

Bachelor Thesis

Examining a new packing method in order to solve inefficiency in the production process:

The effects and opinions analysed for franchise organisation Tulpen.nl.



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Abstract: This research paper looks at the inefficiency that exists in the production process of franchise organisation Tulpen.nl. Until now, tulips are packed both at the associated firm and at the packing company. This paper examines the effects of- and the opinions on investing in a new way of packing the tulips. The effects of this new packing method on the costs of the firm are analysed using difference-in-differences and show a substantial decrease in the total costs of the firm. An experiment is set up for later research to get rid of possible selection bias. The opinions of the members of the franchise organisation are measured with a survey and analysed using the Mann-Whitney U test. Opinions on investing in this new packing method are positive. Big firms seem more positive about this than small firms; however, this outcome lacks significance.

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Background information

Holland is known for many years for its progressive and leading horticulture. Dutch vegetables and flowers are exported across the world and guarantee a certain quality. In order to remain leading in a changing and developing world, the need of being efficient and innovative is high. Rapid growth of the greenhouse industry in developing countries with low costs and wages make that Dutch growers need to think about ways of reducing costs and increasing productivity. In the Dutch market for tulips some major developments took place at the supply side over the last few years. One of those developments is the foundation of 'Tulpen.nl', a franchise organisation formed by 9 tulip growers who want to cooperate and add value to the core business of growing tulips. Together they own almost 10% of the Dutch market for tulips and they have a specific production strategy (Tulpen.nl, 2013).

However, the formula of Tulpen.nl is not like the normal franchise formula. In a normal franchise organisation, e.g. McDonalds, the franchisor provides the franchisee with the products that need to be sold. For Tulpen.nl, it is the case that the franchisees provide the franchisor with their tulips which the franchisor tries to sell on the market for tulips. This difference is important, because the franchisor has a bigger voice in selling the product than all the separate franchisees. The idea is to be able to have, to some extent, a say in the pricing process. In a perfect competition like the market for tulips, with powerful supermarkets on the demand side, it may be clear that this is not easy. In the literature, this type of organisation is more often called a cooperative instead of a franchise organisation. This because Tulpen.nl tries to seek for the optimal amount of member and tries to maximize profits for all those members. In fact a cooperative is only interested in the well-being of their associate members, and this applies very well for Tulpen.nl (Paroush & Kahana, 1980). However, Tulpen.nl states itself as a franchise organisation, so this paper will stick to this naming.

In the production process, every grower separately grows their agreed types of tulips. So, for example, franchisee 1 grows tulip type A and franchisee 2 grows tulip type B etc. After the tulips are harvested, they need to be sorted and packed. This is also done by each firm itself on their assembly line, where the tulips end up in bundles of 50 flowers. Those bundles are put in a bucket. 5 bundles fit in a bucket.

The next step is getting the tulips from every associate firm to a central packing company, which is part of the 'Tulpen.nl' chain. Here, three activities are carried out. First of all, the package paper is removed by the employees of the packing centre. After this, the tulips are sorted and packed again on an assembly line, where all the different types of tulips end up in bundles packed in the foil which meets the customers' needs. The last step is mixing these bundles of different types of flowers into the bucket. After this, the tulips are ready to stand in the supermarket shelves. For clarity, the above process is graphically described in appendix 1.

By mixing different types of tulips, the franchise organisation can respond to changes in demand. The aim of this organisation is to distinguish from other firms in the fields of reliability, quality and flexibility. In this way, value is added to the product which ideally results in a higher price for the growers (Tulpen.nl, 2013).

Research question

An inefficiency of this process of bringing the tulips to a central packing company is that the action of packing the tulips is done twice. This inefficiency can be seen as the excess inputs that are needed to achieve a certain amount of output (Pang & Herrera, 2005). First, all the separate growers bundle their tulips at their own firm. Then, the packing company removes the package paper and the sorting and packing is done again. In the production process of Tulpen.nl, the first step would not be necessary. Working more efficient could mean two things. Either the output could be increased by keeping input constant, or the inputs could be decreased by keeping output constant (Pang & Herrera, 2005). Until now, the tulips are made 'auction-ready', which means that the flowers are ready to go to the flower-auction. But in the concept of Tulpen.nl, the flowers are not going to the auction anymore. This means that the flowers do not need to be 'auction-ready' anymore. It would be better if they were 'production-ready', meaning that they can be processed at the packing company right away, without having to remove the packing paper (Tulpen.nl, 2013).

The reason why the separate growers already pack their tulips at their own firm is because it protects the tulips during the transport from firm to packing company. Also, this is the way it is done for many years. The concept of Tulpen.nl is new in the field of horticulture and

therefore, there is not thought about such inefficiencies yet. This makes it important to start thinking about this. Not only for Tulpen.nl, but also for future horticultural organisations that are similar to Tulpen.nl. A pilot carried out at one of the associated franchisees shows that there are considerable cost-saving possibilities by implementing a new way of packing.

Another important part in this is that in order to overcome this inefficiency, a new packing method needs to be developed. This brings forth an investment that needs to be financed by Tulpen.nl and thus the associate growers. Before making decisions, it is important that a new packing method is supported by the people that need to work with it. The support for this new packing method is measured by asking for the opinion of all the associate growers in a survey. This survey showed that there is major support for the new method, with unexpected, insignificant differences between small and big firms.

This paper is about setting up an experiment and running a pilot in order to investigate the support for a change in packing method and the effects on the costs of this change. This is done by asking the following question;

What are the effects of a change in packing method on the costs of production and to what extent is this change supported by the Tulpen.nl franchisees?

In the next section, some important concepts will be described. This Theoretical framework will clarify some methods and concepts that will be used in this paper. After that, the related literature and the research hypotheses that follow from the literature will be discussed. Next, a look will be taken on what data will be collected and where this will be done. This will be followed by the methodology section, which describes the way of doing research with the data. The results section will be next, before moving on to the conclusions and recommendations. Lastly, references and appendices will be part of the paper.

Theoretical framework

The fact that the packing company removes the wrapping paper before they can pack the product would suggest inefficiency. By making the tulips 'Production-ready' in an earlier stage of the production process, multiple costs are likely to be saved. To make things more clear, multiple important concepts will be defined in this section.

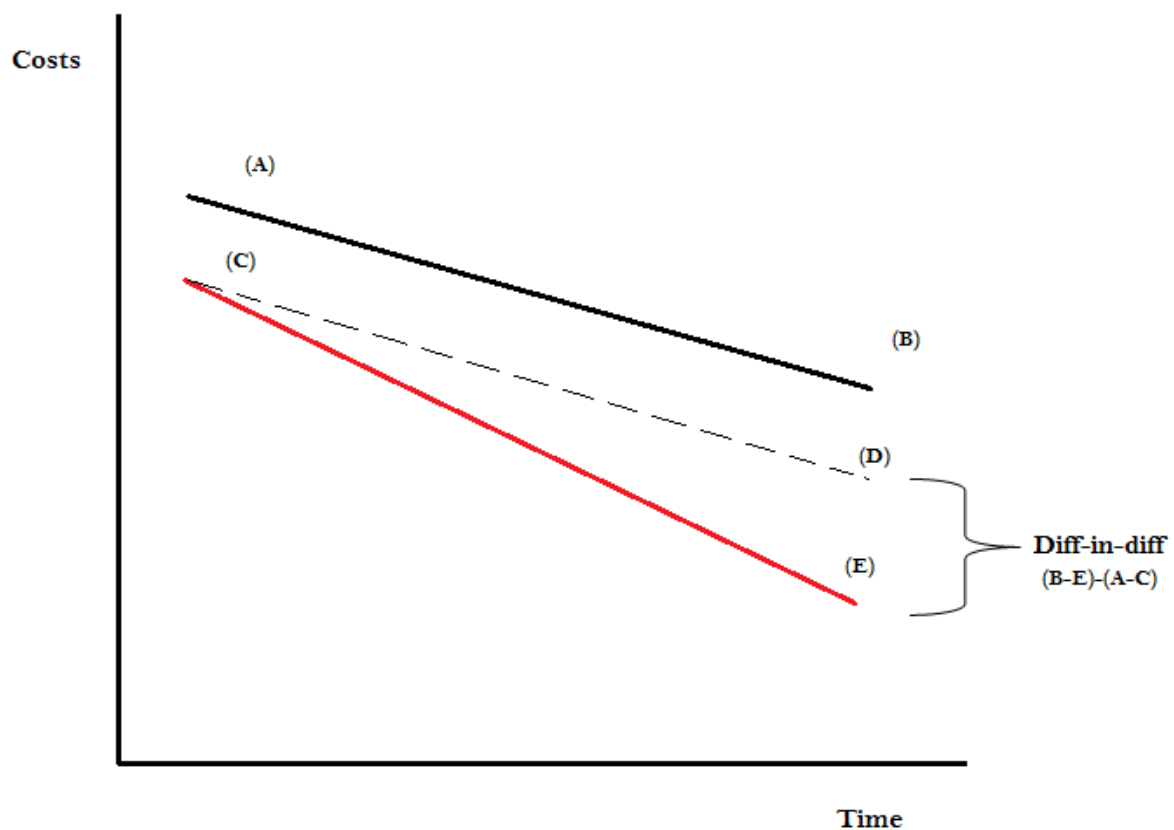
Difference-in-differences

This paper tries to demonstrate a causal effect of a change in packing method on the costs of a firm. By looking at one firm before and after it implements the new method, the only things that can be observed are the costs of the firm in period 1 without the new packing method and in period 2 with the new packing method. By comparing the firm's behaviour in the two periods, the experiment gets biased because the circumstances in both periods are not the same. Ideally, this research would like to observe the firm in the first period had he packed his products via the new method and in the second period had he not packed his products via the new method. In that case, a treatment and control group could be composed. The treatment group would consist out of the firm in period 1 without implementation and in period 2 with implementation. The control group would then consist out of the firm in period 1 without implementation and in period 2 without implementation. Ideally, the costs when implementing the new method would be compared with the costs when not implementing the new method at the same firm. However, a firm, or a person, cannot be observed in both the treatment and the control group. This is not possible, as he can only be observed once each period. This means that the treatment effect for a firm cannot be measured at one particular moment in time, because selection bias arises when there is no control group.

One way to overcome this selection bias would be finding a control group that is, to a large extent, similar to the treatment group. In this research, finding another Tulpen.nl franchisee that works with the same tulips and is of equal size would be a good match with the pilot firm. This firm could be used as the control group, without implementation of the new packing method in period 2. The pilot firm is the treatment group, with implementation of the new method in period 2. When using data from both firms on costs, changes that occur to the treatment group can be compared with changes in the control group (Hill, Griffiths, & Lim, 2012).

In the picture below, it is to see that the effect of the treatment can be isolated by using a control group that is not affected by this treatment. The line CE stands for a possible decline in costs of the pilot firm. Without further research, this would be suggested as the effect of the change in packing method. However, the line AB stands for a possible decline (however, an increase could be possible as well) in the costs of the control group. These are time-

specific effects. Assuming that this change in costs would be the same for the treatment group, because they are very similar firms, would result in the line CD. Now it is to see that the treatment effect is the difference between D and E. If the costs of the pilot firm would be compared before and after the implementation, without looking at the control group, this would have resulted in biased conclusions. This treatment effect can be calculated with the following equation; $(B-E)-(A-C)$ (Hill, Griffiths, & Lim, 2012).



Change in packing method

In order to overcome the inefficiency of packing the tulips twice, a new packing method needs to be developed. This packing method would have to result in packing the tulips only once. This means that the tulips have to be transported from firm to packing company not being wrapped in packing paper anymore. In order to develop a new packing method for this new situation, research needs to be done on the method that would be ideal. Because that research is not yet put into practice, the pilot will be carried out with material that makes it possible to transport the tulips from firm to packing company in a save, unwrapped way. Although this packing method will not be the ideal method, it gives a good view on

what the new situation would look like. Also, it comes close to what Tulpen.nl thinks the new packing material should look like.

Costs of production can be divided into different sub-costs. First of all, the costs of labour. This consists out of the wage that the people who work along the assembly line earn. A look can be taken on both the labour costs at the grower's firm and at the packing company. Also, material costs could be observed. If a new packing method is found in which the use of paper is reduced, it could save money during a tulip season. Third, transport costs. The tulips are transported from grower to packing company by truck. In the current situation, a fixed amount of tulips can be transported by one truck. In the new situation, this number can be higher or lower. This creates an increase or decrease in transport costs, as a truck needs to drive more or less times between grower and packing company. Furthermore, in the current situation, the buckets which are used to put in 5 bundles of tulips need to be hired from the flower auction. In the new situation, this might not be necessary anymore. However, in the new situation, an investment in new package material needs to be made, so the net effect of this needs to be investigated. These are all the costs that are referred to as costs of production. Although costs are likely to be saved, there must be attention on the protection of the tulips during the transport to the packing company. It is essential that this protection is at the same level as before. So this needs to be taken into account when developing a new packing method.

Support for the new method

By investing more in the concept of Tulpen.nl, the cooperation of a grower with the organisation will be intensified. This makes it harder for a grower to leave the franchise organisation. This is because of the fact that working with a possible new packing method can be efficient within the cooperation with Tulpen.nl, but this does not have to be the case outside the franchise organisation. If Tulpen.nl is the first organisation that works with this new way of packing, leaving the franchise would mean that this way of packing cannot be used anymore because other buyers will not accept it. Therefore, it is important to investigate the support for a new packing method among the franchisees before it is implemented.

Related literature and research hypotheses

In this section, the related literature will be discussed. This literature led to some expectations, on which the hypotheses are based. After doing the research, this paper will judge about the hypotheses. This helps answering the main research question.

Hypothesis 1: Labour and material costs will decrease in the new situation

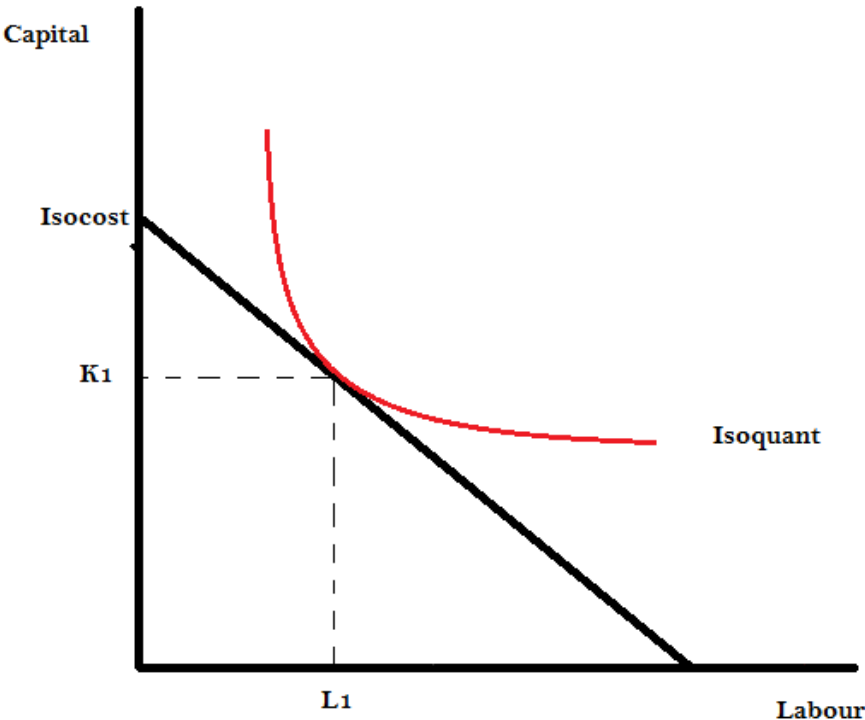
The situation discussed in the previous section described a possible inefficiency in the production process of the franchise organisation. By developing a new packing method, this inefficiency is likely to disappear. This hypothesis is based on the expectations that could be derived from the cost-minimization model which will be described here.

A firm uses capital and labour in the production process. In the long run, the amounts of capital and labour are not fixed. Therefore, a firm will move towards the most efficient production process over time. To model this situation, isoquants and isocosts are used to describe the possible combinations of capital and labour that produce the same level of output or entail the same costs. The isoquant describes the production function and shows the combinations of capital and labour that could be used to produce a certain level of output (Borjas, 2013). The production function of Tulpen.nl is a Cobb-Douglas production function which has the form of $Q = K^\alpha (mL)^\beta$. In this function, K stands for capital and L stands for labour. 'm' stands for the effectiveness of Labour which is determined by technological developments.

The isocost focuses on the costs of production. It shows different combinations of labour and capital which have equal costs. The isocost curve has the following form: $C = rK + wL$ (Frank, 2010). In this function, r stands for the price of capital, w is the wage and K and L stand for capital and labour respectively.

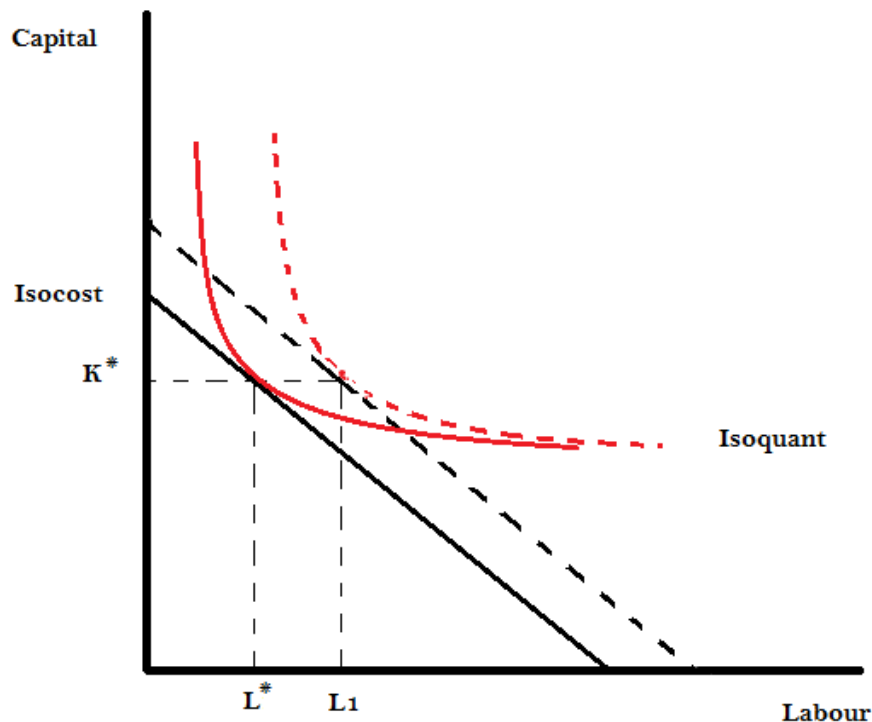
With these two functions, a firm's minimal costs for a certain level of output can be determined. In the case of Tulpen.nl, labour describes the amount of hours that employees work at the assembly line to process the tulips. Capital, describes the amount of assembly lines that are used at the firm and the packing company. The discussed inefficiency described the facts that the action of packing the tulips is done twice. At this moment,

packing the tulips twice is the only possibility, as there is no alternative. The situation is outlined in the graph below;



In this graph, the isoquant is sketched with a flat tail. This implies that a lot of labour is needed to reduce a little capital in order to keep the production constant. This is done because the assembly lines are an irreplaceable part of the production process. Also, the inefficiency focuses on labour and not so much on the amount of capital.

By investing in a new packing method, the production function that Tulpen.nl has is likely to change. As the tulips only have to be packed once, the term 'm' in the production function will increase. This is because labour becomes more effective, as the people who pack the tulips at the firm add more value to the product than before. This would imply that the isoquant will shift to the left, because for every combination of C and L, less labour is needed to produce the same amount of output as before. This would also mean that the isocost function can make a downward shift, as less labour costs need to be made to produce this output. The new situation is shown in the graph below, together with the old situation (dotted lines).



So, in the case of Tulpen.nl, the investment in the new packing method is expected to lead to a new production function with a lower amount of labour needed. Therefore, it is to say that labour costs will decrease, which results in hypothesis 1. Capital, however, is likely to stay at its old level, as the amount of assembly lines do not necessarily need to change.

However, in these graphs and production function, only labour and capital are included. This method does not look at other costs such as transport and material costs, so no conclusions can be derived from only looking at this model.

Thereby, material costs are likely to decrease as well. Less material is likely to be used, as the firm no longer has to pack their tulips. This saves money that is normally spent on packing paper. Therefore, material costs are likely to decrease in the new situation. These two expectations result in hypothesis 1.

Hypothesis 2: Transport costs will increase in the new situation

The old packing method was a very effective way to transport the tulips. The buckets and trolleys are made in a way so that the highest possible amount of flowers can be transported

in a truck. In the new situation, it is likely that they cannot transport as much tulips in one truck compared to the situation before. This because a change in packing method would normally be impossible to result in the same effective situation as before. Therefore, it is likely that transport costs will increase.

If the first and the second hypothesis are both true, it is the question whether the decrease in labour and material costs dominates the increase in transport costs. The answer to this question will lead to the answers of the research question.

Hypothesis 3: Small firms are more positive about investing in the new packing method compared to big firms

As a franchise organisation, multiple firms are part of the concept of Tulpen.nl. These different firms are of different sizes. Therefore, they are likely to behave differently as well. The third hypothesis is based on some expectations that follow from discussing firm size effects.

When comparing big firms with small firms there can be looked at a great variety of components. This paper will focus on two important ones; bargaining power and innovativeness. In general, bigger firms have more bargaining power than small firms. When negotiating with suppliers or customers, the size of a firm plays a big role in the position that it has in the bargaining process (Gale, 1972). For example, from the point of view of a supplier, a relatively big firm is way more important for his turnover than a relatively small firm. Therefore, a bigger firm has more to say in the determination of the prize compared to a smaller firm.

When big and small firms decide to join a franchise organisation, the organisation does the bargaining instead of the firms themselves. When it comes to bargaining power, both firms benefit from joining the franchise organisation because the total franchise has more bargaining power than all the individual firms (Michael, 2000). However, the smaller firms benefit relatively more than the bigger firms. This because a big firm might be able to negotiate for a good price himself, where the smaller firm has the need to cooperate in order to come to a good price.

When it comes to innovativeness, bigger firms are expected to be more innovative and progressive compared to smaller firms (The economist, 2011). This could be because of the advantage in volume. When a relatively big firm invests a lot of money in R&D, it is more likely to profit from it because of its great amount of output. This is harder for a small firm, as the production that needs to pay back the investment is way smaller. In general, it is the case that the bigger the size of the firm, the higher the investments in R&D (The economist, 2011).

At the moment that a relatively big and small firm join a franchise organisation, the R&D will be done by the franchise instead of the individual firms. It is not sure that both the big and the small firm would benefit from this. Although more money can be invested in R&D, as more firms are involved, the eventual idea that comes from R&D needs to be shared with all the associated firms. For a small firm, this is not likely to be a problem, as they would feel that sharing an idea is better than no idea at all. For a big firm however, this could be a problem, as they could have alternatively invested in their own idea which would not need to be shared with other firms. This is important, as the firms who adopt cost-saving innovations ahead of the competition are the ones that really profit from it (Frank, 2010).

In the case of Tulpen.nl, an investment in developing a new packing method means an intensification of the franchise with its associate growers. From the first component, bargaining power, it follows that however both firms benefit from collaborating, the relatively smaller firm is expected to benefit more from it. As it becomes harder to leave after investing in the new method, it is important to know that both firms, at least to a small extend, benefit from being within the franchise as it comes to bargaining power.

The second component, however, tells us that it is doubtful whether big firms are happy with an intensification of the cooperation with other growers. As they need to share innovations with other firms, big firms are expected to be less positive about an intensification compared to smaller firms.

The above expectations result in hypothesis 3; Small firms are more positive about investing in the new packing method compared to big firms. In order to be able to say something about this hypothesis, a survey will be conducted among all the associated firms of which the outcomes will be discussed in the 'results' section.

Data

In order to judge about the hypotheses and to answer the research question, a comparison between the current method and the new method needs to be made and the support for the new packing method needs to be measured. These two parts will be discussed separately. Next to this, an experiment will be set up.

The first part consists out of running a pilot. Therefore, data on labour-, material-, transport- and hiring costs needs to be collected and analyzed. This data cannot be found on the internet, so good contact with the franchise organisation is essential. An advantage is that this research contributes to the goals of the organisation, they are willing to solve this inefficiency. A disadvantage is that existing data might be scarce in the field of horticulture, but data on costs is likely to be available.

The second part consists out of setting up a field experiment which can be carried out in the next tulip season.

The third part will be measuring the support of the associate growers for the new packing method. A survey will be carried out among the 9 involved franchisees.

The pilot

First of all, a pilot will be carried out at one of the associated firms. This is done in order to get a first view on the costs which are made in the new situation. However, in scientific research, one cannot speak of a causal effect when comparing a situation before and after the implementation of a new policy because there will be selection bias. Not only because two different moments in time are compared, which could indicate time-specific effects, but also because results would be based on the outcomes at one particular firm. No firm is the same, so the effects at one firm cannot be generalised over multiple firms. Therefore, a difference-in-differences analysis (Diff-in-diff) will be carried out. Data on the costs of one other firm will be collected in the two periods of the pilot.

Although the pilot at one firm is not enough say something about a causal effect of the implementation of a new packing method, it does give some insights in the costs involved with a change in method. Another reason for carrying out the pilot is a more practical one. A big research among the 9 associated firms cannot be carried out in the short amount of time that is available for writing this paper. Next to this, at this moment of time, the tulip-season

goes towards its end. Only a few growers are still in business at this moment, which makes it impossible, for now, to investigate the situation at all the associated firms.

The firm at which the pilot will be carried out is the firm 'Wesselman Flowers' in Roelofarendsveen in South-Holland. At this firm, there will be looked at the labour costs, material costs, transport costs and hiring costs before and after the implementation of the new packing method. Next to this firm, the firm 'Tulip nursery Woutersen' will be used as the control firm in the diff-in-diff analyses. At this firm, there will be, again, looked at the labour, material, transport and hiring costs, in both periods without implementation of the new packing method.

The field experiment

In the pilot that will be carried out, there will be looked at the costs of a firm at two moments in time. However, the period in which this pilot is run cannot speak for the rest of the season. Maybe the costs in general are higher later in the season, this is not known. Also, it is not legitimate to generalize the effects at one firm for all the associated firms. Maybe there are differences in costs for large and small firms. No firm is the same, so conclusions based on the outcomes of one firm will not lead to reliable outcomes.

This research sticks to constructing the bigger experiment, it will not be carried out in this case. However, thinking about ways to overcome particular problems that arise when running the pilot, such as selection bias and changes in behaviour might be very instructive as well. Further research could be based on the experiment constructed in this paper.

The support for the new method

As it is explained before, it is crucial for a franchise organisation as Tulpen.nl that the associate growers stand behind a change in strategy. Therefore, the general opinion of the growers needs to be found. Even if costs are likely to be reduced with implementing the new packing method, it could still be the case that growers do not support the implementation. A reason for this refusal could lay in the fact that implementation brings forth an investment which intensifies the cooperation of a grower with Tulpen.nl. As more money is involved, this mitigates the independence and flexibility of this grower. It could be the case that a grower is not willing to give up this independence. A good way to observe and analyze the opinion of associated firms is to conduct a survey in which the owners of the 9 firm are asked to give their opinion on the topic concerned. These firms will be divided in two

groups, a group which will be considered as big firms and a group that will be considered as small firms. In this way, a comparison can be made of the way small and big firms think about investing in the new way of packing.

The answers that will be given in the survey will result in ordinal data. This is because of the fact that the franchisees, who will fill in the survey, have to give their opinion on ordinal variables on a 1 to 5 scale, ranked from 'don't agree with the statement' to 'totally agree with the statement'. The division of small and big firms will be at 12.000.000 tulips per year. Firms who produce more will be referred to as a big firm and firms who produce less will be referred to as small firms. The number 12.000.000 is chosen because growing more tulips needs certain investments in order to expand, such as extra assembly lines and cooling cells.

Methodology

The methodology will be discussed based on the same three parts as the 'data' section above. The way of setting up the pilot will be discussed. After this, the way of setting up the field experiment will be discussed, before moving on to the way of measuring the support for the new packing method.

The pilot

1. The treatment group

A diff-in-diff analysis will be carried out with one firm being the treatment group and another firm being the control group. The idea is to analyze data at the pilot firm from before the implementation and compare it with the data which will be collected after the implementation. The focus will be on the costs of labour, material and transport. This will be done by framing these costs as costs per 1000 tulips. This gives a clear view of the situation and makes it easier to make a comparison. The pilot is run in the first week of June. The situation before the implementation of the new packing method is observed on Monday the first of June. On Tuesday the second, the new packing method has been implemented and after a few days, on Friday the fifth, the situation is observed again. Several factors need to be observed in order to determine the costs concerned. The following things need to be observed;

1. The production per hour, measured in the amount of tulips being processed at the assembly line. ((= 60 minutes * 1000 tulips)/ 4.(the time that is needed to process 1000 tulips))
2. The amount of employers standing along the assembly line
3. The wage that one employee earn per hour
4. The time that is needed to process 1000 tulips, measured in minutes
5. The amount of packing paper needed, measured in paper per day
6. The price of packing paper
7. The amount of tulips that fit in one truck
8. The costs of letting a truck ride from firm to packing centre , measured in price per truck
9. The price to hire a certain amount of buckets and trolleys from the flower auction

With these observations, the costs of labour, material and transport can be calculated. First of all, the wage that a person standing at the assembly line earns (3.) will be multiplied by the amount of employers (2.) , and then divided by the amount of tulips that run over the assembly line at a given hour (1.). This results in the total labour costs at the firm and this is stated as C_{LF} .

Then, the amount of packing paper that is used (5.) will be multiplied by the price of the paper (6.). These costs of material that are made at the firm will be stated as C_M .

Next, the transportation costs will be calculated by dividing the costs of letting one truck drive from firm to packing centre (8.) by the amount of tulips that fit in one truck (7.) By doing this, the transport costs per tulip are known, which are stated as C_T .

Lastly, the bundles of tulips are put into buckets. These buckets need to be hired from the flower auction. By knowing the price for hiring those buckets and trolleys(9.), the hiring costs at a given day can be calculated, this will be stated as C_H .

The labour, material and transport costs, together with the hiring of the buckets on Monday could be compared with the new situation after the implementation of the new packing method on Friday. The new situation still has labour, material and transport costs which need to be observed and analysed. This needs to be done together with analyzing the investment that needs to be made. In order to analyze the costs that are made after the

implementation of the new packing method, some extra factors need to be observed, next to the previous factors 1 to 9;

10. The price of one new packing unit
11. The amortization time of the new packing material, measured in days
12. How many tulips fit into one new packing unit
13. How many new packing units fit into one truck

With these observations, the concerned costs after implementation can be calculated. Again, the labour costs can be determined by multiplying (3.) by (2.) and subsequently dividing this by (2.). This results, again, in C_{LF} .

The material costs can be calculated by dividing the price of one new packing unit (10.) by the amortization time (11.). This can result in the price of the new packing material per day, C_M

The transportation costs can be calculated by dividing the costs of letting a truck ride (8.) by the amount of new packing units that fit into a truck (13.). Dividing this with the amount of tulips that fit into a new packing unit (12.) results in the transport costs per tulip, C_T .

These are the costs that are made at the involved firm, but the packing company has labour costs as well. The following needs to be observed in order to calculate the labour costs at the packing company;

14. The time that a person needs to put a certain amount of tulips on the assembly line, measured in minutes per 1000 tulips.
15. The amount of tulips that are processed at a given hour. $= [(60 \text{ minutes} * 1000 \text{ tulips}) / (\text{the time that a person needs to put 1000 tulips on the assembly line (14.)})]$
16. The wage of a person standing along the assembly line in the packing centre, measured per hour

In order to calculate the labour costs, the wage that a person standing at the assembly line earns (16.) needs to be divided by the amount of tulips that are processed at a given hour (15.) This results in the labour costs at the packing company, which is stated as C_{LP} .

2. The control group

At the firm that will be used as the control group, the new packing method will not be implemented. Therefore, the only data that needs to be collected at this firm are the labour, material and transport costs at the two moments in time, Monday and Friday. The same days need to be used for both treatment and control group, so that circumstances and sorts of tulips are most similar to each other.

Thus, for the control group, the data point 1 till 9 and 14 till 16 needs to be collected.

After having observed all those costs, a comparison can be made between the situation before and after implementing the new method. With this data, for each of the costs, a diff-in-diff analysis can be made.

The field experiment

The second step in analyzing the effects of a change in packing method is constructing a field experiment including all the 9 associated firms. This experiment will be constructed in order to get rid of the selection bias that arises by comparing the situation at one firm during a specific period of time. The experiment that will be constructed controls for those time and firm-specific effects. This is done by dividing the 9 associated firms into two groups. The firms should be randomly divided over the two groups. The new packing method will be implemented in one of the groups and not in the other group. One option could be to compare the two groups by matching the firms out of the groups that are most similar to each other. This matching could be based on firm characteristics such as size or the type of tulips they grow. However, the observed sample is relatively small. Therefore, matching firms with each other might not give an objective view on the situation because the matched firms can still be very different from each other. Because of this, it is better to compare averages of both groups. This will come closest to reality. The division of the firms over the two groups should be done again multiple times. At the beginning of each period, the firms should be randomly selected into one of the groups, meaning that a firm is using the new packing method in some of the weeks and the old packing method in other weeks. By regularly changing the formation of the groups, we control for firm specific effects. And by comparing the averages again each two weeks, we control for week period effects. The way how this is done will be described in the results section

The support for the new method

The questions in this survey will not be about the specific investment in a new packing method. This is done because asking questions about the packing method could bias the results of the survey. This could be due to the fact that growers know about the investigation of a new packing method and therefore answer the survey in a way they normally would not do. By asking general questions about investments that lead to a stronger cooperation with Tulpen.nl, the results can be linked to the specific case of a new packing method. Also, questions about the flexibility of firms will be asked in the survey. This is done because investing in a new packing method can result in a production process that is less flexible towards alternative customers. Therefore, by asking questions about the desire for being flexible, the support for the new packing method can be measured indirectly.

As discussed in the data section, ordinal data of two groups, small and big firms, will be compared. This paper tries to find out whether there are differences between those two groups. Therefore, a test is needed which is suitable for comparing ordinal data of two independent groups. The suitable test for this survey therefore will be the Mann-Whitney U test. The Mann-Whitney U test will test the questions that are asked in the survey. By rejecting the null-hypothesis or not for each question, this paper is able to give a good view on the general opinion of the franchisees. With these results, the third hypothesis of the paper can be rejected or not.

Results

The Pilot

The results of the pilot will be discussed via the sub-costs which are explained in the previous section. There will be looked at the labour, material, transport and hiring costs at the pilot firm, before and after the implementation of the new packing method. Also, the labour costs at the packing company will be discussed, as well as all of these costs at the control firm. In appendix 2, the calculations can be found.

Costs of labour at firm (C_{LF})

Pilot firm

The labour costs at the pilot firm on Monday were €8,30 per 1000 tulips. On Friday, after the implementation, costs have decreased to €7,60 per 1000 tulips. This is due to the fact that one employee has been removed from the assembly line. Before implementation, two persons were needed to pack the tulips while after implementation, only one man was needed. This decreased the amount of people standing along the assembly line from 5 to 4 persons, leading to a decrease in labour costs.

Control firm

At the control firm, labour costs decreased as well. On Monday, the firm paid €8,40 per 1000 tulips while on Friday, the firm only paid €8,10. This decrease could be due to several circumstances such as employees that work faster because it is almost weekend. Another reason for this decrease could be that the firm needs to process a certain amount of tulips each week, so during the last day of the week, everybody needs to work a little harder to reach this number.

Costs of material (C_M)

Pilot firm

The costs of material at the pilot firm decrease to a large extent after implementing the new packing method. An 85% decrease from €0,20 per 1000 tulips on Monday to €0,03 per 1000 tulips on Friday is a lot. However, the numbers are relatively small. This decrease in material costs is due to the fact that the firm does not have to use packing paper anymore. Instead of this, investments in new material need to be done, but those costs can be spread over many years, so that the amount per 1000 tulips is low.

Control firm

At the control firm, the costs of material remained the same for the two observations. On both days, the firm had to pay €0,20 per 1000 tulips on material. This makes sense, because nothing changed at the control firm. The price of packing paper did not change in the days between the observations.

Costs of transport (C_T)

Pilot firm

Contrary to the labour and material costs, the transport costs for the pilot firm increased

after implementing the new packing method. On Monday, the firm paid €0,67 per 1000 tulips on transport costs. After implementation, this became €0,92 per 1000 tulips. This increase is the result of less efficient transport methods. Before implementation, 112.000 tulips fitted in one truck. Packing differently led to a decrease of the amount of tulips that fit into one truck. Only 84.000 tulips were possible to be transported by one truck after implementation.

Control firm

The control firm did not change its way of packing the tulips. Therefore, the transport costs remained the same for both observations. On Monday, as well as on Friday, the costs of transport were €1,25 per 1000 tulips. The reason that these costs are higher at the control firm, compared to the pilot firm, is that the distance from the control firm to the packing company is larger than the distance from pilot firm to packing company.

Hiring costs buckets and trolleys pilot firm (C_H)

Pilot firm

Before implementation, both buckets and trolleys needed to be hired from the flower auction. After a new packing method is implemented, the firm does not need to hire buckets anymore. However, the trolleys are still essential, which makes that they still need to be hired from the flower auction. The fact that the buckets no longer need to be hired, leads to a decrease in hiring costs. Before implementation, the firm paid €0,39 per 1000 tulips on hiring buckets and trolleys. After implementation, this was €0,14 per 1000 tulips on only hiring trolleys.

Control firm

During both observations, the control firm had to hire trolleys and buckets from the flower auction. The costs for this firm to hire these materials were €0,39 per 1000 tulips. This is the same amount as what the pilot firm had to pay before implementation.

Costs of labour at packing company (C_{LP})

Pilot firm

The costs of labour that the pilot firm makes when their tulips are being processed by the packing company decreased after implementation. During the first observation, on Monday, the firm paid €1,98 per 1000 tulips. During the second observation, on Friday, the firm paid €1,67 per 1000 tulips. This decrease is due to the fact that the tulips after implementation

do not have to be unpacked before they run over the assembly line. This saves time, which leads to a higher production per day. As a result of this, the costs per 1000 tulips decrease.

Control firm

For the control firm, the costs of labour at the packing company almost stayed the same. Where the firm paid €1,94 per 1000 tulips on Monday, they had to pay €1,96 per 1000 tulips on Friday. This could indicate that the people standing along the assembly line at the packing company might work harder at the beginning of the week compared to the end of the week. However, this is just one of many possible explanations for the fact that costs were higher on Friday than on Monday. Thereby, the difference in costs is negligible.

Total costs

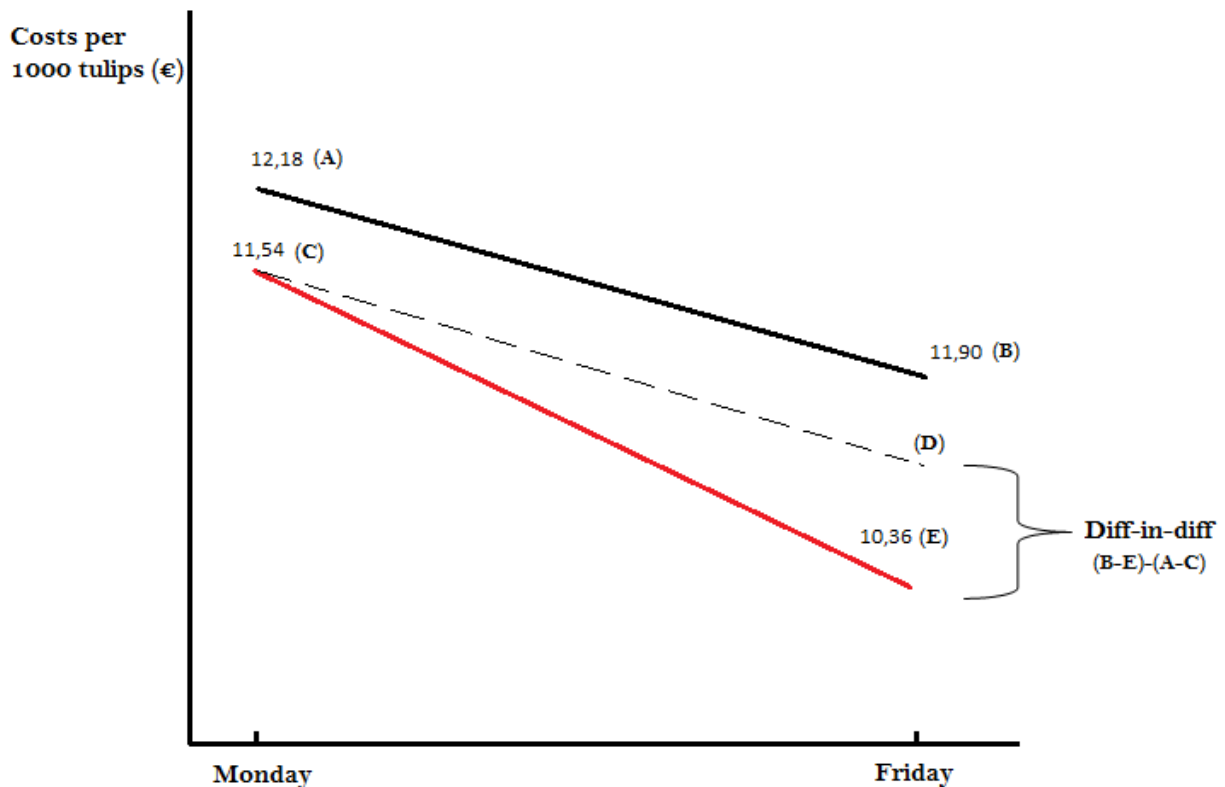
Pilot firm

Now that all the sub-costs are considered, the total costs can be determined. For the pilot firm, the total costs before switching to a new way of packing the flowers were €11,54 per 1000 tulips. After the change in packing method, the pilot paid €10,36 in order to process 1000 tulips. This decrease is due to the lower labour, material and hiring costs, but is limited because of the higher transport costs. The total costs of labour, combining the labour costs at the firm and packing company, decreased from €10,28 to €9,27.

Control firm

At the control firm, which had the most similar characteristics to the pilot firm, costs decreased as well when both observations are compared. On Monday, the control firm had to pay €12,18 in order to pack 1000 tulips, while on Friday, they only paid €11,90 per 1000 tulips. This decrease was mainly due to different circumstances at the two days. A different day of the week was likely to cause the decrease in labour costs at control firm.

These different circumstances need to be taken into account in order to say something well-founded about the success of the pilot. The below figure sketches the situation graphically;



The real change in costs, which is caused by the new way of packing the tulips, is indicated by the Diff-in-diff accolade. This change takes into account the different circumstances in both periods. In this way, the experiment gets rid of the selection bias that arises when different moments in time are compared. What is left is the treatment effect, which can be calculated by running the following formula; $((B-E)-(A-C))$. Doing this $((11,90-10,36)-(12,18-11,54))$ results in a decrease in costs of €0,90 per 1000 tulips processed. This is a decrease in the costs of the firm of 7,8%.

Looking at the first two hypotheses, it is to say that the results of the pilot are in line with the expectations that lead to the hypotheses. First of all, the costs of labour at both the firm and the packing company decreased. The costs of labour at the control firm decreased as well, but not as extreme as at the pilot firm. Next to this, the transport costs increased at the pilot firm. This because of the fact that the new packing method was not as efficient as the old method, when it comes to transporting the tulips. These statements match with both the hypotheses and therefore it is to say that those hypotheses are likely to be true.

The field experiment

In this section, it will be described how the experiment should be set up and to what regression it would lead to.

Because it is not possible to observe a firm at a point when it has implemented the new method, had he not implemented the method, another counterfactual needs to be constructed. As it is already described in the methodology section, the 9 associated firms will be randomly divided into two. The new packing method will be implemented in one of the groups and not in the other group. This makes one group the treatment group and the other group the control group. As the sample is relatively small, averages of the treatment and the control group will be compared.

The next step in this is to determine the period of time in each period. By comparing the averages of treatment and control group again every now and then, there can be controlled for period-specific fixed effects. As the length of a tulips season is on average about 18 weeks, it might be wise to change the groups every two weeks, so that 9 periods will be observed in which a comparison can be made between treatment and control group. A period of two weeks is chosen because the firms might face some start-up issues at the beginning of the period. These period specific fixed effects are likely to be different for each period. Intuitively it is to say that those effect will be bigger at the beginning of the tulip season, leading to relatively higher costs compared to later in the season. This can be due to the fact that the firms face some start up problems. In order to control for these effects, a nominal variable will be added to the regression, indicating the period in the season.

The division of the treatment and control group needs to be changed every now and then, in order to overcome the bias that arises by comparing different firms with each other. These firm-specific fixed effects should not influence the treatment effect. Therefore, after every two weeks the division of the firms in the control and treatment group will be done again. This will always be done randomly, so that it does not influence the experiment. These firm specific fixed effects might be based on firm size, which will be discussed later in order to answer hypothesis 3. In the regression that will be set up, a dummy is added to control for firm-size. This will be done by sorting the 9 firms based on their size. The 4 biggest firms will be seen as 'big firms', leading to '1' as the value for the dummy variable.

The 5 smallest firms will be seen as 'small firms', leading to '0' as the value for the dummy variable.

Another factor that needs to be taken into account is the Hawthorne effect. This effect describes the change in behaviour of the persons who know that they are observed in experiments. If the workers at a firm are selected in the treatment group, it could be the case that they change behaviour, as they now that they are observed (Wickström, 2000). However, because the experiment runs the entire tulip season, and averages are compared every two weeks, it is not likely that this effect still plays an important role here.

The focus of this experiment is examining whether a change in packing method leads to a decrease in the costs of the associated firms. Therefore, during the experiment, the costs need to be observed. The focus will be, just like the pilot, on the labour, material, transport and hiring costs. However, some of these costs will be the same each period. Therefore, the most important costs in this experiment will be the labour and material costs.

After the experiment has been carried out, a regression analysis can be made with a regression function which has the following form:

$$\text{COSTS} = \beta_0 + \beta_1 * \text{IMPLEMENT} + \beta_2 * \text{PERIOD} + \beta_3 * \text{FIRMSIZE}$$

In this regression, β_0 stands for the intercept. These are the basic costs that are always made, independent from the implementation. β_1 stands for the coefficient of the dummy variable IMPLEMENT. When the new packing method is implemented, the dummy has a value of '1'. At that moment, the coefficient determines the effect that the implementation has on the costs of the associated firm. β_2 stands for the coefficient of the nominal variable PERIOD. This variable can take the value from 1 to 9, and the coefficient determines its effect on the costs of the firm. β_3 is the coefficient that belongs to the dummy variable FIRMSIZE. When this variable takes the value of '1', it means that the involved firm belongs to the top 5 biggest firms of the franchise organisation. If the variable is '0', the firm does not belong to the top 5 biggest firms.

With the data that will be collected during this experiment, the value of β_1 can be determined. If β_1 turns out to have a negative value, it is to say that the new packing

method decreases the costs of a Tulpen.nl associated firm. If β_1 has a positive value, the new packing method increases the costs of the firm.

The support for the new method

The original survey can be found in appendix 3, this is the sheet that was actually given to all of the franchisees. An overview of the answers the growers gave can be found in appendix 4. The nine franchise partners of Tulpen.nl received the questionnaire. Eight of them filled in the survey and only one did not want to take part in this research. A response percentage of about 89% is very useful for this paper, however, the sample size is small. This could result in issues with finding significant differences. A bigger sample size would be better, but as there are only nine franchisees, this is not possible.

The first three questions are general ones about the name of the person filling in the questionnaire, the name of the firm and the amount of tulips that this particular firm grows during one year. This third question makes it possible to distinguish between small and big firms. To get a better view on the size differences of both groups, the means are compared.

Report

(3.) Amount of tulips

size	Mean	N	Std. Deviation
0	9000000,00	4	2160246,899
1	33250000,00	4	26437032,108
Total	21125000,00	8	21669184,835

The above table shows that the average amount of tulips that a big firm grows during a year is 33.250.000 tulips, compared to 9.000.000 tulips at a small firm. The difference in the amount of tulips that are grown in the groups are quite big, which makes it relevant to compare the opinions of the franchisees in both groups.

The other four questions are about the opinion of the growers on specific topics. These questions are asked in a way so that a conclusion on the third hypothesis can be derived. The first of these four questions is about investing in R&D. It describes the situation in which the growers can invest in research on a more efficient logistic process. It explains how this can affect the flexibility of the growers once the research becomes a success. As the

franchise organisation is the first to use this new process, it might be harder to leave the franchise because other buyers do not use this method yet. The question for the grower is; *Would you be willing to invest in such a project, knowing the possible consequences? Answer on a 1 to 5 scale, ranged from 'least willing' to 'most willing'*

With this question, the support for an intensification of the cooperation can be measured.

The second specific question is about the size of the investment in R&D that the firm owners are willing to make. A situation is sketched in which the R&D project could either turn out to be a success or a failure. This is not known beforehand. Therefore it is important to know the opinion of the growers on innovation in general. Thus, the question for the growers is; *How much would you be willing to invest in R&D, without knowing if it will lead to gains in the future? Answer on a 1 to 5 scale, 1 being €1000 or less and 5 being €10.000 or more.*

By asking this question, the opinion of growers on innovation can be measured, which indirectly represents the attitude towards investing in the development of a new packing method.

The next question tries to shed light on the view of growers towards collaborating. The text states that the growing process and marketization of flowers changes rapidly over time. The question is:

Do you think that, keeping in mind the future, cooperation with other growers is or becomes essential for your firm? Answer on a 1 to 5 scale, ranged from 'least essential' to 'most essential'.

By asking this question, the view of growers on the way they see their firm can be measured. The answers to this question tell whether growers think they can survive on their own, or need to cooperate with others in the future.

The last question sketches the hypothetical situation of Tulpen.nl trying to respond to this fast changing world of horticulture. This could be done by trying to operate more out of one name than that is already the case. Thus, this question is about an ever increasing way of cooperating. The question that is asked is;

Do you think that your company would benefit from this, and thus benefit from an intensified cooperation? Answer on a 1 to 5 scale, ranged from 'least benefit' to 'most benefit'

With this question, it can be observed whether growers think they would benefit from an intensified cooperation. This is slightly different from question 1, as question 1 is about the support for it. Operating more out of one name could result in less autonomy for the associate growers. If this is undesirable for them, they can still be against intensifying the cooperation although they would benefit from it.

The answers to the above questions are analysed in SPSS using the Mann-Whitney U test. The Null-hypothesis of this test states that there are no differences in the opinion of the two groups. Rejecting the null-hypothesis results in the alternative hypothesis that there are differences in opinion between the two groups. The outcomes of the Mann-Whitney U test are summarized in the below table. The original SPSS output can be found in appendix 5.

	Size	Mean	Mean Rank	Mann-Whitney U	Asymp. Sig (2-tailed)
(4.)	0		4,00		
	1		5,00		
	Total	4,13		6,000	0,508
(5.)	0		3,88		
	1		5,13		
	Total	3,38		5,500	0,405
(6.)	0		4,38		
	1		4,63		
	Total	4,13		7,500	0,877
(7.)	0		3,88		
	1		5,13		
	Total	4,00		5,500	0,445

The outcomes of the test will be discussed per question. First of all, question four, which is the first specific question. The mean of 4,13 shows that the growers are on average very supportive towards a closer cooperation. In addition to this, the outcomes show that firms of bigger size are even more willing to invest in joint projects than firms of smaller size because the mean rank of the big firms is higher than the mean rank of the small firms (5,00 vs. 4,00). However, the results are not significant, which means that the null-hypothesis cannot be rejected. Therefore, it is not possible to conclude that bigger firms are more positive about a stronger cooperation.

The outcomes of the fifth question show that the growers are, on average, a bit reversed to invest large amounts of money in R&D. Question 4 showed that the growers are very supportive to intensify the cooperation by investing in R&D, but the size of the investment should not be too big. Looking at the mean rank, it turns out that bigger firms seem to be prepared to invest more relatively to small firms. But again, these results are not significant, as the 'Asymp. Significance' has a value greater than 0,05 (0,405).

The outcomes of the sixth question tell that the associate members of Tulpen.nl feel to a large extent that cooperating will become essential for their firms in the future. The mean of 4,13 shows that, on average, the growers do not think they could survive on their own over time. Next to this, big firms seem to feel the necessity of cooperating slightly more than small firms do (mean rank 4,63 vs. 4,38). However, the results are not significant because the difference in mean rank is very small, leading to an 'Asymp. Significance' of 0,877 which is way bigger than 0,05.

The output of the last question, question seven, shows that the growers believe that their firms would benefit from an intensified cooperation. Also, the previously stated, potential problem of the loss of autonomy seems not to be a big issue for the firms. This because the mean of question four, which asked growers about the support for a closer cooperation, is even bigger than the mean of question seven, which is about benefitting from it (mean 4,13 vs. 4,00). Another outcome of question seven shows that bigger firms feel like they could benefit more from a closer cooperation compared to smaller firms (mean rank 5,13 vs. 3,88). But again, the result are not significant, meaning that it is not possible to conclude that bigger firms actually think that they could benefit, more than small firms think they could.

It turns out that none of the results are statistically significant. This might be because of the fact that the sample size is relatively small (N=8). Therefore, differences would have to be very big to result in significant outcomes. No significant differences mean that for none of the questions the null-hypothesis can be rejected. Therefore, it is not to say that there are differences in the opinions between small and large firms.

Despite the fact that the results are not significant, it is still possible to say something useful about the outcomes. Especially since the outcomes seem not to be in line with the initial expectations. The outcomes of the four questions discussed showed that if there are

differences in the opinion about a closer cooperation, the bigger firms seem to be more positive about this than the smaller firms. On all of the four questions, the firms of bigger size have a higher mean rank value than the firms of smaller size. Question six is doubtful, since the difference is very small.

When this is compared with the third hypothesis that was set up before the survey was carried out, there are contradicting statements. The third hypothesis, discussed in the hypotheses section, stated that small firms would be relatively more positive about investing in the new packing method compared to big firms. This statement was based on the expectation that, due to bargaining power, small firms would benefit more from an intensified cooperation. Next to this, the hypothesis was based on the expectation that big firms would be able to innovate and survive on their own, in contrast to smaller firms. Therefore, those smaller firms were expected to be more positive about investing in a new packing method, if this investment leads to a stronger cooperation.

These statements do not match with the outcomes of the survey, which seems to show exactly the opposite. Therefore, although the results are not significant, it is to say that hypothesis 3 is not likely to be correct. The answers to the four questions all direct to bigger firms being more positive about investing in a new packing method than smaller firms.

Conclusion and recommendations

The aim of this research paper was to determine the effects of the implementation of a new packing method for franchise organisation Tulpen.nl. This is tried to be established by dividing the research into three parts. First of all, a pilot has been run in order to investigate the effects of a change in packing method on the firms' costs at one firm, compared to a similar firm which did not implement the new method. Also, an experiment has been set up, which can be carried out during the next tulip season. With this experiment, the paper can get rid of the selection bias that arises when different firms are compared at different moments in time. The last part consisted out of conducting a survey among the 9 franchisees of Tulpen.nl. With this survey, the support for the change in packing method has been tried to measure, which resulted in different outcomes for different firm sizes. With these three parts, the three hypotheses were able to be answered.

The results of the first part, the pilot, made it possible to judge about both hypothesis 1 and 2. Using a difference-in-differences analysis, the costs of labour, material, transport and hiring of both the pilot and the control firm are measured. According to the cost-minimization model which resulted in hypothesis 1, solving the inefficiency of packing the tulips twice will decrease the costs of labour. These expectations turned out to be true, as the costs of labour of the pilot firm decreased from €10,28 to €9,27 per 1000 tulips. Also, the costs of material decreased at the pilot firm. An 85% decrease in costs can be considered as substantial.

The costs of transport behaved like expected as well. Because of the fact that less tulips fitted into one truck, cost of transport increased from €0,67 to €0,92 per 1000 tulips at the pilot firm

In total, as the decrease in labour and material costs is bigger than the increase in transport costs, the pilot firms faced a decrease in total costs of €1,18 per 1000 tulips. The control firm faced a decrease of only €0,28 per 1000 tulips. This resulted in the treatment effect of €0,90 lower costs per 1000 tulips.

In the second part of the paper, an experiment has been set up. This experiment will lead to a regression analysis in which the costs are regressed against the implementation of the new packing method and some control variables. This is done because of the selection bias that could possibly arise during the pilot. This experiment will control for period-specific fixed effects by adding a PERIOD variable to the regression, which could take the value 1 to 9. Each number being a period of two weeks. Thereby, a FIRMSIZE dummy variable is added to the regression taking the value 1 for a big firm and 0 for a small firm. With this dummy, the regression controls for firm-specific fixed effects. The coefficient of the dummy variable IMPLEMENT should be measured to see whether costs decrease or increase after implementing the new packing method.

If the experiment will be carried out, hypothesis 1 and 2 can be answered again. Then, the paper is able to give more certainty about the outcomes.

During the last part of this paper, the survey has been analysed to judge about the third hypothesis. According to the literature, small firms were expected to be more open for an intensified cooperation. This because they are likely to benefit more from it compared to bigger firms. Therefore, as investing in the development of a new packing method leads to

an intensified cooperation, smaller firms were expected to be relatively more positive about investing in this new method.

The survey showed that both small and big firms are positive about a closer cooperation with investments in R&D. However, it seems like the bigger firms are more positive about this compared to the relatively small firms. The outcomes of all of the asked questions indicate this unexpected result. Although none of the results were significant, it is legitimate to say that hypothesis 3 turns out not to be true. The outcomes seem to show a reverse statement about the support of big and small firms for the new packing method.

Unfortunately, it is not possible to conclude that the big firms are relatively more positive about investing in the new packing method compared to the small firms. This is because the results were not significant.

Now that a judgement is made about the hypotheses, it is possible to look at the research question. This paper shows a positive effect on the costs of the firm when a new packing method is implemented. The inefficiency that is solved by packing the tulips once instead of doing this twice leads to a decrease in labour and material costs. The increase in transport costs does not compensate this. Therefore, the total costs of the firm decrease. However, there is an issue with selection bias. This is the reason that a bigger experiment is set up, which is likely to get rid of the bias by adding some control variables.

This paper also shows that the associated growers are open for a closer cooperation. This is positive, because it is important that all the growers are behind a big change like implementing a new packing method. However, Tulpen.nl should convince the smaller firms about the advantages that a new packing method could bring.

This paper shows that there are ways for firms within the field of horticulture to adjust to changes in the market. As size becomes more and more important, it is important to learn about the motives of both small and big firms. Thereby, on the micro level, it is good to see how solving inefficiency in the production process results in a big cost reduction of a franchise organisation. This organisation could be an example for other horticultural firms.

This topic is perfectly suitable for further research. First of all, the decrease in costs that seems to be the result of implementing the new packing method can be further investigated. How can the firm further benefit from this decrease? It seems like the firm has two

possibilities. It can either produce more and work with the same amount of employees, or it can work with fewer employees and keep the production at the same level compared to the old situation. Firing people can be undesirable and producing more might not always be possible. Which of the two contributes most to the desires of a firm?

Also, the experiment that has been set up in this research paper should be the focus of future research. Are the findings of the pilot right, or were they biased by firm and period-specific fixed effects? This experiment should also search for ways to reduce the transport costs, so that total costs can decrease even further.

Finally, further research of the differences in opinion between small and big firms would be useful. A possible explanation for the unexpected outcomes could lie in the fact that bigger firms might have a higher budget that they could use for R&D. If it is the case that the big firms are more profitable than smaller firms, then it is possible that bigger firms want to invest more in innovativeness.

Another explanation could be that small firms have more alternatives for selling their tulips. Although it is questionable whether small firms could survive on their own, their relatively small amount of tulips can be sold more easily than a big firm trying to sell all his tulips on the market.

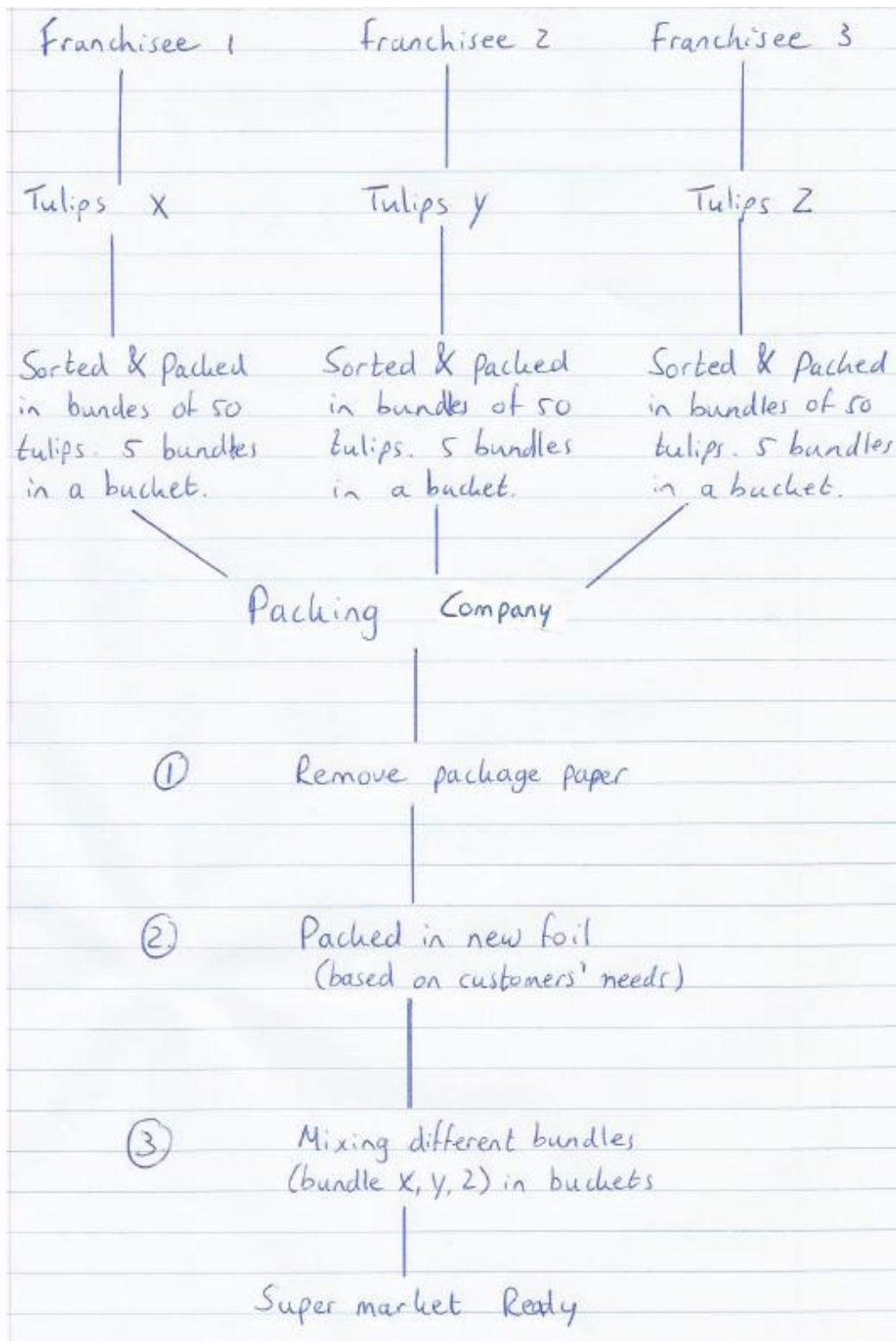
Lastly, it could be the case that bigger firms are more progressive than smaller firms. If this mentality resulted in the size of the firm, the owner is likely to be looking for new ways to improve and grow. These three possible explanations could not only play a role in the market for tulips, but also in other trade markets where differences in the size of firms exist. Therefore, this would be suitable for future studies, in order to find out what exactly drives big and small firms.

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Appendices

Appendix 1



Appendix 2

Data collection

1. The production per hour, measured in the amount of tulips being processed at the assembly line. $((= 60 \text{ minutes} * 1000 \text{ tulips}) / 4.(\text{the time that is needed to process 1000 tulips}))$
2. The amount of employers standing along the assembly line
3. The wage that one employee earn per hour
4. The time that is needed to process 1000 tulips, measured in minutes
5. The amount of packing paper needed, measured in paper per day
6. The price of packing paper
7. The amount of tulips that fit in one truck
8. The costs of letting a truck ride from firm to packing centre , measured in price per km/price per truck
9. The price to hire a certain amount of buckets and trolleys from the flower auction
10. The price of one new packing unit
11. The amortization time of the new packing material, measured in days
12. How many tulips fit into one new packing unit
13. How many new packing units fit into one truck
14. The time that a person needs to put a certain amount of tulips on the assembly line, measured in minutes per 1000 tulips.
15. The amount of tulips that are processed at a given hour. $=[(60 \text{ minutes} * 1000 \text{ tulips}) / (\text{the time that a person needs to put 1000 tulips on the assembly line (14.)}]$
16. The wage of a person standing along the assembly line in the packing centre, measured per hour

Costs of labour pilot firm

*Formula: $(2. * 3.) / 1. \quad (1 = (60 * 1000) / 4.)$*

Before: Monday

- 5 employees

- €20 per hour

- On average 4 min 59 sec per 1000 tulips

$-(2. * 3.) / 1. \quad (5 * 20) / ((60 * 1000) / 4.98) = 0.0083$ cent per tulip = €8.3 per 1000 tulips

After: Friday

- 4 employees

-€20 per hour

- On average 5 min 43 sec per 1000 tulips

$-(2. * 3.) / 1. \quad (4 * 20) / ((60 * 1000) / 5.71) = 0.0076$ cent per tulip = €7.6 per 1000 tulips

Costs of labour control firm

*Formula: $(2. * 3.) / 1. \quad (1 = (60 * 1000) / 4.)$*

Monday

- 5 employees

-€20 per hour

- On average 5 min 3 sec per 1000 tulips

$-(2. * 3.) / 1. \quad (5 * 20) / ((60 * 1000) / 5.05) = 0.0084$ cent per tulip = €8.4 per 1000 tulips

Friday

- 5 employees

- €20 per hour

- On average 4 min 51 per 1000 tulips

$-(2. * 3.) / 1. \quad (5 * 20) / ((60 * 1000) / 4.85) = 0.0081$ cent per tulip = €8.1 per 1000 tulips

Costs of material pilot firm

*Formula: Before: $(5. * 6.)$ After: $(10. / 11. / 121)$*

Before: Monday

- 200 pieces of paper per 1000 tulips

- 100 pieces of paper costs 10 cents

$-(5. * 6.) \quad (10 * 2) = 20$ cents per 1000 tulips = €0.20 per 1000 tulips

After: Friday

- New unit costs €4,-

- 4 units are needed for 1000 tulips

- amortization time is 5 years

- tulip season is 121 days

$-(10. / 11. / 121) = (4 / 5 / 121) * 4 = €0.03$ per 1000 tulips per day

Costs of material control firm*Formula: (5.*6.)**Monday*

- 200 pieces of paper per 1000 tulips

- 100 pieces of paper costs 10 cents

- (5.*6.) (10*2)= 20 cents per 1000 tulips = €0.2 per 1000 tulips

Friday

- 200 pieces of paper per 1000 tulips

- 100 pieces of paper costs 10 cents

- (5.*6.) (10*2)= 20 cents per 1000 tulips = €0.2 per 1000 tulips

Costs of transport pilot firm*Formula: Before:(8./7.) After:(8./13./12.)**Before: Monday*

- 8000 tulips fit into 1 trolley

- 14 trolleys fit into 1 truck

- €5,5 per trolley

- (8./7.) ((5.5*14)/(8000*14))= 0.00067 per tulip = €0.67 per 1000 tulips

After: Friday

- 6000 tulips fit into 1 trolley

- 14 trolleys fit into 1 truck

-€5.5 per trolley

- (8./13./12.) ((5.5*14)/(14/6000)) = 0.00092 per tulip = €0.92 per 1000 tulips

Costs of transport control firm*Formula: (8./7.)**Monday*

- 8000 tulips fit into 1 trolley

- 14 trolleys fit into 1 truck

- €10,- per trolley

- (8./7.) ((10*14)/(8000*14))= 0.00125 per tulip = €1.25 per 1000 tulips

Friday

- 8000 tulips fit into 1 trolley

- 14 trolleys fit into 1 truck
- €10 per trolley
- $(8./7.) \quad ((10*14)/(8000*14))= 0.00125$ per tulip = €1.25 per 1000 tulips

Hiring costs buckets and trolleys pilot firm

Formula: (9.)

Before: Monday

- Hiring 1 bucket costs 7 cents a day
- Hiring 1 trolley costs 85 cents a day
- 1000 tulips fit into 4 buckets
- 8000 tulips fit into 1 trolley
- $(0.07*4)+(0.85/8) = €0.39$ per 1000 tulips

After: Friday

- Hiring 1 trolley costs 85 cents a day
- 6000 tulips fit into 1 trolley
- $(0.85/6) = €0.14$ per 1000 tulips

Hiring costs buckets and trolleys control firm

Formula: (9.)

Monday

- Hiring 1 bucket costs 7 cents a day
- Hiring 1 trolley costs 85 cents a day
- 1000 tulips fit into 4 buckets
- 8000 tulips fit into 1 trolley
- $(0.07*4)+(0.85/8) = €0.39$ per 1000 tulips

Friday

- Hiring 1 bucket costs 7 cents a day
- Hiring 1 trolley costs 85 cents a day
- 1000 tulips fit into 4 buckets
- 8000 tulips fit into 1 trolley
- $(0.07*4)+(0.85/8) = €0.39$ per 1000 tulips

Costs of labour packing company (pilot firm) Formula: $(16./15.) (15.=(60*1000)/14.)$

Before: Monday

- 1 man putting the tulips on the assembly line
- €20 per hour
- On average 5 min 56 seconds per 1000 tulips
- $(16./15.) (20/((60*1000)/5.93))= 0.00198$ per tulip = €1.98 per 1000 tulips

After: Friday

- 1 man putting the tulips on the assembly line
- €20,- per hour
- On average 5 min per 1000 tulips
- $(16./15.) (20/(60*1000)/5)= 0.00167$ per tulip = €1.67 per 1000 tulips

Costs of labour packing company (control firm) Formula: $(16./15.) (15.=(60*1000)/14.)$

Monday

- 1 man putting the tulips on the assembly line
- €20 per hour
- On average 5 min 49 seconds per 1000 tulips
- $(16./15.) (20/((60*1000)/5.82))= 0.00194$ per tulip = €1.94 per 1000 tulips

Friday

- 1 man putting the tulips on the assembly line
- €20,- per hour
- On average 5 min 53 seconds per 1000 tulips
- $(16./15.) (20/((60*1000)/5.88))= 0.00196$ per tulip = €1.96 per 1000 tulips

Total costs per 1000 tulips pilot firm before implementation:

$$8.3+0.2+0.67+0.39+1.98= \underline{\underline{€11.54}}$$

Total costs per 1000 tulips pilot firm after implementation:

$$7.6+0.03+0.92+0.14+1.67= \underline{\underline{€10.36}}$$

Total costs per 1000 tulips control firm period 1:

$$8.4+0.2+1.25+0.39+1.94= \underline{\underline{€12.18}}$$

Total costs per 1000 tulips control firm period 2:

$$8.1+0.2+1.25+0.39+1.96= \underline{\underline{€11.90}}$$

Survey franchisees Tulpen.nl

Good afternoon,

My name is Luuk Woutersen, I'm the son of Tulpen.nl franchise partner Richard. For my study Economics and Business economics at the Erasmus University in Rotterdam, I'm writing my bachelor thesis these months. I'm busy with a research focussed on the working of the franchise organisation Tulpen.nl. This research focuses on the consequences of a more efficient logistic process within the organisation.

I would like to ask you some questions that could contribute to my thesis. These questions are designed by me and are purely hypothetical. I would be pleased if you would answers the following questions. If you have any questions about the research or about the questions, feel free to contact me on 06*****.

Thank you in advance!

General questions

1. What is your name?
2. What is the name of your company?
3. How many tulips do you grow during a year?

The following questions will be about the cooperation with Tulpen.nl and you opinion about this

Imagine that you get the opportunity to invest in a research for a more efficient logistic process, together with the other franchisees. This could be, for example, relate to a new way of packing or transport. The goal is to decrease the cost price at all the associated growers of Tulpen.nl. Now imagine that this project becomes a success at an innovative way, leading to Tulpen.nl being the first organisation to use this new way of working.

4. The above situation could lead to being less flexible to your potential customers, because of the fact that, besides Tulpen.nl, no other firms work via this way. Therefore, it will get harder to leave the franchise, because this is the only buyer working via the new way. Would you be willing to invest in such a project, knowing

the possible consequences? Answer on a 1 to 5 scale, ranged from 'least willing' to 'most willing'

1 2 3 4 5

5. Such investments can be seen as investments in Research and Development (R&D) and can lead to innovative developments that could be cost price-decreasing. However, such a project can also result in a failure. Therefore, it is important to measure how much value is attached to innovation in general. How much would you be willing to invest in R&D, without knowing if it will lead to gains in the future? Answer on a 1 to 5 scale, 1 being €1000 or less and 5 being €10.000 or more.

1 2 3 4 5

The growing and marketization of flowers, and tulips in particular, changes rapidly over time.

6. Do you think that, keeping in mind the future, cooperation with other growers is or becomes essential for your firm? Answer on a 1 to 5 scale, ranged from 'least essential' to 'most essential'.

1 2 3 4 5

Imagine that Tulpen.nl tries to participate on this ever changing world of horticulture. This could be done by trying to operate more out of one name. For example, Tulpen.nl could do the hiring and dividing of employees over the associated firms in order to be more efficient. Another example could be to let Tulpen.nl buy the machinery and assembly lines for the associated firms, together with a maintenance contract. This could lead to a better negotiating position in the buying process. In short, an increasing way of cooperation.

7. Do you think that your company would benefit from this, and thus benefit from an intensified cooperation? Answer on a 1 to 5 scale, ranged from 'least benefit' to 'most benefit'

1 2 3 4 5

Thank you for your time!

Appendix 4

Size	(1.) Name	(2.) Name of firm	(3.) Amount of tulips	(4.) Investing in R&D	(5.) Size of investment	(6.) Essential cooperation	(7.) Benefit from more intensive cooperation
1	Joost Wesselman	Wesselman Flowers	70.000.000	5	4	5	5
1	Richard Woutersen	Kwekerij Woutersen	35.000.000	5	4	3	3
1	Mathe Olyerhoek	Matoco Flowers	15.000.000	5	4	5	5
1	Theo Huigsloot	Fa. P.G. Huigsloot en Zn.	13.000.000	3	3	4	4
0	Michel Smit	Kwekerij Michel Smit	12.000.000	5	4	5	4
0	Paul Akerboom	Springflora	9.000.000	4	4	5	3
0	Jos van der Meer	Mts van der Meer-Weststeijn	8.000.000	5	3	4	3
0	Adri Volwater	Join & Joy	7.000.000	1	1	2	5

Appendix 5

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
(4.) Investing in R&D	8	4,13	1,458	1	5
(5.) Size of investment	8	3,38	1,061	1	4
(6.) Essential cooperation	8	4,13	1,126	2	5
(7.) Benefit from more intensive cooperation	8	4,00	,926	3	5
Size	8	,50	,535	0	1

Mann-Whitney Test

Ranks

	Size	N	Mean Rank	Sum of Ranks
(4.) Investing in R&D	0	4	4,00	16,00
	1	4	5,00	20,00
	Total	8		
(5.) Size of investment	0	4	3,88	15,50
	1	4	5,13	20,50
	Total	8		
(6.) Essential cooperation	0	4	4,38	17,50
	1	4	4,63	18,50
	Total	8		
(7.) Benefit from more intensive cooperation	0	4	3,88	15,50
	1	4	5,13	20,50
	Total	8		

Test Statistics^a

	(4.) Investing in R&D	(5.) Size of investment	(6.) Essential cooperation	(7.) Benefit from more intensive cooperation
Mann-Whitney U	6,000	5,500	7,500	5,500
Wilcoxon W	16,000	15,500	17,500	15,500
Z	-,661	-,833	-,155	-,764
Asymp. Sig. (2-tailed)	,508	,405	,877	,445
Exact Sig. [2*(1-tailed Sig.)]	,686 ^b	,486 ^b	,886 ^b	,486 ^b

a. Grouping Variable: Size

b. Not corrected for ties.