study.

The initial selection within the counties' borders consists of 570 firms operating at the time of this study. The reason for the large quantity of firms is to make the analysis as reliable as possible. It should further be noted that these firms encompass a period back to 1972. Therefore trivially not all of these firms are presented in the more developed quantitative analysis. The number of start-ups each year between 2000 and 2008 range from 15 to 30 for the counties when counted as aggregated.

Information regarding the subsidies for solar heating has been gathered from Boverket, and consists of the aggregated numbers for all of Sweden in a national pot during the studied years.[12] It could be argued that since the firm formation data is situated to certain counties, then the subsidy coverage should cover the same areas as well. Such an approach however faces two main problems in this study. First of all it is a matter of access to county specific information regarding subsidies over an extended period of time. Such information has not been provided by Boverket. Secondly there is the issue of effects of demand across borders. It is quite possible that firms operating on one side of a county border benefits from demand erupted in the county on the other side of the border. Therefore it is deemed to be at least more consistent in referring to the dynamics of the national pot of solar heating subsidies in the quantitative study.

In the regression analysis two independent variables have been added in addition to the solar heating subsidies. The first one is GDP measured in consumption, which has been collected from the Swedish Central Bureau of Statistics (SCB).[13] The second one is payroll

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[12] *Bidrag till installation av solvärmeanläggning*, Boverket 2010.
[13] *BNP från användningssidan (ENS95), försörjningsbalans, fasta priser referensår 2008, mnkr efter användning och tid*, Statistiska centralbyrån (SCB).

tax, which has been collected from Ekonomifakta.se (Ekonomifakta AB), which is an online information platform regarding the Swedish economy.[14]

In the section comparing the different counties to each other, several maps have been created through GIS in order to illustrate the differences. The unedited GIS layers for these maps have been retrieved from the Swedish Central Bureau of Statistics (SCB). These have thereafter been modified for the usage in this study in conjunction with the gathered data regarding successful firm start-ups. The second map normalizes the start-up figures with population figures, which were gathered in 2005 and are included among the GIS-layers retrieved from SCB. The third map normalizes the start-up figures with area figures in km², which where gathered in 1998 and are also included among the fore mentioned GIS-layers.[15]

1.7 Method

As an overlapping approach for this study, an inductive method is being put forth. In order to discern if subsidies for solar units/equipment has had any effect on firm start-ups and/or employment and in what way, a case structure, as illustrated in Fig. 2., will be used.
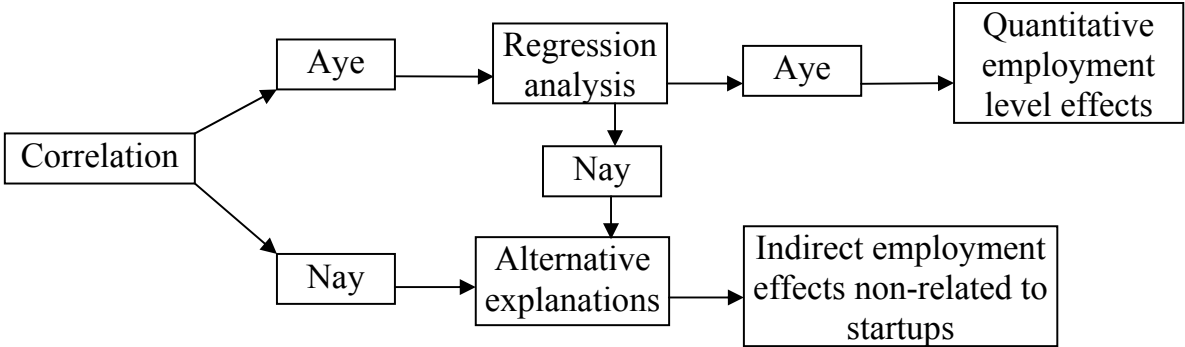

Fig. 2. Case structure model of the conduct in the current study.

First of all correlations between subsidies and firm start-ups will be analyzed in the aspect of correlation relations. If results from such a conduct are positive then this gives us the possibility of building on these results further by conducting a regression analysis, in order to show causation. In the case that these results are also positive, then current employment levels can be extracted from the start-ups caused by the subsidy variables. This would therefore give us quantifiable employment effects.

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[14] *Arbetsgivaravgift*, http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Arbetsgivaravgift/?from365=2000&to365=2008, 30/5-2010.
[15] *SCBs Geoskikt*, Statistiska centralbyrån (SCB), http://www.gis.scb.se/, 30/5-2010.

If the initial analysis of correlation yields a negative result, then alternative explanations to the relation between subsidies and firm start-ups, as well as employment will be given. It is worthy to also note that if the regression analysis does not yield a trustworthy significant result, then alternative explanations will still be sought after, even though the correlation might be positive.

As a second step regardless of the results obtained from this model, the level of start-ups between counties will be compared in order to see where the progress has been the most expansive and how much it has increased.

The usage of Aye and Nay in this study is stipulated as follows. An Aye, which is a positive response, is characterized by different prerequisites depending on where in the model it is occurring. An Aye to correlation would mean a value above 0,75. Otherwise the result of the analysis must be regarded as Nay. In the regression analysis an Aye is characterized by results which are refuting the null hypothesis at a 95% significance level, which means that one is able to state to a 95% certainty that the inverted form of ones initial proposition is false.[16] This also implies the need for an alternative way of moving from one case to another one in the study; which is why the notion of 'Aye and Nay' has been stipulated. If we would have simply used 'Yes and No' as dividers between the different cases, this would have been somewhat unscientific since it implies positivism instead of falsificationism. Then the message would have been that our proposition is being confirmed, instead of what we have now, which is that we corroborate.

When it comes to the classification of the industries for further detailed studies of the results, the following typology has been created for this study:

Table 1. Typology regarding firms involved in the solar heating industry.

	Producers	Services/Retailers
Solar as main occupation	X	X
Solar as complementary occupation	X	X

The columns are dividing the occupations into two parts. The first column covers firms which are producing the solar heating units or conduct some kind of main assembly. The second column covers firms which are merely conducting services or are retailers of some sort. It should be noted that the firms characterized as producers may, or may not, be also involved in offering for example services. The main difference here is thus that the second column of firms doesn't encompass any significant production.

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[16] Charles H. Feinstein & Mark Thomas, *Making history count*, Cambridge 2002, p. 151-152.

In the row line there are two possibilities. The first one is firms which have the solar heating industry as its main occupation. The second one covers all firms which have a more generic firm occupation, but have the solar electricity industry as a complementary occupation. How large ratio of a firms occupation that is related to the solar heating industry might differ though. Both small and large firms are encompassed in this study, which makes it possible that for example some retailers are only selling solar heating units, while others have a much larger array of products to offer.

Further comparisons between different counties will be done by presenting start-ups for each year and county from 2000 until 2008. Two counties will share the same graph in order to facilitate viewing in a gray-scale print-out. The graphs will thereafter be analyzed for patterns and also tied to any of the following literature if possible. Except from presenting the counties per se for each year, the aggregated data from 2000 and 2008 will also be aggregated and presented for each county in a map covering the south of Sweden. The analysis will thereafter proceed by looking at ratios of these aggregated start-ups, normalized by population and area figures.

1.8 Theoretical framework
1.8.1 Porter on competitive advantage

If the quantitative analysis cannot yield a positive response regarding the relation between subsidies and start-ups, other explanations need to be given. Porter's notions come well into place here. In his work regarding competitive strategies Porter bring up his so-called 'five factor model'. Within this model Porter talks about difficulties and possibilities when it comes to competing in a specific industry. The five factor model is encompassed by five key elements called bargaining power of suppliers, threat of new entrants, bargaining power of buyers, threat of substitutes and rivalry among existing firms.

The power of supplier factor consists of matters such as switching costs; i.e. how much it will cost for the suppliers to adapt what they are providing to the product you are assembling yourself. One example of this might be if you are entering the auto industry. You are making a car and you need another firm which makes tires to supply you with a specific set of tires. If that firm will have to undergo too many changes, which result in stampeding costs, then they will be deterred from supplying you with their product. Another matter within this factor is the volume of goods which you are purchasing for your own product. If the volume is too small, then the supplying firm will have little or no incentives to engage in a contract with you.

The new entrants factor is regarding matters such as economies of scale. The question here concerns how established already existing firms are within the industry. If you introduce for example an mp3 player into the market at a certain price, then there might already be some firm that creates mp3 players, which already has a large array of established factors which enable the firm to benefit from economies of scale more than yourself. There is also the matter of relative experience within the industry and knowledge regarding how to compete. The third factor of the power of buyers concerns matters such as buyers' willingness to pay the price offered. Other matters are for example how well your brand is respected by the buyer. Further on we also here have the matter of switching costs. If we look at the situation regarding supplier power discussed earlier and put ourselves in another perspective, namely that you are in control of the firm which is supplying the tires and a firm in the auto industry is supposed to buy your tires. Then their switching costs will determine their will to buy your product or switch to it; hence this is the leverage which is held by the buyer. The fourth factor is regarding the threat of substitutes, which is basically a cost issue between the already existing product, which may or may not be dominating the market, and products at a cheaper price and with low switching costs from the already established products. Finally the fifth and final factor, which is the intensity of rivalry, is a qualitative measurement of the four other factors brought together.

When it comes to competitive advantages Porter further argue that in order to be sustainable and reach a formidable business strategy, one need to focus on a few fields within an industry. In order to become good at what they do then a firm could for example focus on making different types of sodas. A firm should however not engage in both bread production and soda production, since this will make the firm loose a specialized competitive edge. Of course examples can be debated and modified, but this is the general rule of thumb when it comes to Porter's strategy.[17] The author of this study wishes to direct some modifying thoughts against Porter's notions in this case. Porter states, in parallel with basic notions of the industrial revolution, that in order to be competitive one must be specialized. Such a statement is however based on one underlying assumption, namely that the home market or the market which the actor is operating in is endless or at least fairly large (It should be noted that endless in this sense is defined as global in terms of for example online sales). This is trivially a priori made possible due to a high degree of population density. If you are specialized in a huge market, then there will naturally be more people willing to buy your

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[17] Michael E. Porter, *Competitive Advantage – Creating and Sustaining Superior Performance*, 1985, p. 4-20.

product in an extent large enough for you to be sustainable and successful. A high population density increases the permutations of people's preferences and there will be an increasing chance of people wanting to buy your product, which is why we can see so many specialized and bizarre products being sold online. The underlying assumption of a large enough market is further not always valid. In many cases firm managers choose to stay small in a small area due to traditional reasons as portrayed by Smallbone & Wyer, who argue that willingness to delegate responsibility can affect growth.[18] By staying small a local service or retail firm then trivially has access to a smaller market. Thus the underlying principle of a huge or endless market does not always apply and therefore the notion, that focusing on certain products or areas within an industry leads to success, is incomplete. If you are living in a relatively low populated area and stay small as an entrepreneur it a priori does not benefit you to be extremely specialized, due to the fact that your array of potential customers is not large enough.

What should also be highlighted is that the power of buyers, as in Porter's model above, is lower due to there being less firms competing with other products. The intensity of rivalry is hence less which works to your advantage when you are operating in a smaller market. The market might force you to specialize in a later period as the market grows, but this is another matter as for now. With all this being said, the author of this study would like to further argue that in rural areas firms benefit more from being diversified, due to both the lower level of competitors as well as the low population density. Conclusively, if the correlation and/or the regression analysis of this study do not yield an aye respectively, it might be arguable that the increased demand due to subsidies is benefiting firms in that they become more diversified and therefore become more sustainable, rather than that it affects the formation of firms per se. Another example of this phenomenon is that when you enter the countryside you can often find shops which cover a wide array of products. Such shops might then be for example small grocery stores which also sell shoes, plants, building materials and bikes. Also if one wishes to put this in a more nostalgic sense, it is aligned with Adam Smith's statement that "The division of labour is limited by the extent of the market".[19]

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[18] David Smallbone & Peter Wyer, "Growth and development in the small business", *Enterprise and Small Business. Principles, Practice and Policy*, ed. S. Carter & D. Jones-Evans, 2006, p. 108.
[19] Adam Smith, *The Wealth of Nations*, 1776, Book I, Chapter 3.

1.8.2 Verheul et al. on dynamics

Verheul et al. bring forth that the dynamics when it comes to firm start-ups within a region are of a large importance. They however also point to that even though such the dynamics are low, the region might still be successful. Hence this notion ought to be viewed as a generic rule of thumb rather than an absolute directive for success. Verheul et al. state that if the introduction of new firms and the abolishment of old ones are not present, the economy in the region has a risk of becoming stagnated and suffering from a lock-in. The authors further explain this by saying that the tacit segment of the already established firms can over cloud the influences gained from new relationships with firms outside the region.[20]

The author of this study wishes to elaborate on these views by stating that even though there lies a significant truth to what Verheul et al. are saying, it should still be noted that first of all the success of a region depends on ones stipulation of the term. In one discourse a region might be defined as an entire county. In such a situation it is trivially (?) necessary for the region to have a high dynamic nature when it comes to start-ups. However if a region is defined as a significantly smaller area, with one large and influential company, a high regional dynamic nature is perhaps not necessary since the company naturally is already connected to close-by regions and also to regions abroad. I wish to alert the reader to that these are mere deductive speculations and hypotheses of the author and not based on concrete question specific scientific research.

Verheul et al. later on in their article make a statement saying that "Entrepreneurs in retailing and other small-scale services may be attracted to regions with high population density and high incomes, while entrepreneurs in manufacturing may be attracted to regions with low wages and a well-developed infrastructure.".[21] This quote is of importance to the current study, since it is most probable that a majority of the collected firms are within the service sector. The counties of for example Västra Götaland and Skåne in this study are more populated areas with bigger markets than the other counties studied. Therefore a significant increase in start-ups during the latter years might also be caused by a faster generic growing market. Verheul et al. further reinforce this conclusion by pointing to city size and regional growth as more important factors relative subsidies per se.[22] Therefore this should be considered when doing the comparative analysis between counties regarding where the start-ups have been most prominent.

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[20] Ingrid Verheul, Martin Carree, Enrico Santarelli, *Regional Opportunities and Policy Initiatives for New Venture Creation*, 2009, p. 608.
[21] Verheul et al., p. 609.
[22] Verheul et al., p. 618.

Further Verheul et al. denote that in the results of their studies it is shown that policies which are aimed at creating successful incentives for start-ups generally do not have the effect which one is looking for. The incentives which they discuss are basically financial ones in the form of subsidies. The authors also however point to that failure to retrieve the desired results shouldn't necessarily be attributed to as regard financial incentives as poor methods per se. Instead the problem might lie in how one distributes the financial means and to which parties.[23] The main difference between what Verheul et al. studied and what is being analyzed in this study is that they studied direct financial means to firms, while the conduct here is to study the relationship between direct financial support to consumers and the desired start-up effect. The underlying hypothesis and premise of this study is therefore that subsidies directed to consumers create a demand which causes firms to establish. In a way it can be debated if the assumption of such a relationship without further background is illegitimate, but looking from another perspective it can also be regarded as a basic law for economic development; namely that where there is a demand there will be firms looking to establish themselves and fill that demand.

1.8.3 Coad et al. on the importance of subsidies

Coad et al. have a theoretical notion that can very much be anchored to the discourse in the case of a positive return on the regression analysis. When it comes to the matter of adopting environmentally friendly innovative technologies, there is a general consensus that policy makers ought to intervene in the process of 'pushing' consumers in the desired directions with various means in order for the endeavour to be successful. Coad et al. discuss this notion in relation to environmentally friendly cars, but due to the nature of the discourse it can trivially also be expanded to integrate the discussion regarding solar industry units.

Coad et al. present three policies which have been proposed by the EU in this endeavour. The first one is a rather institutional action, where consumers get financial incentives such as subsidies and tariffs. This field might also encompass legal incentives, where one example in the solar industry case might be increased allowance of unit montage on buildings even though such an action to a higher extent may or may not affect facade aesthetics. The second policy is information, such as environmental briefings of pros and cons when it comes to adopting a new product. As Coad et al. also denote, energy labels might also be a valid instrument. The third and last form of policy is voluntary agreements between

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[23] Verheul et al., p. 618-619.

policy makers and manufacturers. Although Coad et al. denote that the agreements are voluntary; the author of this study would rather downplay the altruistic incentives per se from manufacturers and instead shed light upon "voluntary actions" as instruments for manufacturers to promote positive public relations. The issue that Coad et al. bring forth is regarding which policy that ought to be seen as the most effective one.

Coad et al. here differ between intrinsic and extrinsic behaviour when it comes to the incentives for the costumer. The intrinsic motives are seen as the altruistic ones. The authors seem to be rather negatively aligned towards a too large emphasis on financial incentives (extrinsic), since they argue that if one is to introduce a market relationship, then one will move the discourse into a field where we put a price tag on the environment instead of buying goods for the good nature of them per se. Coad et al. do have a point in this. In a way it can be compared to the matter of reward systems used in psychology when raising a child. Usually if a child already has a motivation for doing some useful work or study that will act as a strong motivator alone. However if one would then try to reinforce the behaviour with extrinsic incentives for the task, then the incentives in the child will change from being intrinsic (value in the task per se) to extrinsic (outer reinforcement in the form of money, candy or similar). If thereafter the extrinsic reinforcement is removed or downplayed the initial motivation for doing the task will cease or become less as well. Hence the argumentation by Coad et al. has a valid point, but it is questionable if it is indeed too naive and therefore not applicable in this situation. The authors do further point to several examples in their article which denote the value of direct monetary incentives over altruistic pr-stunts. One of these examples is the introduction of hybrid cars in the Netherlands. In this case the government allotted subsidies for each one who decided to buy a hybrid car. Soon thereafter the sales increased. The subsidies were later revoked and followed by a decline in sales. What should be noted regarding this situation nevertheless is that even though the decline in sales followed the reduction in subsidies, other forces might be at play. It is quite possible that the model was no longer popular or that other financial matters brought the sales of the product to a halt. In a way the study regarding the Netherlands situation faced the same issue as the one within this study, namely that correlation not necessarily is followed by causation. Later on in the article Coad et al. point to this fact as well.

Further Coad et al. do not point to any direct situation where it can be argued that environment information has been the overwhelming cause of the introduction of a new innovative environmental product into society. In relation to this study, this would point to that monetary subsidies indeed have an effect that is stronger than any other when it comes to

innovation. An aye on regression would hence reinforce the actual results presented by Coad et al. more than their hypothesis per se.

Regarding psychological factors Coad et al. do bring up notions from Teisl et al., which state that more emphasis should be given to psychological factors since the underlying influence indeed might have a strong effect. About this matter they do not stress the psychological factor of altruism though, but rather brand labelling, which brings us into a discourse regarding more self preserving psychological motives. The motive here becomes not an eco-friendly one per se, but rather a way of promoting oneself as eco-friendly. Whatever the internal cause of the human nature in relation to purchasing a certain product; models for promoting eco-friendly products in this manner should be regarded as having great potential for success. To put it simply the matter is basically regarding common brand management, which trivially is quite common when it comes to promoting cars in general. Coad et al. point to that the purchase of a car (or other products) proceeds in two stages. The first incentive is the actual brand of the product, which causes emotional will to purchase the product. The second stage is the more rational one in which cost issues come into play in a more elaborate consideration. What Coad et al. are trying to say here is most likely that in the conduct of trying to market an environmental friendly product, one should not rely on one method alone. Different approaches are needed in order to cover the foundations for incentives. What also should be noted in relation to the previous elaboration in this passage is that pr which target the self, either with monetary or identity methods, are most likely far more effective as incentives than generic environmental information aimed at causing altruistic effects.[24] Coad et al. point to this explicitly when they state that "If individuals are genuinely concerned about the state of the environment, their behaviour can be guided by 'environmental morale' even if there is a cost involved. But there are limits to how far behaviour is affected by intrinsic motivation...".[25]

Conclusively the authors denote that the different self-oriented policies should not be seen as complementary to each other, but should instead be used to target different groups. They point to research of public opinion showing that different people are attracted by different incentives when making a purchase.[26] I wish to direct some criticism against Coad et al. in this matter since I reckon it to contradict what they earlier in the article stated about the consumer making their choices in two stages. The author of this study would rather wish to

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[24] Alex Coad, Peter de Haan, Julia Sophie Woesdorfer, *Consumer support for environmental policies: An application to purchases of green cars*, 2009, p. 2078-2079.
[25] Coad et al., p. 2080.
[26] Coad et al., p. 2086.

reformulate the different statements made by Coad et al. into the notion that the consumer makes choices in two stages, but that these different choices can have different weights depending on the characteristics of the consumer. Therefore I reckon that when designing policies for use within different populations one should not rule out any particular variable for incentives, but one should pay attention to the different possibilities within societies and regions which would make it easier or harder to promote the product. This is something for policy makers to keep in mind as well when they are aiming at improving marketing concepts, as denoted by the report from Boverket under the background information in this study.

Such a diversification concept should further be added to the current analysis in this study since it brings light on the fact that even though a causation can be derived from the regression analysis connecting subsidies with firm formation, other lessons are surely to be learned here. In order for the marketing of solar heating equipment to be successful in the southern part of Sweden, it is necessary to also put emphasis on brand labelling and/or the promotion of an identity concept in order to bind the consumer to the product. As has been brought forth by Coad et al, generic environmental policies won't be the major player in this endeavour; at least not in relation to any self-empowering factor.

1.8.4 Lundquist et al. on characterization and dynamics

The theory in this section is mainly brought forth in regards to the section in the analysis regarding the comparison between counties. Lundquist et al. denote that there are strong differences in dynamics between different regions in conjunction with time lags. The authors further state that transformation, growth and employment change happens in different time period for different regions. The message here is that the larger regions, in this case in the Swedish economy, go through transformations earlier than smaller regions. Hence this gives us a sort of pyramid-like dynamic time structure.

Regarding the different regions in Sweden, Lundquist et al. divide them up into 6 tiers. The first tier in their study is naturally Stockholm. The Stockholm tier will however not be useful to relate to in this study, since the conduct here is only to study southern Sweden. The second tier brought forth by Lundquist et al. is Göteborg. This calls for some modification of the notion in regards to the current study. Since we are here studying the effects between different counties, it can be somewhat confusing when talking directly about tiers as cities. The author of this study acknowledges Göteborg as a main tier as well, but would like to extend the notion for this study to encompass all of Västra Götaland. In a way

this raises concerns about differences within the county and if the aggregated results from Västra Götaland is truly representative. However in order to have consistency in the study it is necessary to treat the material in this way. The third tier brought forth by Lundquist et al. is the Malmö/Lund region. In this study it would hence be proper to extend the third largest region to encompass all of Skåne. In modified alignment with the notions brought forth by Lundquist et al. we therefore stipulate Västra Götaland and Skåne as large markets in the further analysis discussion. Lundquist et al. further divide the rest of the regions into other tiers such as big, average and small sized regions. Such a characterization is very useful when it comes to go into depth regarding comparison analysis per se, but in order not to make this study too complex we leave such notions out of the current study. This part of the theory section is further mainly used as a background to characterize different markets or home bases.

Lundquist et al. further go on by stating some of the conclusions from their research, which is that growth and transformation don't occur simultaneously in all of the tiers. The main pattern is that growth and transformation starts in the first tiers and then moves down the ladder. Lundquist et al. refer mainly to growth in value added, as well as employment numbers in their research. However it would add an interesting perspective to this study if a preliminary similar alignment could be drawn in the section regarding the comparison between different counties.[27]

1.8.5 Van Stel & Suddle on SMEs and employment
Van Stel & Suddle discuss effects gained from firm formation on, among other things, employment in the Netherlands. The main purpose of their article is to show that employment numbers from new firms in conjunction with innovations move in basically three steps. First of all there is a significantly higher increase in employment due to R&D ventures being taken to develop the technology and the product. The second step in the timeline is thereafter generally a drop in employment to a lower level due to the then lesser need for further development of the product. The third phase is thereafter characterized by an again rise in employment due to complementary services being developed in conjunction with the brought forth innovation.[28] These notions seem to illustrate modern economic development, where one product gets developed. What other firms might do is then either to compete with the

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[27] Karl-Johan Lundquist, Lars-Olof Olander, Martin Svensson Henning, *Creative destruction and economic welfare in Swedish regions: Spatial dimensions of structural change, growth and employment*, 2008, p. 14-15.
[28] André van Stel & Kashifa Suddle, *The impact of new firm formation on regional development in the Netherlands*, 2007, p. 40.

already existing product/firm or to engage in some kind of joint venture.[29] The joint venture is then focused on division of labour in order for the entire system of part-taking products to be competitive. Then other firms might arise to choose to branch out into specialized fields of the already existing branches and so on. This can further be connected back to what Porter was saying about the importance of specialization. Specialization in conjunction with technological development is therefore naturally intended for larger markets, and it is important to also make the distinction between high- and low knowledge intensive industries when going through this study.

It should also be noted that the labour effects being discussed above from R&D do not necessarily emerge in all regions in conjunction with Van Stel & Suddle's model. This is trivially because a priori not all market conduct any significant R&D. What Van Stel & Suddle argue in the beginning of their article is however of greater importance to this study. Before coming to the actual analysis of their own study, they state that SMEs generally have become more and more important for job creation.[30] This is hence also something to keep in mind when relating to this study and the types of firms which have been collected.

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[29] Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, *Entrepreneurship*, 2008, p. 533.
[30] Van Stel & Suddle, p. 31.

2. Analysis

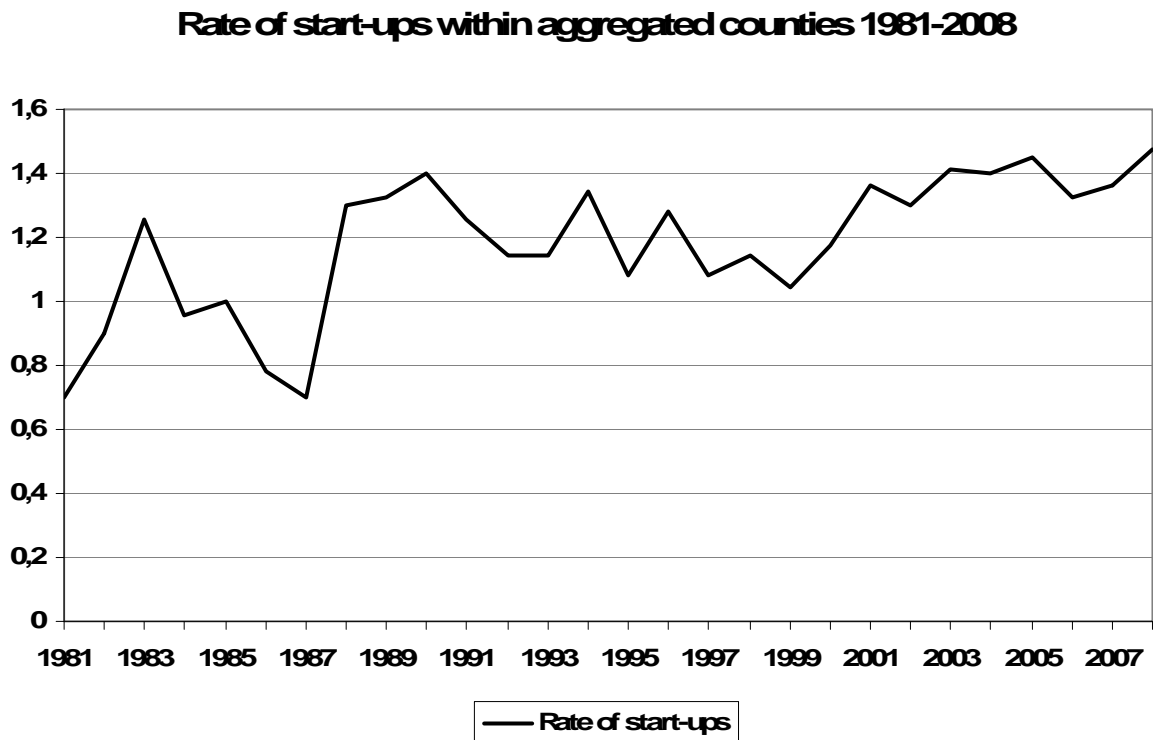**Rate of start-ups within aggregated counties 1981-2008**

Fig. 3. Rate of Start-ups - All counties 1981-2008.

Notes: In this graph the start-ups for each year are presented using a log-scale. What should be noted here is that what is being presented is the start-up year for firms involved within solar heating today. The graph does hence not take into account firms which started up during a particular year and then failed to develop until the current date. Conclusively, only firms still alive today are presented. The data presents start-ups within the counties of Jönköping, Kronoberg, Halland, Kalmar, Blekinge, Skåne, Västra Götaland and Östergötland.

As can be noted from Fig. 3., there has been an increase in successful start-ups from around 2000 and forward, which was the year of the introduction of solar heating subsidies.[31] The increase also seems to be steady if compared to previous years. What should also be taken into account is that this steadiness might in years to come change due to unexpected, and of course regular, failures of firms. As can be further seen from Fig. 3., the start-up rate of successful firms during the 90s was at a significant higher level than during the end of the last decennia. A low level of successful start-ups of firms in this figure during early years should however not necessarily be related to unsuccessful years in the sector of solar heating. Firms which are recently established might just as well not have had the time to go through a shake out where a significant part of them have yet failed. Hence the further back we go in time to compare successful firms, the more arbitrary the definition of a successful start-up becomes,

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[31] *Bidrag till installation av solvärmeanläggning*, Boverket 2010, p. 1.

since we are unable to define a consistent notion of how many years a firm needs to be active in order to be regarded as successful.

Further as can be seen from Table 2., a large majority of the firms involved in the solar heating industry even today have the industry as a secondary occupation. This goes aligned with the call for a regression analysis in order to determine causation, as in the nature of this study.

Table 2. Division of occupations between the 570 gathered firms.

	Producers	Services/Retailers
Solar as main occupation	1	8
Solar as complementary occupation	10	551

Notes: The columns are divided into producers and services/retailers. Producers are here stipulated as firms which are producing a solar heating unit in some way, but may or may not also be involved in acting as a service- or retailing firm. Services encompass matters such as installing the actual unit or repairing it and surrounding connected units. Retailers encompass firms which sell the product, but may or may not also be involved in service for the solar heating units.

Table 2. also shows that even among the producing firms, there are more of them aligned towards having solar heating as a complementary occupation rather than a main one. Of all the 570 collected firms in this study, there is only one that has been classified as being a producer and having solar heating as its main occupation. The ratio in favor of solar heating as a complementary occupation becomes even larger when one observes firms which are services or retailers. Here the number is 551 firms involved in solar as a complementary occupation, versus 8 firms involved in solar heating as a main occupation. Hence this tells us that there seems to be little incentive for firms to operate mainly in the sector of solar heating.

These findings can be connected to the earlier discussion regarding Porter's notion in the theory chapter. The modified version of Porter's notions implied that in an urban environment with a small market it was more beneficial to be diversified than to be specialized, since both the competition and the array of customers are smaller. Since an overwhelming majority, namely 551 + 10 firms, of the total of 570 firms being categorized have solar heating as a complementary occupation; this would imply that the market isn't large enough for firms in this industry to be specialized. It would also imply that the reverse relation is true, namely that since the market is fairly small then the integration of the solar heating industry into already existing firms or start-ups would be beneficial for the survival of these firms in an urban environment. Therefore even if there can't be found any solid

causation from solar heating subsidies on firm start-ups per se, the alternative explanations of the effect in this case from the endeavor of working towards the integration of the technology by the aid of subsidies, might be that it helps already existing firms a priori to survive. The proposal that the conduct towards the integration of the solar heating industry is diversifying and strengthening the industry is also corroborated by the fact that 63% of the successful firms operating within the solar heating industry today were established prior to 2000. Hence much points towards that a large part of already existing firms have chosen to include solar heating as a part of their already existing business.

2.1 Correlation

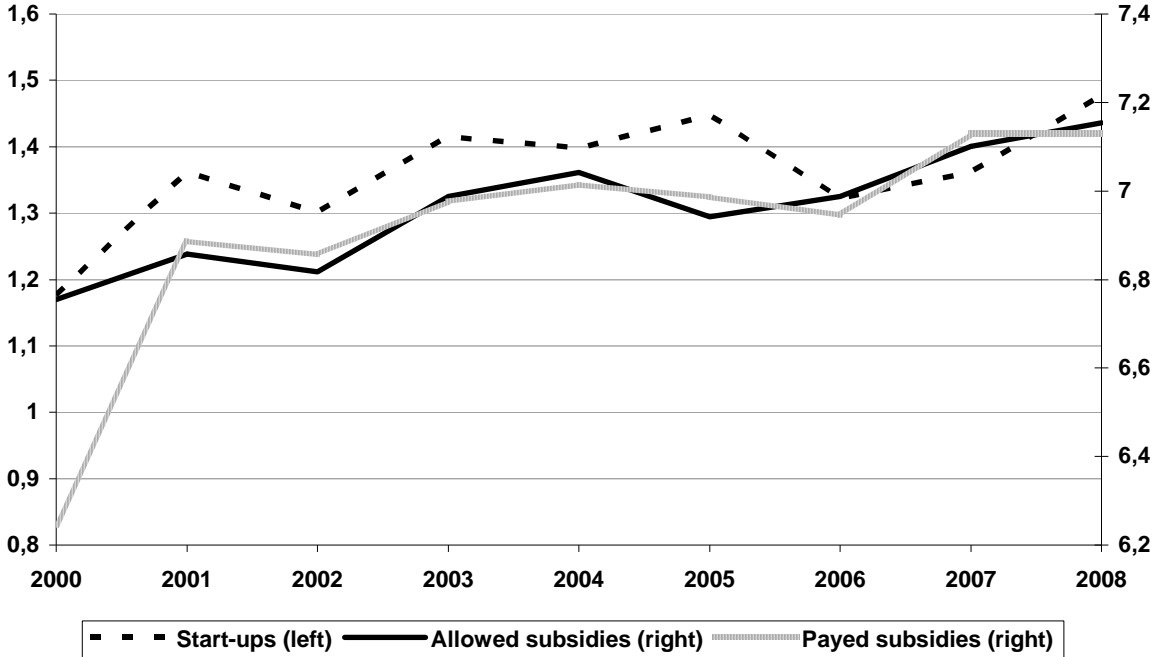**Rate of start-ups within aggregated counties 2000-2008**

Fig. 4. Start-ups, allowed subsidies and payed subsidies on two-log scales from the year 2000 until 2008. Notes: The correlation between start-ups and allowed subsidies was 0,75 and the correlation between start-ups and payed subsidies was 0,86. The area covers the same counties as the previous graph in Fig. 3.

Fig. 4. as seen above represents start-ups and subsidies from the year 2000 and onwards towards 2008. Special attention should be given to the fact that there are no figures representing the years 2009 and 2010. These years are not represented here due to different reasons. Since this study is being done during 2010, the data for this year is trivially hence not complete. To have brought the already existing data into the study in order to make a comparison versus previous years would then not have been proper. Regarding the year 2009

it should be stated that in the sources used in this study, the firm start-ups are updated merely once a year. Data for the latter years could have been retrieved from other sources, but was deemed not possible due to cost issues.

What further should be noticed is the difference between the two types of subsidy formats presented. The amount of allowed subsidies is a pre-determined level of a buffer that can be payed out in the case that people apply for subsidies for their solar heating unit. This is however a preliminary figure that is subject to change later on. The payed subsidy level is the actual amount of money that was payed to the ones seeking subsidies. The general rule of thumb is that once the pre-determined amount of subsidies available runs out, there will be no more opportunity to seek support. However as can be seen from Fig. 4., the amount practically is often somewhat higher than the pre-determined one. This bear witness to that the actual value might sometimes be slightly higher than the allotted benchmark. If for example the pre-determined value for a year is set to 5 million kr, then the actual value might be 4.8 or 5.2 but not different from the pre-determined value in any significant percentual sense.[32]

What can be seen from the graph and also from the calculated correlation figures is that there seems to be a quite strong correlation between successful start-ups and the pre-determined allowed subsidies (0,75). The correlation between successful start-ups and the actual payed values is even higher (0,86). Hence we have an Aye on the correlation. It is important to note that trivially correlation does not mean causation. What should be noted however is that these variables due to their high degree of correlation has a relation either between themselves or from a third variable, such as for example the generic state of the Swedish economy. As noted before, correlation does not necessarily mean that there is a causation. Special attention should however be given to what Coad et al. talk about in the theory section of this study. Coad et al. put forth an example from the Netherlands regarding subsidy implementation for consumers buying environmentally friendly hybrid cars and the effect of this on the quantity of purchases made. In that study, as in the one here, the subsidy levels were followed by an increase/decrease in purchases. It is unclear if the Netherlands situation was determined to be without a doubt caused by the implementation of costumer directed subsidies. What we do know however is that both in the Netherlands case and the case in this study, there lies some kind of connection. In both of the cases it is possible that subsidies and success of the sought endeavor were caused by a third variable, such as the

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[32] *Bidrag till installation av solvärmeanläggning*, Boverket 2010, p. 1.

generic state of the market. In the theory section Verheul et al. gave support to this notion when saying that the size of the city as well as the regional growth per se might be more important factors than the implementation of subsidies. This further strengthens the need to apply variables such as GDP in the upcoming regression analysis in this study. What we also have in relation to this study, is a sort of stand of between Coad et al. and Verheul et al. who earlier argued for their positions regarding this matter in the theory section. Coad et al. seem to have a rather positive view on the effect of subsidies on environmentally friendly products, whereas Verheul et al. are quite negative. The EU directive that it's favorable to target consumers with subsidies, as denoted in the theory section by Coad et al., further put light on this polarity between notions. Conclusively regardless of the quantitative implications, we have strong motives for both aligning with the hypothesis that subsidies have strong effects, as well as the hypothesis that they have not.

A further aspect that ought to be contemplated in relation to Fig. 4. is that the success of solar subsidies should not only be regarded as in relation with firm start-ups but should also be seen in the light of the level of subsidies per se. An increase in solar subsidies payed to the public is also a measure of the increased demand for the products and the success of the marketing of the units themselves. What can be seen from Fig. 4. is that for the years when we have an increase in allowed subsidies, we also have an increase in the subsidies being actually payed. Hence naturally there seems to be a demand.

2.2 Regression analysis

As noted in the previous chapter, the correlations between subsidies and start-ups were strong. However since correlation does not imply a significant causality relation, we need to extend the study into a regression analysis. It is further necessary to find variables which also might have affected the number of start-ups for each year. The first promising variable ought to therefore be payroll tax, since its different levels trivially ought to create incentives and disincentives for starting up a firm. The other independent variable that ought to be used for this regression analysis is the level of GDP. Since the correlation between subsidies and start-ups was particularly strong, this might be due to a third variable. Such a third variable might then for example be the generic state of the Swedish economy. Thus the necessity of using GDP as a possible cause for both the level of subsidies the government is able to pay out each year and the generic success among companies from operating in a market characterized by a population willing to purchase. Since the variables of allowed subsidies and payed subsidies most likely are correlated, separate regressions are carried out in order to avoid issues of

multicoliniarity. The regressions are further calculated on the first differences of the logarithmic values, in order to make findings of causation relations more reliable by filtering anomaly trends.

Table 3A. Regression analysis regarding the comparative impact of allowed subsidies on start-ups.

Variable	Coefficient	p-value
Constant	0,025	0,562
Allowed subsidies	3,476	0,236
Payroll tax	-18,459	0,574
GDP	-17,418	0,167
R-squared	0,551	
Adjusted R-squared	0,214	
Observations	8	

Notes: Start-ups is the dependent variable. Independent variables are allowed subsidies, payroll tax and GDP. All variables used are calculated as Δlogarithmic. Coefficients can thus be interpreted as the difference in percentual changes.

Table 3B. Regression analysis regarding the comparative impact of payed subsidies on start-ups.

Variable	Coefficient	p-value
Constant	0,029	0,365
Payed subsidies	1,368	0,083
Payroll tax	1,962	0,928
GDP	-11,897	0,233
R-squared	0,713	
Adjusted R-squared	0,498	
Observations	8	

Notes: Start-ups is the dependent variable. Independent variables are payed subsidies, payroll tax and GDP. All variables used are calculated as Δlogarithmic. Coefficients can thus be interpreted as the difference in percentual changes.

The results from the regression analyses are shown in Table 3A and Table 3B, which encompass allowed subsidies and payed subsidies respectively. There are two main fields which are going to be explained here. The first one is the adjusted R-squared, which is approximately 21% in Table 3A and 50% in Table 3B. This tells us that the start-ups, which are the dependent variable, are affected by the independent variables to a degree of 21% and 50% respectively.

In order to discern if the independent variables used refute the null hypothesis (that the variables have no effect) we need to move on to view the p-values, which is hence the second field. In order to refute the null hypothesis, these values need to be below 0,05. In

Table 3A. the p-value for allowed subsidies is 0,236 and hence above the specified value. In Table 3B. the p-value for the payed subsidies is 0,083 and thus also above the specified level.

As can be seen from the elaboration above, the probability values do not indicate a relation. We are therefore unable to tie a significant causality relation. The main issue in preventing us from doing so in this matter is that the number of observations is too few. We are observing a total of 9 years, when we need to have approximately 30 years in order to conclude some kind of statistical causation. What this situation tells us nevertheless is that there might be a significant causality relation between these variables, but we are unable to statistically verify it. What can be practically deduced from this is that in the years to come, we might be able to tie a causation between solar subsidies and the successful start-ups for each year. However in accordance with the above discussion, this might take a while. Another issue which arises that might oppose a further regression analysis is the quantity of years during which the solar subsidies will remain. As an industry develops, then naturally there is less and less need for subsidies, either to consumers or producers, in order to promote the industry. Therefore the more the industry is successful, the fewer years there will naturally be in the future to study the effects of its subsidies. This brings us into a bit of a paradox. The hypothetical goal of the aimed regression analysis to be undertaken is quite deductively undermining the possibility for the study per se. Conclusively the results here do not result in giving support for either Coad et al. Or Verheul et al., since the number of years are not enough. The results should therefore be regarded as a Nay on the regression analysis.

2.3 Comparison between counties
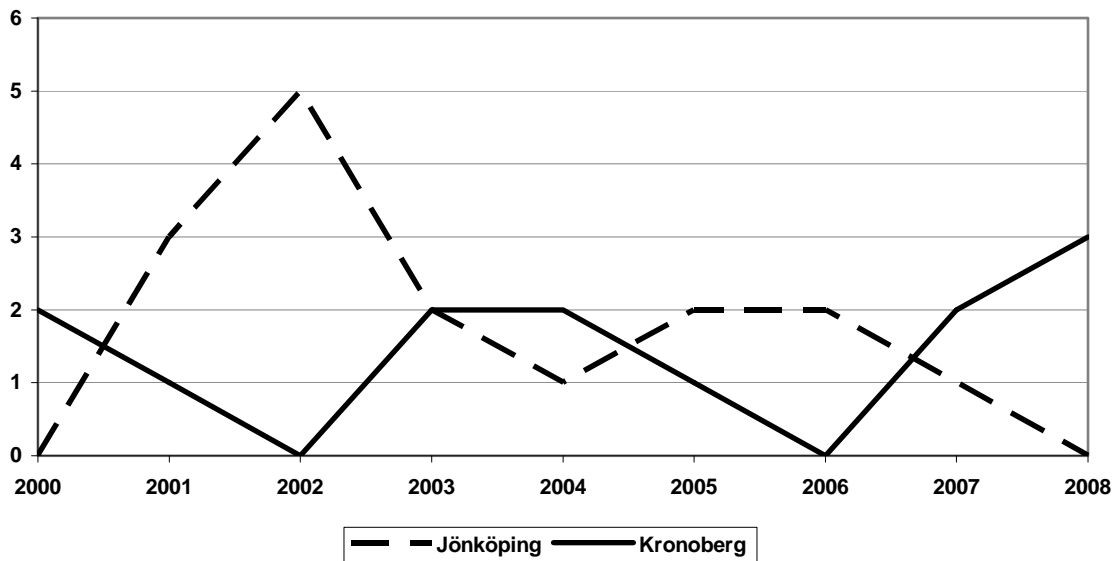
Jönköping and Kronoberg start-ups

Fig. 5. Jönköping and Kronoberg start-ups for each year in absolute numbers.

The graphs in this section depict the start-ups for each county and year during the studied period from 2000 and 2008. The values are not presented on logarithmic scales as the aggregated numbers, due to the fact that there were some years for the counties where the number of start-ups were zero. Using logarithmic values would then have distorted the presentation.

Further in Fig. 5. we can see a graph depicting the counties of Jönköping and Kronoberg. As can be seen from the graph, Jönköping has a majority of its start-ups during the first half of the period, while having less in the second. The start-ups of Kronoberg on the other hand are rather spread out over the entire period.
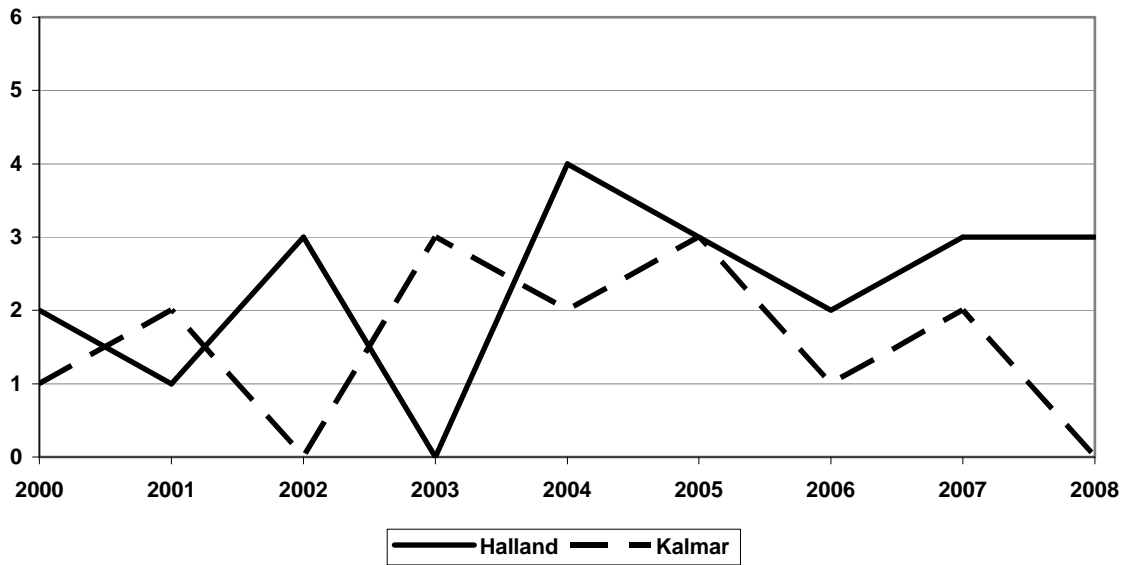
Halland and Kalmar start-ups

Fig. 6. Halland and Kalmar start-ups for each year in absolute numbers.

From Fig. 6. above we can see the start-ups of Halland and Kalmar for each year during the period studied. As can be seen from the graph, Halland has its main level of start-ups from 2004 and onwards. The county had fewer start-ups in the beginning of the period. Kalmar on the other hand can be said to have had its main start-ups during the middle of the period.
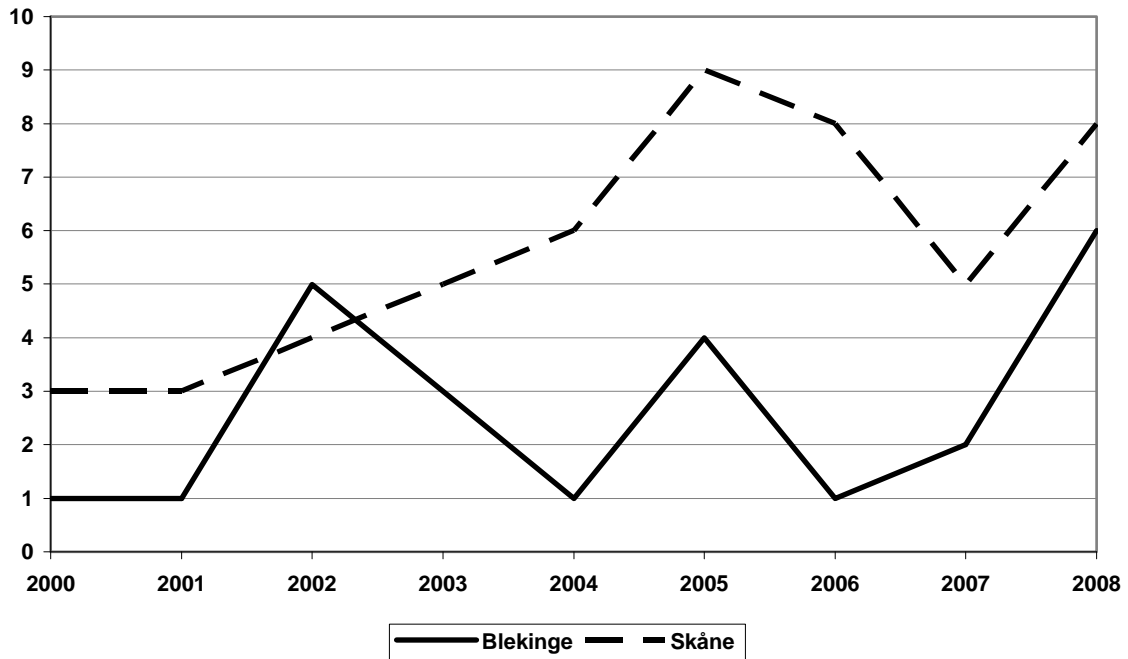
Blekinge and Skåne start-ups

Fig. 7. Blekinge and Skåne start-ups for each year in absolute numbers.

Fig. 7. above depicts the counties of Blekinge and Skåne. As can be seen from the graph, the start-ups of Skåne starts slow and increases to become greater during the second half of the period. The county of Blekinge has its peaks of start-ups during 2002 and 2005, while generally staying low until 2008 when it rises again.
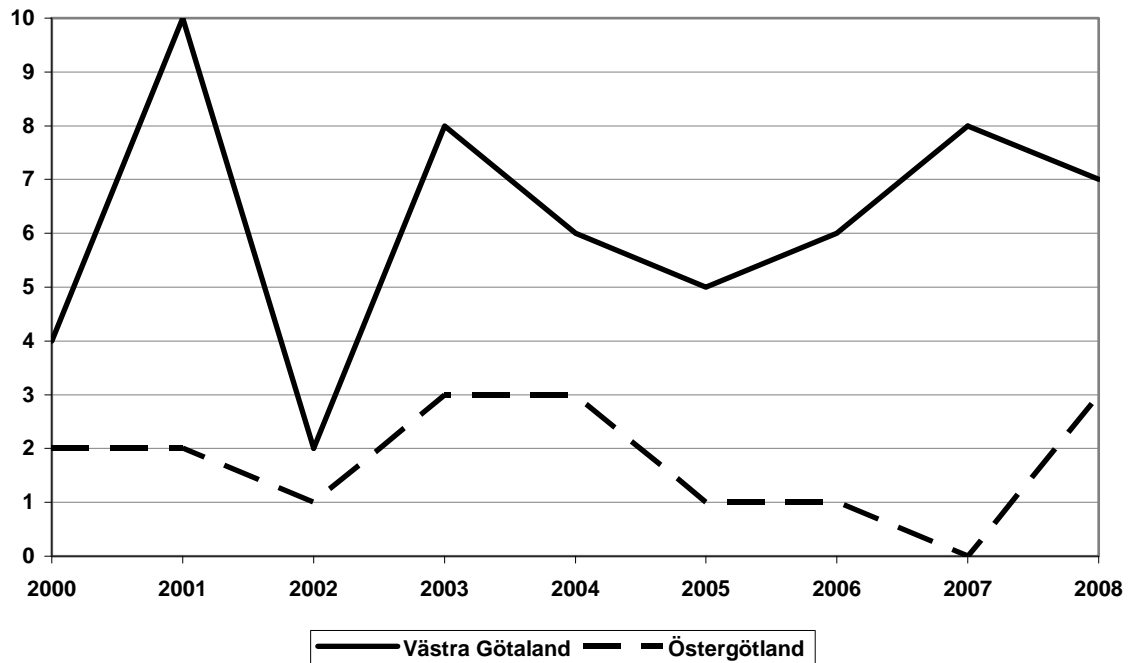
Västra Götaland and Östergötland start-ups

Fig. 8. Västra Götaland and Östergötland start-ups for each year in absolute numbers.

Fig. 8. above depicts the counties of Västra Götaland and Östergötland. The start-ups of Västra Götaland start of strong during 2001, has its inverted peak in 2002, and then continues being relatively high throughout the period studied. Östergötland has generally throughout the entire period a significantly low level of start-ups.

When observing these findings it's important to note that, since the data is presented in absolute numbers and not a logarithmic scale, then an illustration might be somewhat deceiving. Västra Götaland for example has generally a higher number of start-ups for each year than the other counties, but one must then keep in mind that this trivially is because Gothenburg is a larger market. Counties such as Kronoberg for example have naturally smaller markets in which firms can operate, and thus the start-ups in absolute numbers are fewer. Interesting spatial patterns also arise when comparing the counties further. Both Skåne and Halland have few successful start-ups during the first half of the decennia, but increase their success in the latter half. Jönköping and Västra Götaland on the other hand have their peaks in the first half of the decennia, but have a relatively less start-ups during the second half of the period. This holds true especially for the county of Jönköping.

If we are going to compare the results from these counties with the notions from Lundquist et al. in the theory section, it can be said that it looks like there are some

32

similarities between start-ups and the time-lag structure denoted regarding economic transformation and value added growth. The Västra Götaland region/tier seems to have its main number of start-ups in the first half of the period. Skåne which is regarded as a following region/tier to Västra Götaland seems however to have its start-ups in the second half. Hence the results are aligned with the results by Lundquist et al., but it should be very significantly noted that these are primary observations only of such an alignment and should by all means not be regarded as conclusive proof of any sort. In order to make a relationship between these two camps significantly further study is needed and thus the observation regarding this matter needs to be concluded as an observation only. There are many variables which need to be attended for if a comparison between these two camps are to be aligned to a degree of certainty. First of all there is the matter regarding if the dynamics proposed by Lundquist et al. can be transferred to also encompass start-ups per se. There is also the matter, which was discussed earlier, regarding the need for further corroboration of the results. The successful start-ups for each year and county is for example at a maximum of then and it might then be somewhat arbitrary if it can be significantly tied to a theoretical notion. What's important in this study is however also the results per se in order to provide practical information to the county board, and not merely the theoretical aspect. The perspective discussed here is hence backed up by the general nature of the study, which is to attempt to make a more practical approach than research theses in general.
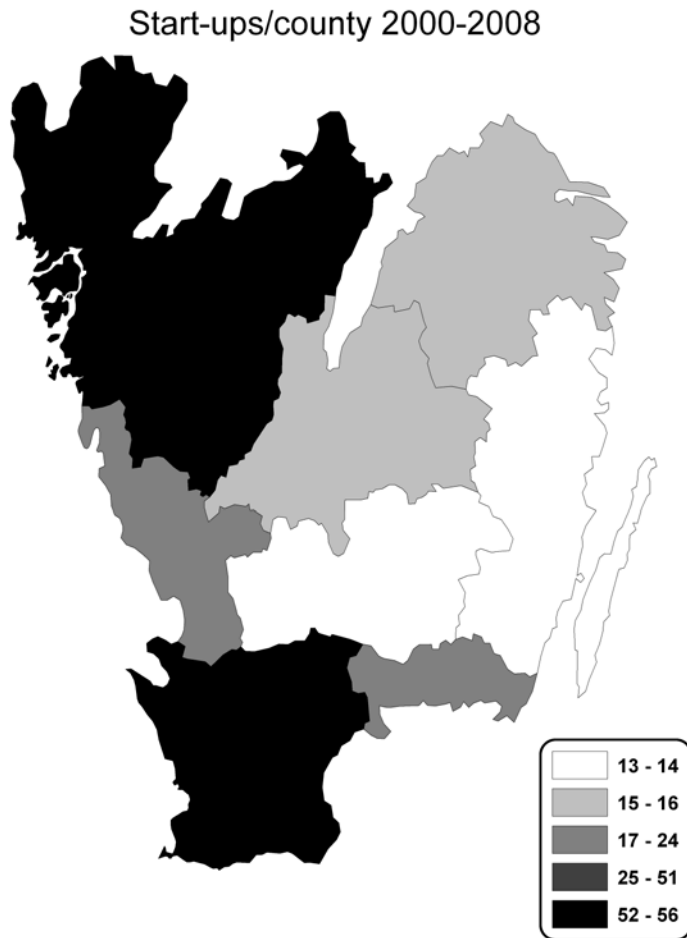
Start-ups/county 2000-2008

Fig. 9. Map of the counties Jönköping, Kronoberg, Östergötland, Kalmar, Blekinge, Skåne, Halland and Västra Götaland depicting number of start-ups in absolute numbers.[33]

Fig 9. above depicts number of start-ups per county during 2000 and onwards to 2008. The map presents the data from these years as aggregated. As can be seen from the map, Skåne and Västra Götaland are the counties which have had the largest number of start-ups. The reader should also be aware of the fact that there are no counties which lie within the 25-51 category. The counties second on the ladder lie within the 17-24 category and they are Halland and Blekinge. On shared fourth place comes Jönköping together with Östergötland. Last on the ladder are Östergötland and Kalmar. As stated in earlier elaborations, the fact that Västra Götaland for example has the highest number of start-ups, does not necessarily mean that this county has been more prosperous regarding successful start-ups during the studied period. The numbers need to be taken into account relative the size of the market. It is the

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[33] The unedited GIS layers for this map have been retrieved from the Swedish Central Bureau of Statistics (SCB). These have thereafter been modified for the usage in this study in conjunction with the gathered data regarding successful firm start-ups.

determination of the author of this study that an increase in start-ups ought to be viewed from a percentual ratio rather than absolute numbers. However since, as addressed earlier, the data in itself makes such an analysis unavailable, this forces us to look at the matter from the perspective conducted here.

Further regarding what can be discerned from the above map is that if we observe the matter from a polarity perspective, we also get confirmation from the data regarding the size of the market of Västra Götaland and Skåne per se. Kalmar, Jönköping, Östergötland and Kronoberg are smaller markets and are therefore naturally characterized by a lesser number of successful start-ups.

If we are going to put these results in a theoretical perspective, it is a good idea to connect back to what Verheul et al. mentioned in the theory section. The message was that service firms are generally attracted to larger markets. This would go in line with that the map is depicting Västra Götaland and Skåne as high level regions, since as noted the absolute majority of the firms being studied were service firms.
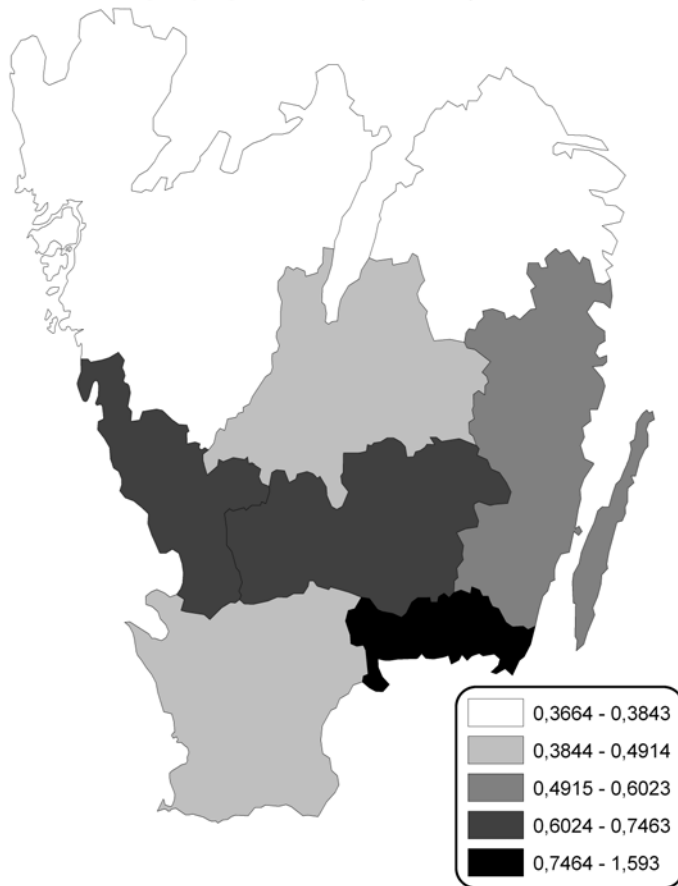
Fig. 10. Map of the counties Jönköping, Kronoberg, Östergötland, Kalmar, Blekinge, Skåne, Halland and Västra Götaland depicting the ratio between start-ups and population.[34]

Fig. 10. above presents the ratio between start-ups and population. As can be seen from the map, when we account for population in the analysis, we get a significantly different result. Västra Götaland now comes in last on the latter. Skåne has a somewhat stronger ratio that Västra Götaland, but also a lot less than before. Jönköping's position among the counties is about the same. After accounting for population, Östergötland on the other hand has a lesser ratio of start-ups than in the previous analysis. Halland, Kronoberg and Kalmar have a significantly higher ratio of start-ups per population than the previous stated larger markets. The county with the highest ratio of start-ups per population was Blekinge, which was significantly above the other counties on this scale. In the light of this perspective, Blekinge

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[34] The unedited GIS layers for this map have been retrieved from the Swedish Central Bureau of Statistics (SCB). These have thereafter been modified for the usage in this study in conjunction with the gathered data regarding successful firm start-ups. The population figures used in the GIS calculation of the start-up/population ratio were gathered in 2005 and are included among the GIS-layers retrieved from SCB.

can therefore be regarded as more successful in comparison to for example Västra Götaland when one accounts for population in the figures.

The results obtained when we make an analysis of ratios seem to somewhat contradict the notions brought forth by Verheul et al. in the theory section, where they stated that service firms are mainly attracted to large markets. If we compare with the first map, the notion seems to fit the data in absolute numbers. However if we calculate the data in ratios normalized by population figures, then we get an entirely different condition. Blekinge isn't generally regarded as a large market and therefore the results, when accounting for ratios instead of absolute numbers, contradicts Verheul et al. Two things should be said about this relationship. First of all the criticism against notion by Verheul et al. should naturally be taken in the light of the perspective. Skåne for example, when counted in absolute numbers, fits well into the notion as attracting service firms. As noted in the previous elaboration this is not the case however when counting in ratios. A peripheral matter which arises regarding this is for example what in general ought to be regarded as a successful region. Is it a region with a large metropolitan area with weaker surroundings or is it having an all over strong set of regions generally? Such a discussion can further be elaborated to cover matters of equality between parts of a specific region. Such a discussion will not be further built upon here, since it will go too much outside the borders of the study. It is however an important thing to keep in mind.

The second thing that one should keep in mind is that even though the results presented in this comparison might be aligned with or against theoretical notions from other authors, there is always the matter of how much these results can be generalizable. The results obtained in this study are based on one comparison. As stated in the chapter regarding sources, the data here regarding the collected companies is based on one selection. It is quite possible that another selection will present a different result. Therefore if the results are to become generalizable, then corroboration might be necessary. This being said there are, as seen in earlier elaborations, quite a few theoretical notions which go aligned with the already presented results.
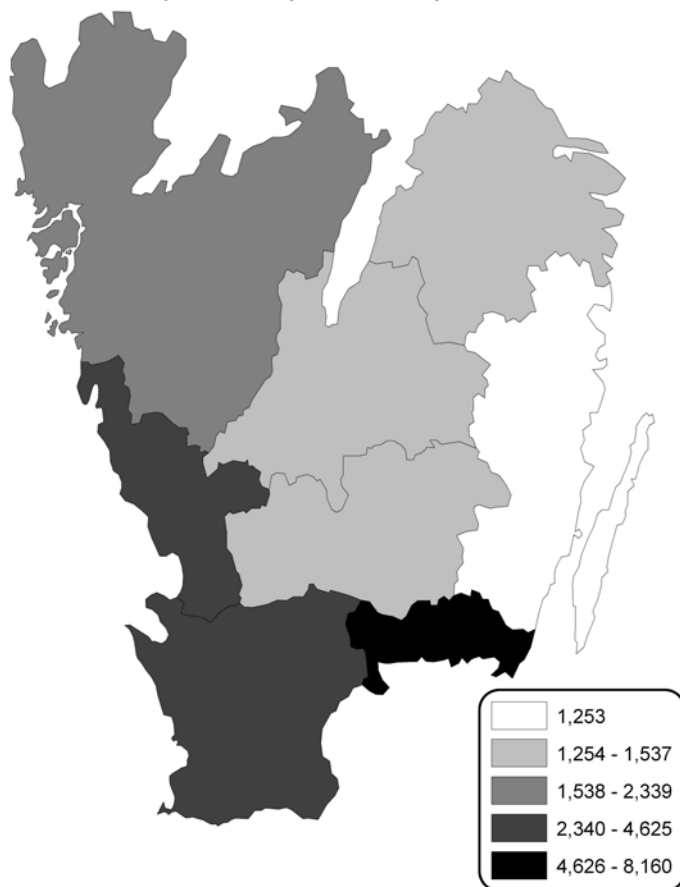
Start-ups/area (1000 km²), 2000-2008

Fig. 11. Map of the counties Jönköping, Kronoberg, Östergötland, Kalmar, Blekinge, Skåne, Halland and Västra Götaland depicting the ratio between start-ups and area in km². [35]

From Fig. 11. we can see that by normalizing the start-ups with area data, we also get a different pattern. In this case Blekinge once again is the county with the highest ratio of start-ups. This hence puts Blekinge as the leader in start-ups both when accounted for population and land area. Second in place come Skåne and Halland, which then can be regarded as rather lucrative in relation to their land area. Västra Götaland has a higher ratio of start-ups when normalizing is done with land area rather than with population; indicating also the peripheral matter that Västra Götaland has a quite high population density. Kronoberg, Jönköping and Östergötland have, like in the prior maps, an average place compared to the other counties. Finally when accounting for land area, Kalmar has the lowest ratio of successful start-ups. All in all, with the exception of Blekinge, it can be said that the larger markets/regional home

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[35] The unedited GIS layers for this map have been retrieved from the Swedish Central Bureau of Statistics (SCB). These have thereafter been modified for the usage in this study in conjunction with the gathered data regarding successful firm start-ups. The area figures used in the GIS calculation of the start-up/area ratio were gathered in 1998 and are included among the GIS-layers retrieved from SCB.

bases have a higher ratio of start-ups when it comes to the land area, but a significantly lower one when population is accounted for. The county of Jönköping has an average place among the other counties when we present the data in absolute numbers, but also when we account for population and land area.

As also noted earlier in the theory section, this study makes an analogy with the notions brought forth by Lundquist et al., namely that Stockholm, Göteborg and the Malmö/Lund regions are regarded as Sweden's main tiers in that order. The only ambiguity when it comes to this situation is however that it can be debatable if the ratio perspective is entirely accurate when it comes to Västra Götaland in conjunction with representing the entire county as one of the main tiers. The reason for this is that the county is fairly large and stretches far beyond the Göteborg per se. Therefore the approach might in a sense be compared to if you would have a large area of wasteland with no population in general, but with one major city complex in the center of it. To then conduct a ratio calculation with the conclusion that the ratio is rather small in comparison with other regions might be somewhat misrepresentative.

2.4 Employment effects

Table 4. The percentual division in employee quantity levels among the gathered 570 firms.

Employee quantity level	Percentage of firms
1-4	40,9
5-9	20,5
10-19	10,2
20-49	4,9
50-99	0,4
100-199	0,4
200-499	0,2
500-999	0,2
Unknown	22,3

Notes: Numbers have been rounded to one decimal.

Table 4. above depicts the division of employee quantity levels among the firms from all of the counties being studied. As can be seen 40,9% of the firms have a number of employees between 1-4, 20,5% of the firms have 5-9 employees and 10,2% have 10-19 employees. Hence an absolute majority of the firms being studied are SMEs. The row in the table presented as 'Unknown' encompasses firms from the sources where no employment figures are shown. Unknown employment figures might then mean one of two things in this aspect.

Trivially it is classified as unknown in the sources if the administrators of the sources themselves have not received any numbers from the firms. The other thing which firms under this category could be is a self-employed individual owning his own firm and with no employees.

This can now be connected to what Stel & Suddle were discussing earlier in the theory section regarding SMEs. The authors stated from their research that it is becoming an ever more clear pattern that SMEs s are responsible for creating most jobs, and that this relationship has also increased per se during the latter years. Since the regression analysis in this study was not sufficient enough to provide a causation we will now, as stated in the method section, align ourselves with alternative explanations and what kind of impact this has on employment. The conclusion made in earlier sections was that the solar heating affected the studied firms in that it diversified them and hence made them better equipped to handle the generic Swedish market. If further, as stated above, the overwhelming majority of firms being benefited from this diversification are SMEs and SMEs are regarded as the most important firms for employment, then this gives us another important perspective on the matter. Instead of the worth of the solar heating industry lying primarily in quantitative proven numbers for added employment (which might still be true per se, even if there weren't enough statistical evidence to support it since there was a strong correlation), its function lies in strengthening the SMEs already present in the environment they are in and thus preventing job losses rather than creating jobs per se. The fact that the majority of the firms now operating within the solar heating industry, due to the allegedly increased demand from subsidies, were established prior to the entrance of the subsidies corroborates this notion.

3. Conclusions

In the beginning of this study we put forth three questions. The first one was what kind of relation there is between subsidies targeted at consumers and successful firm start-ups within the solar heating industry. The second question was whether there are any significant differences between the counties in regards to start-ups. The third and final question was if any employment effects can be derived from the relation between subsidies and start-ups.

The study was carried out by using a case-structured model, where the data was first analyzed with the agenda of finding a possible correlation between solar heating subsidies and successful firm start-ups. The correlation between the pre-determined allowed subsidies and firm start-ups was 0,75 and the correlation between payed subsidies and firm start-ups was 0,86. According to the prerequisites stated earlier this was found to be a strong correlation and was deemed as an Aye on correlation in accordance with the stipulated model. Thereafter a regression analysis was undertaken in order to find a causation. Independent variables used, other than solar heating subsidies, were payroll tax and GDP. The regression analysis was deemed as a Nay, since the solar subsidies have not been in place during enough years in order for a statistically significant result to be reached.

What can be concluded from the analysis so far is that since there is a significant correlation between subsidies and start-ups, then either one is causing the other or both are affected by a third variable. Since we were not able to retain a causation however, this pointed us in the direction of alternative explanations. Note that this does not mean that there isn't a causation. It may or may not be. It simply means that since the years of solar subsidies are not enough, we are not able to prove it.

The conclusion regarding alternative explanations, for the effect of the demand created by subsidies, was that a lot of firms which were already established and operating in other close related fields have chosen to also enter the market of solar heating. In fact an overwhelming majority of the firms were characterized as operating not only within the solar heating industry. A further conclusion drawn was that the integration of the solar heating industry is strengthening already existing firms, since it is making them diversified and thus more able to be successful in relatively rural markets. Hence the main effect of subsidies in this matter lies not in aiding new firms per se, but to strengthen the firms already existing.

Regarding the second question encompassing the relation between different counties it is worthy to note that it is distinct from the first one. The first question was regarding the relation between solar heating subsidies and the counties of southern Sweden

counted as aggregated; thus resulting in a more generic relationship. This second question denotes the mere differences between the studied counties per se. The result from this question, when counting years as aggregated, was depending on ones perspective in the matter. When we looked at absolute numbers, then the large markets/home bases of Skåne and Västra Götaland were on the top of the ladder, followed by Blekinge and Halland. Jönköping and Östergötland had an average position, while Kronoberg and Kalmar had the lowest numbers. When we analyzed the ratio between start-ups and population figures, the results were quite significant. In this case Blekinge had the highest ratio of start-ups per population, followed by Halland and Kronoberg and Kalmar. Jönköping had once again an average position together with Skåne and Västra Götaland and Östergötland had the lowest numbers. We then moved on to look at the ratio between start-ups and land area. In this case Blekinge had once again the highest ratio, and was followed by Skåne, Halland and then Västra Götaland. Jönköping, Kronoberg and Östergötland had an average position and Kalmar had had the lowest ratio. All in all Jönköping seems to have had an average level among the counties, regardless whether if one is counting in absolute numbers or ratios.

When comparing each county for each year, Jönköping had its highest number of start-ups in the beginning of the studied period, which is also true for Västra Götaland. Skåne and Halland have their peaks in start-ups in the second half of the period. Kronoberg, Kalmar, Blekinge and Östergötland have different peaks in the number of start-ups, but do not show as strong patterns as the first four counties.

The answer to the final question regarding employment is based on three key points. First of all it was concluded that the solar heating industry diversified firms so that they would be more prone to success in the southern Swedish market environment. The second point was that most of the firms operating within the solar heating industry were SMEs. The third point, which was derived from Stel & Suddle, was that SMEs are the most important firms in regards to employment. Putting these three key points together, one reaches the conclusion that the employment effect gained from the solar heating industry must be seen in another perspective. Instead of perhaps mainly creating new jobs, it is strengthening the already existing firms and preventing firms from going out of business and in conjunction with this also preventing job losses.

3.1 Theoretical concept

In the endeavour of relating these findings to a theoretical concept, it can be said that the results first of all are tied to the modified notion of Porter, stipulated in the theory section. Porter concluded that firms need to be specialized in order to compete. The author of this study modified the notion by stating that such a conclusion makes the assumption that the market is in a sense endless. The conclusion further made was that the reverse relationship, namely that firms operating in small markets benefit from being diversified. This hence holds true for the results regarding the firms analyzed in this study.

Coad et al. brought forth that subsidies for environmental products targeted at consumers earlier have been followed by an increase or decrease in purchases. Such a notion goes in line, or rather does not conflict, with the results from the correlation analysis conducted in this study, even though a causation could not be determined.

When it comes to the comparison between counties, there are some preliminary findings which suggest that firm start-ups follow roughly a pattern similar to the notion regarding dynamics brought forth by Lundquist et al. regarding value added growth and employment effects. The number of firms for each year and county in this study are however too few to determine any strong relationship in this matter.

Verheul et al. stated earlier in the theory section that service firms mainly are attracted to large regions. In conjunction with regarding Skåne and Västra Götaland as main tiers, as in the modified notion by Lundquist et al., it can be said that this holds true if we count in absolute numbers. However if we count in ratios of start-ups per population or land area, we do not find such results.

Finally, the notion of Stel & Suddle aided in providing alternative explanations for the employment effects from the solar heating industry and subsidies, as was elaborated on in the previous section.

3.2 Further research

This study has performed an analysis encompassing firms established in the counties of southern Sweden. Further research in order to corroborate the findings made here ought to naturally be done encompassing counties in other parts of Sweden. Naturally it would also be beneficial to conduct a future regression analysis when the solar heating subsidies have been in place for more years, in order to determine a distinct causation. As stated earlier however, this is dependent on whether the subsidies will still be in place in the future. Since subsidies

generally are directed towards needing industries, the very success of the subsidies might hinder a quantifiable analysis, resulting in an ironic paradox.

We also have the issue regarding an international comparison of the solar heating industry. Trivially there is not the same demand for solar heating units in significantly warmer countries. An interesting research topic would then be to analyze the effect between countries from solar heating subsidies in regards to differences in climate.

4. Sources and literature

Literature

Bidrag till installation av solvärmeanläggning, Boverket 2010

Coad, Alex, de Haan, Peter, Woesdorfer, Julia Sophie, *Consumer support for environmental policies: An application to purchases of green cars*, 2009

Ett fortsatt solvärmestöd, Boverket 2006

Feinstein, Charles H. & Thomas, Mark, *Making history count*, Cambridge 2002

Hisrich, Robert D., Peters, Michael P. & Shepherd, Dean A., *Entrepreneurship*, 2008

Lundquist, Karl-Johan, Olander, Lars-Olof, Svensson Henning, Martin, *Creative destruction and economic welfare in Swedish regions: Spatial dimensions of structural change, growth and employment*, 2008

Porter, Michael E., *Competitive Advantage – Creating and Sustaining Superior Performance*, 1985

Smallbone, David & Wyer, Peter, "Growth and development in the small business", *Enterprise and Small Business. Principles, Practice and Policy*, ed. S. Carter & D. Jones-Evans, 2006

Smith, Adam, *The Wealth of Nations*, 1776, Book I, Chapter 3

Solar-power subsidies spur growth, Petroleum Economist, January 2010

Solceller - Informationsbroschyr om att producera el med hjälp av solceller, Energimyndigheten 2009

Solklart - solvärme!, Energimyndigheten 2009

Van Stel, André & Suddle, Kashifa, *The impact of new firm formation on regional development in the Netherlands*, 2007

Verheul, Ingrid, Carree, Martin & Santarelli, Enrico, *Regional Opportunities and Policy Initiatives for New Venture Creation*, 2009

Sources

Ekonomifakta - Arbetsgivaravgift, http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Arbetsgivaravgift/?from365=2000&to365=2008, 30/5-2010

Bidrag till installation av solvärmeanläggning, Boverket 2010

BNP från användningssidan (ENS95), försörjningsbalans, fasta priser referensår 2008, mnkr efter användning och tid, Statistiska centralbyrån (SCB)

Energicentrum A6, www.energicentrum.se, 8/2-2010

One to One AB, www.121.nu, 2/8-2010

SCBs Geoskikt, Statistiska centralbyrån (SCB), http://www.gis.scb.se/, 30/5-2010

Images

http://www.gogreenplumbing.co.uk/solar-heating.php 16/3-2010

Other remarks

In quantitative studies conducted in the English language, it is generally customary to separate integers and decimals with a point. In this study however, commas are used as separators. The reason for not applying a different conduct in this matter is based on local software issues where software editions in Swedish handle data somewhat differently. In order to be consistent however, the same conduct has been applied throughout the study.

In this chapter some material is presented both under sources and literature as well. This is because the same material has been used in both ways.

Further two different formats occur in the footnotes and the literature list. The first one denotes months as written (where available), followed by the year. The second

format is denoted as Date/Month-Year in numbers. The latter format is used for internet sources and denotes when the information was retrieved. The prior format denotes the time of the publishing of the material in a standard Oxford customary conduct.