A COMPARISON OF DEA MODELS THAT CONSIDER THE OPERATING ENVIRONMENT OF A NON-PROFIT ORGANIZATION

by

Gabriel Ernesto Read-Rodríguez

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Approved by:

Viviana Cesaní, PhD Member, Graduate Committee	Date
Mauricio Cabrera, PhD Member, Graduate Committee	Date
Alexandra Medina-Borja, PhD President, Graduate Committee	Date
Yolanda Ruiz-Vargas, PhD Representative of Graduate Studies	Date
Viviana Cesaní, PhD Chairperson of the Department	Date

Abstract

Measuring and demonstrating results has become a question of survivability for many nonprofit organizations. Data Envelopment Analysis (DEA) is one of the analytical tools that can be used for benchmarking and target setting among a set of similar operating units. Several scholars have studied how to best consider these non-discretionary variables in DEA by making modifications to the original formulation. Recent studies have analyzed and compared these models using simulated data and a small amount of decision making units (DMUs). The aim of our study is to analyze, compare and evaluate different models in the literature that incorporate the environment and their suitability for peer discrimination and target setting in nonprofit environments. We achieve this by using real data from a large social service organization with 937 DMUs all over the United States and territories. The Ruggiero 1998 model presents the best discriminatory power followed by the Medina-Borja 2002 model.

Resumen

Mostrar y medir resultados se ha convertido en una cuestión de supervivencia para muchas organizaciones sin fines de lucro. El Análisis Envolvente de Datos (DEA) es una de las herramientas analíticas que se pueden utilizar para establecer puntos de referencia y de destino entre un conjunto de unidades que operan similar. Varios estudios han hecho modificaciones a la formulación original de DEA para manejar las variables que no se pueden controlar, mejor conocidas como no-discrecionales. Estudios recientes han analizado y comparado los modelos con datos simulados y una pequeña cantidad de unidades de decisión (DMUs). El objetivo de nuestro estudio es analizar, comparar y evaluar diferentes modelos que incorporan el medio ambiente. Utilizando datos reales de una organización grande que ofrece servicios sociales con novecientos treinta y siete DMUs en todo Estados Unidos y sus territorios. El modelo de Ruggiero de 1998 es el que presenta mejor poder discriminatorio seguido muy de cerca del modelo de Medina-Borja del 2002.

To my parents and uncle for their unconditional support

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List of Abbreviations

DEA	Data Envelopment Analysis
BCC	Banker Charnes and Cooper 1984 model
CCR	Charnes Cooper and Rhodes 1978 model
DMU	Decision Making Unit
ARC	American Red Cross
INSTIT	Combination of federated grants and institutional grants and contracts
DONAT	Donations
MAN_FREXP	Managerial and expenses per household
POP	Population
MEDHHI	Medium Household Income
AGHHI	Aggregated Household Income

Chapter 1: Introduction

The measurement of organizational performance in general and productive efficiency in particular is an issue that has generated great interest given that organizations have always faced problems to improve their productivity (Cook & Seiford, 2008). Measuring and demonstrating results has become a question of survival for many nonprofit organizations (Medina-Borja & Triantis, 2011). New social problems, budgets cuts, reduced number of donors are some of the most common challenges for non-profit organizations as seen in Figure 1 below.

Figure 1: Non-profit landscape

Nonetheless, the vast majority of studies that have been performed for measuring and managing efficiency concentrated in studying endogenous variables that are under control or can be controlled by management. In practice however we can see how this is not sufficiently realistic as generally any productive process is subject to a multitude of exogenous variables that cannot be controlled. Those variables are called non-discretionary variables or exogenous factors. The problem with non-discretionary factors arises when inputs and outputs that are necessary to estimate organizational efficiency are influenced by these factors outside the control of the organization under study. Some examples of non-discretionary factors in the DEA literature are the number of competitors in the branches of a restaurant chain, snowfall or weather in evaluating the efficiency of maintenance units, soil characteristics and topography in different farms, age of facilities in different universities, the populations of wards in evaluating the relative efficiency of public libraries (Hosseinzadeh Lotfi & Jahanshahloo, 2007)

Any methodology that analyzes the level of relative efficiency of a productive unit compared to a group of similar units operating in radically different operating environments has to control in some way for these variables to make of the comparison a fair one. In the data envelopment analysis methodology (DEA) there have been several formulations proposed to deal with this particular issue of differences in the operating environment when units are comparable in the remaining inputs or resources used to produce multiple outputs or products of the transformation process. Authors, (e.g. Ruggiero, 1996; Banker and Morey, 1986; Yang and Paradi, 2003) argue that non-controllable variables ought to be included in the analysis as possibly the only way to demonstrate the correct levels of efficiency and inefficiency of the decision units under analysis (decision making units in the DEA jargon, or DMUs).

The traditional models of data envelopment analysis (DEA), assume that the variables for the inputs and outputs are discretionary in nature. In practice as we just explained, there are several occasions in which the performance is greatly affected by non-discretionary factors. This is why the interest in the study of these variables has been increasing, giving rise to the emergence of various methodological modifications to the original DEA formulation (Charnes et al., 1978; Banker et al., 1984) that incorporate these variables. Currently, the number of available formulations makes it difficult for any researcher seeking to use DEA to study the performance of operating units influenced by non-controllable variables to choose the most appropriate formulation. One has an arduous task to make a decision regarding which of the different variations of the methodology to use. It has been well documented (Ruggiero, 2004) that there are alternatives whose methodological development and possible results may differ substantially.

1.2 Purpose

It has been already explained that different variations to the original DEA formulations have been proposed with the sole objective of including non-discretionary variables in the analysis. Further, it has been demonstrated (e.g. Muñiz et al., (2006)) that those formulations can yield different results (i.e. deeming as inefficient different units). Thus, this study has the intention of analyzing, comparing and evaluating these different formulations. Several authors have analyzed those differences with simulated data. The research objective of this project is to make a comparison of those models but this time by using real operational data from a service non-profit organization. The advantage of this particular data set is that it is familiar to the researchers as well as to the industrial partner's managers, so that results can be verified in practice. Further, the organization has over 900 operating units operating in substantially different environments that have been already classified in clusters. Cluster membership will help us evaluate the validity of the prescribed peers for each inefficient unit in DEA. This comparison on real data basis can serve as great assistance to any research that intends to assess the efficiency of a productive unit relative to other units influenced by different operating conditions. Researchers will be able to choose which methodology is in line with the needs of their research.

1.3 Justification

The assessment and validation of the different formulations of DEA found in the literature performed with real data is justified since the majority of studies that have been published have been based on the use of simulated data. In addition, most studies reach their conclusions with small number of decision units. For this research real data of more than 900 DMUs functioning in different operational environments is at our disposal. The database also includes several variables known to affect the operating environment. Most works have also focused on the adjustment of the efficiency score according to their environment, focusing mainly in the benchmarking function of DEA. However, the actual recommendations for improvement that most DEA formulations can generate have a practical importance sometimes even bigger than the actual ranking score. For companies knowing that they are in certain rank is less important than knowing how to get to the top. The problem is that the recommendations in DEA (the targets) are constructed with the projection to the frontier. A unit's projection is determined by the convex combination of the values of inputs and outputs of peer efficient units in the sample. How similar these peers are to the unit under evaluation is therefore crucial to extract valid targets. Face validity[1] is immediately lost if this is not the case. The proposed comparative study will focus on the formulations' ability to differentiate efficiency scores of productive units under evaluation by selecting a reference set of units operating in similar

[1] According to the Social Research Methods (Methods, 2006) web page face validity is a type of validity that looks at whether the operationalization of the construct "appears" to be valid on its face.

environments to that of the unit under evaluation; as in the practicality of its formulation for application. This is something that has not been done until now.

1.4 Why DEA?

Data envelopment analysis is based on the concept of an efficient frontier. This frontier touches at least one point and all points are therefore on or below the frontier line. These points are the DMUs we are evaluating. The points that touch the frontier line are considered efficient and the other points inefficient. Comparing DEA with other methodologies such as linear regression, we can find that linear regression draw a line through the middle of the data points, averaging all points efficient and inefficient. The operator in the regression would predict the value of the output variable, say profit, by using the values of the various input variables. Productivity assessment is, however, predicated on maximizing output while using a limited number of inputs most effectively, (Pizam, 2010). Linear regression has not been used for peer identification.

DEA identifies an efficient point for future examination or the point is used as a benchmark in seeking improvements. Another difference is that conventional regression methods deal with single output and multiple input cases and DEA analyses multiple outputs and multiple inputs correspondence (Cooper, Seiford, & Tone, 2000).

Other quantitative methodology used for productivity evaluation is the Total Factor Productivity that can be defined as the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficient and intensely the inputs are utilized in production (Comin, 2008). In comparison with DEA the total factor do not show the interaction between each input and output separately and are thus too broad to be used as a tool for improving specific areas.

Comparing DEA with a qualitative methodology such as the Balance Scorecard developed by Kaplan et al., (1996) can be used to connect a company's strategic objectives to their performance measurements. The BSC tool evaluates activities in four categories: financial, customer, internal business processes, and learning and growth. This methodology does not provide targets for improvement and does not evaluate all the indicators together but separately. Hence, DEA remains the most comprehensive scientific tool for systemic performance evaluation, particularly for efficiency studies.

1.5 Research Objectives

- To compare the selected DEA formulations in the literature for the purpose of evaluating the revenue-generating activities of nonprofit organizations, making use of a database of an organization with a large amount of decision making units (DMUs) --approximately 900-- all operating in distinct environments. Analyzing how well the formulations incorporate the operating environment in their benchmarking mechanism for the case of non-profit social service organizations.
- Identify clear differences in terms of the performance of each model regarding number of unfeasible solutions, number of units deemed efficient and its suitability to properly identify peers and appropriate targets for each inefficient unit. Compare the number of peer units that are actually believable peers in reality for the case study organization for the majority of units being evaluated.

- Analyze the discriminating power of each model to identify the efficiency of each decision unit based in operating conditions that may be favorable or unfavorable.

1.6 Research Questions

I. What are the differences in the results obtained by different formulations of DEA including non-discretionary variables?

II. What formulation seems to provide more realistic and believable recommendations for improvement (targets are credible as they are the result of the convex combination of units in similar operating environments)? Under what conditions?

The next chapter discusses the relevant publications to this research project in four sections.

Chapter 2: Literature Review

In this chapter we briefly discuss the relevant publications to this research project in four sections: first we explain the concept of efficiency and then we review the theory of data envelopment analysis with a few examples to demonstrate the methodology; next we cover DEA works concentrating in the inclusion of non-discretional variables, and fourth we cover those studies that have performed model comparison for these types of formulations.

2.1 Technical Efficiency

Before we review the data envelopment analysis methodology first we need to understand the concept of efficiency. Efficiency can be defined as the concept that compares the ability of an operational unit to transform outputs by consuming inputs and it is represented by the following ratio or efficiency measure.

$$\textbf{Efficiency} = \frac{\textbf{Output}}{\textbf{Input}} \qquad \textbf{2.1}$$

Charnes et al. (1978) described DEA as useful evaluation tool only when we have multiple outputs and multiple inputs. In 1957, Farrell proposed a formula to calculate efficiencies for this multiple input and output scenario by introducing weights in the numerator and denominator of the ratio.

$$\boldsymbol{Efficiency} = \frac{\boldsymbol{Weighted\ Sum\ Outputs}}{\boldsymbol{Weighted\ Sum\ Inputs}} \qquad \textbf{2.2}$$

The above can be written as:

$$\boldsymbol{Efficiency\ of\ unit\ j} = \frac{u_1 y_{1j} + u_2 y_{2j} + \cdots + u_i y_{ij}}{v_1 x_{1j} + v_2 x_{2j} + \cdots + v_i x_{ij}} \qquad \textbf{2.3}$$

Where, u_i = weight for output i

y_{ij} = quantity of output i for unit j

v_i= weight of input i

x_{ij} = quantity of input i for unit j

Farrell (1957) formulation for the measurement of productive efficiency is based on a production possibility set consisting of the convex hull of input-output vectors. This production possibility set was represented by means of a frontier unit-isoquant. Murrillo-Zamorano (2004) describes that Farrell's efficiency measures are completely data-based, no specific functional form needed to be predefined. The single-input/output efficiency measure of Farrell is generalized to the multiple input-output cases and reformulated as a mathematical programming problem. This new method was introduced by Charnes et al. (1978). The Data Envelopment Analysis method is described in the next section**.**

2.2 Data Envelopment Analysis

Data Envelopment Analysis was introduced for the first time by Charnes et al. (1978), who defined this methodology as a data-oriented approach used to evaluate the performance of a group of related entities called Decision Making Units (DMU).

The DMUs convert and transform multiple incoming resources into multiple products. DEA enables studying the efficiency of an organization in relation to the behavior observed in other similar organizations included in the analysis. This benchmarking process is based on an efficiency frontier that is constructed by means of non-parametrical approaches. One of the main requisites of this traditional DEA model is that all the involved decision making units have to be as homogenous as possible for the results to make sense. Using DEA for a problem with only one input and only one output is unnecessary as one can calculate the ratio in equation (2.1) with ease. Since the Charnes et al paper, data envelopment analysis has been implemented in different environments, public and private, manufacturing and also in service environments. We can find research in the banking and service industry (e.g. (Jemric & Vujcic, 2002; Sherman & Landino, 1995); in insurance companies (Mahajan, 1991), public schools (Chalos & Cherian, 1995), hotels (Anderson, Fish, Xia, & Michello, 1999). Donthu et al. (1998) applied DEA to the food service industry, focused on fast food restaurants. Hundreds if not thousands of applications have been published in the manufacturing arena as well.

There are several models or variations of DEA formulations. The two most important and referenced ones are: the CCR model (Charnes, Cooper, & Rhodes, 1978) and the BCC model (Banker, Charnes, & Cooper, 1984). The main difference between these two models is the handling of scale performances. BCC enables performances at variable scales; CCR supposes that every DMU operates at constant scale performances.

The CCR model (Charnes, Cooper, & Rhodes, 1978) recognizes the difficulty of a group of common considerations in order to determine the relative efficiency and this is why it proposes that every unit may adopt a series of weighted coefficients that may favor them in comparison to other units. This is the basic DEA model, considering the efficiency measurement as the coefficient between the weighted sum of outputs and the weighted sum of inputs of each decision making unit, the mathematical formula is presented as:

$$\boldsymbol{Max\ h_0} = \frac{\sum_r u_r y_{rj_0}}{\sum_i v_i x_{ij_0}} \qquad \textbf{2.4}$$

Subject to,

$$\frac{\sum_r u_r y_{rj_0}}{\sum_i v_i x_{ij_0}} \leq 1 \quad \textit{for each j unit} \qquad 2.5$$

$$u_r, v_i \geq \varepsilon \qquad 2.6$$

Where:

Max ho – is the objective function.

y_{rj} – Output r of the DMU j

x_{ij} – Input i of the DMU j

v_i,-Weight assigned to input i

u_r - Weight assigned to output r

ε-Small positive number

The DEA model shown in equation 2.4 is a fractional model, but may be converted to a linear form so that linear programming may be applied. Models using DEA are usually solved as a dual problem due to the fact that in their primal state there are so many restrictions in decision variables and that in their dual state there are as many restrictions as entries. The dual model is shown as:

$$Max\ h_0 = \sum_{r=1} u_r y_{rj_0} \qquad 2.7$$

Subject to,

$$\sum_{i=1}^{m} v_i x_{ij_0} = 1 \qquad 2.8$$

$$\sum_{i=1}^{m} u_r y_{rj_0} - \sum_{i=1}^{m} v_i x_{ij_0} \leq 1, \quad j = 1, 2, 3, \dots, n \qquad 2.9$$

$$u_r, v_i \geq \varepsilon \; \forall \; r \; and \; i \qquad 2.10$$

Or also in its output increasing form as,

$$Max \;\; \theta \qquad 2.11$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{ij0}, \quad i = 1, 2, 3, \dots, m \quad Inputs \qquad 2.12$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq \theta y_{rj0}, \quad i = 1, 2, 3, \dots, t \quad Outputs \qquad 2.13$$

Where:

Max θ – is the objective function that maximizes efficiency

y_{rj} – Output r of the DMU j

x_{ij} – Input i of the DMU j

λ_j Respective weighted inputs and outputs

Equation 2.12 treats the inputs of the DMU that is being evaluated. The left hand side of the restrictions in 2.12 and 2.13 shows the hypothetical DMU will be shaped by taking the formula for weighted average of the DMU weights for inputs and outputs. The entire 2.12 restriction guarantees that the weighted hypothetical DMU inputs are not greater than that of the DMU which efficiency is being evaluated. Constraint 2.13 indicates that the weights generally will be selected so that each hypothetical DMU (the projection to the frontier) produces outputs in the same proportion as the DMU that is being evaluated.

The CCR model assumes that every decision making unit operates at a constant optimal scale, in other words, that any increment in utilized inputs is translated into a proportional increase in outputs, excluding the existence of inefficiencies due to scale, considering any deviation from the frontier inefficient. Thus, the BCC model (Banker, Charnes, & Cooper, 1984) proposed adding a restriction 2.14 below to the previous model that allows variable scale performance.

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad \textbf{2.14}$$

The implementation of the 2.14 restriction assured the sum of the weights of all units is equal to 1 assuring that the efficient surfaces can have a variable shape.

The following illustrates some examples to explain how data envelopment analysis works.

Example 1.

Consider the possibility of a number of bank branches. For each branch there is only one measured output (number of finished personal transactions) and only one measured input (amount of personnel). This process evaluates one input and one output, we can state that efficiency is defined as in equation (2.1):

Data is shown as:

Table 1: Branch Data: Inputs = No. Of Operations and Outputs = Number of Personnel

Branches	No. Of Operations	Number of Personnel
Branch A	95,000	18
Branch B	25,000	16
Branch C	65,000	17
Branch D	12,000	11

In order to find the relative efficiency in outputs and inputs it is necessary to calculate a rate. The relative efficiency in this example (see table 2) where branch A shows 100%, being the most efficient requires that the rest of the efficiencies be calculated. Efficiency of each one divided by the highest efficiency in the group.

Table 2: Efficiency and Relative Efficiency of Each Branch

Branches	Outputs	Inputs	Efficiency	Relative Efficiency
Branch A	95,000	18	5.28	100%
Branch B	25,000	16	1.57	30%
Branch C	65,000	17	3.82	72%
Branch D	12,000	11	1.17	22%

Example 2

Let us consider the same number of bank branches. For each branch there are two measured outputs: balance and loan balance and only one input: operating expenses. This example aims at evaluating only one input with multiple outputs. Farrell's formula to calculate efficiencies for this scenario as explain before in section 2.1 is:

$$Efficiency = \frac{Weighted\ Sum\ Outputs}{Weighted\ Sum\ Inputs}$$

Table 3 shows data for different branches.

Table 3: Two Outputs (Expenses and Loans) and One Input (Deposits)

Branch	Expenses	Loans	Deposits
Branch A	$ 140,464,000.00	$ 356,847,000.00	$ 20,034,330.00
Branch B	$ 110,464,000.00	$ 254,856,000.00	$ 10,045,624.00
Branch C	$ 120,567,381.00	$ 429,002,101.00	$ 16,023,450.00
Branch D	$ 100,543,811.00	$ 123,654,909.00	$ 14,076,644.00

Table 4 explains the efficiencies and relative efficiencies of each one of the branches.

Table 4: Branch efficiencies

Branches	Output 1	Output 2	Input	Efficiency 1	Efficiency 2	Relative Efficiency 1	Relative Efficiency 2
A	$ 140,464,000.00	$ 356,847,000.00	$ 20,034,330.00	7.01	17.81	64%	67%
B	$ 110,464,000.00	$ 254,856,000.00	$ 10,045,624.00	11	25.37	100%	95%
C	$ 120,567,381.00	$ 429,002,101.00	$ 16,023,450.00	7.52	26.77	68%	100%
D	$ 100,543,811.00	$ 123,654,909.00	$ 14,076,644.00	7.14	8.78	65%	33%

In this case, reaching a conclusion may be difficult, since there are two dimensions of performance that can be evaluated separately. For example, branch B is better regarding expenses, but when we analyze loans, branch C is the best choice. This is why when there are multiple outputs and inputs an interpretation may become difficult. Prior results presented in table 4 can also be explained graphically as shown in figure 2 where the relation between two outputs and only one input are shown, as well as the efficient frontier.

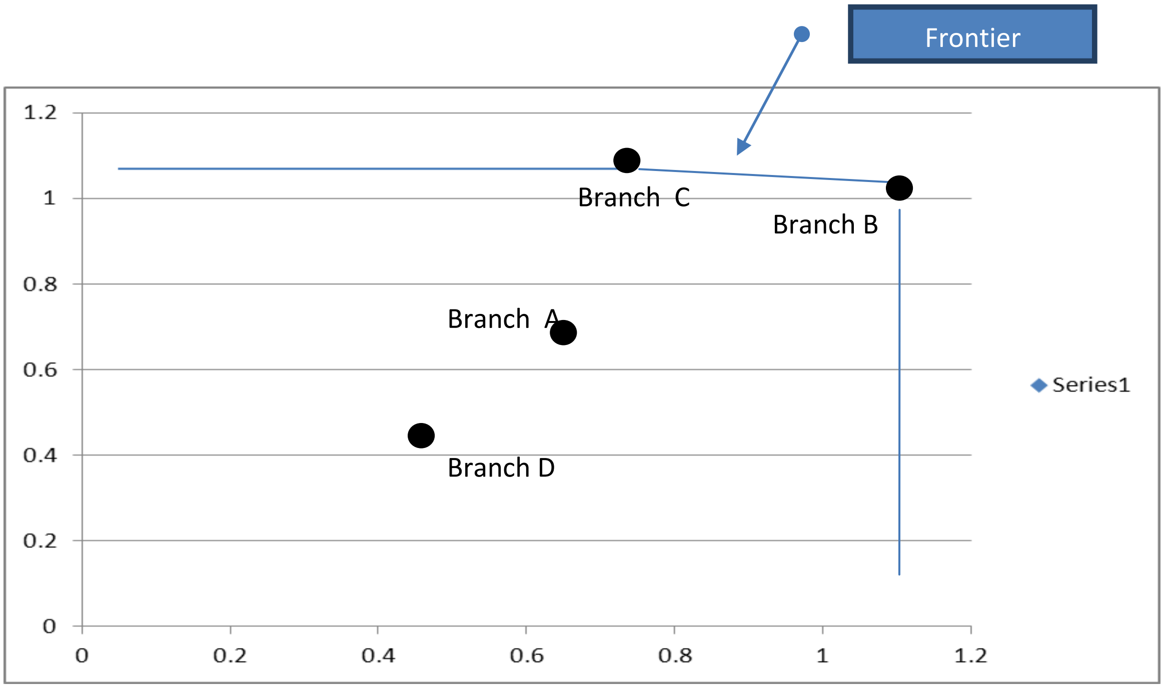


Figure 2: Efficient Frontier

Every branch on the frontier is considered 100% efficient, but this does not mean that they cannot improve, what this means is that with the data we have we cannot determine where and for what amount they must improve. Relatively speaking to the comparison set, they are performing at their best.

Example 3

This example illustrates how the mathematical formulation is made using data envelopment analysis taking as data 4 baseball players. Considering as input the amount of times at bat with a minimum of 500 times and as outputs the amount of hits and homeruns. The data is from a complete season.

Table 5: Data Summary Example

Players	Output Hits	Output HR	Input Frequency
Alex Rodriguez	154	33	510
Manny Ramirez	183	37	552
Albert Pujols	187	37	524
Aramis Ramirez	160	27	554

$$\max E$$

$$E_{Rodríguez=}\frac{154W_{hits}+33W_{HR}}{510W_{frecuency}}$$

$$E_{Ramirez=}\frac{183W_{hits}+37W_{HR}}{552W_{frecuency}} \qquad E_{Pujols=}\frac{187W_{hits}+37W_{HR}}{524W_{frecuency}}$$

$$E_{Ramirez=}\frac{160W_{hits}+27W_{HR}}{554W_{frecuency}}$$

$$0 \leq E_{Rodríguez} \leq 1$$

$$0 \leq E_{Ramirez} \leq 1$$

$$0 \leq E_{Pujols} \leq 1$$

$$0 \leq E_{Ramirez} \leq 1$$

$$W_{Hits\geq 0} \qquad W_{HR\geq 0} \qquad W_{Frecuency\geq 0}$$

The problem was solved with linear programming. The results obtained are shown in table 6 where “one” is considered 100% efficient according to evaluated data.

Table 6: Efficiency Indicators

$E_{Rodriguez}$	**0.90**
$E_{Ramirez}$	**0.94**
E_{Pujols}	**1.00**
$E_{Ramirez}$	**0.75**

2.3 DEA with Non-Discretional Factors

Several authors have developed methodologies to integrate non-discretional variables to efficiency analysis and several others have aimed to compare those methodologies or changes to the original formulation. Muñiz (2002) describes several of them and states that there aren´t any indications that make a single methodology superior. For a better understanding of the methodologies, they can be divided into groups according to the number of methodological steps involved in the calculations. In the following sections we will present one stage and multiple stage models.

2.3.1 One Stage Models

One stage models are those where non-discretional variables are included in the initial part of the formulation, through a DEA algorithm where these variables are treated in a specific fashion. The most representative effort in this group is also one of the first to analyze non-discretional variables Banker and Morey (1986) developed a new formulation and applied it to a fast food restaurant franchise. They integrated a modification to the standard DEA model restrictions considering explicitly the non-discretional character that some variables may have, besides defining relative efficiency only for discretional inputs. After that first formulation, these authors also developed an alternative model where non-discretional inputs behave specifically as categorical variables (Banker & Morey, 1986).

Lozano et al. (2001) methodology evaluates the efficiency within the banking industry. Another model extension was made by Gollany et al., (1993), where the analysis of non-controllable inputs as percentages was introduced; creating the ability to evaluate special cases where examined units exert limited control over non-discretional variables.

Ruggiero (1996) also developed a model for non-discretional variables. This author considers that the Banker and Morey (1986) model overestimates the efficiency rate reached by decision making units in unfavorable environments. The model do not limit the reference group enough for the evaluated decision making unit, enabling the results for the unit being evaluated in an adverse environment to be classified as inefficient. This may be due to the fact that the reference group in the Banker and Morey (1986) formulation to which the unit under evaluation is being compared may have decision units working in a positive environment and therefore overestimating inefficiency. For this reason, Ruggiero proposed a model modifying the restrictions in a way so that it would exclude from the reference group all units that count with a more favorable environment than the unit being evaluated at that time.

Yang and Paradi (2003) based their methodology on what is designated as “Handicapped DEA”. This happens when a DMUs turn out to be in a disadvantaged environment and in some measure it will be compensated by increasing their outputs or decreasing their inputs the advantaged DMUs may be handicapped by increasing their inputs or decreasing their outputs.

Their formulation evaluates the efficiency through different productivity levels of several Canadian banks. This allows the evaluation of cultural differences that competitors might have from one another. Furthermore, this “handicapped” approach can be applied to any situation where normal DEA analysis may be used.

These single-stage models may encompass limitations when the number of factors rises due to the probability of wrongly recognizing an inefficient unit when it is not. This is why there are multiple stage models in order to correct this limitation.

2.3.2 Multiple Stage Models

Multiple stage models carry out the analysis in steps where the estimation of initial DEA efficiency indicators is performed at the beginning, skipping at first the non-discretional variables. Within this group we can mention the work of Pastor et al., (1994), which develops an early stage of the DEA model using only controlled variables to allow for all the units to be influenced under the same external factors. In a second stage the units that are considered inefficient have their output value modified in order to compensate for the negative effects of the environment. When levels of efficiency are calculated one more time these units will depend on discretional variables.

Furthermore, Pastor et al., (2001) proposed an extension to the Banker and Morey (1986) model by establishing a procedure to determine which variables are the most influential over efficiency indicators. Once identified, these variables are the only ones introduced in the model.

Likewise, Fried and Lovell (1996) use data envelopment analysis in three phases, being the first phase a model which only considers discretional variables. In a second phase, levels of efficiency are estimated to distinguish and quantify the technical inefficiency and the influence of the non-discretionary variables. In the third and last phase DEA is applied to inefficient units resulting in an increase in inputs and a decrease in outputs.

On the other hand, Ruggiero (1998) in a second follow-up model to his prior 1996 model also divides the analysis in three stages. The first stage is identical as other prior standard models (CCR or BCC) as it proposes to solve DEA with only discretional variables. After the results of this preliminary analysis are obtained develops a regression model which includes non-discretional variables and in the third and last stage he accomplishes a DEA analysis correcting for any bias caused by the regression.

2.4 Model Comparison

As stated before, some authors in the literature have already performed the task of comparing different existing methodologies which include non-discretional variables to see which has the best performance.

One of the main articles for this research project is Muñiz et al., (2006). These authors compared five different formulations using simulated data. One stage models and multiple stage models are compared. These authors used the simulation done by Ruggiero (1998) and compared the estimated efficiencies of the models. To accomplish this, they defined the equation of the technology that transforms inputs into outputs as to calculate what they call the "true efficiency", and then randomly generated data for their simulation. They divided their experiment in order to generate data for the simulation in three stages. First they allowed variation in the number of decision making units to be at 50,100,150. In order to measure model performance, a rank correlation is used along with the median absolute deviation (MAD) from the true efficiency and the percentage of units that overestimates the levels of inefficiency is calculated.

They concluded that one stage models show the worst performance. This is due to a significantly lower rank correlation and high number of inefficiency overestimation. Multiple state models perform better when it comes to working with non-discretional variables obtaining the best rank correlation, and is not affected with the variable increase.

Other study that compares methodologies is Ruggiero (1998). In this study three models are compared and weaknesses and strengths are identified, using random generated data of a uniform distribution with only 200 observations.

Ruggiero analyzes the Banker and Morey (1986) model, for which concludes that efficiency measures are distorted due to the methodology makes inappropriate comparisons with the decision making units.

Analyzing as well a model developed by Ray (1991), Ruggiero concludes that the methodology imposes some assumptions of distribution over efficiency and this is why inefficiency may be overestimated.

Muñiz (2002) empirically and systematically analyzed the one stage model of Banker and Morey (1986) and the three stage method developed by Fried et al., (1996). For this last model he proposes a modification that enables to improve the interpretation and results of this mode. For the empirical analysis he chose an application to the educational industry.

One of the latest studies completed comparing methodologies that include non-discretional variables was done by Cordero et al., (2009). These authors have a different vision of prior work done since the Monte Carlo simulation was used for data generation. The advantage of using this simulation is that it used more replicas for data and can define a more flexible function. Here, four methodologies are used to do the comparisons: The one stage model of Banker and Morey (1986), the two stage model of Simar and Wilson (2007), the three stage model of Muñiz (2002) and the four stage model of Fried et al. (1999). In this study two samples were considered of decision units with n= 50 and n=400, where true efficiency is compared with the efficiency obtained by model development. It was concluded that the four stage model is the model that best simulates reality. The two stage models are the worst models due to their poor performance since their structure concentrates in finding the non-discretional variables. That mainly influences the processes instead of creating a frontier that will take them into consideration. Regarding one stage and three stage model, it is concluded that one stage models have a better performance in larger samples and the three stage model are better when the samples are smaller.

The next chapter discusses the methodology proposed to perform the comparisons of formulations with real data and presents the results from a preliminary analysis with two models.

Chapter 3: Methodology

In this chapter we present a discussion on the models to be compared, followed by which decision making units (DMU´s) will be used, what group of DMU´s will be analyzed, where does the data come from and a brief description of each one of the variables. In a third section the metrics proposed for the comparison (evaluating the performance of the models) along with a proposed validation method is presented.

3.1 Models

The models we are comparing are DEA models that can be found in the literature. All of them analyze non-discretional variables. Following the notation made by Muñiz et al. (2006), which is the same used by Ruggiero in 1996, we are going to assume that the production notation can be characterized by the transformation of inputs x = ($x_{1,}$. . . ,x_m), $\in R^m$ with notation for outputs and = (y_1, . . . , y_s), $\in R^s$, given the non-discretional variables considered as z=(z_1, . . . , z_R) for j DMUs. And the factor z represents a more favorable environment. Also the production environment is represent by y^0, x^0

3.1.1. Banker and Morey Model (1986)

This model is the first DEA model that appeared in the literature to evaluate efficiency considering non-discretional variables, and it assumes performance at variable returns to scale. The model in its input decreasing formulation is described in the following manner:

$$\boldsymbol{BM(y^0, x^0) = \min \theta} \tag{3.1}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j\, y_{kj} \;\geq y_{k0} \qquad k = 1, 2, 3, \ldots, S} \tag{3.2}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j\, x_{kj} \;\leq \theta x_{i0} \qquad i = 1, 2, 3, \ldots, M} \tag{3.3}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j\, z_{rj} \;\leq z_{r0} \qquad r = 1, 2, 3, \ldots, R} \tag{3.4}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j = 1} \tag{3.5}$$

$$\boldsymbol{\lambda_j \geq 0.} \tag{3.6}$$

The main difference of this model to the traditional one is the introduction of the restriction that controls non-discretional variables (3.4). This restriction uses the non-discretional variables for building a reference set and does not alter the efficiency result of the DMU that is being evaluated. The equation 3.2 states that the potential output of a DMU is being evaluated and if the unit is inefficient the result will be greater than one. The left side of the 3.2 and 3.3

restrictions illustrates that the hypothetical DMU´s that are created will take their weighted averages from the real DMU for each input and output. The entire 3.3 restriction indicates that the weights of the inputs from the hypothetical DMU´s are not more than the DMU that is being evaluated and restriction 3.2 indicates that the weights generally are going to be selected for each hypothetical DMU so that they produce outputs in the same proportion as the evaluated DMU. Finally, restriction 3.5 and 3.6 assures that every DMU to be studied at the same rank and do not acquire negative weighted values assigned to each DMU.

3.1.2 One Stage Model of Ruggiero (1996)

Ruggiero proposed a model modifying the restrictions in a way so that it would exclude from the reference group all units that count with a more favorable environment than the unit being evaluated at that time.

$$\boldsymbol{R}(\boldsymbol{y}^{\mathbf{0}}, \boldsymbol{x}^{\mathbf{0}}) = \mathbf{min}\,\boldsymbol{\theta} \qquad 3.7$$

Subject to,

$$\sum_{j=1}^{J} \lambda_j \, y_{kj} \;\geq y_{k0} \qquad k = 1, 2, 3, \dots, S \qquad 3.2$$

$$\sum_{j=1}^{J} \lambda j x_{kj} \;\leq \theta x_{i0} \qquad i = 1, 2, 3, \dots, M \qquad 3.3$$

$$\lambda_j \; = 0 \; if \quad z_{rj} > z_{r0} \qquad r = 1, 2, 3, \dots, R \qquad 3.8$$

$$\sum_{j=1}^{J} \lambda_j = 1 \qquad 3.5$$

$$\lambda_j \geq 0. \qquad 3.6$$

While all other restrictions in the Ruggiero model are similar to that of the CCR or BCC models, it varies on one additional restriction 3.8 which introduces a variable or factor of environmental harshness that represents the difficulty that the DMU has producing products or delivering services in its operating environment. The idea is that the higher the environmental factor z, the more difficult it is to perform, and therefore it would be unfair to benchmark those DMUs with different harsher levels of this variable. Restriction 3.8 of this model excludes the DMU´s with the creation of a reference set in a more favorable environment and the performance scale may be forced due to the restriction. The rest of the restrictions in this model are similar to 3.2 and 3.3 of the previous model. It must be emphasized that according to the author of this model, (Ruggiero J. , 1998), this model may present difficulties if worked with more than one discretional variable.

3.1.3 One Stage Model of Yang and Paradi (2003)

The Yang and Paradi model requires the definition of a handicapped function that compensates the different environments in which the DMU operates (Muñiz, Paradi, Ruggiero, & Yang, 2006). The models try to balance the environmental differences of the DMU under evaluation.

$$YP(y^0, x^0) = \min \theta \qquad 3.9$$

Subject to,

$$\sum_{j=1}^{J}(m_j\, y_{kj})\lambda_j - s_k = (m_0 y_{k0}) \qquad k = 1, 2, 3, \dots, S \qquad 3.10$$

$$\theta(h_0 x_{i0}) - \sum_{j=1}^{J}(h_j\, x_{ij})\lambda_j - s_i = 0 \qquad i = 1, 2, 3, \dots, M \qquad 3.11$$

$$\sum_{j=1}^{J}\lambda_j = 1 \qquad 3.5$$

$$\lambda_j \geq 0. \qquad 3.6$$

Yang and Paradi introduced the concept of input and output incapacity in this model based on the levels on which non-discretional variables can be found. This model assumes h_j as the incapacity to measure the disadvantages in measurements for inputs and m_j as output disadvantages. In restriction 3.10, it is considered $h_j x_{ij}$ the adjustment of the inputs and in 3.11

$m_j y_{ij}$ is considered the adjustment for outputs. These restrictions penalize the DMU that has a better operational advantage in regards to its environment, increasing the measured input incapacity h_j o either with the decrease of the output incapacity m_j.

3.1.4 Multiple Stage Model of Ruggiero (1998)

Following Ruggiero's 1996 model, this author developed a 3-stage approach because the model he develops in 1996 may present difficulties if worked with more than one discretional variable. This model is developed in three stages. The first stage only develops discretional variables for inputs and outputs as well. This first stage measures the relative performance with regards to which ones better represent the efficiency frontier without the influence of the discretional factors. The input minimizing model is represented as:

$$\boldsymbol{R2(y^0, x^0) = \min \theta} \qquad \textbf{3.12}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j\, y_{kj} \;\geq y_{k0} \qquad k = 1, 2, 3, \dots, S} \qquad \textbf{3.2}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j\, x_{kj} \;\leq \theta x_{i0} \qquad i = 1, 2, 3, \dots, M} \qquad \textbf{3.3}$$

$$\boldsymbol{\sum_{j=1}^{J} \lambda_j = 1} \qquad \textbf{3.5}$$

$$\boldsymbol{\lambda_j \geq 0.} \qquad \textbf{3.6}$$

The result of this model is a composition of the measurement of the technical efficiency and the impact that non-discretional variables possess. In the first stage the original DEA model is employed using only the discretionary variables. All equations are the same as Banker and Morey explains in section 3.1.1. This produces a first measure FS. (y^0, x^0). That captures not only technical inefficiency but also the harshness of the production environment. (Muñiz, Paradi, Ruggiero, & Yang, 2006).

As a result, the index cannot be used as an index of pure technical efficiency. Therefore in order to analyze this composition. Ruggiero (1998) recommends using a linear regression in the second stage to factor out the effect that the environment has on production following the formula used by Ray (1991), see equation 3.13, to determine the significant factors z of this formula and try to identify the non-discretional nature of the variables. In particular, Ruggiero advises using regression to create an index for non-discretional factors. In Equation 3.14, Z represents the index of environmental harshness. This index collapses several non-discretional variables into one variable.

$$\boldsymbol{R2 = \alpha + \beta 1 z 1 + \cdots \ldots + \beta_i + z_i + \varepsilon} \qquad \textbf{3.13}$$

$$\boldsymbol{Z = \sum_{i=1}^{R} \beta_i \, z_i} \qquad \textbf{3.14}$$

3.1.6 Medina-Borja Model (2002)

In 2002 Medina-Borja developed a four-stage approach to measure performance for non-profit organizations considering the formulations at each stage as output increasing. The different operations were divided into 4 activity nodes: financial node, capacity node, service delivery node and customer node. In this work we are going to use only the financial node. All nodes treat non-discretionary variables in the same fashion. The model described below by Medina-Borja considers a set of j=1, 2, 3…, n. Operating units that will be referred to as DMUs. This set of DMUs uses a set of discretionary inputs; x_{ij}^{fr} represent the input i of DMU j in F∈ R^F. F is the set of all fundraising/managerial, and f is the number of such variables. Each DMU is impacted by continuous non-discretionary environmental factors z_{mj}^{e}, where the environmental input m of DMU j in E where E is the environmental factors set. These affect the production of output quantities which are represented by x_{kj}^{d} in k of DMU j in D ∈ R^b where D is set of donations and in-kind contributions and b represents number of such variables. In this model the objective function 3.15 below maximizes the value of the sum of θ_{kj} and incorporates the concept of weights or preferences given by the DMU's.

$$\boldsymbol{Max} \sum \quad \boldsymbol{w_k} \, \boldsymbol{\theta_{kj}} \tag{3.15}$$

$$\sum_{j=1}^{j} \boldsymbol{\lambda_j} \, \boldsymbol{x_{ij(t-1)}^{fr}} \quad \leq \boldsymbol{x_{ij0(t-1)}^{fr}} \qquad \boldsymbol{i} \in \boldsymbol{F} \tag{3.16}$$

$$\sum_{j=1}^{j} \boldsymbol{\lambda_j} \, \boldsymbol{x_{mj(t-1)}^{e}} \quad = \boldsymbol{x_{mj0(t-1)}^{e}} \qquad \boldsymbol{m} \in \boldsymbol{E} \tag{3.17}$$

$$\sum_{j=1}^{j} \boldsymbol{\lambda_j} \, \boldsymbol{x_{kj(t-1)}^{d}} \quad \geq \boldsymbol{\theta_{kj0}} \, \boldsymbol{x_{kj0(t-1)}^{d}} \qquad \boldsymbol{k} \in \boldsymbol{D} \tag{3.18}$$

$$\sum_{j=1}^{J} \boldsymbol{\lambda_j} = \boldsymbol{1} \tag{3.19}$$

$$\boldsymbol{\lambda_j} \geq \boldsymbol{0} \forall \boldsymbol{j} \ni \boldsymbol{z_{j(t-1)\leq}^{e}} \quad \boldsymbol{z_{jo(t-1)}^{e}} \tag{3.20}$$

$$\boldsymbol{\lambda_j} = \boldsymbol{0} \forall \boldsymbol{j} \ni \boldsymbol{z_{j(t-1)>}^{e}} \quad \boldsymbol{z_{jo(t-1)}^{e}} \tag{3.21}$$

The restriction represented by equation 3.17 is used for non-controllable environmental factors that affect the organization also seen in Banker and Morey (1986). The equation 3.16 treats the inputs as discretionary inputs. The author incorporated a “*variation to the normal treatment of inputs in DEA since this formulation utilizes the expenses incurred at time (t-1). This is to recognize that the money collected during year t-1 usually pays for the services provided in year t*”. The equation 3.18 assumes the outputs as non-discretionary variables, because this model carries a non-radial projection to the frontier. Medina-Borja says that it allows each output to project itself to the frontier not necessarily in the same proportion as others, equations 3.19, 3.20, 3.21 were taken from other models. Equation 3.19 from Banker and Morey (1986) to allow the variable return to scale and the last two were taken from Ruggiero model to deal with environmental variables. Equation 3.20 makes sure that all sets are chosen from the DMUs that operate at the same or lower environment. The equation 3.21 not includes the DMU that operates at a more favorable environment in the calculations (Medina-Borja, 2002).

All the models discussed above were programmed using Solver in Excel plus VBA for application; given the amount of DMUs, an upgrade to Excel Solver™ had to be done using the packaged provide by Frontline solvers. The algorithm used and the results from each one of the models tested are in the following appendices of this document:

- Banker and Morey 1986: Appendix A shows the results from the model and Appendix G the excel solver algorithm.
- Ruggiero 1996: Appendix B shows the results from the model and Appendix F the excel solver algorithm.
- Ruggiero 1998: Appendix C shows the results from the model and Appendix H shows the results for regression made in Ruggiero 1998 and I the excel solver algorithm.
- Medina-Borja 2002: Appendix D shows the results from the model and Appendix J the excel solver algorithm.
- Yang and Paradi 2003: Appendix E shows the results from the model and Appendix K the excel solver algorithm.

3.2 The American Red Cross Case: Data Collection and Variable Selection

The selection and collection of data is an important step in the development of systems that measure performance and the success of any DEA analysis. The purpose of this section is to describe the variables that will be used in the study and their source. The data is provided by the American Red Cross (ARC), a non-profit humanitarian organization, managed by volunteers and guided by the statute established by the Congress of the United States and the Fundamental Principles of the International Red Cross Movement.

3.2.1 How ARC Operates

The American Red Cross is not a government agency. Its mission is to offer help to disaster victims, help people to prevent, be prepared for, and respond to emergencies. This agency has five service divisions (disaster service, armed forces services, health services, international services) and biomedical blood processing. All input and output data were provided by the ARC for the service divisions.

The performance measurements objectives for ARC are:

- **Maximize outputs**: Increase the amount of income (donations, grants, contracts) so that their funds or revenues increase while their fundraising and managerial expenses decrease or are kept constant.
- **Target settings**: Putting national performance standards into a local context, establishing a level of performance for the organization’s improvement.
- **Peers**: Finding field unit peers to make more fair comparisons
- **Ranking**: Establish a ranking for the units is less important.

For nonprofit organizations in general, but particularly for the American Red Cross the revenue generation activity is a crucial one. Field offices have to generate enough funds to operate and pay a fee to national headquarters. Not having enough funds to survive is often criteria to close the office or intervene it. To collect funds nonprofits often depend on the goodwill of the general public though donations, legacies and bequests but also contracts with the government to provide services and in the case of the ARC, the sales of some of their classes for a fee, such as the First Aid and CPR or swimming lessons that they offer The fundraising function then is extremely important, having offices to perform fundraising activities such as banquets, mailing campaigns and marketing campaigns. It is believed that some offices overspend in fundraising events while others underspend. However, the success of the revenue generation activity is in fact influenced by the wealth of the community where they operate. This is why this particular area of operation of a nonprofit is a perfect test bed for our research objective. We will test the models in data relating to revenue generating activities only. For the ARC identifying which chapters or field offices are inefficient in this function but considering the adjustments granted by their operating environment is of great importance.

3.2.2 Data Selected

The data used is for one entire year (2001) and was collected from 937 DMUs or chapters all over the United States and territories.

Data to be used in this project may be divided into two categories:

- **Financial indicators**: Unique indicators to non-profit organizations that measure income and costs (income by donations, fund raising expenses, personnel and administrative expenses, etc.). We have to take into account that financial objectives in, a non-profit organization are different than in for profit organization.

- **Demographic data** for each office such as, population, racial composition, income per family, etc.

3.2.3 Chosen Variables

The chosen variables include every variable measuring resources used and funds obtained common to all the decision making units being studied. Variables are related to only revenue generating activities used to maintain service and operations at the Red Cross. These variables are found in data repositories used by the agency. Tables 7-8 show the variables with their description. Later, a correlation analysis of the selected variables was recommended for the assessment and study of different models.

Table 7: List of variables for 2001

	Code	Min	Max	Average	St deviation
Cost (Input)	**MAN_FREXP**	$ 1,876.00	$ 6,380,295.00	$ 254,257.41	$ 560,397.51
Income (Output)	**INSTIT**	$ 0.00	$ 9,973,627.00	$ 210,744.37	$ 636,737.76
Income (Output)	**DONAT**	$ 0.00	$ 7,003,749.00	$ 208,767.21	$ 581,955.68

Table 7 above shows the tree variables used in this project.

1. **MAN_FREXP** code represents the managerial and expenses per household. This variable represents the cost of revenue generating activities and it is the combination between management expenses and fundraising events' expenses at the Red Cross. The other variables INSTIT and DONAT are income variables.

2. **INSTIT** is the combination of federated grants and institutional grants and contracts with local or state government.

3. The **DONAT** variable represents all donations received by the Red Cross. A combination of disaster donations and other monetary contributions made by the general public plus donations generated by special events.

3.2.4. Non- Discretionary Variables

Table 8: Lists of non-discretionary variables

Code	Description	Mean	MAX	MIN	Standard deviation
POP	Size of the market through the population served	273,351.36	8,922,583	2,247	706,002.61
MINORITY	Diversity in the population measured by the percentage of minorities	17.867668	95	0	16.95207079
HH	Urban Development of the area served	100,726.54	3,323,900	0	256,161.76
MEDHHI	Medium household income	$38,974.47	$124,865	$18,978	$10,373.94
AGHHI	Aggregated household income	$5,860,821.70	$1,991,352	0	$16,283,342.20
AREA	population per square Km	2,112.82	146,753.80	0	8,866.30

This project uses two non-discretionary variables taken from table 8: Population is coded POP that represent market size and the medium household income, MEDHHI. These variables are used by officials at ARC. Statistically the two selected were the ones with higher correlation**.** These environmental variables are shown in Appendix N.

Chapter 4: Application, Results, and Discussions

This chapter presents the results of the comparative analysis performed for this application of the five DEA models presented in Chapter 3. The objective of this chapter is to test and illustrate the use of the formulations with real life data by applying the models to the American Red Cross' financial performance model explained later in this chapter. The correlations between the variables selected are tested first for adequacy of the input/output configuration selected. Then the DEA efficiency and inefficiency results are provided, and the classification of each DMU is evaluated analyzing the discretionary ability of each model to identify credible peers.

The purpose of this comparative analysis is to evaluate the models on the following assumption: *that for DEA being able to achieve credible results and recommendations for the units being evaluated, the process of peer selection and target setting has to be done with peers with similar environment and scale of operations.*

For testing the suitability of the peers and evaluate the validity of the peers selected for each model the following analysis was performed:

1. K-means cluster analysis to obtain the centroids of each different group according to the environmental characteristics or factors chosen. The distance to the centroid of the unit under analysis from each peer is what will be used to evaluate the model
2. Technique called "peeling the frontier" (Yang Z. , 2002), was utilized to show the extent to which the peers are "practical". According to Yang, if there is no dramatic improvement in the scores of the inefficient units after all efficient units are peeled

off, then it is possible to infer that the peers were appropriate in the first place. If there is too much change after the peel off, the peers selected are not validated. This technique removes all efficient units on the frontier at one time to see how the remaining performs. In section 4.4.6 a more elaborate explanation is given. Each model has to provide credible solution to most units.

3. Top Red Cross officials familiar with the units being evaluated reviewed the similitude or not of the reference sets.

4.1 Financial Performance Model

No matter the type of organization, to provide a service or a product, it is initially necessary to consume the resources from which these products or services emerge. In our analysis the initial resources or inputs are the funds spent by the organization: managerial and fundraising expenses. These two expenses represent the inputs or resources used during these so called revenue-generating activities. By expending this fund nonprofit organizations are able to collect or receive donations from the public and grants and contracts from the government (hereinafter called *institutional income*). It is the institutional income what we will consider the output of the financial system being tested.

It is necessary to emphasize that the operational environment of the organization is directly affected by variables like the market size and community wealth. In our study we are seeking to estimate the impact of these variables within the operating environment of the organization.

Figure 3 below describes the financial performance model for the American Red Cross. The revenue generating activities are directly influenced by variables that are external to the system. We are incorporating these variables to the performance analysis as the non-discretionary variables, which are the variables the organization cannot control. In our case the variables are market size and community wealth. The market size is represented by the population and community wealth is given by the median household income. The objective of the performance model is to increase the amount of income (donations, institutional income) so that their funds or revenues increase while their fundraising and managerial expenses decrease or are kept constant (inputs).

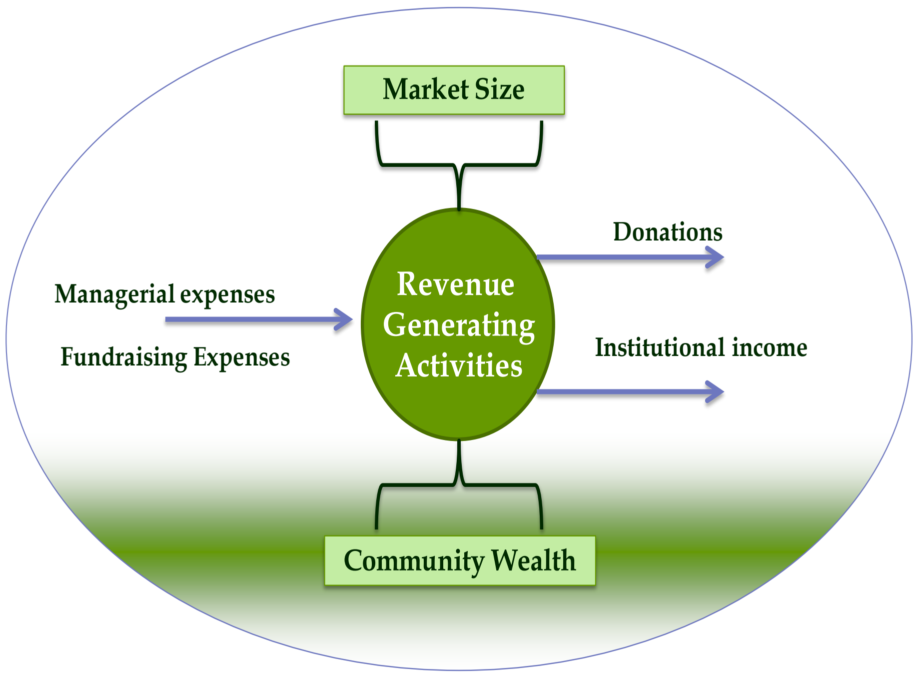


Figure 3: Financial Performance Model of the American Red Cross

4.2 Correlation Analysis

The degree of correlation between variables is very important in DEA models. For DEA analysis it is not advisable for input variables to be strongly correlated among them but need to be correlated to the output variables (Medina Borja, 2002). A correlation analysis is vital to establish suitable inputs and outputs.

Furthermore Yang (2002) explains that if very high correlations are found between an input variable and any other input variable or between an output variable and any other output variable, the variable may be thought of as a representation of each other. So, this input or output should be excluded from the model. On the other hand, if an input variable has very low correlation with all the output variables or else an output variable has very low correlation with all the inputs variables. The correlation results are shown in Table 9.

Table 9: Correlation results[2]

	Managerial expenses (input)	Institutional Income (Output)	Donation (Output)	Population (Non-discretionary)	Median_Household (Non-discretionary)
Managerial expenses (Input)	1	0.6357	0.8693	0.8813	0.7282
Institutional Income (Output)	0.6357	1	0.6008	0.6793	0.6190
Donation (Output)	0.86931	0.6008	1	0.8693	0.7604
Population (Non-discretionary)	0.8813	0.6793	0.8693	1	0.6742
Median_Household (Non-discretionary)	0.7287	0.6190	0.7604	0.6742	1

The result for the correlation indicates that the variables selected can be used in the DEA models chosen for this project.

[2] P-value for all correlations <= 0.001

4.3 Performance Evaluation Results

The following section presents the results for each of the models selected for the comparative analysis. Results using these formulations are shown and comparisons drawn. Because DEA works best when the number of DMUs is significantly larger than the number of variables, the discriminatory power of the models is expected to be very good for the analysis.

The algorithm used and the results from each one of the models tested are in the following appendices:

- Banker and Morey (1986): Appendix A shows the results from the model and Appendix G the excel solver algorithm.
- Ruggiero (1996): Appendix B shows the results from the model and Appendix F the excel solver algorithm.
- Ruggiero (1998): Appendix C shows the results from the model and Appendix H shows the results for regression made in Ruggiero 1998 and I the excel solver algorithm.
- Medina-Borja (2002): Appendix D shows the results from the model and Appendix J the excel solver algorithm.
- Yang and Paradi (2003): Appendix E shows the results from the model and Appendix K the excel solver algorithm.

Since all models were output oriented, the efficiency scores represent the proportion of output expected to be produced by a DMU with its available input resources. In our case, we are evaluating the proportion between the invested money in fundraising events and activities used (revenue generating activities) and the monetary income actually received. In other words, our inputs are represented by the expenses related to the revenue generating activities and our output is represented by the monetary income received by the organization.

Table 10: DEA results for each model

Efficiency	Banker and Morey 1986	Ruggiero 1996	Ruggiero 1998	Medina-Borja 2002	Yang and Paradi 2003
No. Reciprocal efficient DMUs	15	19	49	38	7
% Reciprocal Efficient	2%	2%	5%	4%	1%
No. inefficient DMUs	922	918	888	899	930
% Reciprocal Inefficient	98%	98%	95%	96%	99%
Average score	0.20691	0.256207	0.4061663	0.3736372	0.086623
Standard deviation of the scores	0.170203	0.2072967	0.2544047	0.2549975	0.126611
MIN	0E+00	0	0	0	0
MAX	1	1	1	1	1

Table 10 above presents a summary of the results obtained for each model. We start seeing differences as non-feasible solutions affect a number of DMUs being evaluated.

The Banker and Morey model yields two unfeasible solutions, one less than the others models. DMU, number 15048 is common non-feasible DMUs. When we review the values in the data for these DMUs several one of the outputs is zero therefore it is logic that such DMU can't have a feasible solution. The runs with the Yang and Paradi model don't have unfeasible solutions. Some highlights of the runs are the following:

- The Banker and Morey (1986) model produces 15 reciprocal efficient DMUs leading to 922 inefficient ones. This may happen because in the Banker and Morey model the restrictions are placed for the composite reference group but not for the individual DMUs in the reference set. Would not exclude from the reference group the individual DMU that count with a more favorable environment.

- The Ruggiero (1996) model produces 19 reciprocal efficient DMUs leading to 918 inefficients. This model does not return more units efficient because they may present difficulties if worked with more than one non-discretional variable. Also, the increased number of efficient DMUs is the result of the gradually reduced number of DMUs in the sample as the harshest environments limit the inclusion of other DMUs in the analysis as explained by Ruggiero (1998) later.
- Ruggiero (1998) is the one that produces the greater number of reciprocal efficient units with 49 in this category and only 888 being therefore inefficient. The characteristic of this model allows for the creation of an environmental index. This model maintains the desirable original DEA properties as he describes and uncovers the efficient reference set.
- The Medina Borja (2002) model is very close to Ruggiero (1998) producing 38 reciprocal efficient units leading to 899 inefficient. This model expands the reference set. When the model uses the non-discretionary restriction from Banker and Morey (1984) it allows for variable returns to scale and the inclusion of the other restrictions from Ruggiero (1996) to deal with environmental variables provide the necessary exclusion of more favorable environments. This allows for the partition of the DMUs set into groups of the same or worse level. Only those DMUs with the same level or less favorable environment to the DMU being evaluated are considered in the analysis. The model tries to compare in a more fairly environment each DMUs by creating as many frontiers as DMUs. However, the same restriction of number of DMUs in the analysis being reduced as the harshness of

the environment increases is faced as in Ruggiero (1996); being that the last 10 DMUs are efficient by default.

- Yang and Paradi (2003) is the model that is more selective resulting with the lower amount of reciprocal efficient units.

Furthermore, Figure 4 below shows the average inefficiency score of the inefficient DMus for each model.

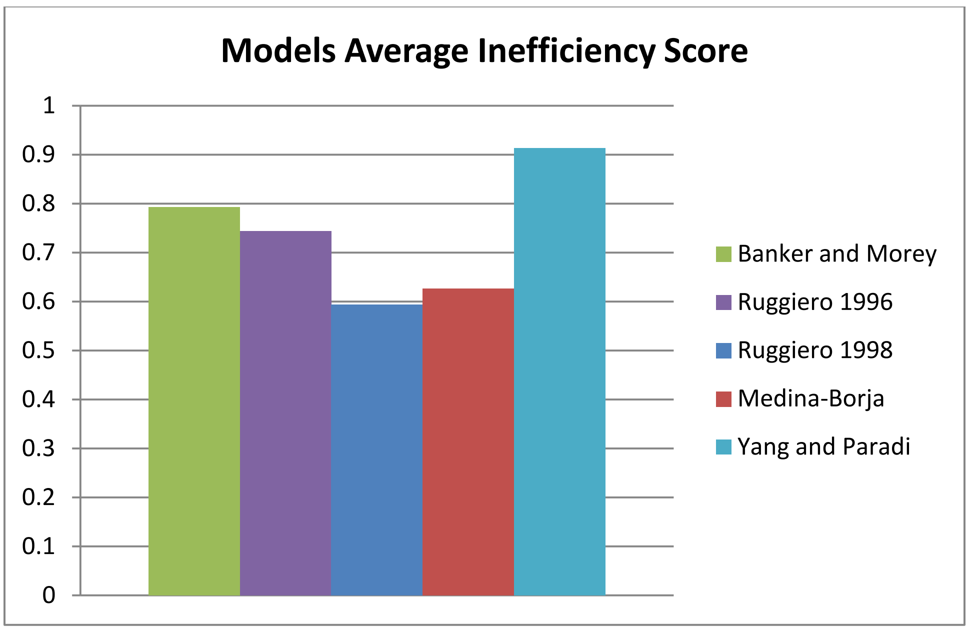


Figure 4: Average Inefficiency Score for each model

Table 11 below shows the reciprocal efficient units in each model. We are looking for efficient DMUs in common across the models that can serve the organization for establishing targets.

Table 11: Efficient Units for the ARC in each model

Banker and Morey	Ruggiero 1996	Ruggiero 1998	Medina-Borja	Yang and Paradi
32380	**25150**	01019	32380	30124
01292	01019	01248	01019	**25150**
01300	01248	**01292**	01248	**43336**
16354	13364	01300	**01292**	**32500**
17420	15162	01303	01300	**35384**
23164	15468	05503	11408	40104
25150	16228	11408	13328	35288
27012	23164	11472	13364	
32500	32036	13328	**15162**	
35288	32088	13364	15468	
35384	**32500**	**15162**	16228	
38082	33120	15468	16354	
42136	**35288**	16228	16452	
43336	**35384**	16274	17420	
48160	35392	16452	22044	
	38082	17336	22232	
	42196	17380	23164	
	43336	17420	**25150**	
	49166	22232	27012	
		23164	32036	
		23200	32088	
		25150	**32500**	
		27012	33120	
		32036	35040	
		32088	35144	
		32336	35288	
		32500	35384	
		33009	35392	
		33120	36232	
		33188	**38082**	
		33408	42136	
		35040	42196	
		35106	43092	
		35144	**43336**	
		35156	43660	
		35170	48160	
		35288	48214	
		35384	**49166**	
		35392		
		38082		
		40020		
		40160		
		42012		
		42136		
		42196		
		43336		
		43660		
		48160		
		48214		
		49166		

In Table 11 it can be noticed that the models coincide in the identification of some of the efficient DMUs. As an example, DMUs 25150, 32500, and 43336 resulted reciprocal efficient for all the five different models. Results like this drive us to believe that these DMUs are really efficient because after evaluating their performance with different models they turned out to be always evaluated as efficient. The nonprofit organization under analysis may use these DMUs as a reference point for benchmarking and establishing best practices for improvement that would allow other units to mirror aiming at reaching a global state of high performance within the organization.

4.4 Peer Analysis Results

In this part we evaluated the peer group membership. The peers are the efficient DMUs in a set of data that are deemed performing best so that they become the reference set for all inefficient DMUs. When these optimal DMUs are identified the inefficient DMUs are projected to them in order to determine how these inefficient units should operate to achieve a desired state of performance. Effective DEA models should always identify peers under a similar operating environment of that of the unit under evaluation so that the resulted projection of the inefficient units onto the frontier is the result of a fair comparison (the convex combination of credible peers). Our main objective is to determine which of the selected DEA models do this fair projection of the inefficient units by analyzing the discriminatory power of each model with regards to the membership to peer groups that the organization consider homogeneous within and heterogeneous between. To accomplish this we performed K-means cluster analysis to separate de data in subgroups of DMUs that perform in the same environment.

4.4.1 Cluster Definition & Method Selected

Cluster analysis is a technique whose basic idea is to group a set of observations in a given number of clusters or groups. This grouping is based on the idea of distance or similarity between the observations. As we describe above we used the K-mean method.

K-means is one of the most popular data mining learning algorithms, hails from statistics that solve the well-known clustering problem presented by Ming (2007); it is a method that assigns to each observation the cluster that is closer in terms of the centroid.

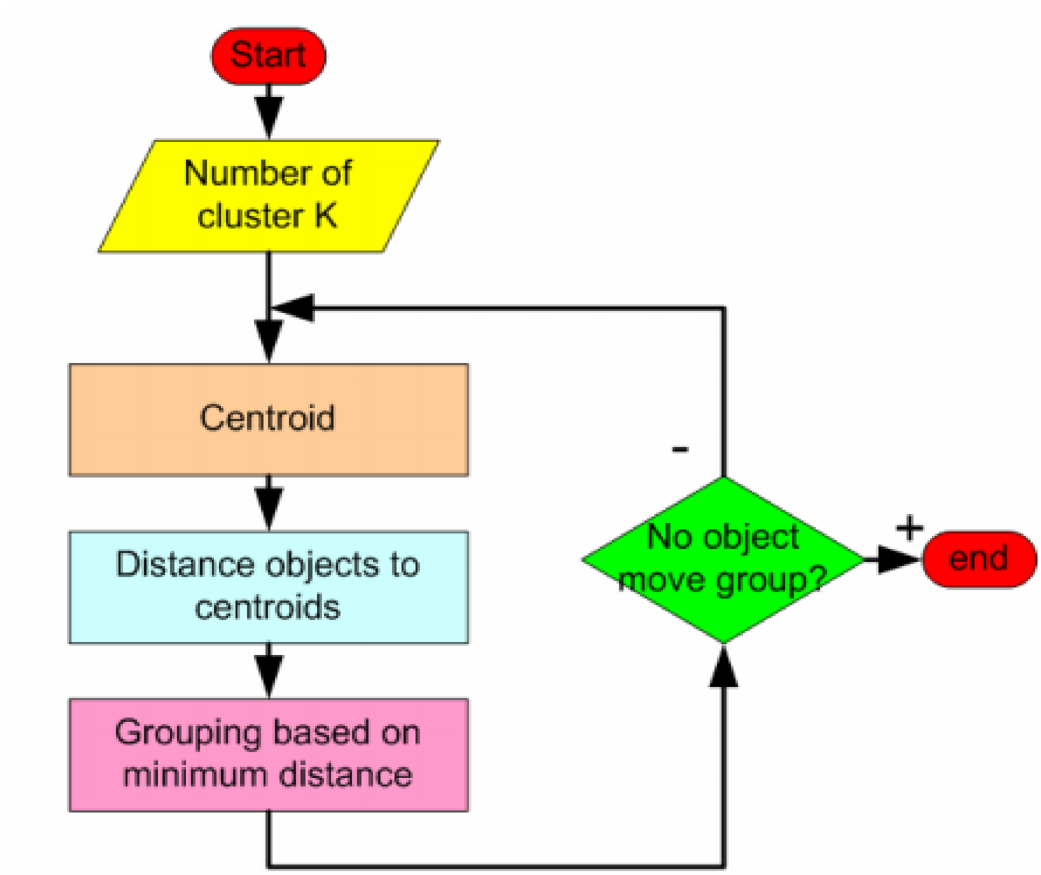
The technique follows a simple and easy way to classify a given data set through certain number of clusters assuming k clusters fixed a at the beginning. The main idea is to define k centroids, one for each cluster. Ming et al., (2007) and Rajalakshimi (2010) described that the centroids should be placed in such a way that they are as far away as possible from each other; otherwise different locations of centroids give rise to different clusters. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early grouping is done. At this point we re-calculate k new centroids as centers of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. In other words centroids do not move any more.

This algorithm aims at minimizing an objective function, in this case a squared error function. The objective function:

$$\text{Min } Z = \sum_{z=1}^{k} \sum_{i=1}^{n} (DMU_i^{(z)} - c_z)^2 \qquad \mathbf{4.1}$$

Where $(DMU_i^{(z)} - c_z)^2$ is a chosen distance measure between a data point $DMU_i^{(z)}$ and the cluster centre c_z, is an indicator of the distance of the *n* data points from their respective clusters center.

Figure 5 is a graphical representation of the k-means algorithm.



Source: (Teknomo, 2007), http://www.croce.ggf.br/dados/K%20mean%20Clustering1.pdf

Figure 5: Flowchart representation of k-means algorithm

The following is a summary of the algorithm k-means for clustering:

1. Decide on a value for K, the number of clusters.

2. Initialize the K cluster centers (randomly, if necessary).

3. Decide the class memberships of the N objects by assigning them to the nearest cluster center.

4. Re-estimate the K cluster centers, by assuming the memberships found above are correct.

5. Repeat 3 and 4 until none of the N objects changed membership in the last iteration

In our case in particular, the algorithm will take two non-discretionary variables that characterize each DMU's environment and will group the DMUs based on the above algorithm.

Appendix M contains an example of how the algorithm of K-Means is applied. This example was developed by Teknomo (2007) and was presented under the title K-Means Clustering Tutorials.

This document can be access electronically in the flowing link.
http://www.croce.ggf.br/dados/K%20mean%20Clustering1.pdf

4.4.2 Selection of the Number of Clusters.

As previously described, the K-means analysis is a technique for grouping cases in the data. When this tool is applied, the analyst needs to initially define how many groups need to be generated by this method. Once the numbers of groups or clusters are defined, the algorithm executes in order to determine the centroids of the clusters that best describe the commonalities of the different groups of cases. In our case, clustering means that we must decide the number of clusters or groups in which our DMUs are to be grouped. This is a very important decision since our conclusions will be greatly influenced by this selection.

Graphs with different number of clusters, k, were generated and analyzed in order to decide which describes best the data in terms of the non-discretionary variables used: population and median household income. In other words, the selection was based on what we as analyzers could appreciate while seeing the results of the particular k under analysis. The two non-discretionary variables (population size and median household income) selected are good indicators of market size and wealth of the community. Both environmental variables are good indicators of the operating environment of a social service nonprofit organization. Medina-Borja and Triantis (2011) describe several non-discretionary variables that can be used to evaluate a non-profit organization. They concluded that fundraising activities, recruiting volunteers/generating other capabilities, and providing service is more difficult in poor, small and rural communities. In addition depends on the demographic composition of the population served. Also Medina-Borja and Triantis (2007) designed and implemented an integrated performance measurement system for non-profit service providers in general and in particular for disaster relief agencies, indicating that market size and wealth of the community are good characterizers of the operating environment of a social service nonprofit organization.

We started our analysis with K=3 clusters. In our analysis we are seeking to evaluate the dispersion among the DMUs in terms of the non-discretionary variables.

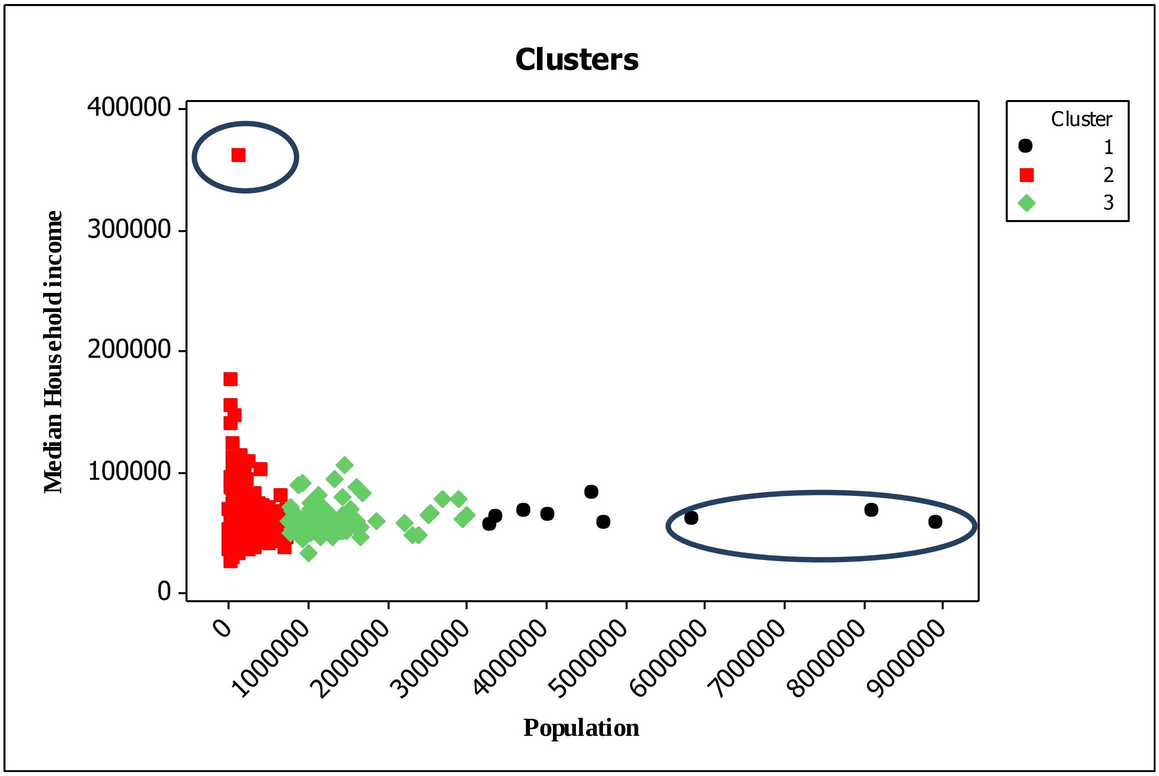


Figure 6: Analysis of three clusters

In Figure 6 we can notice that population for all DMUs varies in a range from 2,247 to 9,000,000 people and their median household income is distributed in a range from $18,978 up to $400,000 dollars. We can appreciate that there are DMUs for which the combination of non-discretionary variables makes them significantly different from the other DMUs. For example, observe that there is a DMU with a very small population having a very high median household income.

This DMU has been selected to be part of cluster number 2 in terms of population. Nonetheless, it does not seem fair to compare the execution of the DMUs in that cluster having a similar population but with a significant lesser income to the DMU in question on terms of revenue generation. Also in cluster number 1 we have three DMUs that are in a similar range of wealth as represented by their median household income but have a noticeable distance between them in terms of population size. We understand that these DMUs should not be members of the clusters they are part now, because their operational environment are not similar in terms of the non-discretionary variables. This means, we need to find the value of k that makes grouping of the DMUs one that includes those DMUs that are “extremes” as part of a different cluster regardless of the cluster having few members. For this reason we increased the value of k, this time to five and observed the impact it has on the grouping of the DMUs.

Figure 7 shows the cluster with k=5 where we can see better discrimination among the DMUs that form different clusters. But there are still DMUs which are very distant and should not be grouped in the same cluster. We need to reduce the distances in the cluster data. The DMUs should be grouped together in such a way that we can compare the results from the DEA models clearly with cluster membership.

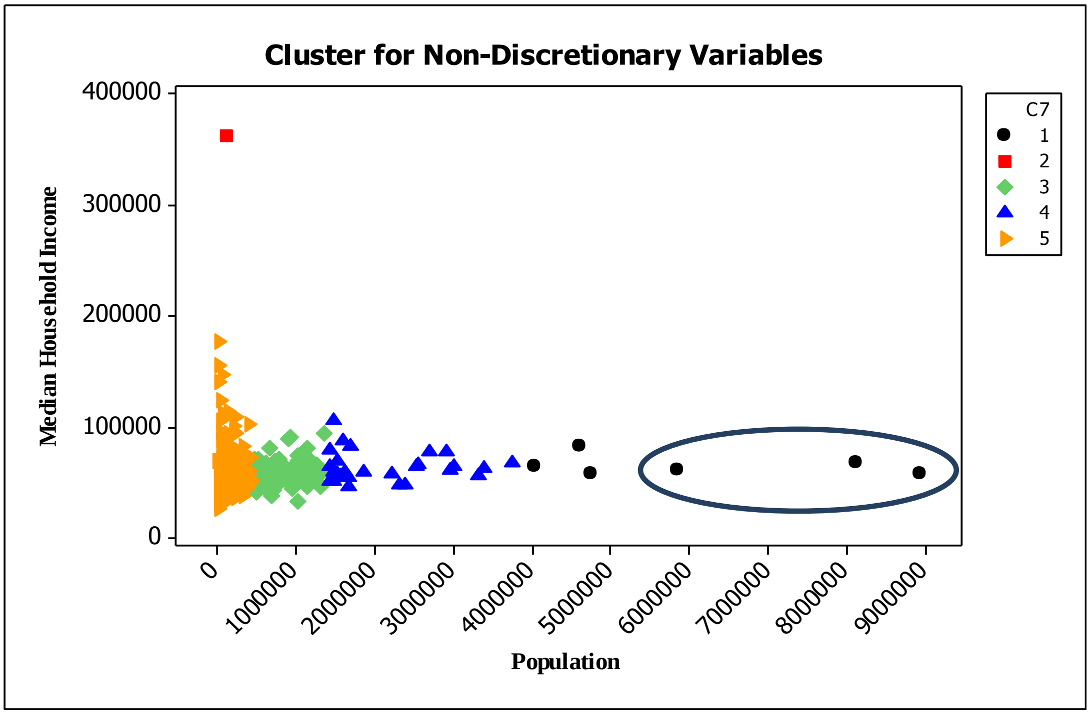


Figure 7: View of five Clusters for Non-discretionary variables.

The data is now divided into 8 clusters, seeking for an adequate number of clusters as can be seen in Figure 8 below.

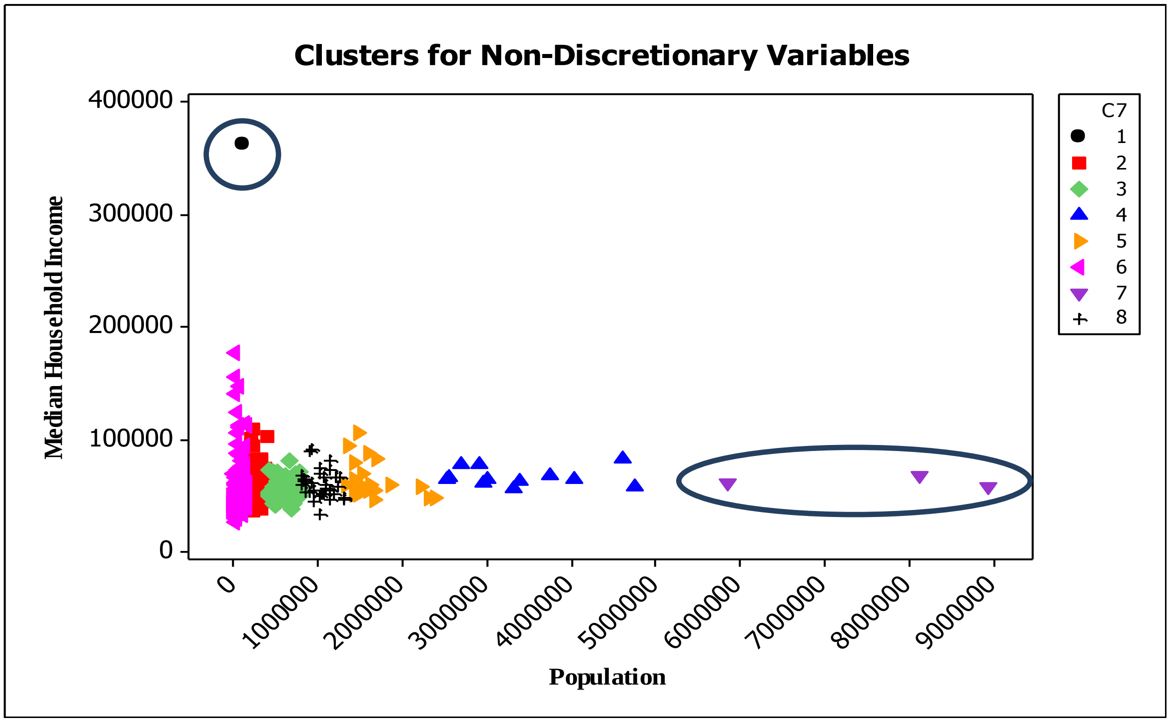


Figure 8: View of eight Clusters for Non-discretionary variables.

In Figure 8 above, we can see the extreme points are better segregated. There is better grouping of the DMUs for the formation of the clusters. With K=8 the DMUs are grouped together in such a way that we can say with more certainty that DMUs with the same cluster membership operates in fairly similar environments. The distance between DMUs to its cluster both when k=5 and k=8 is shown in Table 12. Figure 9 below shows a representation without cluster one to see a better distribution of the different clusters.

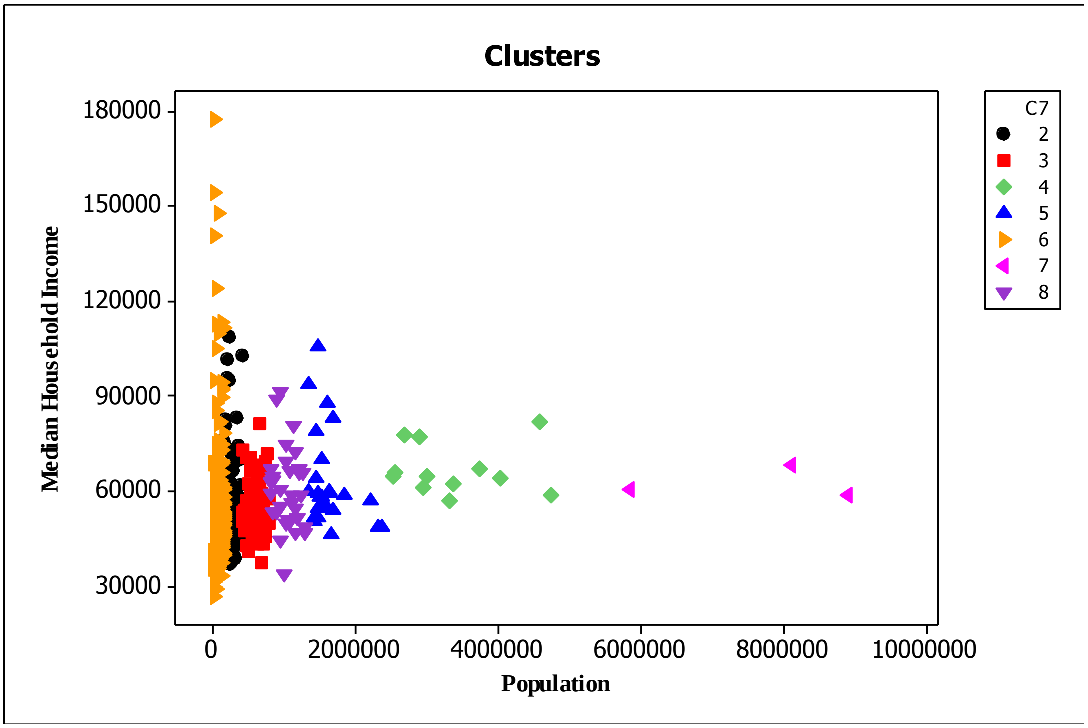


Figure 9: Cluster representation without cluster one

Now we can test whether the DEA models can prescribe peers to the inefficient DMUs that are grouped into clusters that are sufficiently equal to the DMU being evaluated.

Table 12 shows the distance between a particular DMU and the centroid of the cluster from which this DMU is part. We randomly selected a sample of eleven DMUs to demonstrate how these distances change when grouping the DMUs into five clusters or eight clusters. It can be noticed how these distances significantly decrease when eight clusters are defined. By grouping the DMUs in eight clusters we can assure that all the members in each cluster are operating under similar environmental conditions in terms of the non-discretionary variables.

Table 12: Distance between DMUs and the Centroid of its Cluster

DMUs	K=5	K=8
7040	1,565,574	210,598
30110	1,606,880	246,125
30244	1,589,818	225,072
7152	1,490,021	129,069
30213	1,570,130	203,333
7064	1,472,961	113,249
30216	1,555,476	188,611
5276	1,384,510	55,165
5378	163,780	121,769
30120	1,578,959	210,043
30124	1,214,718	167,843

The average distance of all chapters to their centroids is 282,530.21 for K=8 and 506,679.83 for K=5. This suggests that K=8 is a better choice as it reduces the distance.

Eight clusters were used in this work. As shown in below, Figure 9 presents the centroids of each of these eight clusters. In Table 13 the information for each cluster is given and in Table 14 the distance between the centroids of each cluster is shown

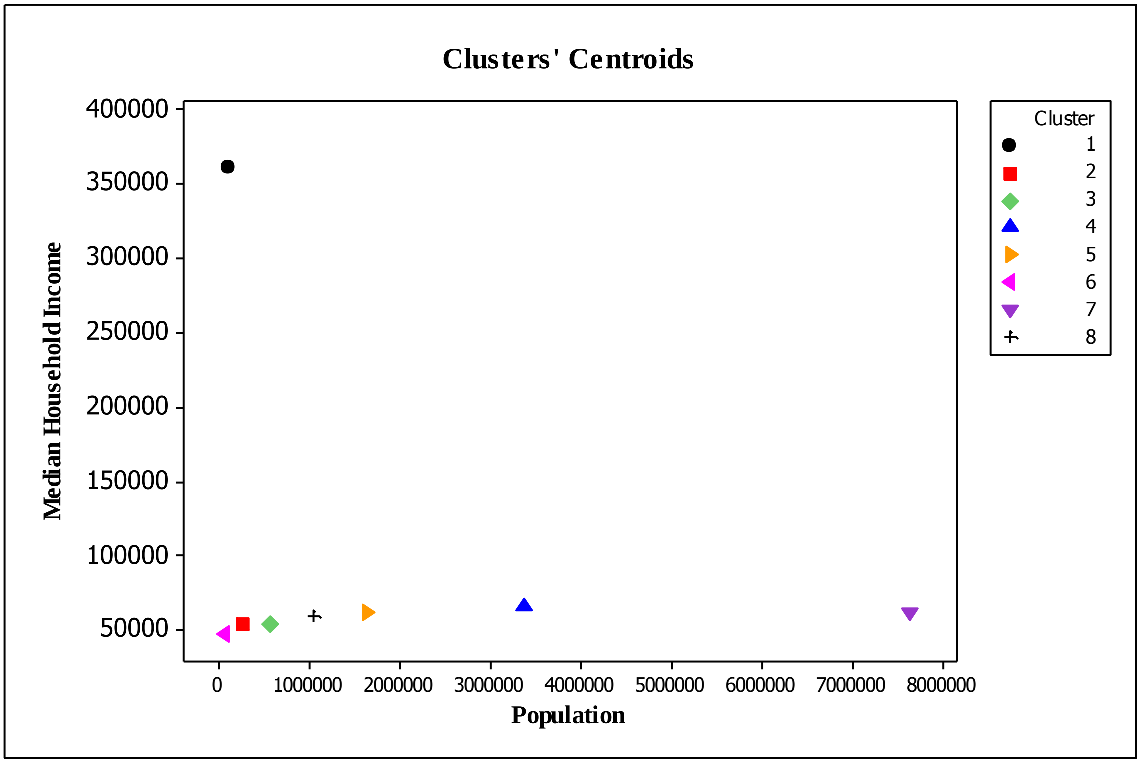


Figure 10: Clusters Centroids

Table 13, shows information about each cluster regarding the number of DMUs on each, the average distance of each cluster from the centroid and the maximum distance from the centroid to each cluster. Cluster 2 and 6 are clusters containing the most significant amount of decision making units and represents 80% of the DMUs.

Table 13: Information of each cluster

	Number of Observations	Sum of squares	Average Dist. From centroid	Max Dist. From centroid
Cluster1	1	0	0	0
Cluster2	178	9.30E+11	61666.193	167843.143
Cluster3	63	7.83E+11	97619.732	222468.126
Cluster4	12	6.34E+12	607078.344	1379554.257
Cluster5	25	1.91E+12	193950.464	756178.571
Cluster6	623	1.02E+12	34206.871	136195.31
Cluster7	3	5.09E+12	1189023.961	1783515.939
Cluster8	32	7.19E+11	129116.152	262082.729

Table 14 shows the distance between the clusters and its centroid.

Table 14: Distance between the centroids of each clusters.

	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7	Cluster8
Cluster1	0	336184.288	554195.5652	3.27E+06	1.54E+06	317833.5	7.52E+06	971009.5
Cluster2	336184.2883	0	325918.7195	3.12E+06	1.37E+06	187272.3	7.38E+06	787701.9
Cluster3	554195.5652	325918.72	0	2.80E+06	1.05E+06	513139.1	7.06E+06	461794.1
Cluster4	3.27E+06	3.12E+06	2.80E+06	0	1.75E+06	3.31E+06	4.26E+06	2.33E+06
Cluster5	1.54E+06	1.37E+06	1.05E+06	1.75E+06	0	1.56E+06	6.01E+06	586966.6
Cluster6	317833.4693	187272.277	513139.111	3.31E+06	1.56E+06	0	7.57E+06	974933.3
Cluster7	7.52E+06	7.38E+06	7.06E+06	4.26E+06	6.01E+06	7.57E+06	0	6.59E+06
Cluster8	971009.4846	787701.892	461794.1473	2.33E+06	586966.6	974933.3	6.59E+06	0

Table 15 below presents the results for an analysis of mean differences for each cluster with a value of significance at the 0.05 level.

Table 15: Mean Difference between Clusters

Cluster	Cluster	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
2	3	-576.48272	1955.6161	1	-6534.18713	5381.2217
	4	-12786.057	3978.6115	0.0284659	-24906.7346	-665.38029
	5	-8695.633	2849.2028	0.0491029	-17375.6129	-15.65308
	6	5862.0545	1133.7508	6.005E-06	2408.129202	9315.9798
	7	-8456.5044	7766.4762	1	-32116.7563	15203.748
	8	-6342.7417	2561.4154	0.2825278	-14145.9889	1460.5055
3	2	576.48272	1955.6161	1	-5381.22169	6534.1871
	4	-12209.575	4201.7005	0.0787363	-25009.8833	590.7339
	5	-8119.1503	3153.2355	0.2138162	-17725.3534	1487.0528
	6	6438.5372	1763.6123	0.0057971	1065.764532	11811.31
	7	-7880.0216	7883.0888	1	-31895.5293	16135.486
	8	-5766.259	2895.8222	0.9817015	-14588.2629	3055.7449
4	2	12786.057	3978.6115	0.0284659	665.3802947	24906.735
	3	12209.575	4201.7005	0.0787363	-590.733899	25009.883
	5	4090.4244	4684.8489	1	-10181.7762	18362.625
	6	18648.112	3887.8327	3.947E-05	6803.988546	30492.235
	7	4329.5531	8610.9236	1	-21903.2734	30562.38
	8	6443.3157	4515.6064	1	-7313.29451	20199.926
5	2	8695.633	2849.2028	0.0491029	15.6530802	17375.613
	3	8119.1503	3153.2355	0.2138162	-1487.05281	17725.353
	4	-4090.4244	4684.8489	1	-18362.625	10181.776
	6	14557.687	2721.0018	2.326E-06	6268.266778	22847.108
	7	239.12864	8150.8657	1	-24592.1504	25070.408
	8	2352.8913	3560.8017	1	-8494.94546	13200.728
6	2	-5862.0545	1133.7508	6.005E-06	-9315.97979	-2408.1292
	3	-6438.5372	1763.6123	0.0057971	-11811.3099	-1065.7645
	4	-18648.112	3887.8327	3.947E-05	-30492.2353	-6803.9885
	5	-14557.687	2721.0018	2.326E-06	-22847.1082	-6268.2668
	7	-14318.559	7720.3657	1	-37838.3371	9201.2194
	8	-12204.796	2418.0039	1.131E-05	-19571.1461	-4838.4463
7	2	8456.5044	7766.4762	1	-15203.7476	32116.756
	3	7880.0216	7883.0888	1	-16135.4861	31895.529
	4	-4329.5531	8610.9236	1	-30562.3795	21903.273
	5	-239.12864	8150.8657	1	-25070.4077	24592.15
	6	14318.559	7720.3657	1	-9201.21938	37838.337
	8	2113.7627	8054.7814	1	-22424.7995	26652.325
8	2	6342.7417	2561.4154	0.2825278	-1460.50547	14145.989
	3	5766.259	2895.8222	0.9817015	-3055.74491	14588.263
	4	-6443.3157	4515.6064	1	-20199.926	7313.2945
	5	-2352.8913	3560.8017	1	-13200.728	8494.9455
	6	12204.796	2418.0039	1.131E-05	4838.446299	19571.146
	7	-2113.7627	8054.7814	1	-26652.3248	22424.8

In table 15 above the results for the mean differences between clusters is presented, analyzing the table for a 0.05 level of significance, cluster two is significance difference than cluster four, five and six. Cluster three is only significance different with cluster six, continuing the analysis cluster four and six are different. Cluster seven is not different than all the others cluster.

4.4.3. Discriminatory Power of DEA Models: Cluster Analysis

An analysis of cluster membership was performed in order to analyze the discriminatory power of the models and how confident one can be that these models could select credible reference sets for the inefficient DMUs. The main idea of the analysis was based on the assumption that consistent and efficient models taking into consideration the non-discretionary variables will define as reference set DMUs that are part of the same cluster or clusters that are next to the cluster containing the inefficient DMU. Looking for this behavior the following tables were created. Tables 16 to Table 20 contain the results of this analysis. In the tables the neighboring cluster next to each cluster under analysis is included to make easier appreciating the results.

Regarding the model developed by Yang and Paradi (2003) and the model of Ruggiero (1996) were the models which performed worst in this analysis. Yang and Paradi fails to produce good reference sets. For example inefficient DMUs in clusters 6 and 8 have not been referenced to efficient DMUs contained in cluster 6 or 8, respectably. These models do not produce sufficient efficient DMUs for the above be able to occur (having reference sets close to the units of analysis in terms of operating environment). The model presented by Ruggiero (1996) tends to expand too much the reference set. That is, selecting as peers for inefficient units some (not all) that are far from the level of environmental variables For example in cluster 6 there are units that are referenced nearly in all other clusters showing dominance.

Medina-Borja's (2002) model results in Table 19 shown how this model tend to define as reference set DMUs in the same cluster or neighboring clusters of the inefficient DMUs. It fails because it generates too many efficient DMUs that are dominant to most. As an example, inefficient DMUs in cluster 2 were referenced to efficient DMUs in the same cluster and in clusters next to cluster 2, but also to two different clusters that are not in the neighboring zone to cluster 2. It can be noticed in the Medina-Borja model a tendency to correctly project the inefficient DMUs to efficient DMUs in the cluster or clusters next to the corresponding cluster but not exclusively thus benchmarking becomes unfair.

The Ruggiero (1998) was the model that performed above all others as shown in Table 18. This model clearly identifies as reference sets DMUs in the same or close neighboring clusters. For example in cluster 2 all inefficient DMUs were referenced to efficient DMUs classified in cluster 2 by their environmental non-discretionary variables or into neighboring clusters. Contrary to Medina-Borja's model, this model has a higher discriminatory power. This means, that the inefficient units are more likely to be referenced to a similar efficient unit in terms of its operating environment or discriminatory variables. If these models are compared in terms of the amount of units that are part of the reference set for each cluster, the Medina-Borja's model defines larger references sets. The Banker and Morey model does not perform well either as shown in table 16. For example in cluster 3 the inefficient DMUs have not been referenced to efficient DMUs contained in its cluster at all. This model tends to not accurately restrict the reference sets to the efficient units in neighboring clusters either.

Table 16: Banker and Morey 1986 cluster results

Cluster i	Neighboring Clusters next to cluster i	Cluster of Reference Sets
1	5,6	2
		3
		6
2	3, 6	3
		5
		6
3	2,8	3
		6
		5
		7
4	5,7	3
		4
		5
		7
5	4,8	3
		4
		5
		6
		7
6	2,3	3
		5
		6
7	4	4
		5
		7
8	3,5	3
		4
		5
		6

Table 17: Ruggiero 1996 cluster results

Cluster i	Neighboring Cluster next to cluster i	Cluster of Reference Sets
1	5,6	3
		5
		6
2	3, 6	2
		3
		4
		5
		6
		8
3	2,8	2
		3
		4
		5
		6
		8
4	5,7	3
		4
		5
		7
5	4,8	3
		4
		5
		6
		8
6	2,3	2
		3
		5
		6
		8
7	4	4
		5
		7
8	3,5	3
		4
		5
		6
		8

Table 18: Ruggiero 1998 cluster results

Cluster i	Neighboring Clusters next to cluster i	Cluster of Reference Sets
1	5,6	3
		6
2	3, 6	2
		3
		6
3	2,8	2
		3
		6
4	5,7	3
		4
		5
5	4,8	3
		5
		6
		8
6	2,3	2
		6
7	4	4
		5
		7
8	3,5	2
		3
		6
		8

Table 19: Medina-Borja 2002 Cluster results

Cluster i	Neighboring Clusters next to cluster i	Cluster of Reference Sets
1	5,6	3
		5
		6
2	3, 6	2
		3
		5
		6
		8
3	2,8	2
		3
		5
		6
		8
4	5,7	3
		4
		5
		7
5	4,8	3
		4
		5
		6
		8
6	2,3	2
		3
		5
		6
7	4	4
		5
		7
8	3,5	3
		4
		5
		6
		8

Table 20: Yang and Paradi 2003 Cluster Results

Cluster i	Neighboring Clusters next to cluster i	Cluster of Reference Sets
1	5,6	3
		5
2	3, 6	2
		3
		5
3	2,8	2
		3
		5
		4
4	5,7	3
		4
		5
		7
5	4,8	2
		3
		4
		5
6	2,3	2
		3
		5
7	4	4
		5
		7
8	3,5	2
		3
		4
		5

4.4.4 Models' Execution.

The following analysis was developed to evaluate the execution of the models in order to determine which one has a better discriminatory ability to establish the peers of the decision making units. Two types of percentages were estimated to understand in a simple manner the models execution, by taking in consideration the environmental variables that influence the operational performance of the DMUs. Every model shall provide each unit being evaluated a set of efficient units located in its own cluster. Table 21 shows the results of the analysis and describes the percentage of inefficient DMUs that were referenced to at least one efficient DMU contained in its cluster. It also shows the percentage of inefficient DMUs that were only referenced or compared against efficient DMUs in its own cluster. The best performing model is the one with the discriminatory power to reference to DMUs of the same cluster, *i.e.,* the higher percent in the evaluation.

Table 21: % of Cluster Reference

Models	% of DMUs with at least one reference peer in its own cluster	% of DMUs where all its reference are in the same cluster
Banker and Morey 1986	75%	44%
Ruggiero 1996	69%	14%
Ruggiero 1998	89%	68%
Medina-Borja 2002	85%	49%
Yang and Paradi 2003	14%	3%

As said before, in this analysis the models developed by Yang and Paradi (2003) and Ruggiero (1996) were the models that represented the most inadequate reference sets. Ruggiero´s percentage of DMUs with at least one reference was only 69% and the percentage of DMUs that have all peers in the same cluster was 14%. The Yang and Paradi's model performance was the lowest with only 3% of DMUs with reference sets in the same cluster.

The results suggest that Ruggiero´s (1998) and Medina-Borja´s models performed better than the other models with 89% and 85% respectively when considering the percentage of DMUs with at least one reference in its cluster. Ruggiero´s 1998 model outperformed Medina-Borja´s in the number of DMUs that represent all its reference sets in the same cluster with values of 68% and 49% respectively.

The Banker and Morey model was in the middle range with 75% of DMUs with at least one reference in its cluster and 44% of all its reference sets in the same cluster. This last percentage turned out to be higher since the model identifies good peers for cluster number 6 in particular. This cluster is the one that has more DMUs.

4.4.5 Sample Discriminatory Analysis for Individual DMUs.

This section intends to analyze the discriminatory power of the models with specific sample DMUs by evaluating the environmental non-discretionary factors of each unit and those of their prescribed peers in the reference set. The objective is to test if the units that are considered peers have similar characteristics to the unit that is being assessed. For this analysis, two random DMUs (38360 and 47116) were evaluated. Tables 22 and 23 contain the results of the peers given by each model.

Table 22: DMU 38360 analysis

	Model	DMU	Cluster	POP	MHHI
DMU under analysis: ID 38360 Cluster:2 Pop: 3,378,116 MHHI: $62,11.46	B&M	43336	4	4,750,864	$58,562.61
		35384	3	516,516	$55,743.77
		32500	7	8,922,583	$58,449.49
	R96	43336	4	4,750,864	$58,562.61
		32500	7	8,922,583	$58,449.49
	R98	35384	3	516,516	$55,743.77
		25150	5	1,468,930	$59,151.06
	MB	43336	4	4,750,864	$58,562.61
		35384	3	516,516	$55,743.77
		32500	7	8,922,583	$58,449.49
	Y&P	43336	4	4,750,864	$58,562.61
		32500	7	8,922,583	$58,449.49

Table 22 shows the results of DMU 38360. In the Banker and Morey model the peer groups for this DMU were 43336, 35384 and 32500. DMU 43336 has a larger population but a similar household income. The other two peers demonstrate a more disadvantageous environment in terms of population since a large city is being compared with a small one. DMU 32500 operates in a better environment regarding market size which is more than double the number of inhabitants and a little harsher regarding wealth in the community as the community is poorer. DMU 43336 operates in a similar operating environment; it has a larger population but a similar household income. DMU 35384 operates in the worst environment regarding market size, which is less than double the number of inhabitants, and behaves harsher when it comes to wealth in the community. The significance of the peer group regarding the operating environment is not clear. In this case, like in others, the model fails to deliver a fair comparison between DMUs.

Similarly, Ruggiero (1996) fails to provide credible peers; his model provides the same peers of Banker´s and Morey´s model. The peers for DMU 38360 are 43336 and 35384.

Like Ruggiero (1996) and Banker and Morey, the Medina-Borja and the Yang and Paradi models offer peers in the same clusters as discussed in previous paragraphs. Hence, there is no representative differentiation between the models.

The Ruggiero (1998) model offers two contradictory results. It provides the group of peers that offer the more credible peers since DMU 25150 operates in a similar environment to the DMU being evaluated. However, the model also delivers a peer that is not in the same operational environment.

Table 23 shows the results of DMU 47116. This DMU has a considerable large market size. The wealth of the community is above the median class. The Banker and Morey model offers three DMUs as peers. DMU 35384 does not operate in the same environment; its population is nearly half of the DMU being evaluated and DMU 43336 is not a credible peer due to the fact that its population is almost three times the population of DMU 47116.

The last peer is 25150. This DMU is a credible peer since it has similar characteristics and operates in the same cluster.

Table 23: DMU 47116 analysis

	Model	DMU	Cluster	POP	MHHI
DMU under analysis: ID:47116 Cluster:5 Pop: 1,680,747 MHHI: $82,721.93	B&M	35384	3	516,516	$55,743.77
		43336	4	4,750,864	$58,562.61
		25150	5	1,468,930	$59,151.06
	R96	35384	3	516,516	$55,743.77
		43336	4	4,750,864	$58,562.61
	R98	35384	3	516,516	$55,743.77
		25150	5	1,468,930	$59151.06
	MB	35384	3	516,516	$55,743.77
		43336	4	4,750,864	$58,562.61
		25150	5	1,468,930	$59,151.06
	Y&P	43336	4	4,750,864	$58,562.61
		35384	3	516,516	55,743.77

Ruggiero (1996) fails to deliver credible peers groups for the DMU under analysis. DMU 43336 operates in a better environment when it comes to market size being more than double the number of inhabitants but it is harsh regarding wealth in the community.

DMU 35384 operates in the worst environment on the topic of market size which is less than double the number of inhabitants and it is also harsh when it comes to wealth in the community.

Yang and Paradi (2003) model provides the same peer as Ruggiero (1996). These peers do not operate in the same environment as the DMU assed. The other two models, Ruggiero (1998) and Medina-Borja´s, provide peer DMU 25150; a credible peer classified in a nearby cluster. It operates in the same environment regarding the market size but has less median household income.

4.4.6 Peeling off the Frontier

Peeling off the frontier is another technique that can be used to show if the peers given by each model are practical. Let us assume that a group of DMUs are being evaluated with these models. Other than their level of inputs and outputs, we want the units to be evaluated minding the environment in which they operate. The models need to discriminate the efficient units as to choose appropriate reference sets for all inefficient units. Some units will be operating producing more outputs with similar amounts of inputs and other will be producing similar amounts of outputs with much less input. Those are the ones that will be deemed efficient. Now, the efficiency score of the inefficient ones depends on the comparison set or the region of the hyperplane where they will be projected, which is determined by such efficient units. We have then two issues, the appropriate scale of operation and the appropriate environment. Both need to be congruent to the inefficient chapter conditions. There will be cases in which the units selected as reference sets are what is called, "super-efficient." That is, units operating at levels very distant from the majority of others in the data set (hence their name). The larger distance can be because of scale of operations (much more output produced or less input used) but can also be a representation of a much favorable or very distinct environment.

The peeling off technique removes all the efficient units on the frontier at the same time to see how the remaining units perform. Under the assumption that if you are similar to me the efficiency score when you are removed will change, but not too much, this technique can be used to identify odd results. Rao (2003) describes that in the presence of measurement errors and noise, DEA can produce impractical results. This can occur when DMUs with errors, operating in highly favorable environments or super-efficient end up as peers.

A way to check if DEA scores of DMUs are affected by noise is to check the sensitivity of the scores after dropping all the efficient units and re-running DEA. Peeling the frontier is a procedure highly recommended when there are enough observations. Paradi et al. (2004), Divine (1986) and Thanassoulis (1999) suggest using layering or the peeling technique where the efficient units are removed from the analysis and the DEA ran again. Paradi et al. (2004), also describes that another set of units will make up the frontier. When this is the case, units of poor performance can be found.

The following tables summarize the results before and after peeling off the frontier for each model.

Table 24: Banker and Morey before and after Peeling off the Frontier

Banker and Morey	Before Peeling off the Frontier	After Peeling off the Frontier
Standard deviation efficiency score	0.1702	0.4814
Min efficiency score	0E+00	1.0847E-10
Max efficiency score	1	1
Total No. of Evaluated DMUs	937	922
Total No. of Efficient DMUs	15	39
Total No. of Inefficient DMUS	922	883
Average Score	0.2069	0.3645

The results shown in Table 24 demonstrate that there is a dramatic improvement after the frontier is peeled off. The number of efficient units increased from 15 to 39 units. This further proves that the efficient units on the original frontier of the Banker and Morey model are non-practical targets for the other inefficient units. Like in the Sowlati (2001) work, peeling off the frontier resulted in increasing efficiency scores therefore, the distribution is distorted towards higher scores since eliminating the robustly efficient and marginally efficient units reduced the number of units in the analysis thus decreasing the discriminating power of the DEA model.

Table 25: Ruggiero 1996 before and After Peeling off the Frontier

Ruggiero 1996	Before Peeling off the Frontier	After Peeling off the Frontier
Standard deviation efficiency score	0.2072	0.2392
Min efficiency score	0	9E-11
Max efficiency score	1	1
Total No. of Evaluated DMUs	937	918
Total No. of Efficient DMUs	19	20
Total No. of Inefficient DMUS	918	898
Average Score	0.2562	0.3380

For the Ruggiero (1996) model, Table 25 shows that there is not a dramatic improvement after the frontier was peeled off. This further proves that the efficient units found on the original frontier of the model are practical targets for the other inefficient units. Peeling off in this case did not resulted in increasing numbers of efficiency. The robustly efficient and marginally efficient units did not reduce the number of units in the analysis and therefore did not decrease the discriminating power of DEA model.

Table 26 also shows that the standard deviation remained almost the same. This proves that the efficient units on the original frontier of Ruggiero (1998) model are practical targets for the other inefficient units.

Table 26: Ruggiero 1998 before and after Peeling of the frontier

Ruggiero 1998	Before Peeling off the Frontier	After Peeling off the Frontier
Standard deviation efficiency score	0.2544	0.2703
Min efficiency score	1E-10	3E-10
Max efficiency score	1	1
Total No. of Evaluated DMUs	937	937
Total No. of Efficient DMUs	49	61
Total No. of Inefficient DMUS	888	806
Average Score	0.4061	0.5891

Peeling off did not resulted in significantly increased numbers of reciprocal efficiency units. The robustly efficient and marginally efficient units did not reduce the number of units in the analysis, therefore did not decreased the discriminating power of DEA model. It can be observed that there is little variation in the total number of efficiency units.

Table 27 shows that there is no dramatic improvement after the frontier was peel off. This proves that the efficient units on the original frontier of the Medina Borja model are practical targets for the other inefficient units. The standard deviation remained almost the same. Just as Ruggiero (1998), the robustly efficient and marginally efficient units did not reduce the number of units in the analysis and therefore did not decrease the discriminating power of DEA model.

Table 27: Medina Borja before and after Peeling of the frontier

Medina-Borja 2002	Before Peeling off the Frontier	After Peeling off the Frontier
Standard deviation efficiency score	0.254997504	0.260201311
Min efficiency score	1.07442E-10	1.69427E-10
Max efficiency score	1	1
Total No. of Evaluated DMUs	937	899
Total No.of Efficient DMUs	38	46
Total No. of Inefficient DMUS	899	853
Average Score	0.373637212	0.515264372

Table 28 below shows that there are some improvements after the frontier was peeled off. This proves that the efficient units on the original frontier of the Yang and Paradi model are not all practical targets for the other inefficient units. Eliminating the efficient units reduces the number of units in the analysis and therefore decreases the discriminating power of DEA model. There is also a variation of 0.04 in the standard deviation.

Table 28: Yang and Paradi before and after Peeling of the frontier

Yang and Paradi	Before Peeling off the Frontier	After Peeling off the Frontier
Standard deviation efficiency score	0.126611127	0.166591205
Min efficiency score	0	0
Max efficiency score	1	1
Total No. of Evaluated DMUs	937	930
Total No.of Efficient DMUs	7	14
Total No. of Inefficient DMUS	930	916
Average Score	0.086623136	0.150182943

Chapter five provides further insights on these conclusions and recommendations for future research.

Chapter 5 Conclusion and Future Work

This chapter presents the conclusion and recommendations for future work. It is structured in three sections. The first section summarizes the justification and objectives of this project. The second section makes final remarks about the models analyzed, and the third section outlines some recommendations for future work.

5.1 Summary

Data envelopment Analysis (DEA) is increasingly used for measuring and evaluating performance in all types of organizations, as DEA has the ability to evaluate the performance of a set of productive entities called decision making units (DMUs) in the DEA jargon. DEA thus enables studying the efficiency of an organization transforming resources into products or any sort in relation to the behavior observed in other similar organizations included in the analysis that transform the same sort of inputs into the same sort of outputs.

Our objective with this work was to evaluate and compare five DEA formulations. The peculiarity of these five models is that they attempt to consider environmental non-discretionary conditions where the DMUs operate. Other authors have attempted this comparison, but the majority of studies comparing these models have been based on the use of simulated data and not data from real organizations Also, most studies have reach their conclusions with a small number of decision units. In all those cases the performance of each model has been compared against a pre-determined production function that was used to generate the data. Therefore, this is not always the case of a real situation where the exact production function is unknown, particularly in service production.

The five formulations selected were Banker and Morey (1986), Ruggiero (1996), Ruggiero (1998), Medina-Borja (2002) and Yang and Paradi (2003). All these models include in its formulation non-discretionary variables. These are variables that cannot be controlled by the organization, such as the characteristics of the client population, their wealth, etc. We applied the models to a social service organization with the purpose of evaluating the revenue-generating activities of non-profit organizations. Making use of a database provided by the American Red Cross (ARC), which is an organization with a large amount of decision making units (DMUs) -- in our case 937-- all operating in distinct environments.

Regarding the models, we identify clear differences in terms of the performance of each model regarding number of unfeasible solutions, number of units deemed efficient and their suitability to properly identify peers and appropriate targets for each inefficient unit. Then we compared the number of peer units that are actually believable peers in reality to the units evaluated. Cluster membership helped us evaluate the validity of the prescribed peers for each inefficient unit in DEA. A k-means clustering analysis was performed. For this we considered two non-discretionary variables: market size measured in population (number of inhabitants) and wealth measured by the median household income.

Furthermore, we analyzed the discriminatory ability of each model to identify the efficiency of each decision unit based in operating conditions that may be favorable or unfavorable. That is, that units operating in unfavorable environments cannot be compared to units operating in much favorable or radically different environments.

Peer selection is important for the definition of targets. The peer group, made up of DMUs which are characterized by operating efficient units related to the inefficient unit being examined, is a rational term of comparison which the unit should aim to imitate in order to establish targets to improve its performance. If bad peers are selected the target setting will be based on units that do not operate in the same environment and the improvement goals establish never could be achieved.

5.2 Models Conclusions

In this section we make some final remarks about the models tested.

- Banker and Morey (1986) model: in the analysis this model fairly identifies credible peers. 75% of the DMUs have at least one DMU in the same cluster. This model tends to not accurately restrict the reference sets. The reference set may include units that operate in different environments than the evaluated unit, allowing the results for the unit being evaluated in a different environment to be classified as inefficient.

- Ruggiero (1996) model: This model does not show a good discriminatory power to identify credible peers as only 14% of the DMUs evaluated have all its reference sets in the same cluster and 69% of the DMUs have at least one DMU in the same statistical cluster. This model suggests that a unit should only be compared with units that operate in the same environments buts fails to unfold the efficient frontier. Some authors have written that this model fails when there is more than one non-discretionary variable.

- Ruggiero (1998) model: This model present the best discriminatory power, 68% of DMUs have all its reference sets in the same cluster and 89% has at least one DMU in the same cluster. This model adopts a priori regression formulation that can affect the results of DEA.

- Medina-Borja (2002) model: This model has a competitive discriminatory power. 85% of the DMUs have at least one DMU of its reference set in the same cluster and 49% DMUs have all its reference sets in the same cluster. Because it restricts the units in the comparison sample by eliminating those that operate in better environments, after certain number all DMUs are deemed efficient. By applying also the Banker and Morey restriction this model tends to expands too much the reference set selecting as peers for inefficient units some that are far from the level of environmental variables. Medina-Borja's behaves close to the Ruggiero's 1998 model when selecting the reference sets for the inefficient units.

- Yang and Paradi (2003) model: of all the models analyzed, this is the one with the poorest results. Only 3% of the DMUs evaluated have all its reference sets in the same cluster. This model identifies 90% technical inefficiency. Meaning the model tends to overestimate the inefficiency. The model assumes a handicap factor a priori affecting the DEA results.

Evaluation of Red Cross Officials

The American Red Cross has its own technique for grouping the DMUs in order to benchmark them. Their method for grouping chapters is also based on non-discretionary variables based on two variables population and median household income. Groups of 12 units trying to make these are similar as possible based on its operating environment are generated. Our methodology for grouping during this research presents similar characteristics based on a combination of market size and median household income but with a statistical tool, k means clustering. For example, the cluster 2 of the ARC has an average of $51,145 of median household income and average of 274,375 people in the market for its population. After we grouped the DMUs using K-means clustering our cluster 2 had a centroid of 276,059 for its population and 50,604 for its median household income. Tables 29 illustrate a peer resulted comparison for DMU 47116 based the ARC grouping method against the five models we studied in this research.

Table 29: DMu 47116: Red Cross vs Models

	Model	DMU	POP	MHHI
	Red Cross	10029	1,486,923	$ 57,932.63
		32397	1,433,968	$ 79,089.11
		25150	1,468,930	$ 59,151.06
		43336	4,750,864	$ 58,562.61
DMU: 47116 Cluster:5 Pop: 1,680,747 MHHI: $82,721.93	B&M	35384	516,516	$ 55,743.77
		43336	4,750,864	$ 58,562.61
		25150	1,468,930	$ 59,151.06
	R96	35384	516,516	$ 55,743.77
		43336	4,750,864	$ 58,562.61
	R98	35384	516,516	$ 55,743.77
		25150	1,468,930	$ 59,151.06
	MB	35384	516,516	$ 55,743.77
		43336	4,750,864	$ 58,562.61
		25150	1,468,930	$ 59,151.06
	Y&P	43336	4,750,864	$ 58,562.61
		35384	516,516	$ 55,743.77

For the American Red Cross

Given that none of the models have an acceptable reliability level in terms of recommending targets based on comparable peers, it is difficult to suggest the use of any to an organization that wants to base their real performance goals on those. For example, the best formulation is that of Ruggiero 1998 but still 11% of the chapters of the American Red Cross (approximately 85 units) would get recommendations that are not suitable to their environment. Therefore, it still seems that the best way to incorporate the environment in DEA formulations is to cluster the DMUs a-priori and then apply the most appropriate DEA formulation, either constant or variable or mixed returns to scale and input or output orientation. This seems to be the only way to guarantee that the reference sets for each DMU are really operating in a similar, comparable environment.

5.3 Limitations of this Research and Recommendation for Future Work

The work presented in this document has several limitations. First, the real production function is unknown; therefore it is impossible to know whether those efficient units are really efficient. Those are the limitations of any DEA analysis of service systems. However, regarding the definition of peers for target setting when the DMUs operate in different environments, it is possible to statistically group the DMUs as we did and make the types of comparisons we did and in addition show the results to officials who know well the units, to ask them for their assessment of accuracy in the groupings and peer selection. We also did the former. Nonetheless, when the number of units is so large, it is very difficult for a human being to evaluate all DMUs. This was done on a small sample basis and it could be that this expert assessment missed some differences or mistakes. In general terms, organizational officials agreed with the evaluation of statistically-generated clusters and clustering membership but pointed out that other environmental variables such as density and racial composition play a role besides the two variables selected for our study.

Future work then could include the following:

- Other DEA formulation that incorporate non-discretionary variables can be analyzed and evaluated for evaluating the revenue-generating activities of non-profit organizations and other service systems as well.
- The models can be used to measure performance in other areas within the non-profit organization like measuring the performance of service delivery and see if the results vary regarding model suitability.
- Evaluate and applied other cluster methods.
- Evaluate the models in a for-profit organization. The revenue-generating activities for this type of organization are very different. The models may yield different results. Same with manufacturing organizations and retailing organizations.

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Appendix A: Results for Banker and Morey

			Reference Sets		
DMUs	**Cluster**	**Score**	**1**	**2**	**3**
26036	1	0.1292	38082	35384	25150
7028	6	0.1679	32380	38082	
7078	6	0.1923	32380	38082	
7040	6	0.8038	32380	38082	25150
30110	6	0.2489	32380	38082	25150
30244	6	0.4077	38082	32380	23164
7152	6	0.1713	38082	32380	25150
30213	6	0.2062	23164	38082	32380
7064	6	0.1626	38082	32380	25150
30216	6	0.1359	38082	35384	
5276	2	0.2622	38082	35384	
5378	5	0.3979	35384	43336	
30120	6	0.3192	38082	32380	
30124	2	0.2645	38082	35384	25150
30190	2	0.2387	38082	25150	35384
5052	2	0.1127	38082	35384	
5058	6	0.2054	38082	32380	
7020	2	0.1398	38082	35384	25150
42428	6	0.117	38082	32380	25150
32236	5	0.2228	35384	43336	
30088	6	0.0646	38082	35384	25150
7124	6	0.3093	38082	32380	25150
32442	8	0.2795	35384	38082	25150
13140	6	0.1134	38082	25150	32380
30140	8	0.3257	35384	43336	
9004	5	0.2942	35384	43336	
5068	6	0.3078	23164	32380	38082
5023	6	0.273	38082	32380	25150
46348	2	0.2157	38082	35384	25150
47116	5	0.4531	35384	43336	25150
46248	2	0.2561	38082	35384	
33380	6	0.1922	32380	38082	25150
5503	4	0.9755	43336	35384	
43156	3	0.0415	35384	38082	
21115	6	0.1249	32380	25150	38082
46024	2	0.1724	38082	35384	25150
30176	8	0.1947	35384	43336	
32397	5	0.188	35384	38082	25150
30220	6	0.3537	35288	38082	
21501	4	0.4745	35384	32500	43336

5264	4	0.5814	35384	43336	
22196	2	0.1084	38082	25150	35384
5388	6	0.1751	38082	35384	25150
21127	6	0.0986	38082	23164	32380
35112	6	0.2123	23164	38082	35288
23280	8	0.2379	35384	43336	25150
38216	2	0.2002	38082	35384	25150
29092	2	0.0661	38082	35384	
20016	6	0.0683	38082	32380	25150
46008	6	0.2022	38082	35384	25150
1236	6	0.1238	32380	23164	38082
7115	2	0.1178	38082	35384	25150
30036	3	0.1695	38082	35384	25150
30116	8	0.1938	35384	43336	
22332	2	0.2303	38082	35384	25150
46464	6	0.2781	35288	23164	38082
5468	3	0.2998	38082	35384	25150
32102	2	0.1915	38082	35384	25150
5380	2	0.0961	38082	35384	
30172	3	0.2182	38082	25150	35384
5310	3	0.1778	38082	35384	
46454	6	0.3908	38082	23164	35288
23193	5	0.5492	35384	25150	43336
5232	2	0.1356	38082	35384	
2030	2	0.1682	38082	35384	25150
33430	3	0.2556	25150	38082	35384
2012	6	0.0684	38082	25150	35384
20032	6	0.0444	38082	25150	35384
23044	6	0.042	23164	38082	25150
5022	2	0.0167	35288	25150	
7038	8	0.2424	25150	35384	38082
7068	6	0.4878	32380	38082	25150
2017	6	0.0739	32380	23164	38082
5414	6	0.1002	38082	35384	
32380	6	1	32380		
7054	6	0.1438	23164	25150	35288
13302	7	0.8698	43336	25150	
21125	3	0.1992	38082	25150	35384
46148	6	0.0575	38082	35384	
20064	8	0.2119	38082	35384	25150
11378	4	0.7511	25150	43336	
32336	3	0.581	25150	38082	35384
54004	8	0.1788	35384	25150	43336

20044	2	0.2617	38082	35384	
46168	2	0.1343	38082	35288	25150
29044	2	0.2581	38082	35384	25150
10198	8	0.3165	38082	25150	35384
7114	3	0.1316	38082	35384	25150
35272	6	0.169	38082	35288	25150
30067	8	0.1918	35384	38082	
10048	2	0.114	38082	35384	
29036	6	0.0722	23164	38082	32380
47012	6	0.1014	32380	38082	25150
6166	4	0.4158	35384	43336	25150
43129	8	0.1887	35384	25150	38082
47128	3	0.1812	35384	38082	25150
5120	2	0.0859	38082	35384	25150
5348	4	0.3303	43336	35384	
20012	4	0.3886	25150	43336	35384
21244	8	0.1497	38082	25150	35384
22322	4	0.5434	43336	25150	
23294	2	0.2258	38082	25150	35384
5280	5	0.1794	35384	43336	25150
2032	6	0.1616	23164	38082	35288
33181	8	0.4392	35384	25150	43336
23336	2	0.331	38082	35384	25150
21114	6	0.0236	38082	32380	
46372	8	0.306	35384	25150	43336
21064	2	0.1496	38082	35384	25150
35180	2	0.1723	23164	25150	32380
21066	3	0.2704	38082	25150	35384
30040	3	0.1818	38082	35384	25150
30076	2	0.1187	38082	35288	23164
38360	4	0.7305	43336	35384	32500
5300	2	0.1878	38082	25150	35384
7072	6	0.2919	32380	23164	38082
22288	2	0.1407	38082	35384	25150
35136	6	0.1957	23164	35288	25150
5340	6	0.0222	38082	35384	
5376	2	0.0867	35384	38082	
43200	3	0.4568	25150	43336	
38100	6	0.2657	32380	16354	38082
14296	6	0.6148	35288	38082	
29020	2	0.1625	38082	25150	35384
20072	6	0.0593	38082	35384	25150
10188	6	0.1621	38082	35384	25150

43068	2	0.2803	35288	38082	25150
5180	7	0.7886	43336	32500	
35412	6	0.2284	32380	23164	25150
33188	2	0.5291	32380	25150	38082
8004	8	0.2309	35384	25150	43336
38256	6	0.1789	38082	35288	25150
15080	3	0.2453	38082	25150	35384
5483	6	0.1183	38082	35288	
17552	6	0.2055	23164	32380	25150
14164	5	0.1869	35384	25150	43336
7113	2	0.1722	38082	25150	35384
7144	2	0.1778	35288	38082	25150
46456	6	0.1927	38082	23164	35288
5368	2	0.1798	38082	35384	
43812	5	0.1909	35384	25150	43336
37104	5	0.274	25150	35384	43336
14392	6	0.1598	32380	16354	25150
49344	6	0.3495	32380	16354	25150
6164	2	0.0643	38082	35384	
25150	5	1	25150		
46441	8	0.1979	38082	35384	25150
13290	2	0.1933	38082	32380	25150
5497	3	0.0916	38082	35384	
25062	6	0.1461	23164	38082	32380
49314	6	0.372	35288	23164	38082
44084	8	0.4072	35384	38082	
35232	2	0.2511	35288	25150	38082
22178	3	0.2043	25150	38082	35384
5332	5	0.2286	35384	43336	
23352	6	0.0263	35288	38082	25150
47170	6	0.1175	23164	38082	35288
10228	8	0.2206	35384	43336	
43336	4	1	43336		
21134	6	0.1243	38082	25150	35384
32500	7	1	32500		
11148	6	0.1432	32380	23164	25150
31096	6	0.0791	38082	35384	
49110	5	0.3331	25150	35384	43336
10030	6	0.1389	38082	35288	25150
10029	5	0.1832	35384	25150	43336
22124	6	0.0235	38082	35384	
5132	3	0.1072	35384	38082	25150
21156	2	0.2976	35288	38082	25150

10120	2	0.0952	35384	38082	
47028	2	0.0889	38082	35384	25150
44022	2	0.0881	38082	35288	25150
41208	2	0.1762	38082	25150	32380
49064	3	0.216	35384	38082	25150
25380	5	0.5486	25150	43336	35384
17184	6	0.2579	32380	16354	25150
49232	2	0.132	38082	35384	25150
44006	2	0.1761	38082	35384	25150
42344	2	0.1446	35288	25150	38082
3008	4	0.3132	43336	35384	25150
25036	6	0.1047	23164	38082	25150
22232	6	0.5261	23164	38082	35288
30044	6	0.0344	38082	35288	
47140	2	0.2218	38082	35384	25150
6204	3	0.3612	38082	35384	25150
28066	3	0.1377	38082	35384	
23050	2	0.3619	35288	38082	25150
32002	2	0.1384	38082	35384	25150
47138	3	0.1243	35384	25150	38082
27234	2	0.2746	38082	25150	32380
11242	6	0.3659	23164	38082	25150
39004	8	0.1003	38082	25150	35384
32404	6	0.2879	38082	32380	25150
14364	6	0.1823	38082	32380	25150
5360	3	0.1192	38082	35384	25150
16236	6	0.4234	35288	23164	25150
35072	5	0.6524	25150	1292	43336
46036	6	0.1119	23164	38082	35288
44012	6	0.0971	38082	35384	
21188	6	0.1865	32380	23164	38082
33152	2	0.2433	38082	25150	32380
35240	6	0.1209	32380	16354	38082
46081	2	0.1759	38082	35384	25150
35384	3	1	35384		
32416	2	0.0827	38082	35384	25150
27186	3	0.2863	35384	38082	25150
43322	6	0.1717	32380	16354	38082
41214	6	0.0785	23164	38082	32380
6144	3	0.2043	38082	35384	
14010	6	0.1643	32380	23164	38082
35352	6	0.0803	23164	32380	25150
38196	8	0.2928	35384	25150	1292

13164	6	0.2257	32380	16354	38082
40048	3	0.1015	38082	35384	25150
38444	2	0.224	38082	35384	25150
36316	6	0.3603	38082	23164	32380
42036	2	0.2969	32380	38082	25150
5324	5	0.1036	35384	38082	25150
28016	5	0.1252	35384	25150	1292
34118	2	0.2302	38082	35384	
19104	2	0.1713	38082	35384	25150
40032	2	0.2893	38082	35288	25150
13056	2	0.1564	38082	35288	25150
47018	2	0.1835	35288	38082	25150
38400	6	0.0934	32380	16354	25150
35086	8	0.3411	25150	35384	1292
22108	3	0.1554	38082	25150	35384
15198	2	0.2508	38082	35384	25150
33092	6	0.2582	38082	32380	25150
23264	6	0.0949	32380	16354	38082
11024	2	0.3515	38082	25150	35384
21336	6	0.3978	23164	35288	38082
33304	6	0.0975	32380	16354	38082
29010	6	0.1613	38082	32380	25150
10276	2	0.1561	38082	35384	
29024	6	0.0801	32380	38082	16354
10164	3	0.0963	38082	35384	25150
38212	3	0.0997	35384	25150	38082
35400	6	0.3924	23164	32380	25150
10024	5	0.1557	35384	43336	1292
36064	2	0.1398	35288	38082	25150
41016	6	0.1447	38082	32380	23164
37142	2	0.1071	38082	35384	25150
33432	6	0.2626	23164	32380	38082
17048	2	0.1187	38082	25150	35384
32400	3	0.2106	35384	25150	1292
34116	6	0.1216	23164	35288	38082
1192	2	0.1866	38082	32380	25150
25152	2	0.1849	38082	32380	25150
33322	3	0.4086	38082	25150	32380
35248	2	0.3112	35288	25150	38082
40196	2	0.3063	38082	35288	25150
47152	2	0.1257	38082	25150	35384
22240	6	0.1085	38082	32380	25150
32004	8	0.1122	35384	38082	1292

49152	6	0.1907	38082	35384	25150
38081	6	0.2613	35288	23164	38082
37036	6	0.1376	38082	32380	25150
40120	2	0.1439	38082	35288	25150
42296	8	0.2024	35384	1292	43336
42298	6	0.2279	23164	38082	35288
35284	6	0.2061	23164	38082	32380
33208	6	0.1735	23164	38082	25150
46212	6	0.2224	23164	35288	38082
22234	3	0.2196	38082	35384	25150
22172	2	0.327	38082	25150	35384
29032	6	0.1011	38082	35288	25150
49162	2	0.1121	38082	25150	35384
25060	6	0.3053	23164	35288	38082
40050	3	0.1615	35384	25150	1292
35184	6	0.4003	16354	32380	25150
33068	6	0.1875	23164	32380	38082
10296	2	0.0708	38082	35384	25150
23304	6	0.1373	16354	32380	38082
45061	2	0.1492	38082	35384	25150
16034	6	0.0845	23164	32380	25150
46176	6	0.0491	23164	38082	35288
5428	3	0.1042	38082	35288	25150
14224	6	0.225	23164	32380	38082
11472	2	0.3859	38082	32380	16354
14084	2	0.2138	38082	35384	25150
43333	2	0.0784	38082	25150	35384
14200	6	0.2239	23164	38082	25150
14066	6	0.1772	32380	16354	38082
47120	6	0.2752	35288	38082	
11418	2	0.2105	38082	25150	35384
35170	3	0.3408	38082	25150	35384
46380	2	0.2232	38082	25150	32380
13378	2	0.3317	38082	25150	35384
13052	6	0.2293	16354	32380	25150
33130	2	0.0497	38082	35384	25150
13392	2	0.1469	38082	35384	25150
17496	6	0.2599	16354	32380	25150
14208	6	0.1643	16354	32380	38082
18172	6	0.2506	23164	32380	25150
49166	3	0.6309	35288	38082	25150
35438	6	0.1497	23164	38082	32380
40008	6	0.1985	35288	25150	23164

5314	3	0.1206	38082	35384	25150
24045	3	0.2472	38082	35384	25150
22192	6	0.3683	35288	23164	25150
14006	3	0.1634	38082	25150	35384
35100	6	0.19	23164	32380	25150
49096	6	0.1277	38082	32380	16354
15348	6	0.2222	16354	32380	25150
38024	2	0.2577	38082	25150	32380
5492	6	0.0903	38082	35384	25150
33468	2	0.1752	38082	35384	25150
43784	2	0.259	35288	38082	25150
16213	2	0.238	38082	25150	32380
42264	8	0.1873	25150	1292	35384
34032	6	0.0874	38082	25150	35384
30004	2	0.2066	38082	35288	25150
45020	2	0.1293	38082	35384	
46108	6	0.0425	16354	32380	38082
35106	3	0.4827	35384	25150	1292
49176	6	0.3002	38082	35384	25150
29042	6	0.1836	38082	25150	35384
19112	2	0.1476	38082	35384	25150
46198	2	0.2641	38082	25150	35384
14160	6	0.3196	16354	32380	25150
38052	2	0.138	38082	35288	25150
23072	6	0.0528	38082	32380	16354
35168	5	0.4646	25150	1292	35384
35288	6	1	35288		
38300	5	0.2503	35384	43336	1292
1216	3	0.263	38082	35384	25150
38098	6	0.2591	23164	38082	35288
13096	6	0.0388	16354	32380	38082
49248	6	0.4072	32380	23164	16354
38004	6	0.0841	38082	25150	32380
5495	2	0.0848	38082	35288	25150
42184	6	0.2457	16354	32380	25150
13054	2	0.4434	38082	35384	25150
13364	2	0.4548	35384	38082	1300
43916	6	0.3202	38082	35288	23164
49264	6	0.1835	38082	32380	25150
35344	6	0.1505	38082	32380	16354
23028	6	0.2484	23164	38082	35288
14244	6	0.1348	38082	16354	32380
17340	8	0.4088	25150	1292	35384

11412	2	0.1822	16354	32380	25150
38368	2	0.129	38082	25150	35384
38160	6	0.6426	38082	32380	16354
22304	2	0.1462	38082	35384	
46028	6	0.1342	38082	32380	25150
14036	6	0.2142	38082	23164	32380
49180	6	0.1549	35288	23164	38082
49296	6	0.2398	16354	32380	25150
16274	3	0.4181	38082	35384	25150
43746	5	0.202	35384	1292	25150
13012	2	0.1739	35288	38082	25150
32120	6	0.2352	23164	38082	32380
16214	6	0.0253	38082	32380	23164
32140	8	0.2339	35384	1292	25150
43596	3	0.0666	38082	25150	35384
49288	6	0.0649	38082	35288	25150
35424	6	0.1525	23164	35288	38082
41284	6	0.102	23164	32380	25150
21254	3	0.1979	38082	35384	25150
4244	3	0.1793	38082	35384	25150
5404	2	0.077	38082	35288	25150
14088	2	0.2207	38082	32380	16354
32105	6	0.2275	16354	32380	25150
13004	6	0.2785	38082	35288	23164
35068	6	0.1251	23164	38082	32380
31061	3	0.2437	35384	1292	32500
5344	3	0.0926	38082	35384	25150
4304	2	0.0645	38082	25150	35288
6140	6	0.0633	38082	16354	32380
11552	6	0.0489	38082	23164	32380
48036	2	0.1642	38082	25150	35384
20088	2	0.0776	35288	38082	25150
38420	6	0.0443	38082	35384	
14300	6	0.2922	16354	32380	25150
22168	2	0.1451	35288	23164	38082
35280	6	0.0615	16354	32380	38082
42020	6	0.3815	35288	23164	25150
23186	6	0.0463	23164	35288	38082
36308	3	0.4351	25150	35384	1292
14328	2	0.1265	38082	25150	35384
46450	6	0.118	16354	32380	38082
38108	6	0.2543	16354	32380	38082
46304	6	0.0085	23164	38082	35288

21036	6	0.3244	16354	38082	32380
38424	6	0.1951	16354	32380	25150
40104	3	0.2872	38082	25150	35384
11364	2	0.1783	23164	35288	38082
35436	6	0.1149	23164	32380	38082
24136	6	0.3527	35288	27012	25150
13120	6	0.0602	16354	32380	23164
16298	6	0.3699	16354	38082	32380
46201	6	0.0926	38082	35288	25150
43552	2	0.1267	38082	25150	35384
33029	2	0.2597	38082	23164	25150
33424	6	0.1308	16354	32380	38082
1019	8	0.7313	35384	25150	1292
38116	2	0.1779	38082	25150	35384
16108	6	0.1309	16354	32380	25150
11164	6	0.2511	23164	35288	25150
47024	6	0.049	38082	16354	32380
15148	6	0.2873	23164	38082	32380
17381	6	0.1024	16354	32380	38082
15436	6	0.161	38082	32380	16354
35152	6	0.1566	23164	32380	25150
13186	6	0.1537	16354	32380	38082
22020	2	0.0372	38082	35384	25150
33334	6	0.063	16354	38082	32380
49228	2	0.3406	35288	38082	1292
33252	6	0.1642	16354	32380	25150
35332	6	0.1795	16354	32380	25150
50060	3	0.0487	38082	25150	35384
32440	6	0.1315	16354	38082	32380
10022	3	0.104	38082	35384	25150
42196	3	0.4095	35288	38082	25150
13260	6	0.2773	23164	32380	25150
33216	6	0.3589	16354	32380	38082
4108	6	0.098	38082	16354	32380
16352	6	0.1437	16354	32380	38082
43072	6	0.0964	23164	38082	25150
16364	6	0.1572	16354	32380	38082
16340	6	0.214	16354	38082	32380
1315	6	0.175	16354	38082	32380
20084	6	0.2106	38082	25150	35384
47148	6	0.132	23164	35288	38082
42256	6	0.1116	16354	32380	38082
32036	2	0.4638	38082	35384	1292

32256	6	0.0843	38082	16354	32380
27172	6	0.2563	16354	32380	25150
32420	2	0.1841	23164	38082	25150
15241	6	0.1776	16354	32380	25150
23222	2	0.1413	38082	35384	1292
14156	6	0.3604	35288	23164	38082
38240	6	0.1486	16354	32380	38082
43484	6	0.1491	38082	16354	32380
37060	2	0.1848	35288	38082	1292
12024	8	0.1951	35384	1292	43336
23104	6	0.2016	16354	38082	32380
23348	6	0.1666	38082	16354	32380
4100	6	0.0953	16354	32380	25150
33168	2	0.2032	38082	16354	32380
35012	6	0.3143	16354	32380	38082
16272	6	0.0667	23164	35288	38082
36176	6	0.2294	16354	32380	38082
33348	6	0.1505	16354	32380	38082
35142	6	0.2457	16354	32380	38082
11298	2	0.4539	35288	1292	25150
30196	6	0.2405	23164	38082	35288
10060	5	0.4774	35384	1292	32500
35060	2	0.2567	38082	16354	25150
19010	6	0.4334	38082	35384	25150
35196	6	0.3267	16354	32380	25150
10091	5	0.3145	43336	1292	25150
13216	6	0.1656	35288	23164	38082
16066	6	0.0998	16354	32380	38082
43330	6	0.2964	16354	32380	25150
23136	6	0.0936	16354	32380	38082
10240	3	0.2073	38082	35384	25150
15320	6	0.1421	16354	38082	32380
14308	6	0.044	23164	38082	32380
13328	6	0.5331	35288	27012	38082
22072	6	0.1676	16354	38082	32380
47015	2	0.0555	38082	35384	25150
23084	6	0.0505	23164	38082	32380
22216	6	0.0745	38082	35384	25150
22052	6	0.2689	16354	38082	32380
14248	6	0.2034	16354	32380	38082
42056	6	0.298	23164	38082	35288
46236	6	0.0769	16354	38082	32380
16252	6	0.0955	23164	38082	32380

33264	6	0.1953	16354	32380	38082
43064	2	0.1235	38082	35288	1292
49336	6	0.0732	23164	38082	32380
14026	3	0.1498	38082	25150	1292
38132	6	0.1676	35288	1292	38082
43390	2	0.1445	38082	35288	25150
41028	6	0.1039	16354	32380	25150
32208	6	0.0677	16354	38082	32380
43332	6	0.1665	23164	35288	38082
47066	3	0.0935	35384	1292	38082
14386	2	0.1173	38082	35384	
43142	3	0.3073	38082	35288	25150
45010	6	0.0611	38082	35384	1292
32076	6	0.046	38082	16354	25150
27044	6	0.1728	16354	38082	32380
33324	6	0.1224	35288	38082	1292
38208	6	0.2463	23164	38082	25150
46280	6	0.1149	38082	16354	32380
16120	6	0.2066	16354	32380	38082
38436	6	0.205	16354	32380	25150
47036	6	0.0797	38082	16354	32380
14256	2	0.2112	16354	38082	32380
22044	2	0.9925	35288	27012	25150
24205	2	0.4272	35288	38082	1292
42048	6	0.1871	35288	1292	38082
43436	6	0.3395	16354	32380	25150
34180	6	0.0688	23164	32380	25150
27252	6	0.1265	16354	32380	25150
11542	6	0.1243	23164	32380	25150
11468	6	0.3969	38082	35288	25150
13240	6	0.0947	23164	38082	25150
35020	6	0.258	16354	32380	38082
35108	6	0.1792	16354	32380	25150
15072	6	0.2533	23164	38082	32380
22300	2	0.1531	38082	16354	25150
35076	6	0.1858	23164	38082	35288
10061	8	0.1988	35384	38082	1292
3060	8	0.216	35384	1292	43336
32340	6	0.2451	35288	23164	38082
32449	6	0.1544	16354	32380	25150
40186	2	0.1814	38082	25150	35384
23168	6	0.0329	23164	38082	32380
5220	2	0.1244	38082	35288	1292

24306	6	0.3317	16354	32380	38082
16144	6	0.1181	16354	32380	38082
49084	2	0.1116	38082	25150	1300
32092	6	0.2281	23164	16354	32380
46428	6	0.1688	23164	35288	38082
24192	6	0.1075	38082	16354	25150
34204	6	0.1671	23164	38082	35288
34072	6	0.1209	38082	23164	35288
38428	2	0.1199	38082	25150	1292
32048	6	0.1745	16354	32380	38082
35104	6	0.0977	23164	32380	25150
11004	6	0.1765	38082	16354	32380
23190	6	0.0793	38082	16354	25150
35228	6	0.178	16354	32380	38082
38082	6	1	38082		
14168	6	0.4679	16354	32380	25150
42324	6	0.0925	16354	32380	25150
23144	6	0.1332	16354	32380	38082
35308	6	0.2048	16354	32380	25150
15226	2	0.2741	38082	35384	1292
23200	6	0.5635	16354	38082	32380
22164	6	0.1035	16354	38082	32380
33256	6	0.2456	16354	32380	25150
13316	6	0.2502	23164	38082	35288
15422	2	0.2817	38082	35384	1292
48084	6	0.1234	16354	32380	38082
1220	6	0.2186	16354	38082	32380
46408	6	6E-11	23164	38082	32380
15112	6	0.2332	16354	38082	32380
31090	6	0.093	38082	16354	32380
23100	6	0.1984	16354	32380	25150
46274	6	0.1489	16354	38082	32380
27004	6	0.2707	23164	35288	38082
43652	6	0.3611	23164	32380	16354
43550	6	0.3564	35288	1292	38082
23032	6	0.0925	23164	32380	38082
14004	6	0.1253	23164	32380	38082
18206	5	0.4309	1292	25150	35384
14180	6	0.2328	16354	32380	25150
35260	6	0.4785	16354	38082	32380
10180	2	0.1785	38082	1300	25150
40100	6	0.1403	38082	16354	32380
15394	6	0.4988	35288	38082	1292

14124	6	0.1093	16354	32380	38082
22036	6	0.2446	38082	16354	32380
5152	6	0.0396	38082	1292	35384
13224	6	0.2705	38082	16354	32380
38384	6	0.0676	38082	16354	32380
40184	6	0.0796	38082	16354	32380
35356	6	0.2231	16354	38082	32380
33352	6	0.1339	16354	38082	32380
33088	2	0.1416	38082	16354	25150
18125	3	0.2114	25150	1292	38082
35256	2	0.1396	38082	17420	25150
32124	6	0.3298	16354	32380	38082
35404	6	0.6114	16354	32380	25150
14212	6	0.1031	16354	32380	25150
33260	6	0.1548	35288	38082	23164
1288	2	0.1956	38082	16354	25150
35392	2	0.4579	16354	32380	25150
23332	6	0.102	16354	32380	23164
33452	6	0.128	16354	38082	32380
36072	6	0.1449	35288	27012	1292
40128	6	0.0829	16354	32380	38082
36252	6	0.1079	16354	38082	32380
33008	2	0.2505	35288	1292	25150
47160	2	0.1928	38082	16354	25150
35420	6	0.1785	16354	38082	32380
37120	6	0.0419	16354	38082	32380
17052	6	0.0645	23164	38082	32380
42192	2	0.2667	16354	38082	32380
14384	6	0.169	16354	32380	38082
14116	6	0.1489	16354	32380	38082
25288	6	0.1038	23164	35288	25150
22224	6	0.0765	16354	38082	32380
22252	2	0.2854	38082	1300	25150
13232	6	0.2028	16354	32380	25150
13204	6	0.12	23164	32380	25150
40116	2	0.1379	38082	1292	25150
27034	6	0.2103	16354	23164	32380
13448	6	0.1572	16354	32380	25150
13424	6	0.2327	16354	32380	25150
1168	6	0.2549	16354	38082	32380
11054	6	0.1094	16354	38082	32380
19052	6	0.129	38082	35384	1292
35244	6	0.2087	16354	32380	25150

14220	6	0.1531	35288	1292	38082
1176	6	0.0776	16354	32380	25150
22220	6	0.1522	16354	32380	38082
6216	2	0.1093	38082	1292	35384
32064	6	0.3658	16354	38082	32380
15140	6	0.2108	16354	32380	38082
33382	6	0.209	38082	16354	25150
16016	6	0.3361	16354	32380	25150
13287	6	0.0659	38082	16354	32380
38036	6	0.3446	16354	32380	38082
13288	6	0.1188	16354	32380	25150
27240	6	0.0897	16354	38082	32380
36328	6	0.206	16354	32380	38082
38012	2	0.0965	38082	35288	1292
32072	6	0.1483	16354	32380	38082
32450	6	0.2541	16354	32380	25150
43044	2	0.2468	35288	1292	25150
27300	6	0.0679	16354	32380	25150
16398	6	0.1328	16354	32380	25150
32088	6	0.6493	38082	1292	25150
33456	6	0.4235	35288	1292	38082
33472	6	0.2213	23164	38082	25150
35368	6	0.2294	16354	32380	38082
13036	6	0.1353	23164	32380	38082
25052	6	0.1785	16354	32380	25150
42061	6	0.053	16354	32380	25150
11189	2	0.1479	38082	1292	25150
19001	2	0.2045	38082	1292	25150
41168	6	0.2341	16354	32380	25150
38332	2	0.2408	38082	16354	1300
5088	6	0.0476	16354	23164	32380
40108	6	0.1229	16354	32380	38082
42170	2	0.1851	35288	1292	38082
43660	6	0.3975	23164	25150	32380
33356	2	0.1474	38082	35288	1292
27270	6	0.128	16354	32380	38082
14316	6	0.0047	23164	38082	35288
42126	6	0.244	16354	32380	25150
18142	3	0.2241	38082	1292	35288
10004	2	0.2685	35288	38082	1292
32176	6	0.1303	38082	1292	35288
40172	6	0.1929	16354	38082	32380
41024	6	0.095	16354	38082	32380

13200	6	0.1795	16354	32380	38082
5112	8	0.1023	35384	1292	43336
46364	6	0.1286	16354	32380	38082
11256	6	0.1229	16354	32380	38082
1180	6	0.1352	16354	32380	25150
35311	6	0.1589	38082	35288	1292
32248	6	0.2514	16354	38082	25150
37004	6	0.1817	23164	35288	38082
43636	6	0.0733	23164	32380	16354
3066	6	0.0617	35288	27012	1292
37072	6	0.1591	16354	32380	25150
17046	6	0.1557	16354	38082	32380
1208	3	0.2186	1300	25150	35384
11516	6	0.0798	16354	32380	38082
33132	2	0.1869	38082	1292	35288
32106	6	0.064	38082	1292	35384
46164	6	0.0566	16354	38082	32380
16299	6	0.2677	16354	32380	25150
38220	6	0.2052	23164	38082	35288
25320	6	0.2106	16354	32380	25150
43580	6	0.1993	16354	32380	38082
35360	6	0.1807	16354	38082	32380
40016	2	0.1217	38082	1292	35288
47084	6	0.0975	16354	38082	32380
16072	6	0.0482	23164	38082	35288
32422	6	0.2308	16354	32380	38082
1032	6	0.0974	16354	38082	32380
36296	6	0.1427	16354	32380	25150
24277	2	0.1217	38082	1300	25150
25004	6	0.2801	16354	32380	38082
25352	6	0.1376	16354	32380	38082
16416	6	0.0288	23164	32380	38082
13188	6	0.0336	38082	16354	32380
37056	6	0.2064	16354	32380	38082
34026	6	0.0871	16354	38082	32380
17120	6	0.1666	16354	32380	25150
37080	2	0.2043	35384	1292	38082
38180	6	0.2948	27012	35288	38082
14128	6	0.0197	23164	38082	25150
33408	6	0.3403	35288	23164	27012
42068	6	0.0872	23164	35288	25150
32216	6	0.2153	16354	32380	38082
35028	6	0.0871	16354	38082	32380

35016	6	0.1053	23164	16354	38082
25040	2	0.3317	38082	1300	35384
18040	2	0.2005	35288	1292	38082
24180	6	0.0666	16354	38082	25150
35318	6	0.0919	16354	38082	32380
14032	6	0.2388	16354	32380	25150
38412	6	0.2056	16354	32380	38082
35096	6	0.3805	16354	32380	38082
15488	6	0.0677	16354	38082	25150
5147	3	0.1113	38082	1292	35384
14400	6	0.0829	38082	27012	23164
22328	6	0.0663	16354	38082	32380
36232	3	0.526	1292	35384	25150
47076	6	0.085	16354	38082	32380
36104	6	0.231	35288	1292	38082
38204	6	0.1769	23164	38082	35288
14196	6	0.2293	16354	32380	38082
33200	2	0.0389	38082	1292	17420
43088	6	0.1534	16354	32380	38082
49184	6	0.0764	38082	16354	1300
38292	2	0.0867	38082	16354	1300
38040	6	0.1472	16354	38082	32380
27100	6	0.1142	16354	32380	23164
42248	6	0.1651	16354	32380	25150
38032	6	0.2026	38082	48160	25150
36208	6	0.1422	23164	35288	25150
33457	6	0.1015	16354	23164	32380
15431	6	0.2032	16354	32380	25150
17088	6	0.1365	16354	32380	38082
15476	6	0.0143	23164	38082	35288
38236	6	0.1375	16354	38082	25150
25470	6	0.0788	16354	38082	25150
17056	6	0.1233	16354	32380	38082
4236	6	0.0709	16354	32380	38082
32221	6	0.0696	38082	27012	1292
46010	6	0.2208	16354	32380	25150
35212	6	0.0053	38082	48160	17420
23212	6	0.0744	16354	38082	32380
48119	6	0.2516	16354	38082	32380
18006	3	0.1674	1292	38082	35288
33384	6	0.2771	16354	32380	38082
33344	6	0.0706	16354	38082	32380
38352	6	0.1606	16354	23164	38082

23184	6	0.0442	23164	16354	32380
15068	6	0.1169	23164	16354	32380
31053	6	0.1542	16354	32380	38082
48012	6	0.1029	23164	38082	25150
35312	6	0.1629	38082	48160	27012
27396	6	0.0841	23164	38082	32380
35188	6	0.0835	23164	32380	16354
33064	6	0.2029	35288	1292	27012
31008	6	0.127	27012	38082	35288
33120	6	0.6797	38082	1300	35384
31016	6	0.1507	16354	23164	38082
38440	2	0.2366	38082	1292	27012
15236	6	0.0281	16354	38082	32380
38388	6	0.1014	16354	38082	32380
24224	6	0.0842	16354	38082	25150
36244	6	0.1054	16354	32380	38082
25212	6	0.0328	23164	38082	32380
16004	6	0.2547	16354	38082	32380
13172	6	0.0658	16354	32380	25150
43504	6	0.1009	16354	32380	38082
38380	6	0.1846	16354	38082	32380
11408	6	0.4312	23164	38082	32380
46418	6	0.1787	38082	1292	35384
13428	6	0.1415	16354	32380	25150
16146	6	0.0831	16354	38082	32380
32060	6	0.1911	38082	1300	16354
40136	6	0.1465	16354	38082	32380
38008	6	0.0958	16354	32380	25150
33396	6	0.2566	16354	32380	38082
35224	6	0.1233	23164	16354	38082
19096	2	0.1318	1292	38082	35384
27144	6	0.0485	23164	38082	16354
11072	6	0.1399	16354	32380	38082
48140	6	0.0949	23164	25150	38082
33040	6	0.0924	16354	32380	38082
17252	6	0.139	16354	38082	32380
43828	2	0.1089	38082	17420	25150
47064	6	0.0874	16354	38082	32380
47096	6	0.0493	16354	32380	25150
38194	2	0.1186	38082	1292	25150
17240	6	0.1664	23164	25150	38082
32010	6	0.0956	16354	38082	32380
38168	6	0.2389	35288	1292	38082

42252	6	0.1245	16354	32380	25150
34210	6	0.0418	23164	38082	35288
5416	6	0.0215	27012	35288	1292
38152	6	0.386	16354	32380	38082
1070	6	0.1853	16354	32380	38082
37132	6	0.0379	16354	38082	1300
36264	6	0.077	16354	38082	32380
20004	6	0.1015	38082	1300	16354
11530	6	0.1516	16354	38082	25150
16036	6	0.3077	16354	32380	38082
36044	6	0.1159	16354	38082	25150
24158	2	0.409	35288	1292	38082
37128	6	0.1241	23164	32380	38082
35092	6	0.3021	16354	32380	38082
16320	6	0.813	23164	16354	32380
17216	6	0.1297	16354	38082	32380
35024	6	0.1088	35288	1292	38082
17372	6	0.0404	27012	35288	38082
27148	6	0.1692	16354	38082	32380
11184	6	0.101	16354	32380	25150
10090	3	0.4001	1292	35288	38082
15468	6	0.3932	38082	1292	35384
33072	6	0.1356	16354	32380	25150
11008	6	0.0703	38082	48160	17420
11134	6	0.0893	16354	32380	38082
1120	6	0.3343	35288	1292	38082
16452	2	0.4401	1292	35288	38082
36300	6	0.0841	16354	38082	32380
42204	6	0.0516	38082	17420	1292
38364	2	0.1254	1292	38082	35288
38328	6	0.1908	16354	38082	32380
1304	6	0.3326	16354	32380	38082
1248	6	0.6389	16354	32380	25150
13148	6	0.06	38082	48160	16354
35156	6	0.6856	16354	32380	25150
33436	6	0.1208	16354	32380	25150
33360	6	0.2284	27012	38082	35288
4142	6	0.1687	16354	38082	25150
33412	6	0.1518	16354	38082	1300
46052	2	0.3163	1292	35288	38082
15412	6	0.0797	23164	16354	38082
17428	6	0.0697	16354	38082	25150
23260	6	0.0924	16354	38082	32380

48240	6	0.1123	38082	17420	1300
38068	6	0.4602	16354	32380	25150
25016	6	0.0492	16354	38082	32380
36268	6	0.0669	16354	48160	38082
6222	6	0.089	16354	32380	25150
15084	6	0.0445	23164	38082	32380
11512	6	0.1194	16354	38082	1300
16228	6	0.6417	16354	38082	1300
13112	6	0.0018	27012	23164	38082
15162	6	0.5754	16354	38082	48160
36144	6	0.0898	16354	38082	1300
25252	6	0.1388	16354	32380	38082
23092	6	0.0625	23164	35288	25150
15308	6	0.1657	16354	38082	32380
38038	6	0.1772	16354	38082	25150
38096	6	0.2937	16354	32380	25150
4016	6	0.0552	27012	35288	1292
38248	6	0.2591	16354	38082	32380
36020	6	0.0317	38082	17420	1292
17040	6	0.0444	16354	25150	1300
42412	6	0.1052	16354	23164	32380
35040	6	0.7591	16354	32380	25150
16324	6	0.3053	16354	38082	1300
31024	2	0.1806	38082	1292	25150
42216	6	0.1357	16354	38082	32380
4296	6	0.1481	16354	25150	32380
16020	6	0.0982	16354	38082	1300
17520	6	0.0379	23164	35288	38082
11540	6	0.2104	16354	38082	1300
18144	2	0.1024	17420	25150	35384
46328	6	0.1302	16354	1300	25150
42088	6	0.0982	16354	38082	1300
48128	6	0.0993	1300	38082	35384
5496	6	0.0419	16354	1300	38082
17380	6	0.3257	16354	32380	25150
16292	6	0.1	16354	38082	25150
40056	6	0.2011	16354	38082	25150
35373	6	0.1088	1292	38082	35384
16048	6	0.1557	16354	38082	1300
23308	6	0.0305	16354	38082	32380
25180	6	0.0271	16354	23164	25150
13348	6	0.0492	48160	16354	38082
35144	6	0.8813	16354	32380	25150

41072	6	0.2261	16354	38082	25150
42116	6	0.1259	16354	1300	25150
4308	6	0.0647	16354	48160	25150
1092	6	0.209	16354	48160	25150
1156	6	0.0569	48160	16354	38082
18050	2	0.2525	38082	1292	25150
35321	6	0.1141	16354	1300	38082
4044	6	0.0801	16354	1300	38082
46412	6	0.0923	16354	23164	25150
46300	6	0.0577	48160	38082	17420
36080	6	0.2665	16354	38082	25150
15448	6	0.0176	27012	38082	1292
33290	6	0.1156	16354	1300	38082
23164	6	1	23164		
4036	6	0.1613	16354	1300	38082
25388	6	0.0454	27012	35288	1292
24012	6	0.2034	16354	1300	38082
46266	6	0.2894	16354	1300	38082
16354	6	1	16354		
25440	6	0.1694	16354	1300	38082
17110	6	0.1512	16354	48160	25150
40176	2	0.593	1292	35288	38082
24155	6	0.1075	1300	16354	38082
48072	6	0.1594	48160	1300	38082
25164	6	0.2078	16354	1300	38082
33284	6	0.2388	16354	1300	38082
48076	2	0.1345	1292	38082	17420
48176	6	0.078	1300	38082	16354
43900	2	0.0564	1292	38082	35288
24304	6	0.0515	42136	27012	38082
43256	3	0.1213	1292	35384	38082
17028	6	0.0943	27012	1292	35288
33464	6	0.2027	48160	38082	1292
48110	6	0.0827	48160	1300	38082
24316	6	0.1548	1292	35288	38082
25108	6	0.0099	48160	17420	38082
27012	6	1	27012		
1212	6	0.1392	48160	16354	25150
38088	6	0.2003	16354	1300	38082
36256	2	0.4947	1292	35288	38082
27088	6	0.0684	48160	38082	17420
42012	6	0.1061	27012	1292	25150
36322	6	0.1856	16354	1300	48160

24189	6	0.0601	1292	38082	35288
24008	6	0.1553	48160	25150	16354
42136	6	1	42136		
27384	6	0.6372	48160	16354	1300
4116	6	0.0495	48160	1300	25150
17204	6	0.0958	1300	16354	38082
48160	6	1	48160		
17336	6	0.0991	27012	1292	38082
17072	6	0.0447	27012	1292	25150
1104	6	0.1621	48160	1300	16354
42028	6	0.1293	48160	1300	38082
46196	6	0.1017	48160	1300	38082
48060	6	0.0353	1292	38082	17420
1303	6	0.1936	48160	1300	17420
1084	6	0.1291	1300	38082	17420
1044	6	0.0392	17420	38082	1300
24064	6	0.1531	17420	38082	1300
46182	6	0.0748	1292	48160	38082
42272	6	0.0664	1292	48160	38082
42424	6	0.0904	27012	1292	35288
43092	8	0.2533	1292	25150	35384
42060	6	0.0607	1292	27012	35288
1107	6	0.1819	17420	48160	1300
40160	6	0.1704	48160	17420	1292
48048	6	0.0898	17420	1300	38082
17289	6	0.0513	1292	38082	35384
1244	6	0.1748	17420	48160	1292
33009	6	0.2403	17420	1300	38082
40020	6	0.0816	48160	1292	17420
48144	6	0.0327	1292	38082	48160
48100	6	0.1023	17420	48160	1292
1300	6	1	1300		
17420	6	1	17420		
48214	6	0.2484	17420	1292	1300
24206	6	0.0759	1292	38082	35384
1292	6	1	1292		

Appendix B: Ruggiero 1996 Results

		Reference Sets			
DMUs		Score	1	2	3
26036	1	0.094142	38082	35384	25150
7028	6	0.055231	38082	35384	
7078	6	0.051882	38082	35384	
7040	6	0.081081	35384	25150	38082
30110	6	0.083054	38082	35384	
30244	6	0.26261	38082	35288	25150
7152	6	0.04157	35384	38082	25150
30213	6	0.145146	35288	38082	25150
7064	6	0.068825	38082	25150	35384
30216	6	0.067026	38082	35384	
5276	2	0.138073	35384	38082	
5378	5	0.396555	35384	43336	
30120	6	0.171537	38082	35384	
30124	2	0.264478	38082	35384	25150
30190	2	0.238704	38082	25150	35384
5052	2	0.112652	38082	35384	
5058	6	0.086898	38082	35384	
7020	2	0.111402	38082	35384	25150
42428	6	0.08767	38082	35288	25150
32236	5	0.217991	35384	43336	
30088	6	0.052053	38082	35384	25150
7124	6	0.089275	38082	35384	25150
32442	8	0.27951	35384	38082	25150
13140	6	0.097376	38082	25150	35384
30140	8	0.317107	35384	43336	
9004	5	0.270423	43336	35384	
5068	6	0.141354	35288	38082	25150
5023	6	0.124141	38082	35384	25150
46348	2	0.215739	38082	35384	25150
47116	5	0.359651	43336	35384	
46248	2	0.209453	38082	35384	
33380	6	0.077993	38082	25150	35384
5503	4	0.864211	32500	43336	
43156	3	0.041525	35384	38082	
21115	6	0.031756	35288	25150	38082
46024	2	0.14616	38082	35384	25150
30176	8	0.19465	35384	43336	
32397	5	0.187992	35384	38082	25150

30220	6	0.353685	35288	38082	
21501	4	0.419177	43336	32500	
5264	4	0.581398	35384	43336	
22196	2	0.108422	38082	25150	35384
5388	6	0.072672	38082	35384	
21127	6	0.078009	38082	35288	25150
35112	6	0.19204	35288	38082	25150
23280	8	0.210382	43336	35384	
38216	2	0.200223	38082	35384	25150
29092	2	0.066073	38082	35384	
20016	6	0.048033	38082	25150	35384
46008	6	0.169227	38082	35384	25150
1236	6	0.051281	35288	38082	25150
7115	2	0.105935	38082	35384	25150
30036	3	0.16945	38082	35384	25150
30116	8	0.188437	35384	43336	
22332	2	0.208481	38082	35384	25150
46464	6	0.237158	35288	38082	25150
5468	3	0.299838	38082	35384	25150
32102	2	0.191457	38082	35384	25150
5380	2	0.096073	38082	35384	
30172	3	0.218172	38082	25150	35384
5310	3	0.177833	38082	35384	
46454	6	0.347674	35288	38082	25150
23193	5	0.453472	43336	35384	25150
5232	2	0.135638	38082	35384	
2030	2	0.16822	38082	35384	25150
33430	3	0.255584	25150	38082	35384
2012	6	0.060279	38082	35384	25150
20032	6	0.044422	38082	25150	35384
23044	6	0.035926	35288	38082	25150
5022	2	0.016724	35288	25150	
7038	8	0.183646	25150	43336	35384
7068	6	0.141084	38082	35288	25150
2017	6	0.017065	38082	35288	25150
5414	6	0.100151	38082	35384	
32380	6	0.057441	38082	35384	
7054	6	0.125897	35288	25150	
13302	7	0.869815	43336	25150	
21125	3	0.199216	38082	25150	35384
46148	6	0.054162	38082	35384	
20064	8	0.211902	38082	35384	25150
11378	4	0.751104	25150	43336	

32336	3	0.310804	25150	43336	
54004	8	0.178482	35384	25150	43336
20044	2	0.2617	38082	35384	
46168	2	0.134264	38082	35288	25150
29044	2	0.258095	38082	35384	25150
10198	8	0.316461	38082	25150	35384
7114	3	0.131636	38082	35384	25150
35272	6	0.169001	38082	35288	25150
30067	8	0.191784	35384	38082	
10048	2	0.110552	38082	35384	
29036	6	0.036264	35288	38082	
47012	6	0.015607	38082	35384	25150
6166	4	0.41576	35384	43336	25150
43129	8	0.188658	35384	25150	38082
47128	3	0.181199	35384	38082	25150
5120	2	0.047848	38082	35384	25150
5348	4	0.298327	43336	32500	
20012	4	0.360462	43336	25150	
21244	8	0.149733	38082	25150	35384
22322	4	0.543379	43336	25150	
23294	2	0.225759	38082	25150	35384
5280	5	0.17936	35384	43336	25150
2032	6	0.148099	35288	38082	25150
33181	8	0.311929	43336	35384	
23336	2	0.331032	38082	35384	25150
21114	6	0.013166	38082	35384	
46372	8	0.277855	35384	43336	25150
21064	2	0.149571	38082	35384	25150
35180	2	0.157975	35288	25150	
21066	3	0.270432	38082	25150	35384
30040	3	0.181804	38082	35384	25150
30076	2	0.117185	38082	35288	25150
38360	4	0.651396	43336	32500	
5300	2	0.187833	38082	25150	35384
7072	6	0.109054	35288	38082	25150
22288	2	0.140714	38082	35384	25150
35136	6	0.177932	35288	25150	
5340	6	0.012705	38082	35384	
5376	2	0.086657	35384	38082	
43200	3	0.45683	25150	43336	
38100	6	0.0372	38082	25150	35384
14296	6	0.614755	35288	38082	
29020	2	0.137474	38082	35384	25150

20072	6	0.059265	38082	35384	25150
10188	6	0.151656	38082	35384	25150
43068	2	0.280297	35288	38082	25150
5180	7	0.746755	32500	43336	
35412	6	0.050879	35288	25150	38082
33188	2	0.208885	25150	38082	35384
8004	8	0.218949	35384	25150	43336
38256	6	0.178861	38082	35288	25150
15080	3	0.208159	38082	25150	35384
5483	6	0.118301	38082	35288	
17552	6	0.05257	35288	25150	
14164	5	0.179211	25150	35384	43336
7113	2	0.1722	38082	25150	35384
7144	2	0.177829	35288	38082	25150
46456	6	0.176755	35288	38082	25150
5368	2	0.179838	38082	35384	
43812	5	0.190164	35384	25150	43336
37104	5	0.225359	43336	25150	
14392	6	0.053923	35288	25150	
49344	6	0.142988	35288	25150	
6164	2	0.063667	38082	35384	
25150	5	1	25150		
46441	8	0.401843	42196	43336	
13290	2	0.196383	42196	35384	43336
5497	3	0.091618	38082	35384	
25062	6	0.255093	35288	42196	49166
49314	6	0.376884	35288	49166	38082
44084	8	0.407212	35384	38082	
35232	2	0.621418	42196	35288	
22178	3	0.46945	42196		43336
5332	5	0.228564	35384	43336	
23352	6	0.036106	49166	35288	38082
47170	6	0.161529	49166	35288	42196
10228	8	0.204979	43336	35384	
43336	4	1	43336		
21134	6	0.175123	49166	42196	35384
32500	7	1	32500		
11148	6	0.205387	42196	35288	
31096	6	0.074974	38082	35384	
49110	5	0.345744	25150	35384	
10030	6	0.16992	38082	49166	35384
10029	5	0.18551	35384	25150	
22124	6	0.022207	38082	35384	

5132	3	0.131105	35384	42196	
21156	2	0.597946	49166	42196	35288
10120	2	0.094223	35384	38082	
47028	2	0.145183	42196	49166	35384
44022	2	0.173348	49166	42196	35384
41208	2	0.197333	42196	35384	
49064	3	0.172705	35384		
25380	5	0.609183	25150	35384	
17184	6	0.168678	42196	35288	
49232	2	0.209139	49166	42196	35384
44006	2	0.229866	49166	42196	35384
42344	2	0.36757	42196	35288	
3008	4	0.389554	35384	25150	
25036	6	0.222559	42196	35288	
22232	6	0.961156	35288	42196	49166
30044	6	0.034421	38082	35288	
47140	2	0.239314	38082	49166	35384
6204	3	0.442588	49166	35384	42196
28066	3	0.137667	38082	35384	
23050	2	0.562009	49166	35288	42196
32002	2	0.217618	49166	42196	35384
47138	3	0.162431	35384	42196	
27234	2	0.351579	42196		35384
11242	6	0.509225	49166	35288	42196
39004	8	0.245853	42196		35384
32404	6	0.179213	42196	35384	49166
14364	6	0.262512	42196	49166	35384
5360	3	0.129542	38082	49166	35384
16236	6	0.563406	35288	42196	
35072	5	0.613654	25150	35384	
46036	6	0.157572	35288	49166	42196
44012	6	0.075991	38082	35384	
21188	6	0.064753	38082	35288	
33152	2	0.351546	42196		1019
35240	6	0.154378	42196		
46081	2	0.215386	49166	38082	35384
35384	3	1	35384		
32416	2	0.133898	38082	42196	1019
27186	3	0.475811	1019	42196	35384
43322	6	0.197882	42196	35288	
41214	6	0.036801	35288	38082	49166
6144	3	0.204343	38082	35384	
14010	6	0.220891	42196	35288	49166

35352	6	0.065702	35288	42196	
38196	8	0.451437	1019	35384	42196
13164	6	0.147528	35288	42196	49166
40048	3	0.212039	42196	1019	35384
38444	2	0.454068	42196	38082	1019
36316	6	0.336203	49166	38082	35288
42036	2	0.562067	42196		
5324	5	0.103616	35384	38082	25150
28016	5	0.124687	35384	25150	38082
34118	2	0.371517	38082	13364	
19104	2	0.243895	38082	1019	42196
40032	2	0.36121	38082	49166	42196
13056	2	0.267782	49166	42196	38082
47018	2	0.378754	35288	42196	49166
38400	6	0.072003	35288	42196	
35086	8	0.729257	1019		
22108	3	0.343648	42196	1019	35384
15198	2	0.486383	13364	38082	1019
33092	6	0.230188	42196	38082	1019
23264	6	0.118268	49166	42196	35288
11024	2	0.630947	42196	38082	1019
21336	6	0.412787	35288	49166	38082
33304	6	0.057359	42196		1019
29010	6	0.202121	42196	38082	1019
10276	2	0.273393	38082	13364	
29024	6	0.024829	38082	13364	
10164	3	0.17283	38082	13364	1019
38212	3	0.121999	1019	35384	
35400	6	0.468336	35288	42196	
10024	5	0.152191	35384	25150	
36064	2	0.312191	42196	49166	35288
41016	6	0.192427	49166	42196	38082
37142	2	0.188255	38082	42196	1019
33432	6	0.469991	42196	35288	
17048	2	0.260132	42196	1019	38082
32400	3	0.27797	35384	1019	42196
34116	6	0.077457	23164	35288	
1192	2	0.428051	42196		
25152	2	0.190399		42196	
33322	3	0.647302		42196	
35248	2	0.75821	35288	42196	
40196	2	0.560928	49166	42196	38082
47152	2	0.189103	38082	42196	1019

22240	6	0.122043	42196	38082	1019
32004	8	0.118195	35384	42196	1019
49152	6	0.267171	38082	42196	1019
38081	6	0.489726	35288	42196	
37036	6	0.141261	42196	38082	1019
40120	2	0.286522	49166	42196	38082
42296	8	0.217672	35384	1019	
42298	6	0.345096	35288	42196	49166
35284	6	0.323078	49166	42196	35288
33208	6	0.280143	49166	35288	42196
46212	6	0.279423	35288	42196	
22234	3	0.237957	1019	35384	
22172	2	0.594364	42196	1019	
29032	6	0.149811	49166	38082	42196
49162	2	0.155438	1019	42196	38082
25060	6	0.420379	35288	42196	49166
40050	3	0.258875	1019		
35184	6	0.423822	42196	35288	
33068	6	0.355961	42196	35288	
10296	2	0.133379	38082	1019	13364
23304	6	0.080326	35288	42196	49166
45061	2	0.270905	38082	13364	1019
16034	6	0.112874	35288	42196	
46176	6	0.041433	35288	49166	38082
5428	3	0.163964	49166	38082	42196
14224	6	0.224884	35288	42196	
11472	2	0.739344	42196		
14084	2	0.289701	38082	1019	13364
43333	2	0.158137	42196	38082	1019
14200	6	0.344277	35288	42196	49166
14066	6	0.172133	35288	42196	
47120	6	0.275237	35288	38082	
11418	2	0.40441	42196	38082	1019
35170	3	0.625536		1019	
46380	2	0.468125	42196	38082	1019
13378	2	0.601594	38082	42196	1019
13052	6	0.070489	35288	42196	
33130	2	0.075594	38082	1019	42196
13392	2	0.239429	38082	1019	42196
17496	6	0.141773	35288	42196	
14208	6	0.210339	42196	49166	35288
18172	6	0.354746	35288	42196	
49166	3	1	49166		

35438	6	0.298082	42196	35288	
40008	6	0.431962	35288	42196	
5314	3	0.142077	35384	49166	42196
24045	3	0.46729	13364	38082	1019
22192	6	0.621288	35288	42196	
14006	3	0.357685	42196	38082	1019
35100	6	0.046191	35288	42196	
49096	6	0.170574	42196	38082	35288
15348	6	0.180302	42196	35288	
38024	2	0.462028		42196	
5492	6	0.102773	38082	13364	1019
33468	2	0.319008	38082	42196	1019
43784	2	0.441547	35288	42196	38082
16213	2	0.273247	42196	1019	38082
42264	8	0.596007		42196	
34032	6	0.112646	38082	42196	1019
30004	2	0.405292	42196	38082	35288
45020	2	0.200225	38082	13364	
46108	6	0.036239	35288	42196	38082
35106	3	0.636281	1019	35384	
49176	6	0.337933	38082	13364	1019
29042	6	0.26309	38082	42196	35288
19112	2	0.176884	38082	1019	13364
46198	2	0.598376	42196	38082	1019
14160	6	0.216815	35288	42196	
38052	2	0.234312	38082	42196	35288
23072	6	0.064906	42196	38082	35288
35168	5	0.400528	25150	35384	
35288	6	1	35288		
38300	5	0.32923	1019	35384	
1216	3	0.27357	1019	13364	
38098	6	0.420533	35288	42196	38082
13096	6	0.026616	42196	38082	1019
49248	6	0.528115		42196	
38004	6	0.085104	38082	42196	1019
5495	2	0.127115	35288	38082	42196
42184	6	0.285068	42196	35288	
13054	2	0.970547	13364	38082	1019
13364	2	1	13364		
43916	6	0.599337	35288	42196	38082
49264	6	0.279314	42196	38082	1019
35344	6	0.237667	42196	38082	1019
23028	6	0.414248	35288	42196	38082

14244	6	0.148104	42196	38082	1019
17340	8	0.89326	1019		
11412	2	0.356392	42196		
38368	2	0.244147	42196	38082	1019
38160	6	0.40123	38082	42196	1019
22304	2	0.201131	38082	1019	
46028	6	0.146372	38082	42196	
14036	6	0.329355	42196	38082	35288
49180	6	0.29661	35288	42196	
49296	6	0.189947	42196	35288	
16274	3	0.426471	1019	35384	
43746	5	0.308301	1019	35384	42196
13012	2	0.372226	35288	42196	
32120	6	0.333754		42196	38082
16214	6	0.017532	38082	23164	
32140	8	0.288415	1019	35384	
43596	3	0.129123	42196	1019	38082
49288	6	0.106251	38082	35288	42196
35424	6	0.271706	35288	42196	38082
41284	6	0.062929		42196	
21254	3	0.352084	38082	1019	42196
4244	3	0.327025	38082	1019	42196
5404	2	0.126563	35288	42196	38082
14088	2	0.365532	42196	38082	1019
32105	6	0.293419	42196	35288	
13004	6	0.356191		38082	42196
35068	6	0.134368		38082	42196
31061	3	0.199014	35384		
5344	3	0.11051	49166	35384	42196
4304	2	0.14597	42196	38082	1019
6140	6	0.038932	38082	42196	
11552	6	0.060214	38082		42196
48036	2	0.246314	42196	38082	1019
20088	2	0.148445	35288	42196	38082
38420	6	0.054456	38082	1019	
14300	6	0.133538		42196	
22168	2	0.340239	42196	35288	
35280	6	0.044607		42196	38082
42020	6	0.74325	35288	42196	
23186	6	0.038724		38082	42196
36308	3	0.673655	1019		
14328	2	0.1676	42196	1019	38082
46450	6	0.108849	42196		38082

38108	6	0.111232		42196	38082
46304	6	0.00858	23164	38082	
21036	6	0.200137	42196	1019	
38424	6	0.104136		42196	
40104	3	0.618077	42196	38082	1019
11364	2	0.438345	42196	35288	
35436	6	0.139932		42196	
24136	6	0.572396	35288	42196	
13120	6	0.049228		42196	
16298	6	0.360719		42196	38082
46201	6	0.104889	38082	35288	42196
43552	2	0.305817	42196	38082	1019
33029	2	0.617713	42196	38082	1019
33424	6	0.051766	38082	42196	
1019	8	1	1019		
38116	2	0.265522		38082	42196
16108	6	0.208764	42196	35288	
11164	6	0.462444	35288	42196	
47024	6	0.051714	42196	38082	
15148	6	0.480528	35288	42196	38082
17381	6	0.087135	42196		38082
15436	6	0.195301	38082	42196	
35152	6	0.204262		42196	
13186	6	0.09862	42196		38082
22020	2	0.071739	38082	32036	
33334	6	0.05544	42196	38082	35288
49228	2	0.642458	35288	42196	38082
33252	6	0.150207		42196	
35332	6	0.150708	42196		
50060	3	0.113062		38082	42196
32440	6	0.169999	42196	35288	38082
10022	3	0.208993	38082		13364
42196	3	1	42196		
13260	6	0.520014	35392	35288	
33216	6	0.41755	35392		38082
4108	6	0.105268	38082	35392	
16352	6	0.055627	38082		35392
43072	6	0.21856		35392	38082
16364	6	0.066089	38082	35392	
16340	6	0.106815	38082		35392
1315	6	0.203393	35392	38082	
20084	6	0.31551	38082	35392	
47148	6	0.164348		32088	38082

42256	6	0.126668	35392		32088
32036	2	1	32036		
32256	6	0.057686	38082	35392	
27172	6	0.220922	35392		32088
32420	2	0.424437	35392		38082
15241	6	0.155463		35392	32088
23222	2	0.286872	38082		
14156	6	0.679257	35288	35392	
38240	6	0.082814	32088		35392
43484	6	0.139952	38082	35392	
37060	2	0.319461		38082	35288
12024	8	0.238443	1019	35384	
23104	6	0.16113	32088		35392
23348	6	0.098529	38082	35392	
4100	6	0.125659	35392	35288	38082
33168	2	0.242033	35392		38082
35012	6	0.374579	35392	38082	
16272	6	0.060061		23164	38082
36176	6	0.112808	38082	35392	32088
33348	6	0.24841	35392	38082	
35142	6	0.409781	35392	38082	
11298	2	0.760919	35288	35392	
30196	6	0.372042		32088	35392
10060	5	0.412544	35384	25150	
35060	2	0.56669	35392	38082	
19010	6	0.474387	38082		
35196	6	0.119581	35392		
10091	5	0.280458	35384	25150	
13216	6	0.299292	35288	35392	38082
16066	6	0.077716		35392	32088
43330	6	0.122396		35392	32088
23136	6	0.088558		32088	35392
10240	3	0.348865	42196	35384	49166
15320	6	0.215523	35392	35288	38082
14308	6	0.038055		32088	38082
13328	6	0.658512		32088	38082
22072	6	0.087319	38082	35392	
47015	2	0.093435	38082		35392
23084	6	0.048217		32088	38082
22216	6	0.091496	38082		
22052	6	0.285575	35392		38082
14248	6	0.124968	32088	35392	
42056	6	0.581992	35288	35392	38082

46236	6	0.025177	38082		
16252	6	0.093178		32088	35392
33264	6	0.207168	35392		32088
43064	2	0.260495		35392	38082
49336	6	0.084393		32088	35392
14026	3	0.419833	35392	49166	
38132	6	0.264309	35288	35392	38082
43390	2	0.313226	35392	38082	
41028	6	0.082794		35392	
32208	6	0.092489	35392	35288	38082
43332	6	0.320085		35288	35392
47066	3	0.156645	42196		35384
14386	2	0.117811	38082		
43142	3	0.719101	49166	35392	
45010	6	0.078359		38082	
32076	6	0.082045	35392	38082	
27044	6	0.204226	32088		35392
33324	6	0.245851		35392	38082
38208	6	0.484202		35392	38082
46280	6	0.130636	38082	35392	
16120	6	0.109301		32088	35392
38436	6	0.09836	35392		32088
47036	6	0.066362	38082		
14256	2	0.267619	35392		38082
22044	2	0.885961	35288	35392	
24205	2	0.614816		35288	38082
42048	6	0.380461	35288		35392
43436	6	0.207992		23164	
34180	6	0.066391	23164		
27252	6	0.151797		23164	
11542	6	0.224303	35392	35288	
11468	6	0.597013	38082	35392	35288
13240	6	0.171635			
35020	6	0.1643	35392	38082	
35108	6	0.132741		35392	
15072	6	0.218346	23164	38082	
22300	2	0.183482	35392		38082
35076	6	0.400337		35392	38082
10061	8	0.280326	42196	35384	1019
3060	8	0.194505	35384	38082	
32340	6	0.512367			38082
32449	6	0.115869		35392	
40186	2	0.373853	38082	35392	

23168	6	0.025783		38082	
5220	2	0.166746	38082		35288
24306	6	0.458002			32088
16144	6	0.061079		32088	
49084	2	0.250799	35392	38082	
32092	6	0.32968		23164	
46428	6	0.361741			
24192	6	0.149379	38082	35392	
34204	6	0.309054			
34072	6	0.187938	35288	38082	35392
38428	2	0.307704	35392	38082	
32048	6	0.170505	35392	38082	
35104	6	0.177936		23164	
11004	6	0.309868	35392	38082	
23190	6	0.092357	38082	35392	
35228	6	0.126686	35392	38082	
38082	6	1	38082		
14168	6	0.245697	35392		32088
42324	6	0.131398		23164	
23144	6	0.053657		32088	23164
35308	6	0.163819		23164	
15226	2	0.583083	38082		
23200	6	0.39209	32088	23164	
22164	6	0.100397	35392	38082	
33256	6	0.108802	35392		
13316	6	0.423732		38082	
15422	2	0.471442	38082		
48084	6	0.084678	32088		35392
1220	6	0.410757	35392	38082	
46408	6	8.88E-11			32088
15112	6	0.239408	32088		35392
31090	6	0.120194	35392	38082	
23100	6	0.121755		35392	
46274	6	0.264794	35392	38082	
27004	6	0.600408		23164	
43652	6	0.116785	23164		
43550	6	0.437851	35288		38082
23032	6	0.131326	23164		
14004	6	0.165708	23164		
18206	5	0.358655	25150	35384	38082
14180	6	0.166322		23164	
35260	6	0.318128	35392	38082	
10180	2	0.405438	35392		38082

40100	6	0.124939	38082	35392	
15394	6	0.83201	35288	35392	38082
14124	6	0.172472			32088
22036	6	0.356266	35392	38082	
5152	6	0.040749	38082		
13224	6	0.228438	38082	35392	
38384	6	0.071924	32088	33120	
40184	6	0.128831	35392	38082	
35356	6	0.296482	35392		38082
33352	6	0.084384	32088	23164	
33088	2	0.295377	35392	38082	
18125	3	0.731958		42196	35384
35256	2	0.415708	35392	38082	
32124	6	0.387053		35392	32088
35404	6	0.221547		35392	
14212	6	0.091515		35392	
33260	6	0.309846		35392	38082
1288	2	0.523615	35392	38082	
35392	2	1	35392		
23332	6	0.071242			32088
33452	6	0.087193	32088		
36072	6	0.289415		35288	
40128	6	0.110674			38082
36252	6	0.163479		32088	
33008	2	0.488902		35288	
47160	2	0.486857	35392	38082	
35420	6	0.150492		32088	
37120	6	0.063298		32088	
17052	6	0.162653			
42192	2	0.632232			
14384	6	0.1059	32088		
14116	6	0.144978			23164
25288	6	0.26243	23164		
22224	6	0.092884		32088	
22252	2	0.471218	35392		
13232	6	0.177352		23164	
13204	6	0.17268	23164		
40116	2	0.330443	35392	38082	
27034	6	0.103132	23164		
13448	6	0.233146			
13424	6	0.213644			
1168	6	0.419297		32088	
11054	6	0.164691		32088	

19052	6	0.18051	38082		
35244	6	0.175161			
14220	6	0.298023		35288	38082
1176	6	0.151763			
22220	6	0.139411			
6216	2	0.191869	32088	38082	
32064	6	0.513607			
15140	6	0.165216		32088	
33382	6	0.263258		32088	
16016	6	0.097089		23164	
13287	6	0.08522	32088	23164	
38036	6	0.259598			
13288	6	0.106406			
27240	6	0.056314	32088	23164	
36328	6	0.101623			23164
38012	2	0.243521		32088	
32072	6	0.071274			32088
32450	6	0.131735		23164	
43044	2	0.644581	35392		38082
27300	6	0.077145			
16398	6	0.11106			
32088	6	1	32088		
33456	6	0.631362	35288		38082
33472	6	0.415333		38082	
35368	6	0.195506			
13036	6	0.188737			23164
25052	6	0.167305		23164	
42061	6	0.103547			
11189	2	0.29956	35392	38082	
19001	2	0.437788	35392	38082	
41168	6	0.09461		23164	
38332	2	0.347466	35392		
5088	6	0.052265	23164		
40108	6	0.181061			38082
42170	2	0.412105			
43660	6	0.905713		35288	
33356	2	0.254473		32088	38082
27270	6	0.119222			33120
14316	6	0.01442	15162	23164	
42126	6	0.271816			
18142	3	0.516766	42196	49166	35384
10004	2	0.490583		38082	35288
32176	6	0.221784	32088		

40172	6	0.241756		38082	
41024	6	0.10727		33120	
13200	6	0.127082		33120	
5112	8	0.090336	35384	38082	
46364	6	0.119393			
11256	6	0.13393			
1180	6	0.182696			
35311	6	0.2379		38082	35288
32248	6	0.278819			32088
37004	6	0.652432	23164	15162	
43636	6	0.121719		23164	
3066	6	0.127618		35288	
37072	6	0.269007			
17046	6	0.231896			
1208	3	0.526859	35384		
11516	6	0.05751			33120
33132	2	0.552469	35392	38082	
32106	6	0.060222	38082		32088
46164	6	0.073621			33120
16299	6	0.133099		23164	
38220	6	0.426919			
25320	6	0.163444			
43580	6	0.13929		33120	
35360	6	0.265232		38082	
40016	2	0.244582		35392	38082
47084	6	0.089386		38082	
16072	6	0.148276	23164	15162	
32422	6	0.101572		33120	
1032	6	0.157437			
36296	6	0.135702			
24277	2	0.168563	35392		38082
25004	6	0.144189			33120
25352	6	0.060083			
16416	6	0.012873	23164		
13188	6	0.078341	15162	33120	
37056	6	0.082271			33120
34026	6	0.087057		15162	33120
17120	6	0.227366			
37080	2	0.437332	13364	35392	38082
38180	6	0.534779		35288	38082
14128	6	0.035941		23164	
33408	6	0.863704	23164		
42068	6	0.229954	23164		

32216	6	0.125161			
35028	6	0.074242			38082
35016	6	0.185219			38082
25040	2	0.679889	32088		
18040	2	0.372017		38082	35392
24180	6	0.144152			
35318	6	0.1349		38082	
14032	6	0.18758			
38412	6	0.208569			33120
35096	6	0.16572			33120
15488	6	0.072963		38082	
5147	3	0.121156	49166	38082	35384
14400	6	0.133949		38082	35288
22328	6	0.098294		38082	
36232	3	0.742142			35384
47076	6	0.075429		33120	
36104	6	0.273506	35288		38082
38204	6	0.35798		35288	38082
14196	6	0.162073			
33200	2	0.113718	35392	33120	
43088	6	0.099516			33120
49184	6	0.090516		38082	
38292	2	0.214452	35392	33120	
38040	6	0.177141			33120
27100	6	0.123488	23164		
42248	6	0.178753	23164		
38032	6	0.450723		32088	
36208	6	0.308657			
33457	6	0.170405		23164	
15431	6	0.101613		23164	
17088	6	0.089824			33120
15476	6	0.044975	23164	15162	
38236	6	0.293014			
25470	6	0.155421			32088
17056	6	0.112668			33120
4236	6	0.08498			38082
32221	6	0.101747		38082	
46010	6	0.146125		23164	
35212	6	0.012807	15162	33120	
23212	6	0.094862			33120
48119	6	0.337638		33120	
18006	3	0.526918	35392		38082
33384	6	0.338069			

33344	6	0.084547			33120
38352	6	0.288691		15162	33120
23184	6	0.057292	23164		
15068	6	0.10751	23164		
31053	6	0.178793		23164	
48012	6	0.18324		35288	38082
35312	6	0.375843		32088	
27396	6	0.110125	23164		15162
35188	6	0.135422	23164		
33064	6	0.352808		35288	
31008	6	0.199577			38082
33120	6	1	33120		
31016	6	0.2555			38082
38440	2	0.706583	35392	33120	
15236	6	0.027057	15162	23164	
38388	6	0.14437	15468		
24224	6	0.154489	15468		
36244	6	0.073643			
25212	6	0.070015		15162	15468
16004	6	0.149051	15468		
13172	6	0.041333		23164	
43504	6	0.141581		23164	
38380	6	0.13953	15468		
11408	6	0.757936		23164	
46418	6	0.245863	38082		33120
13428	6	0.136562	23164		
16146	6	0.099594			
32060	6	0.436555			32088
40136	6	0.170392			38082
38008	6	0.160188			
33396	6	0.127111			15468
35224	6	0.226162			38082
19096	2	0.369531	33120	35392	
27144	6	0.109254	15162	23164	
11072	6	0.161936			
48140	6	0.20436	23164		
33040	6	0.102708			
17252	6	0.159939		15468	
43828	2	0.301034			32088
47064	6	0.111589			38082
47096	6	0.034577			
38194	2	0.286729	35392	33120	38082
17240	6	0.369553			

32010	6	0.124101		15468	
38168	6	0.355127			38082
42252	6	0.157847		23164	
34210	6	0.107047	15162	23164	
5416	6	0.047789		23164	15162
38152	6	0.205015		15468	
1070	6	0.161333		23164	
37132	6	0.081038			15468
36264	6	0.091874			15468
20004	6	0.222006			32088
11530	6	0.242427			38082
16036	6	0.127364			
36044	6	0.152834			
24158	2	0.424398	35288		38082
37128	6	0.107472	23164	15162	
35092	6	0.188673			
16320	6	0.109275	23164		15162
17216	6	0.147883			23164
35024	6	0.190096		35288	
17372	6	0.080447		23164	
27148	6	0.153884	15468		
11184	6	0.092121			
10090	3	0.793079		49166	35392
15468	6	1	15468		
33072	6	0.224152			
11008	6	0.231534	16228		
11134	6	0.105339		23164	
1120	6	0.536754	35288		32088
16452	2	0.928924			
36300	6	0.143802		15162	
42204	6	0.159316			
38364	2	0.238783		35392	38082
38328	6	0.248584			1248
1304	6	0.281319	1248		
1248	6	1	1248		
13148	6	0.148867			
35156	6	0.291862			
33436	6	0.197816			
33360	6	0.571068	35288		1248
4142	6	0.400742	1248	35288	
33412	6	0.274255	1248		38082
46052	2	0.440887		35288	38082
15412	6	0.114539	23164		15162

17428	6	0.116404			
23260	6	0.104195	15162		
48240	6	0.267712			32088
38068	6	0.247393			
25016	6	0.078971			
36268	6	0.158		32088	
6222	6	0.140295			
15084	6	0.077862	23164		
11512	6	0.15788			
16228	6	1	16228		
13112	6	0.005343	15162	23164	
15162	6	1	15162		
36144	6	0.166887			
25252	6	0.136017			
23092	6	0.161212	23164		
15308	6	0.17442		15162	
38038	6	0.33758	1248	38082	
38096	6	0.071766			
4016	6	0.132411	1248		38082
38248	6	0.176014			
36020	6	0.087517			
17040	6	0.117831			
42412	6	0.235331			
35040	6	0.637874			
16324	6	0.586855			
31024	2	0.204196	38082		35288
42216	6	0.183059			
4296	6	0.280933	1248		
16020	6	0.122673			
17520	6	0.136792			
11540	6	0.30092	16228		15162
18144	2	0.29555		35392	38082
46328	6	0.23916			
42088	6	0.136768			
48128	6	0.155395	33120		
5496	6	0.061958	1248		38082
17380	6	0.250687			
16292	6	0.112948			
40056	6	0.155726			
35373	6	0.134538	38082		
16048	6	0.164308		15162	
23308	6	0.015916			
25180	6	0.062857			

13348	6	0.106131	15162	23164	
35144	6	0.252781			
41072	6	0.164188			
42116	6	0.19928	1248		38082
4308	6	0.147668	1248		38082
1092	6	0.385975	1248		
1156	6	0.097333	1248		38082
18050	2	0.39873	38082	35392	
35321	6	0.140633	1248		38082
4044	6	0.147731		35288	1248
46412	6	0.18862			
46300	6	0.134325			
36080	6	0.142291			
15448	6	0.041701			
33290	6	0.211066			
23164	6	1	23164		
4036	6	0.169385			
25388	6	0.115687		23164	
24012	6	0.325984			
46266	6	0.508608	1248		38082
16354	6	0.170325			
25440	6	0.171532			
17110	6	0.159333			
40176	2	0.535942	35288		38082
24155	6	0.210874			
48072	6	0.290891	1248	38082	
25164	6	0.175571			
33284	6	0.219779			
48076	2	0.410926	35392	33120	
48176	6	0.125278	35288		38082
43900	2	0.074052		35288	38082
24304	6	0.137361	15162	23164	
43256	3	0.161374	42196	49166	35384
17028	6	0.209949		23164	
33464	6	0.425977	35288		38082
48110	6	0.116643	1248	38082	
24316	6	0.329976	35288		38082
25108	6	0.019238	15162		
27012	6	0.80548	23164		
1212	6	0.245392			
38088	6	0.202496	15162		
36256	2	0.399981	35288		38082
27088	6	0.412065			

42012	6	0.433706	23164		
36322	6	0.216535	15162	23164	
24189	6	0.121893	35288		38082
24008	6	0.309808	23164		
42136	6	0.928211	23164	15162	
27384	6	0.195313			
4116	6	0.109414	1248		
17204	6	0.111751	1248		
48160	6	0.803432			
17336	6	0.39946	23164		15162
17072	6	0.130105	23164		
1104	6	0.255302	1248		
42028	6	0.301274	23164		15162
46196	6	0.19043	23164	15162	
48060	6	0.087088			
1303	6	0.327745	23164		15162
1084	6	0.175813			
1044	6	0.070446	15162	16228	
24064	6	0.260483			
46182	6	0.132977		1248	38082
42272	6	0.141836			15162
42424	6	0.269906	23164		15162
43092	8	0.594501	42196		35384
42060	6	0.263152	23164		15162
1107	6	0.273741		15162	
40160	6	0.609738	23164		
48048	6	0.177459			
17289	6	0.093361		33120	
1244	6	0.66791		23164	16228
33009	6	0.351015		16228	23164
40020	6	0.19411	23164		
48144	6	0.05571	15162	23164	
48100	6	0.359739	23164		
1300	6	0.974377		15162	
17420	6	0.293052			23164
48214	6	0.667657	23164		15162
24206	6	0.103024	15162		
1292	6	0.2566	23164	15162	

Appendix C: Ruggiero 1998 Results

			Reference sets		
DMUs	Cluster	Score	1	2	3
26036	1	0.094714	38082	35384	49166
7028	6	0.061786	38082	13364	
7078	6	0.066852	38082	13364	
7040	6	0.313468	33188	13364	
30110	6	0.092178	38082	13364	
30244	6	0.298086	38082	35288	22232
7152	6	0.188349	11472	13364	
30213	6	0.236645	22232	35288	38082
7064	6	0.230492	11472	35392	13364
30216	6	0.160316	38082	33120	
5276	2	0.494669	13364		
5378	5	0.414897	35384		
30120	6	0.276404	38082		
30124	2	0.338724	49166	35384	42196
30190	2	0.49185	35392	38082	33188
5052	2	0.190323	38082	13364	
5058	6	0.130403	38082		
7020	2	0.261642	13364	38082	33188
42428	6	0.212381	35392	38082	33120
32236	5	0.231109	35384		
30088	6	0.128222	33120	38082	
7124	6	0.509808	35392	33120	
32442	8	0.343497	35384	42196	1019
13140	6	0.201173	35392	38082	33120
30140	8	0.331195	35384		
9004	5	0.323873	35384	25150	
5068	6	0.220789	22232	35288	38082
5023	6	0.251922	33120	38082	
46348	2	0.358168	38082	33188	13364
47116	5	0.512548	35384	25150	
46248	2	0.52177	32036		
33380	6	0.290319	35392	33120	
5503	4	1	5503		
43156	3	0.041525	35384	38082	
21115	6	0.125062	35392	33120	
46024	2	0.342031	32036	35392	38082
30176	8	0.197713	35384	1019	
32397	5	0.187992	35384	38082	25150
30220	6	0.353685	35288	38082	
21501	4	0.537859	35384	25150	

5264	4	0.63455	35384		
22196	2	0.254598	35392	33120	38082
5388	6	0.246129	33120	38082	
21127	6	0.115598	22232	38082	35288
35112	6	0.418508	22232	35392	38082
23280	8	0.281462	35384	1019	
38216	2	0.480727	13364	38082	33188
29092	2	0.122949	38082	33120	
20016	6	0.092956	32088	33120	22232
46008	6	0.41161	33120	35392	
1236	6	0.119105	16452	35288	32088
7115	2	0.282489	33188	38082	13364
30036	3	0.391049	13364	42196	38082
30116	8	0.199312	35384		
22332	2	0.583508	33188	38082	13364
46464	6	0.353889	35288	22232	38082
5468	3	0.4296	49166	42196	35384
32102	2	0.411823	35392	38082	13364
5380	2	0.17224	38082	13364	
30172	3	0.420296	42196	49166	35384
5310	3	0.177833	38082	35384	
46454	6	0.481232	35288	22232	38082
23193	5	0.60146	35384	25150	
5232	2	0.223732	38082	13364	
2030	2	0.405805	13364	33188	38082
33430	3	0.852654	33188	35384	42196
2012	6	0.087803	38082	32088	33120
20032	6	0.083121	38082	35392	33120
23044	6	0.062984	22232	35288	38082
5022	2	0.052761	35392	33188	
7038	8	0.531558	1019		
7068	6	0.61894	43660	32088	
2017	6	0.020229	38082	32088	35288
5414	6	0.117642	38082		
32380	6	0.05974	38082		
7054	6	0.296421	22232	35288	
13302	7	0.869815	43336	25150	
21125	3	0.402993	42196	49166	35384
46148	6	0.063523	38082		
20064	8	0.349495	42196	35384	49166
11378	4	0.944567	25150	35384	
32336	3	1	32336		
54004	8	0.329514	1019	35384	42196

20044	2	0.573098	33120	38082	
46168	2	0.29267	35392	22232	38082
29044	2	0.540002	35392	38082	13364
10198	8	0.716248	42196	1019	35384
7114	3	0.28735	33188	42196	35384
35272	6	0.30926	22232	38082	35392
30067	8	0.191784	35384	38082	
10048	2	0.307331	32036		
29036	6	0.039945	23164	38082	
47012	6	0.065398	32088	43660	
6166	4	0.50759	35384	25150	
43129	8	0.267807	35384	1019	42196
47128	3	0.194126	35384	49166	42196
5120	2	0.266715	33120	35392	
5348	4	0.373307	35384	25150	
20012	4	0.465201	25150	35384	
21244	8	0.308393	42196	35384	33188
22322	4	0.709883	25150	35384	
23294	2	0.532163	35392	33120	38082
5280	5	0.203022	35384	1019	
2032	6	0.270199	22232	35288	38082
33181	8	0.725142	32336	35384	
23336	2	0.421236	38082	33120	35392
21114	6	0.014967	38082		
46372	8	0.553423	35384	32336	33188
21064	2	0.28038	33120	38082	
35180	2	0.453481	35392	33120	
21066	3	0.563056	42196	33188	35384
30040	3	0.267736	42196	35384	33188
30076	2	0.344541	35392	32036	38082
38360	4	0.978286	35384	25150	
5300	2	0.542577	33120	35392	
7072	6	0.274966	43660	35288	32088
22288	2	0.430686	33120	35392	
35136	6	0.441382	35392	35288	
5340	6	0.022819	38082		
5376	2	0.226541	13364		
43200	3	0.550272	25150	35384	
38100	6	0.166032	1248	38082	
14296	6	0.614755	35288	38082	
29020	2	0.379403	33120	35392	
20072	6	0.080592	38082	32088	33120
10188	6	0.319817	33120	35392	38082

43068	2	0.515774	22232	35288	38082
5180	7	0.815296	43336		
35412	6	0.164607	1248	38082	13328
33188	2	1	33188		
8004	8	0.678439	33188	32336	35384
38256	6	0.278079	22232	38082	35392
15080	3	0.667619	33188	42196	35384
5483	6	0.118301	38082	35288	
17552	6	0.1657	1248	13328	38082
14164	5	0.375106	1019	42196	
7113	2	0.492113	35392	11472	38082
7144	2	0.430938	22232	35392	35288
46456	6	0.33631	32088	43660	35288
5368	2	0.234974	38082	33120	
43812	5	0.211798	35384	25150	
37104	5	0.296843	35384	25150	
14392	6	0.212967	43660	32088	
49344	6	0.51842	43660	32088	
6164	2	0.178423	38082		
25150	5	1	25150		
46441	8	0.553242	33188	42196	35384
13290	2	0.418679	35392	33120	
5497	3	0.091618	38082	35384	
25062	6	0.299569	22232	33120	
49314	6	0.388023	35288	32088	38082
44084	8	0.407212	35384	38082	
35232	2	0.64596	35392	22232	35288
22178	3	0.744315	33188	32336	35384
5332	5	0.238254	35384		
23352	6	0.038297	32088	35288	16452
47170	6	0.186587	32088	35288	43660
10228	8	0.227809	35384		
43336	4	1	43336		
21134	6	0.26474	33120	22232	32088
32500	7	1	32500		
11148	6	0.296944	16452		
31096	6	0.159155	38082		
49110	5	0.345744	25150	35384	
10030	6	0.173995	38082	22232	35288
10029	5	0.18551	35384	25150	
22124	6	0.035138	38082		
5132	3	0.148204	35384	33188	42196
21156	2	0.638853	22232	35392	38082

10120	2	0.224656	13364		
47028	2	0.210369	38082	33188	35392
44022	2	0.194149	35392	38082	33188
41208	2	0.438061	35392	33120	
49064	3	0.657296	13364	33188	
25380	5	0.609183	25150	35384	
17184	6	0.413058	1248	33120	
49232	2	0.322777	33120	35392	38082
44006	2	0.369208	38082	33188	13364
42344	2	0.382595	35392	22232	35288
3008	4	0.389554	35384	25150	
25036	6	0.289557	22232		
22232	6	1	22232		
30044	6	0.034421	38082	35288	
47140	2	0.329486	38082	33120	35392
6204	3	0.442588	49166	35384	42196
28066	3	0.137667	38082	35384	
23050	2	0.584189	22232	35288	38082
32002	2	0.288666	35392	38082	13364
47138	3	0.198242	35384	35170	33188
27234	2	0.929469	35392	33120	
11242	6	0.612549	43660	35288	32088
39004	8	0.257245	42196	1019	
32404	6	0.576575	32088	43660	
14364	6	0.364987	35392	33120	
5360	3	0.129542	38082	49166	35384
16236	6	0.617726	35288	43660	
35072	5	0.613654	25150	35384	
46036	6	0.190485	43660	35288	32088
44012	6	0.136612	38082		
21188	6	0.27654	15162	15468	
33152	2	0.889929	35392	33120	
35240	6	0.228127	35392	33120	
46081	2	0.347704	33120	38082	35392
35384	3	1	35384		
32416	2	0.197005	33120	35392	38082
27186	3	0.727895	35170	35384	33188
43322	6	0.359206	43660	32088	
41214	6	0.1457	15162	11408	23164
6144	3	0.204343	38082	35384	
14010	6	0.347938	43660	32088	
35352	6	0.106969	1248	33408	23164
38196	8	0.725988	33188	32336	35384

13164	6	0.2741	1248	38082	
40048	3	0.276633	33188	42196	35384
38444	2	0.639529	35392	13364	11472
36316	6	0.424813	1248	38082	
42036	2	0.819108	11472		
5324	5	0.103616	35384	38082	25150
28016	5	0.177565	35384	1019	42196
34118	2	0.443749	38082		
19104	2	0.590402	33120	35392	
40032	2	0.371139	38082	22232	35392
13056	2	0.285568	38082	22232	35392
47018	2	0.400038	22232	35392	38082
38400	6	0.126429	1248		
35086	8	0.729257	1019		
22108	3	0.427961	33188	42196	35384
15198	2	0.668124	13364	11472	
33092	6	0.576457	22232	33120	
23264	6	0.179267	43660	32088	
11024	2	0.722757	38082	35392	11472
21336	6	0.632068	13328	1248	38082
33304	6	0.182334	43660	32088	
29010	6	0.35937	22232	33120	
10276	2	0.273393	38082	13364	
29024	6	0.103567	15468	15162	23200
10164	3	0.214976	38082	13364	33188
38212	3	0.227177	35170	35384	
35400	6	0.991764	1248	33408	23164
10024	5	0.152191	35384	25150	
36064	2	0.343743	35392	38082	22232
41016	6	0.265828	32088	43660	
37142	2	0.247992	35392	38082	13364
33432	6	0.693924	22232		
17048	2	0.369589	11472	35392	13364
32400	3	0.352595	35384	33188	
34116	6	0.380348	23164	15162	
1192	2	0.603655	11472		
25152	2	0.57925	35392	33120	
33322	3	0.97097	33188	13364	
35248	2	0.784695	35392	35288	22232
40196	2	0.603171	35392	38082	22232
47152	2	0.305693	33120	35392	
22240	6	0.296703	22232	33120	
32004	8	0.118372	35384	42196	33188

49152	6	0.393392	33120	32088	22232
38081	6	0.60186	43660	35288	32088
37036	6	0.325104	16452	32088	
40120	2	0.310764	35392	22232	38082
42296	8	0.24206	35384	32336	33188
42298	6	0.432707	43660	35288	32088
35284	6	0.457833	43660	32088	
33208	6	0.357627	43660	32088	35288
46212	6	0.459912	13328	1248	
22234	3	0.500212	35384		
22172	2	0.992356	11472	13364	
29032	6	0.166103	32088	35288	43660
49162	2	0.331419	11472	13364	
25060	6	0.660928	13328	1248	32088
40050	3	0.434232	33188	32336	35384
35184	6	0.918455	1248	33120	
33068	6	0.538892	22232		
10296	2	0.189918	13364	33188	38082
23304	6	0.149122	1248	38082	
45061	2	0.317547	13364	38082	35392
16034	6	0.190645	1248	33120	
46176	6	0.093386	33408	23164	38082
5428	3	0.170669	49166	38082	35392
14224	6	0.382531	1248	33408	38082
11472	2	1	11472		
14084	2	0.585879	33120	35392	
43333	2	0.235978	35392	33120	
14200	6	0.437662	43660	35288	32088
14066	6	0.303471	1248	38082	
47120	6	0.275237	35288	38082	
11418	2	0.501459	38082	35392	33188
35170	3	1	35170		
46380	2	0.721082	35392	33120	
13378	2	0.7384	35392	38082	13364
13052	6	0.169565	1248	23200	
33130	2	0.129483	33120	35392	
13392	2	0.328221	35392	13364	38082
17496	6	0.288174	1248	38082	
14208	6	0.439162	43660	32088	
18172	6	0.552349	1248	33120	
49166	3	1	49166		
35438	6	0.386228	22232		
40008	6	0.449115	22232	35288	

5314	3	0.142077	35384	49166	42196
24045	3	0.472345	13364	38082	42196
22192	6	0.707133	35288	43660	
14006	3	0.492352	38082	33188	35392
35100	6	0.164253	23164	1248	
49096	6	0.289774	43660	32088	
15348	6	0.400935	1248	38082	
38024	2	0.648742	33188	35392	38082
5492	6	0.115696	38082	33120	32088
33468	2	0.429433	35392	13364	38082
43784	2	0.45493	22232	35288	38082
16213	2	0.772406	35392	33120	
42264	8	0.619455	1019	42196	
34032	6	0.144026	32088	33120	
30004	2	0.442041	35392	38082	33188
45020	2	0.249784	38082	33120	
46108	6	0.060769	1248	38082	
35106	3	1	35106		
49176	6	0.565209	33120	32088	
29042	6	0.298421	32088	38082	33120
19112	2	0.372081	33120	35392	
46198	2	0.778817	35392	13364	38082
14160	6	0.395705	1248	38082	
38052	2	0.247344	38082	22232	35392
23072	6	0.091219	32088	43660	
35168	5	0.917904	1019		
35288	6	1	35288		
38300	5	0.32923	1019	35384	
1216	3	0.674645	33188	13364	
38098	6	0.518942	43660	32088	35288
13096	6	0.082857	43660	32088	
49248	6	0.904925	1248	33120	
38004	6	0.120738	33120	32088	38082
5495	2	0.130271	22232	38082	35288
42184	6	0.687062	43660	32088	
13054	2	0.977721	13364	38082	33188
13364	2	1	13364		
43916	6	0.716532	16452	32088	
49264	6	0.448271	22232	33120	
35344	6	0.437017	22232	33120	
23028	6	0.513908	43660	32088	35288
14244	6	0.335393	16452	32088	
17340	8	0.89326	1019		

11412	2	0.494216	35392		
38368	2	0.378867	22232	33120	
38160	6	0.852632	1248	38082	
22304	2	0.21772	38082		
46028	6	0.19545	38082	1248	
14036	6	0.41818	32088	43660	
49180	6	0.344737	16452	35288	32088
49296	6	0.614133	1248	33120	
16274	3	1	16274		
43746	5	0.308301	1019	35384	42196
13012	2	0.391224	22232	35392	38082
32120	6	0.490395	1248	13328	38082
16214	6	0.08057	15162	15468	
32140	8	0.288415	1019	35384	
43596	3	0.193486	33188	38082	13364
49288	6	0.123211	32088	43660	
35424	6	0.345786	43660	32088	35288
41284	6	0.123379	23164	1248	
21254	3	0.549988	33188	13364	38082
4244	3	0.511626	33188	13364	38082
5404	2	0.130337	22232	38082	35288
14088	2	0.562165	35392	33120	
32105	6	0.477318	43660		
13004	6	0.464002	13328	1248	38082
35068	6	0.314463	11408	15162	23200
31061	3	0.199014	35384		
5344	3	0.11051	49166	35384	42196
4304	2	0.178917	35392	38082	13364
6140	6	0.074837	1248	38082	
11552	6	0.081287	1248	38082	
48036	2	0.531098	35392	33120	
20088	2	0.17189	22232	33120	32088
38420	6	0.06438	38082	33120	
14300	6	0.256147	1248	23200	
22168	2	0.366075	35392	22232	38082
35280	6	0.099044	23200	1248	
42020	6	0.914686	43660	35288	32088
23186	6	0.146737	23164	11408	15162
36308	3	0.951138	32336	33188	35384
14328	2	0.45182	35392	33120	
46450	6	0.258307	1248	33120	
38108	6	0.234333	1248	15468	
46304	6	0.026086	23164	15162	

21036	6	0.898607	16452	32088	
38424	6	0.219549	1248	23200	
40104	3	0.835075	38082	33188	35392
11364	2	0.514386	35392	33120	
35436	6	0.281064	33408	1248	23164
24136	6	0.585321	35288	22232	
13120	6	0.074769	1248	11408	23164
16298	6	0.579665	1248	38082	
46201	6	0.107107	38082	32088	35288
43552	2	0.40409	35392	13364	11472
33029	2	0.87493	35392	33120	
33424	6	0.1707	23200	1248	
1019	8	1	1019		
38116	2	0.652838	35392	33120	
16108	6	0.338751	43660	32088	
11164	6	0.564529	43660	35288	
47024	6	0.091861	32088	43660	
15148	6	0.66697	43660	32088	
17381	6	0.20848	1248	38082	
15436	6	0.384603	32088	43660	
35152	6	0.382657	1248	23164	
13186	6	0.273751	1248	38082	
22020	2	0.127218	33120	35392	
33334	6	0.139239	1248	33120	
49228	2	0.666012	22232	35288	38082
33252	6	0.269066	1248	38082	
35332	6	0.314659	1248	38082	
50060	3	0.161423	33188	38082	13364
32440	6	0.278769	43660	32088	
10022	3	0.274847	38082	33188	13364
42196	3	1	42196		
13260	6	0.803259	43660	32088	
33216	6	0.99694	16452	32088	
4108	6	0.169332	32088	43660	
16352	6	0.279709	1248	38082	
43072	6	0.286038	22232		
16364	6	0.271434	23200	1248	
16340	6	0.40983	1248	38082	
1315	6	0.435974	43660	32088	
20084	6	0.507113	32088	16452	
47148	6	0.284795	33408	38082	1248
42256	6	0.259317	1248	38082	
32036	2	1	32036		

32256	6	0.116496	1248	38082	
27172	6	0.537309	1248	38082	
32420	2	0.571244	22232		
15241	6	0.277915	1248	23200	
23222	2	0.424229	33120	35392	
14156	6	0.809867	43660	35288	32088
38240	6	0.201281	1248	15162	15468
43484	6	0.24809	33120	1248	
37060	2	0.319461	22232	38082	35288
12024	8	0.238443	1019	35384	
23104	6	0.406096	23200	1248	11408
23348	6	0.215169	1248	38082	
4100	6	0.211257	43660	32088	
33168	2	0.501655	35392	33120	
35012	6	0.857601	43660	32088	
16272	6	0.250023	23164	11408	15162
36176	6	0.348278	23200	1248	
33348	6	0.438541	16452		
35142	6	0.700965	16452	32088	
11298	2	0.766087	35288	22232	
30196	6	0.588836	33408	1248	38082
10060	5	0.412544	35384	25150	
35060	2	0.691534	35392	33120	
19010	6	0.600487	33120	38082	
35196	6	0.294976	1248	15468	
10091	5	0.280458	35384	25150	
13216	6	0.349442	43660	35288	32088
16066	6	0.140203	1248	15162	15468
43330	6	0.210132	1248	15468	
23136	6	0.187083	11408	23200	1248
10240	3	0.348865	42196	35384	49166
15320	6	0.271461	43660	32088	
14308	6	0.112575	15162	23200	11408
13328	6	1	13328		
22072	6	0.29346	23200	1248	
47015	2	0.141637	33120	35392	
23084	6	0.12551	11408	15162	23200
22216	6	0.154313	32088	33120	
22052	6	0.771675	16452	32088	
14248	6	0.294941	23200	1248	
42056	6	0.722974	43660	32088	35288
46236	6	0.161493	16228		
16252	6	0.212793	11408	23200	15162

33264	6	0.419387	1248	38082	
43064	2	0.260495	22232	35392	38082
49336	6	0.203286	11408	15162	23200
14026	3	0.529447	35392	33188	38082
38132	6	0.296355	35288	43660	32088
43390	2	0.333185	35392	38082	33120
41028	6	0.120711	1248	11408	23200
32208	6	0.159834	1248	33120	
43332	6	0.39839	43660	35288	32088
47066	3	0.266087	13364	33188	42196
14386	2	0.117842	38082		
43142	3	0.72739	35392	38082	22232
45010	6	0.095196	38082	33120	
32076	6	0.132247	22232	33120	
27044	6	0.296929	1248	38082	
33324	6	0.259616	22232	33120	32088
38208	6	0.676147	43660	32088	
46280	6	0.223154	1248	33120	
16120	6	0.241256	1248	15468	15162
38436	6	0.197431	1248	15468	
47036	6	0.190289	32088	43660	
14256	2	0.655225	22232		
22044	2	0.88674	35288	22232	
24205	2	0.614816	22232	35288	38082
42048	6	0.419221	16452	35288	
43436	6	0.461398	11408	35040	
34180	6	0.098227	11408	35040	
27252	6	0.17698	1248	11408	23200
11542	6	0.304384	43660	32088	
11468	6	0.602298	32088	38082	35288
13240	6	0.229098	11408	23164	15162
35020	6	0.415948	1248	38082	
35108	6	0.229811	1248	23200	
15072	6	0.66609	15162	23164	
22300	2	0.411482	35392	33120	
35076	6	0.521498	16452	32088	
10061	8	0.280326	42196	35384	1019
3060	8	0.194505	35384	38082	
32340	6	0.615965	33408	1248	38082
32449	6	0.217541	1248	23200	
40186	2	0.604981	35392	33120	
23168	6	0.067181	15162	11408	15468
5220	2	0.166746	38082	22232	35288

24306	6	0.64479	1248	38082	
16144	6	0.11854	1248	15468	
49084	2	0.357948	35392	33120	
32092	6	0.42554	1248	11408	23200
46428	6	0.43201	33408	1248	38082
24192	6	0.191993	32088	43660	
34204	6	0.373316	1248	33408	38082
34072	6	0.258535	1248	38082	33120
38428	2	0.400165	35392	33120	
32048	6	0.437845	1248	33120	
35104	6	0.210122	1248	11408	33408
11004	6	0.504289	43660	32088	
23190	6	0.151758	33120	1248	38082
35228	6	0.29954	1248	38082	
38082	6	1	38082		
14168	6	0.656382	1248	23200	
42324	6	0.192974	1248		
23144	6	0.166248	15162	35040	23164
35308	6	0.234604	1248	15468	15162
15226	2	0.795799	33120	38082	
23200	6	1	23200		
22164	6	0.221201	43660	32088	
33256	6	0.485245	1248	38082	
13316	6	0.489772	33408	38082	1248
15422	2	0.701998	33120	35392	
48084	6	0.215375	23200	1248	
1220	6	0.674961	16452	32088	
46408	6	1.4E-10	11408	15162	1248
15112	6	0.429141	1248	38082	
31090	6	0.203022	43660	32088	
23100	6	0.222587	1248	15468	
46274	6	0.456134	16452	32088	
27004	6	0.886024	11408	23164	15162
43652	6	0.346906	23164	35040	15162
43550	6	0.437851	35288	22232	38082
23032	6	0.161044	11408	23164	1248
14004	6	0.205475	11408	1248	23164
18206	5	0.358655	25150	35384	38082
14180	6	0.230452	1248	15468	
35260	6	0.952605	1248	38082	
10180	2	0.651116	35392	33120	
40100	6	0.196871	1248	38082	
15394	6	0.930103	43660	35288	32088

14124	6	0.257238	1248	38082	
22036	6	0.599704	43660	32088	
5152	6	0.041129	38082		
13224	6	0.472928	1248	38082	
38384	6	0.158446	15468		
40184	6	0.192013	43660	32088	
35356	6	0.692168	43660	32088	
33352	6	0.248372	16228		
33088	2	0.482439	22232	33120	
18125	3	0.731958	33188	42196	35384
35256	2	0.518053	35392	33120	
32124	6	0.700601	1248	38082	
35404	6	0.771278	35040		
14212	6	0.160003	1248	23200	
33260	6	0.410079	43660	32088	
1288	2	0.588312	35392	33120	
35392	2	1	35392		
23332	6	0.225928	23164	35040	15162
33452	6	0.247196	23200	1248	
36072	6	0.352616	43660	35288	32088
40128	6	0.171159	1248	23200	11408
36252	6	0.271184	1248	38082	
33008	2	0.488902	22232	35288	
47160	2	0.558254	35392	33120	
35420	6	0.366895	23200	1248	
37120	6	0.094542	1248	38082	
17052	6	0.191714	16452	32088	
42192	2	0.851174	22232		
14384	6	0.257735	1248	15468	15162
14116	6	0.202542	1248	15162	15468
25288	6	0.300951	23164	1248	
22224	6	0.147488	1248	38082	
22252	2	0.93747	35392	33120	
13232	6	0.241208	1248	15468	
13204	6	0.496492	23164	35040	15162
40116	2	0.355676	35392	33120	38082
27034	6	0.312548	23164	35040	15162
13448	6	0.444284	1248	38082	
13424	6	0.389456	1248	23200	
1168	6	0.656426	1248	33120	
11054	6	0.278181	1248	38082	
19052	6	0.201759	38082		
35244	6	0.329897	1248	23200	

14220	6	0.375893	43660	32088	35288
1176	6	0.236063	43660	32088	
22220	6	0.321238	1248	38082	
6216	2	0.234649	33120	22232	
32064	6	0.964965	43660	32088	
15140	6	0.329411	1248	15468	
33382	6	0.531616	43660	32088	
16016	6	0.290247	35040	23164	15162
13287	6	0.17646	15468	15162	
38036	6	0.540379	1248	15468	
13288	6	0.220744	1248	23200	
27240	6	0.167477	15468	1248	15162
36328	6	0.31677	35040	23164	15162
38012	2	0.275731	22232	33120	
32072	6	0.223756	35040	15162	23164
32450	6	0.389679	35040	23164	
43044	2	0.644581	35392	22232	38082
27300	6	0.134074	1248	23200	
16398	6	0.194468	1248	15468	
32088	6	1	32088		
33456	6	0.723963	35288	43660	32088
33472	6	0.587363	1248	33120	38082
35368	6	0.478037	1248	38082	
13036	6	0.251399	11408	1248	15162
25052	6	0.357412	11408	35040	
42061	6	0.167722	1248	33120	
11189	2	0.29956	35392	38082	22232
19001	2	0.441095	35392	38082	33120
41168	6	0.292037	35040	23164	15162
38332	2	0.624056	35392	33120	
5088	6	0.15989	23164	35040	15162
40108	6	0.264544	1248	38082	
42170	2	0.415801	22232		
43660	6	1	43660		
33356	2	0.254473	22232	32088	38082
27270	6	0.209521	1248	15468	
14316	6	0.01442	15162	23164	
42126	6	0.503985	1248	23200	
18142	3	0.517353	42196	38082	49166
10004	2	0.490583	22232	38082	35288
32176	6	0.241353	32088	43660	
40172	6	0.36657	1248	38082	
41024	6	0.243384	15162	35040	23164

13200	6	0.2626	1248	15468	
5112	8	0.090336	35384	38082	
46364	6	0.229122	1248	23200	
11256	6	0.259785	1248	23200	
1180	6	0.299522	1248	38082	
35311	6	0.263164	32088	35288	43660
32248	6	0.566309	43660	32088	
37004	6	0.755408	23164	15162	11408
43636	6	0.14625	1248	11408	23164
3066	6	0.140485	43660	35288	32088
37072	6	0.384812	1248		
17046	6	0.407683	43660	32088	
1208	3	0.673658	33188	13364	
11516	6	0.109431	1248	15468	
33132	2	0.556949	35392	13364	11472
32106	6	0.061041	38082	33120	32088
46164	6	0.108688	23200	1248	11408
16299	6	0.40224	35040	23164	15162
38220	6	0.553978	43660	32088	
25320	6	0.279196	1248	15468	
43580	6	0.274472	1248	15468	
35360	6	0.427667	1248	38082	
40016	2	0.244582	22232	35392	38082
47084	6	0.193634	1248	38082	
16072	6	0.148276	23164	15162	
32422	6	0.318225	35040	16228	
1032	6	0.264702	43660	32088	
36296	6	0.227241	1248		
24277	2	0.415437	22232	33120	
25004	6	0.397787	35040	16228	
25352	6	0.272465	35040	16228	
16416	6	0.05527	23164	40160	15162
13188	6	0.119233	16228	15162	
37056	6	0.240553	35040	16228	
34026	6	0.181547	15162	35040	23164
17120	6	0.398681	1248		
37080	2	0.883177	33120	35392	
38180	6	0.72629	1248	38082	13328
14128	6	0.048801	11408	23164	15162
33408	6	1	33408		
42068	6	0.26446	23164	1248	11408
32216	6	0.343246	1248	15468	
35028	6	0.212306	1248	23200	

35016	6	0.222842	1248	38082	
25040	2	0.915586	22232	33120	
18040	2	0.372017	22232	38082	35392
24180	6	0.204305	43660	32088	
35318	6	0.214702	1248	38082	
14032	6	0.33891	1248	15468	
38412	6	0.320866	1248	15468	15162
35096	6	0.460865	35040	16228	
15488	6	0.129498	1248	38082	
5147	3	0.121156	49166	38082	35384
14400	6	0.178689	1248	38082	
22328	6	0.155841	1248	38082	
36232	3	0.86723	35170	35384	
47076	6	0.191144	16228	35040	
36104	6	0.64926	33408	23164	38082
38204	6	0.518627	1248	38082	
14196	6	0.437806	1248	23200	
33200	2	0.113718	35392	33120	
43088	6	0.322105	35040	16228	
49184	6	0.235982	23200	15162	11408
38292	2	0.319165	22232	33120	
38040	6	0.302521	23200	1248	
27100	6	0.363535	23164	35040	15162
42248	6	0.524469	23164	35040	15162
38032	6	0.575052	43660	32088	
36208	6	0.416599	1248	23164	33408
33457	6	0.207892	1248	11408	23200
15431	6	0.310701	35040	23164	15162
17088	6	0.273084	35040	15162	16228
15476	6	0.044975	23164	15162	
38236	6	0.40022	43660	32088	
25470	6	0.217745	43660	32088	
17056	6	0.223035	1248	15468	
4236	6	0.177917	1248	38082	
32221	6	0.251956	23200	15162	11408
46010	6	0.432411	35040	23164	
35212	6	0.021939	16228		
23212	6	0.191139	11408	16228	35040
48119	6	0.77757	1248	33120	
18006	3	0.526918	35392	33188	38082
33384	6	0.627543	1248	23200	
33344	6	0.15658	11408	35040	16228
38352	6	0.438882	11408	16228	15162

23184	6	0.16355	23164	35040	
15068	6	0.502167	40160	23164	15162
31053	6	0.299879	1248	23200	
48012	6	0.246594	1248	38082	
35312	6	0.48009	43660	32088	
27396	6	0.380308	23164	40160	15162
35188	6	0.401581	23164	35040	15162
33064	6	0.505866	1248	13328	38082
31008	6	0.442097	23200	11408	15162
33120	6	1	33120		
31016	6	0.419311	1248	23200	11408
38440	2	0.706583	35392	33120	
15236	6	0.027057	15162	23164	
38388	6	0.282948	16228	35040	
24224	6	0.227816	15468	35040	
36244	6	0.203571	35040	16228	15162
25212	6	0.142653	15162	23164	35040
16004	6	0.287264	16228	35040	
13172	6	0.120983	23164	35040	
43504	6	0.197302	1248	15162	15468
38380	6	0.334244	16228	35040	
11408	6	1	11408		
46418	6	0.248723	33120	38082	32088
13428	6	0.397153	23164	35040	
16146	6	0.178501	1248	15468	
32060	6	0.596799	43660	32088	
40136	6	0.329763	1248	23200	
38008	6	0.228178	1248		
33396	6	0.514342	35040	16228	
35224	6	0.28801	1248	38082	
19096	2	0.369531	33120	35392	
27144	6	0.109254	15162	23164	
11072	6	0.279222	1248	23200	
48140	6	0.809786	23164	40160	15162
33040	6	0.242189	35040	11408	15468
17252	6	0.265907	1248	15468	
43828	2	0.342153	22232	33120	
47064	6	0.217163	1248	23200	
47096	6	0.115089	35040	16228	
38194	2	0.286729	35392	33120	38082
17240	6	0.465156	1248	33408	38082
32010	6	0.191777	1248	15468	
38168	6	0.690753	11408	23164	15162

42252	6	0.476255	23164	35040	15162
34210	6	0.166372	15162	23164	35040
5416	6	0.065489	23164	11408	15162
38152	6	0.520305	35040	16228	
1070	6	0.451188	35040	11408	16228
37132	6	0.114933	11408	15468	35040
36264	6	0.199979	35040	15162	23164
20004	6	0.302544	43660	32088	
11530	6	0.406086	1248	38082	
16036	6	0.631624	35156	40160	15162
36044	6	0.350331	1248	38082	
24158	2	0.439698	35288	32088	16452
37128	6	0.651995	27012	33009	
35092	6	0.611209	35040	16228	
16320	6	0.743629	27012	1300	23164
17216	6	0.462504	35040	23164	15162
35024	6	0.27021	1248	13328	38082
17372	6	0.108721	11408	23164	15162
27148	6	0.333975	16228	35144	35156
11184	6	0.248927	35040	11408	
10090	3	0.793079	22232	49166	35392
15468	6	1	15468		
33072	6	0.357652	1248	38082	
11008	6	0.233862	16228		
11134	6	0.231433	11408	35040	
1120	6	0.778653	1248	13328	38082
16452	2	1	16452		
36300	6	0.245686	15162	35040	23164
42204	6	0.204842	16228		
38364	2	0.255307	22232	33120	
38328	6	0.488657	35040	15162	16228
1304	6	0.653174	35040	16228	
1248	6	1	1248		
13148	6	0.199946	16228	11408	15162
35156	6	1	35156		
33436	6	0.295564	35040	11408	
33360	6	0.615831	1248	38082	
4142	6	0.462646	1248	38082	
33412	6	0.414748	1248	23200	
46052	2	0.440887	22232	35288	38082
15412	6	0.542619	42136	17380	1300
17428	6	0.22343	15162	35040	23164
23260	6	0.246205	40160	15162	35156

48240	6	0.372804	43660	32088	
38068	6	0.988	35144		
25016	6	0.171895	35040	23164	15162
36268	6	0.22446	1248	38082	
6222	6	0.219266	35040	11408	
15084	6	0.348909	42136	23164	40160
11512	6	0.33581	16228	35040	
16228	6	1	16228		
13112	6	0.005343	15162	23164	
15162	6	1	15162		
36144	6	0.269878	16228	35040	11408
25252	6	0.245753	35040	15162	23164
23092	6	0.564757	23164	40160	
15308	6	0.527058	35156	40160	15162
38038	6	0.436308	1248	15468	15162
38096	6	0.297995	35144	1300	
4016	6	0.159094	1248	11408	23164
38248	6	0.564018	35144	15162	
36020	6	0.117826	16228	15162	11408
17040	6	0.16198	43660	32088	
42412	6	0.520395	23164	35040	15162
35040	6	1	35040		
16324	6	0.695118	1248	15468	15162
31024	2	0.204196	38082	22232	35288
42216	6	0.373654	35040	23164	15162
4296	6	0.376461	1248	23200	
16020	6	0.280471	35040	16228	
17520	6	0.446999	27012	1300	23164
11540	6	0.490536	16228	35144	35156
18144	2	0.393805	35392	33120	
46328	6	0.481453	1248	33120	
42088	6	0.284554	35040	15162	23164
48128	6	0.2434	1248	33120	
5496	6	0.110488	23200	1248	
17380	6	1	17380		
16292	6	0.208486	35040	15162	16228
40056	6	0.367351	35040	16228	
35373	6	0.134538	38082		
16048	6	0.390143	15162	35144	35156
23308	6	0.10817	27012	23164	1300
25180	6	0.149747	23164	35040	
13348	6	0.677007	42136	1300	
35144	6	1	35144		

41072	6	0.582955	35156	35144	15162
42116	6	0.278469	1248	15468	
4308	6	0.162673	1248	11408	23200
1092	6	0.553531	1248	23200	
1156	6	0.190483	11408	35040	16228
18050	2	0.39873	38082	35392	22232
35321	6	0.383509	35040	16228	
4044	6	0.236482	1248	38082	
46412	6	0.464646	23164	35040	15162
46300	6	0.19496	11408	16228	35040
36080	6	0.823833	40160	23164	1300
15448	6	0.108093	23164	35040	15162
33290	6	0.418348	35040	23164	15162
23164	6	1	23164		
4036	6	0.313028	35040	16228	15162
25388	6	0.307874	23164	35040	15162
24012	6	0.674563	35040	23164	15162
46266	6	0.742567	1248	23200	
16354	6	0.997271	27012	33009	
25440	6	0.859107	40160	42136	1300
17110	6	0.340026	35040	16228	
40176	2	0.562642	35288	32088	43660
24155	6	0.40931	1248	33120	
48072	6	0.410156	1248	15468	
25164	6	0.70423	17380	1300	42136
33284	6	0.734329	35156	1300	35144
48076	2	0.410926	35392	33120	
48176	6	0.234246	23200	1248	
43900	2	0.074052	22232	35288	38082
24304	6	0.776932	42136	1300	
43256	3	0.161374	42196	49166	35384
17028	6	0.487801	23164	35040	15162
33464	6	0.615847	1248	23200	11408
48110	6	0.280254	35040	16228	11408
24316	6	0.353423	1248	38082	33408
25108	6	0.04896	1300		
27012	6	1	27012		
1212	6	0.818579	40160	1300	42136
38088	6	0.665141	35144	16228	
36256	2	0.399981	35288	22232	38082
27088	6	0.854035	27012	33009	
42012	6	1	42012		
36322	6	0.778292	27012	1300	23164

24189	6	0.187008	23200	1248	11408
24008	6	0.742211	35156	40160	
42136	6	1	42136		
27384	6	0.371619	48214	1300	
4116	6	0.115524	1248		
17204	6	0.26043	35040	16228	
48160	6	1	48160		
17336	6	1	17336		
17072	6	0.287479	23164	48214	
1104	6	0.567576	35040	16228	
42028	6	0.788602	17380	42136	1300
46196	6	0.452293	35156	35144	15162
48060	6	0.126689	15162	35040	16228
1303	6	1	1303		
1084	6	0.495122	35144	15162	
1044	6	0.451927	33009	27012	
24064	6	0.453494	16228	35156	35144
46182	6	0.352423	35040	15162	23164
42272	6	0.384637	40160	35156	15162
42424	6	0.696239	23164	1303	48214
43092	8	0.594501	42196	33188	35384
42060	6	0.576155	23164	40160	1300
1107	6	0.749458	33009	27012	1300
40160	6	1	40160		
48048	6	0.410488	35156	35144	16228
17289	6	0.157048	1248	38082	
1244	6	0.914211	48214	27012	
33009	6	1	33009		
40020	6	1	40020		
48144	6	0.492284	27012	33009	
48100	6	0.723057	40160	1300	
1300	6	1	1300		
17420	6	1	17420		
48214	6	1	48214		
24206	6	0.857082	33009	27012	
1292	6	1	1292		

Appendix D: Medina-Borja Results

			Reference sets		
DMUs		**Score**	**1**	**2**	**3**
26036	1	0.129173	38082	35384	25150
7028	6	0.167893	32380	38082	
7078	6	0.192333	32380	38082	
7040	6	0.803809	32380	38082	25150
30110	6	0.24892	32380	38082	25150
30244	6	0.407721	38082	32380	23164
7152	6	0.171279	38082	32380	25150
30213	6	0.206173	23164	38082	32380
7064	6	0.162567	38082	32380	25150
30216	6	0.135899	38082	35384	
5276	2	0.262154	38082	35384	
5378	5	0.397923	35384	43336	
30120	6	0.319165	38082	32380	
30124	2	0.264478	38082	35384	25150
30190	2	0.238704	38082	25150	35384
5052	2	0.112652	38082	35384	
5058	6	0.205433	38082	32380	
7020	2	0.139766	38082	35384	25150
42428	6	0.116962	38082	32380	25150
32236	5	0.222828	35384	43336	
30088	6	0.064572	38082	35384	25150
7124	6	0.309251	38082	32380	25150
32442	8	0.27951	35384	38082	25150
13140	6	0.11342	38082	25150	32380
30140	8	0.325724	35384	43336	
9004	5	0.294231	35384	43336	
5068	6	0.307791	23164	32380	38082
5023	6	0.273023	38082	32380	25150
46348	2	0.215739	38082	35384	25150
47116	5	0.453126	35384	43336	25150
46248	2	0.256086	38082	35384	
33380	6	0.192157	32380	38082	25150
5503	4	0.975516	43336	35384	
43156	3	0.041525	35384	38082	
21115	6	0.124877	32380	25150	38082
46024	2	0.172367	38082	35384	25150
30176	8	0.19465	35384	43336	

32397	5	0.187992	35384	38082	25150
30220	6	0.353685	35288	38082	
21501	4	0.474531	35384	32500	43336
5264	4	0.581398	35384	43336	
22196	2	0.108422	38082	25150	35384
5388	6	0.175091	38082	35384	25150
21127	6	0.09864	38082	23164	32380
35112	6	0.212256	23164	38082	35288
23280	8	0.237855	35384	43336	25150
38216	2	0.200223	38082	35384	25150
29092	2	0.066073	38082	35384	
20016	6	0.068284	38082	32380	25150
46008	6	0.202237	38082	35384	25150
1236	6	0.123838	32380	23164	38082
7115	2	0.117841	38082	35384	25150
30036	3	0.16945	38082	35384	25150
30116	8	0.193842	35384	43336	
22332	2	0.230328	38082	35384	25150
46464	6	0.278139	35288	23164	38082
5468	3	0.299838	38082	35384	25150
32102	2	0.191457	38082	35384	25150
5380	2	0.096073	38082	35384	
30172	3	0.218172	38082	25150	35384
5310	3	0.177833	38082	35384	
46454	6	0.390847	38082	23164	35288
23193	5	0.54921	35384	25150	43336
5232	2	0.135638	38082	35384	
2030	2	0.16822	38082	35384	25150
33430	3	0.255584	25150	38082	35384
2012	6	0.068381	38082	25150	35384
20032	6	0.044422	38082	25150	35384
23044	6	0.042016	23164	38082	25150
5022	2	0.016724	35288	25150	
7038	8	0.242359	25150	35384	38082
7068	6	0.487817	32380	38082	25150
2017	6	0.07385	32380	23164	38082
5414	6	0.100151	38082	35384	
32380	6	1	32380		
7054	6	0.143846	23164	25150	35288
13302	7	0.869815	43336	25150	
21125	3	0.199216	38082	25150	35384
46148	6	0.05746	38082	35384	
20064	8	0.211902	38082	35384	25150

11378	4	0.751104	25150	43336	
32336	3	0.581035	25150	38082	35384
54004	8	0.178842	35384	25150	43336
20044	2	0.2617	38082	35384	
46168	2	0.134264	38082	35288	25150
29044	2	0.258095	38082	35384	25150
10198	8	0.316461	38082	25150	35384
7114	3	0.131636	38082	35384	25150
35272	6	0.169001	38082	35288	25150
30067	8	0.191784	35384	38082	
10048	2	0.114041	38082	35384	
29036	6	0.072163	23164	38082	32380
47012	6	0.101398	32380	38082	25150
6166	4	0.41576	35384	43336	25150
43129	8	0.188658	35384	25150	38082
47128	3	0.181199	35384	38082	25150
5120	2	0.08594	38082	35384	25150
5348	4	0.330256	43336	35384	
20012	4	0.388593	25150	43336	35384
21244	8	0.149733	38082	25150	35384
22322	4	0.543379	43336	25150	
23294	2	0.225759	38082	25150	35384
5280	5	0.17936	35384	43336	25150
2032	6	0.161573	23164	38082	35288
33181	8	0.439235	35384	25150	43336
23336	2	0.331032	38082	35384	25150
21114	6	0.023608	38082	32380	
46372	8	0.306002	35384	25150	43336
21064	2	0.149571	38082	35384	25150
35180	2	0.172273	23164	25150	32380
21066	3	0.270432	38082	25150	35384
30040	3	0.181804	38082	35384	25150
30076	2	0.118686	38082	35288	23164
38360	4	0.73045	43336	35384	32500
5300	2	0.187833	38082	25150	35384
7072	6	0.2919	32380	23164	38082
22288	2	0.140714	38082	35384	25150
35136	6	0.195677	23164	35288	25150
5340	6	0.022205	38082	35384	
5376	2	0.086657	35384	38082	
43200	3	0.45683	25150	43336	
38100	6	0.265744	32380	16354	38082
14296	6	0.614755	35288	38082	

29020	2	0.162495	38082	25150	35384
20072	6	0.059265	38082	35384	25150
10188	6	0.162122	38082	35384	25150
43068	2	0.280297	35288	38082	25150
5180	7	0.788621	43336	32500	
35412	6	0.228449	32380	23164	25150
33188	2	0.529109	32380	25150	38082
8004	8	0.230928	35384	25150	43336
38256	6	0.178861	38082	35288	25150
15080	3	0.245293	38082	25150	35384
5483	6	0.118301	38082	35288	
17552	6	0.205536	23164	32380	25150
14164	5	0.186934	35384	25150	43336
7113	2	0.1722	38082	25150	35384
7144	2	0.177829	35288	38082	25150
46456	6	0.192673	38082	23164	35288
5368	2	0.179838	38082	35384	
43812	5	0.190941	35384	25150	43336
37104	5	0.274027	25150	35384	43336
14392	6	0.159839	32380	16354	25150
49344	6	0.34955	32380	16354	25150
6164	2	0.064267	38082	35384	
25150	5	1	25150		
46441	8	0.414391	42196	35384	
13290	2	0.301045	1248		35384
5497	3	0.091618	38082	35384	
25062	6	0.285246	22232	1248	
49314	6	0.483386	35288	1248	23164
44084	8	0.407212	35384	38082	
35232	2	0.632903	35288	35392	42196
22178	3	0.478906	42196		35384
5332	5	0.228564	35384	43336	
23352	6	0.036423	35288	22232	35384
47170	6	0.19264	1248	22232	35288
10228	8	0.220631	35384	43336	
43336	4	1	43336		
21134	6	0.18959	22232	1248	38082
32500	7	1	32500		
11148	6	0.265439	1248	35392	
31096	6	0.079112	38082	35384	
49110	5	0.346064	25150	35384	1292
10030	6	0.170269	38082	35288	49166
10029	5	0.18551	35384	25150	

22124	6	0.023513	38082	35384	
5132	3	0.131105	35384	42196	
21156	2	0.600085	35288	42196	49166
10120	2	0.095151	35384	38082	
47028	2	0.146198	42196	22232	35384
44022	2	0.173651	42196	49166	35288
41208	2	0.269317	1248	35384	
49064	3	0.28258	35384	35040	
25380	5	0.622526	25150	35384	1292
17184	6	0.415103	35040		35384
49232	2	0.214159	22232	35384	42196
44006	2	0.230097	49166	42196	35384
42344	2	0.375943	35392	35288	42196
3008	4	0.389554	35384	25150	
25036	6	0.231454	35392	22232	35288
22232	6	1	22232		
30044	6	0.034421	38082	35288	
47140	2	0.239314	38082	49166	35384
6204	3	0.442588	49166	35384	42196
28066	3	0.137667	38082	35384	
23050	2	0.564209	35288	49166	42196
32002	2	0.218222	35288	42196	49166
47138	3	0.162431	35384	42196	
27234	2	0.45654	1248		
11242	6	0.671527	1248	35288	38082
39004	8	0.245853	42196		35384
32404	6	0.405951	35040		35384
14364	6	0.320453	1248	22232	
5360	3	0.129542	38082	49166	35384
16236	6	0.656471	35288	1248	35392
35072	5	0.675572	25150	1292	35384
46036	6	0.206392	1248	35288	38082
44012	6	0.097063	38082	35384	
21188	6	0.186521	32380	23164	38082
33152	2	0.499319	35392	1248	1019
35240	6	0.244109	35392	1248	
46081	2	0.215737	35288	38082	49166
35384	3	1	35384		
32416	2	0.137831	38082	35392	1019
27186	3	0.525685	1019		35392
43322	6	0.314014	1248	1019	
41214	6	0.101439	23164	1248	38082
6144	3	0.204343	38082	35384	

14010	6	0.304157	1248	35392	38082
35352	6	0.127572	1248	23164	32380
38196	8	0.452888	1019	35384	
13164	6	0.346513	35040	1248	38082
40048	3	0.215858	35392	1019	42196
38444	2	0.462104	38082	42196	35392
36316	6	0.445907	1248	38082	32380
42036	2	0.662492	35392	1019	
5324	5	0.103616	35384	38082	25150
28016	5	0.125217	35384	25150	1292
34118	2	0.371517	38082	13364	
19104	2	0.299539	38082	1248	1019
40032	2	0.361893	38082	49166	42196
13056	2	0.271984	38082	42196	22232
47018	2	0.384809	22232	35288	42196
38400	6	0.146434	1248	35040	
35086	8	0.729257	1019		
22108	3	0.349647	42196	35392	1019
15198	2	0.489717	13364	38082	1019
33092	6	0.44867	1248	38082	
23264	6	0.167714	1248	38082	35392
11024	2	0.631716	42196	38082	35392
21336	6	0.538193	35288	1248	38082
33304	6	0.169499	1248		1019
29010	6	0.276905	1248	38082	1019
10276	2	0.273393	38082	13364	
29024	6	0.080137	32380	38082	16354
10164	3	0.17283	38082	13364	1019
38212	3	0.167194	1019		35384
35400	6	0.788729	1248	23164	35288
10024	5	0.163534	35384	1292	25150
36064	2	0.324824	42196	22232	35392
41016	6	0.244135	1248	38082	35392
37142	2	0.188255	38082	42196	1019
33432	6	0.542056	35392	1248	38082
17048	2	0.273115	35392	1019	42196
32400	3	0.289311	35384	1019	
34116	6	0.121596	23164	35288	38082
1192	2	0.454107	35392	1019	42196
25152	2	0.385047	35392	1248	1019
33322	3	0.856914		1019	1292
35248	2	0.75821	35288	42196	
40196	2	0.584499	22232	38082	42196

47152	2	0.217054	1248	38082	1019
22240	6	0.19355	1248	38082	
32004	8	0.118839	35384	42196	1292
49152	6	0.274413	38082	35392	1019
38081	6	0.504583	35288	35392	1248
37036	6	0.237747	1248	38082	
40120	2	0.297353	22232	42196	38082
42296	8	0.224785	35384	1019	1292
42298	6	0.447534	1248	35288	35392
35284	6	0.390126	1248	35392	38082
33208	6	0.340502	1248	35392	35288
46212	6	0.384585	35288	1248	23164
22234	3	0.396829		1019	1300
22172	2	0.664162	35392	1019	
29032	6	0.155058	22232	38082	35288
49162	2	0.204294		38082	1019
25060	6	0.538072	35288	1248	35392
40050	3	0.306516	1019		
35184	6	0.716795	1248	35392	
33068	6	0.392513	35392	22232	38082
10296	2	0.133379	38082	1019	13364
23304	6	0.208153	35040	1248	32380
45061	2	0.270905	38082	13364	1019
16034	6	0.153074	1248	35392	38082
46176	6	0.075427	23164	1248	35288
5428	3	0.163964	49166	38082	42196
14224	6	0.368523	1248	23164	38082
11472	2	0.84396	35392	1019	
14084	2	0.339373	38082	1019	1248
43333	2	0.169899	35392	38082	42196
14200	6	0.44907	1248	35288	35392
14066	6	0.289517	1248	38082	1019
47120	6	0.275237	35288	38082	
11418	2	0.40441	42196	38082	1019
35170	3	0.746257	1019		1292
46380	2	0.504744	35392	38082	42196
13378	2	0.601594	38082	42196	1019
13052	6	0.319177	35040	32380	38082
33130	2	0.077654	38082	1019	1248
13392	2	0.239429	38082	1019	42196
17496	6	0.393553	35040	1248	38082
14208	6	0.307416	1248	1019	
18172	6	0.473577	1248	35288	35392

49166	3	1	49166		
35438	6	0.315639	22232	35392	1248
40008	6	0.439715	35288	35392	42196
5314	3	0.142224	35384	42196	49166
24045	3	0.46729	13364	38082	1019
22192	6	0.629995	35288	35392	42196
14006	3	0.360841	42196	38082	1019
35100	6	0.287098	23164	35040	1248
49096	6	0.223231	1248	38082	35392
15348	6	0.372764	1248	38082	1019
38024	2	0.539432	35392		1019
5492	6	0.102773	38082	13364	1019
33468	2	0.319008	38082	42196	1019
43784	2	0.441547	35288	42196	38082
16213	2	0.47082	1248	1019	35392
42264	8	0.608198		1019	42196
34032	6	0.13078	38082	1248	35392
30004	2	0.405292	42196	38082	35288
45020	2	0.200225	38082	13364	
46108	6	0.063223	1248	38082	35040
35106	3	0.777801	1019		35384
49176	6	0.406764	38082	1019	
29042	6	0.267107	38082	42196	22232
19112	2	0.235861	38082	1248	1019
46198	2	0.61491	42196	35392	38082
14160	6	0.497373	35040	1248	38082
38052	2	0.237208	38082	22232	42196
23072	6	0.086356	1248	38082	1019
35168	5	0.50529	25150	35384	1292
35288	6	1	35288		
38300	5	0.330092	1019	35384	1292
1216	3	0.482638	38082	1019	
38098	6	0.489913	35288	1248	35392
13096	6	0.068027	1248		38082
49248	6	0.725665	1248	35392	38082
38004	6	0.117018	38082	1248	
5495	2	0.127115	35288	38082	42196
42184	6	0.491658	1248	35392	
13054	2	0.970547	13364	38082	1019
13364	2	1	13364		
43916	6	0.63194	22232	32088	35288
49264	6	0.324675	38082	1248	35392
35344	6	0.293966	1248	35392	38082

23028	6	0.466298	35288	35392	1248
14244	6	0.247431	1248		1019
17340	8	0.89326	1019		
11412	2	0.409445	35392	1019	
38368	2	0.264241	35392	38082	42196
38160	6	0.878773	1248	38082	35040
22304	2	0.201131	38082	1019	
46028	6	0.16549	38082	1248	1019
14036	6	0.374935	38082	35392	1248
49180	6	0.31229	35288	35392	22232
49296	6	0.439269	1248	35392	
16274	3	0.757717		1019	1300
43746	5	0.308301	1019	35384	42196
13012	2	0.388602	35288	35392	22232
32120	6	0.471656	1248	13328	32088
16214	6	0.025287	38082	32380	23164
32140	8	0.296571	1019	35384	1292
43596	3	0.134862	35392	1019	38082
49288	6	0.110555	22232	32088	38082
35424	6	0.288929	35288	22232	35392
41284	6	0.159882	23164	1248	35040
21254	3	0.356677	38082	1019	35392
4244	3	0.332495	38082	1019	35392
5404	2	0.126563	35288	42196	38082
14088	2	0.436882	1248	35392	1019
32105	6	0.429447	1248	35392	
13004	6	0.435184	13328	32088	38082
35068	6	0.221583	1248	23164	13328
31061	3	0.24639	35384	1292	
5344	3	0.111014	42196	38082	35384
4304	2	0.14935	42196	38082	35392
6140	6	0.083271	1248	38082	35040
11552	6	0.069827	1248	38082	32088
48036	2	0.304279	1248	38082	1019
20088	2	0.154991	32088	22232	35288
38420	6	0.057421	38082	1019	
14300	6	0.419095	35040	1248	32380
22168	2	0.356717	35392	22232	42196
35280	6	0.089881	1248	35040	38082
42020	6	0.770068	35288	35392	1248
23186	6	0.083461	23164	13328	1248
36308	3	0.829697	1019		1292
14328	2	0.246963	1248	1019	

46450	6	0.196655	1248	38082	
38108	6	0.362068	35040	32380	1248
46304	6	0.00858	23164	38082	
21036	6	0.605817	1248	1019	
38424	6	0.290466	35040	1248	38082
40104	3	0.618077	42196	38082	1019
11364	2	0.465406	35392	42196	38082
35436	6	0.250607	1248	23164	13328
24136	6	0.590162	35288	22044	42196
13120	6	0.095084	1248	23164	35040
16298	6	0.549424	1248	38082	1019
46201	6	0.104889	38082	35288	42196
43552	2	0.320459	35392	42196	38082
33029	2	0.668858	35392	42196	38082
33424	6	0.161372	35040	38082	32380
1019	8	1	1019		
38116	2	0.44444	35392	36232	38082
16108	6	0.259786	1248	35392	
11164	6	0.539054	35288	1248	35392
47024	6	0.083161	1248	38082	35392
15148	6	0.576014	1248	35392	35288
17381	6	0.166822	1248	38082	35392
15436	6	0.285275	35392	38082	1248
35152	6	0.343461	1248	23164	13328
13186	6	0.249679	1248	38082	35392
22020	2	0.085022	38082	35392	36232
33334	6	0.107359	1248	35392	38082
49228	2	0.668401	35288	35392	32088
33252	6	0.268144	1248	38082	35392
35332	6	0.299259	1248	35392	38082
50060	3	0.14516	38082		35392
32440	6	0.238513	1248	35392	38082
10022	3	0.227046	38082		
42196	3	1	42196		
13260	6	0.570206	1248	35392	22232
33216	6	0.725876	35392	1248	38082
4108	6	0.160017	38082	35392	1248
16352	6	0.231069	1248	38082	35392
43072	6	0.220237	35392	22232	35288
16364	6	0.22088	1248	35040	38082
16340	6	0.332663	1248	38082	35392
1315	6	0.330857	35392	1248	38082
20084	6	0.38535	38082	35392	36232

47148	6	0.222181	13328	1248	38082
42256	6	0.197107	1248	35392	38082
32036	2	1	32036		
32256	6	0.116249	1248	38082	35392
27172	6	0.439089	1248	35392	
32420	2	0.427866	35392	22232	35288
15241	6	0.283812	1248	35040	38082
23222	2	0.288667	38082	36232	
14156	6	0.701479	35288	35392	1248
38240	6	0.205424	1248	32380	23164
43484	6	0.225531	38082	1248	35392
37060	2	0.328941	35288	35392	38082
12024	8	0.262817	1019	35384	1292
23104	6	0.267835	1248	35040	38082
23348	6	0.218137	1248	38082	35040
4100	6	0.181281	1248	35392	
33168	2	0.455231	35392	38082	36232
35012	6	0.615104	35392	1248	38082
16272	6	0.114674	23164	13328	1248
36176	6	0.290654	35040	38082	1248
33348	6	0.309897	35392	1248	38082
35142	6	0.49798	35392	1248	38082
11298	2	0.792697	22044	35288	35392
30196	6	0.492687	13328	1248	32088
10060	5	0.558549	35384	1292	25150
35060	2	0.611588	35392	38082	36232
19010	6	0.57546	38082	35392	36232
35196	6	0.457544	35040	1248	38082
10091	5	0.398453	35384	25150	1292
13216	6	0.306105	35288	35392	32088
16066	6	0.155268	1248	32380	23164
43330	6	0.419175	35040	32380	1248
23136	6	0.137153	1248	38082	23164
10240	3	0.358014	42196	35384	1292
15320	6	0.25018	1248	35392	38082
14308	6	0.056506	1248	38082	23164
13328	6	1	13328		
22072	6	0.212291	35040	38082	1248
47015	2	0.116014	38082	35392	36232
23084	6	0.082387	23164	32088	1248
22216	6	0.12715	38082	35392	36232
22052	6	0.541506	35392	1248	38082
14248	6	0.291557	35040	1248	38082

42056	6	0.640307	35288	35392	1248
46236	6	0.076936	16354	38082	32380
16252	6	0.149075	23164	1248	32088
33264	6	0.336783	1248	35392	
43064	2	0.263591	32088	35392	22232
49336	6	0.127417	23164	32088	1248
14026	3	0.439851	35392		38082
38132	6	0.279333	35288	16452	35392
43390	2	0.313226	35392	38082	
41028	6	0.16198	1248	32380	35040
32208	6	0.118715	1248	35392	38082
43332	6	0.336991	35288	35392	32088
47066	3	0.186898		35392	35384
14386	2	0.117811	38082	36232	
43142	3	0.723493	35392	49166	38082
45010	6	0.089843	38082	36232	
32076	6	0.092835	35392	38082	36232
27044	6	0.26287	1248	38082	35392
33324	6	0.253671	35392	35288	32088
38208	6	0.502957	35392	32088	22232
46280	6	0.181696	38082	1248	35392
16120	6	0.285441	35040	1248	32380
38436	6	0.29096	35040	32380	1248
47036	6	0.141328	35392	38082	1248
14256	2	0.439421	35392	38082	1248
22044	2	1	22044		
24205	2	0.636021	32088	35288	16452
42048	6	0.395046	35288	16452	35392
43436	6	0.500026	35040	23164	1248
34180	6	0.109466	23164	1248	32380
27252	6	0.200127	1248	32380	23164
11542	6	0.258422	1248	35392	35288
11468	6	0.600759	38082	35392	35288
13240	6	0.192819	23164	1248	
35020	6	0.398845	1248	38082	35392
35108	6	0.273804	1248	35040	38082
15072	6	0.253273	23164	38082	32380
22300	2	0.354107	35392	38082	36232
35076	6	0.408843	35392	35288	32088
10061	8	0.290213	42196	35384	
3060	8	0.216779	35384	1292	
32340	6	0.520803		23164	
32449	6	0.24036	1248	35040	38082

40186	2	0.433434	35392	38082	
23168	6	0.041365	23164	1248	38082
5220	2	0.170645	32088	38082	35288
24306	6	0.551364	1248	38082	35392
16144	6	0.165077	35040	32380	1248
49084	2	0.286052	35392	38082	36232
32092	6	0.385174	1248	23164	32088
46428	6	0.382598	23164		35392
24192	6	0.173141	38082	35392	1248
34204	6	0.341239	23164		1248
34072	6	0.20162	35288	38082	1248
38428	2	0.309461	35392	38082	
32048	6	0.312352	1248	35392	38082
35104	6	0.19815	23164	1248	35392
11004	6	0.339363	35392	38082	1248
23190	6	0.121811	38082	35392	1248
35228	6	0.277962	1248	38082	35392
38082	6	1	38082		
14168	6	0.736751	1248	35040	33120
42324	6	0.160744	1248	35392	
23144	6	0.202744	16354	32380	35040
35308	6	0.318879	1248	32380	35040
15226	2	0.583083	38082	36232	
23200	6	0.89975	16354	32380	35040
22164	6	0.186485	1248	35392	38082
33256	6	0.423627	1248	35392	38082
13316	6	0.430887	23164		38082
15422	2	0.515068	38082	35392	36232
48084	6	0.191697	35040	32088	33120
1220	6	0.450309	35392	1248	38082
46408	6	1.04E-10	23164	1248	32088
15112	6	0.362616	1248	38082	35392
31090	6	0.167239	35392	1248	38082
23100	6	0.297894	35040	1248	32380
46274	6	0.301595	35392	38082	1248
27004	6	0.613487	23164		
43652	6	0.529012	23164	35040	32380
43550	6	0.512369	35288	16452	1292
23032	6	0.154122	23164	1248	32088
14004	6	0.206876	1248	23164	32088
18206	5	0.464365	25150	1292	35384
14180	6	0.345237	35040	1248	23164
35260	6	0.769109	1248	38082	35392

10180	2	0.436596	35392	36232	38082
40100	6	0.182263	38082	1248	35392
15394	6	0.872831	35288	32088	16452
14124	6	0.199105	1248	32088	35392
22036	6	0.453711	35392	1248	38082
5152	6	0.041902	38082	1292	36232
13224	6	0.396411	1248	38082	35392
38384	6	0.147809	15162	33120	32380
40184	6	0.144886	35392	38082	1248
35356	6	0.44665	35392	1248	38082
33352	6	0.251502	15162	32380	33120
33088	2	0.306603	35392	38082	36232
18125	3	0.846801		42196	43092
35256	2	0.415708	35392	38082	36232
32124	6	0.564598	1248	35392	38082
35404	6	0.823648	35040	32380	
14212	6	0.16503	1248	35040	33120
33260	6	0.327272	35392	35288	16452
1288	2	0.523615	35392	38082	36232
35392	2	1	35392		
23332	6	0.163678	16354	23164	32380
33452	6	0.19845	35040	33120	32380
36072	6	0.315963	16452	35288	22232
40128	6	0.134168	1248	32088	38082
36252	6	0.209496	1248	32088	43660
33008	2	0.525667	16452	35288	22232
47160	2	0.486857	35392	38082	36232
35420	6	0.285279	1248		33120
37120	6	0.07819	1248	32088	43660
17052	6	0.180317	16452	22232	1248
42192	2	0.742753	1248	22232	36232
14384	6	0.259689	35040	32380	32088
14116	6	0.23857	1248	32380	16354
25288	6	0.270336	23164	16452	43660
22224	6	0.124933	1248	32088	
22252	2	0.688135	35392	38082	36232
13232	6	0.312609	1248	32380	35040
13204	6	0.198901	23164	1248	32088
40116	2	0.335684	35392	38082	43092
27034	6	0.320392	23164	32380	1248
13448	6	0.34631	1248	36232	
13424	6	0.37766	1248	35040	33120
1168	6	0.519918	1248	32088	43660

11054	6	0.216739	1248	32088	43660
19052	6	0.205321	38082	36232	1292
35244	6	0.33529	1248	35040	33120
14220	6	0.329119	16452	22232	35288
1176	6	0.198221	1248	22232	36232
22220	6	0.274143	1248	32088	
6216	2	0.193127	38082	32088	36232
32064	6	0.852725	1248	36232	
15140	6	0.328474	35040	1248	33120
33382	6	0.443636	32088	1248	22232
16016	6	0.435985	35040	32380	16354
13287	6	0.142308	15162	33120	32380
38036	6	0.542853	1248	35040	33120
13288	6	0.198798	1248	32088	36232
27240	6	0.141532	16354	35040	32380
36328	6	0.30472	16354	35040	32380
38012	2	0.257035	16452	22232	32088
32072	6	0.221188	16354	35040	32380
32450	6	0.35597	35040	23164	1248
43044	2	0.653491	35392	16452	32088
27300	6	0.117623	1248	32088	36232
16398	6	0.209805	1248	35040	33120
32088	6	1	32088		
33456	6	0.717988	35288	16452	1292
33472	6	0.480704	43660	38082	1248
35368	6	0.409715	1248	33120	
13036	6	0.259124	11408	1248	15162
25052	6	0.274237	1248	35040	23164
42061	6	0.126872	43660	1248	36232
11189	2	0.314233	35392	38082	1292
19001	2	0.45855	35392	38082	43092
41168	6	0.327545	16354	35040	32380
38332	2	0.543699	35392	33120	36232
5088	6	0.078245	1248	23164	15162
40108	6	0.234167	1248	43660	38082
42170	2	0.435912	16452	22232	43092
43660	6	1	43660		
33356	2	0.270881	32088	16452	22232
27270	6	0.202553	1248	35040	33120
14316	6	0.01442	15162	23164	
42126	6	0.432191	1248	33120	36232
18142	3	0.579009	42196	1292	43092
10004	2	0.532089	16452	32088	35288

32176	6	0.226583	32088	16452	22232
40172	6	0.316374	1248	38082	36232
41024	6	0.15807	15162	1248	32380
13200	6	0.275842	35040	1248	33120
5112	8	0.102665	35384	1292	
46364	6	0.209026	1248	33120	
11256	6	0.213603	1248	33120	36232
1180	6	0.257296	1248	36232	38082
35311	6	0.261322	16452	35288	38082
32248	6	0.527141	1248	32088	36232
37004	6	0.652432	23164	15162	
43636	6	0.143519	1248	11408	23164
3066	6	0.135809	16452	35288	1248
37072	6	0.33928	1248	16452	36232
17046	6	0.351505	1248	22232	36232
1208	3	0.677476	36232	35384	1292
11516	6	0.121887	35040	1248	33120
33132	2	0.59363	35392	43092	38082
32106	6	0.068841	38082	1292	36232
46164	6	0.094328	1248	15162	33120
16299	6	0.380032	35040	23164	32380
38220	6	0.505034	16452	1248	22232
25320	6	0.324283	1248	35040	33120
43580	6	0.30142	35040	1248	33120
35360	6	0.361217	1248	16452	38082
40016	2	0.255189	32088	16452	35392
47084	6	0.161913	1248	33120	
16072	6	0.148276	23164	15162	
32422	6	0.317659	35040	32380	35144
1032	6	0.23009	1248	22232	36232
36296	6	0.226483	1248	36232	
24277	2	0.270944	35392	33120	36232
25004	6	0.396449	35040	16354	32380
25352	6	0.201835	35040	33120	1248
16416	6	0.042663	23164	32380	1248
13188	6	0.078341	15162	33120	
37056	6	0.282912	35144	35040	32380
34026	6	0.141325	15162	1248	16354
17120	6	0.337606	1248	36232	
37080	2	0.539167	13364	1292	36232
38180	6	0.606967	1248	16452	35288
14128	6	0.048344	11408	23164	15162
33408	6	0.871204	23164	16452	

42068	6	0.229954	23164	16452	
32216	6	0.336922	1248	35040	33120
35028	6	0.147504	1248	33120	
35016	6	0.211673	1248	16452	38082
25040	2	0.728965	32088	1248	36232
18040	2	0.409355	16452	32088	35288
24180	6	0.175102	1248	16452	22232
35318	6	0.183931	1248	16452	38082
14032	6	0.37037	1248	35040	33120
38412	6	0.328477	1248	16354	32380
35096	6	0.527551	35040	16354	35144
15488	6	0.10958	1248	33120	
5147	3	0.131198	38082	1292	42196
14400	6	0.154524	1248	38082	16452
22328	6	0.128988	1248	38082	16452
36232	3	1	36232		
47076	6	0.130716	16354	35040	33120
36104	6	0.345729	35288	1292	16452
38204	6	0.416855	1248	16452	38082
14196	6	0.384695	1248	33120	16452
33200	2	0.117997	35392	33120	43092
43088	6	0.232058	35040	1248	33120
49184	6	0.11149	1248	38082	33120
38292	2	0.236054	35392	33120	1292
38040	6	0.235619	1248		33120
27100	6	0.180459	23164	1248	32380
42248	6	0.25868	1248	23164	32380
38032	6	0.525999	16452	32088	1248
36208	6	0.352613	1248	13328	16452
33457	6	0.193797	1248	23164	16452
15431	6	0.294881	16354	35040	1248
17088	6	0.204053	35040	1248	32380
15476	6	0.044975	23164	15162	
38236	6	0.37705	16452	1248	22232
25470	6	0.204251	16452	32088	1248
17056	6	0.196688	1248		33120
4236	6	0.152266	1248	16452	33120
32221	6	0.109329	38082	1248	16452
46010	6	0.318741	35040	1248	23164
35212	6	0.012807	15162	33120	
23212	6	0.123661	1248	15162	33120
48119	6	0.618824	1248	16452	32088
18006	3	0.594793	35392	43092	13364

33384	6	0.521121	1248	16452	33120
33344	6	0.119312	1248	15162	11408
38352	6	0.355232	11408	15162	33120
23184	6	0.069627	23164	1248	35040
15068	6	0.186946	23164	1248	32380
31053	6	0.262271	1248	33120	16452
48012	6	0.21855	1248	16452	38082
35312	6	0.433018	16452	32088	1248
27396	6	0.158221	23164	15162	11408
35188	6	0.159166	23164	1248	11408
33064	6	0.416235	16452	35288	1248
31008	6	0.217719	1248	38082	23164
33120	6	1	33120		
31016	6	0.290366	1248	16452	38082
38440	2	0.792547	35392	43092	33120
15236	6	0.046633	15162	16354	32380
38388	6	0.195622	1248		15468
24224	6	0.191159	15468		1248
36244	6	0.16343	1248	16228	35040
25212	6	0.079811	15162	11408	16452
16004	6	0.359687	16228	35144	35040
13172	6	0.095467	23164	35040	1248
43504	6	0.185728	1248	15162	16452
38380	6	0.291302	16228	1248	35040
11408	6	1	11408		
46418	6	0.275201	38082	33120	1292
13428	6	0.217849	23164	1248	35040
16146	6	0.161672		1300	16452
32060	6	0.532466	16452	32088	1248
40136	6	0.268934	1248	16452	38082
38008	6	0.203952	1248	16452	
33396	6	0.399218	1248	35040	16228
35224	6	0.265845	1248	16452	13328
19096	2	0.371968	33120	43092	35392
27144	6	0.109254	15162	23164	
11072	6	0.248058	1248	16452	38082
48140	6	0.222764	23164	1248	16452
33040	6	0.153987	1248		16228
17252	6	0.263871	1248	15468	
43828	2	0.363076	16452	32088	43092
47064	6	0.169322	1248	16452	38082
47096	6	0.078104	1248	35040	
38194	2	0.322428	35392	33120	43092

17240	6	0.421962	1248	16452	13328
32010	6	0.191163	1248	15468	
38168	6	0.4322	13328	1292	16452
42252	6	0.202436	1248	23164	15162
34210	6	0.116709	15162	23164	16452
5416	6	0.057924	23164	15162	
38152	6	0.543844	35040	16228	32380
1070	6	0.296396	1248	35040	
37132	6	0.095833	15162	16228	16452
36264	6	0.130605	1248	16228	15162
20004	6	0.283513	16452	1248	33120
11530	6	0.343465	1248	16452	38082
16036	6	0.436193	16354	35040	15162
36044	6	0.283684	1248	16452	38082
24158	2	0.60457	35288	1292	16452
37128	6	0.204107	23164	15162	32380
35092	6	0.468419	1248	35040	16228
16320	6	0.989782	23164	16354	32380
17216	6	0.211651	1248	15162	16228
35024	6	0.221821	16452	35288	1292
17372	6	0.102929	23164	15162	16452
27148	6	0.252721	16228	35040	32380
11184	6	0.15928	1248	35040	
10090	3	0.910775	16452	35392	32088
15468	6	1	15468		
33072	6	0.308066	1248	16452	
11008	6	0.233615	16228		
11134	6	0.143936	1248	16228	15162
1120	6	0.63911	16452	35288	1292
16452	2	1	16452		
36300	6	0.164676	15162	1248	16228
42204	6	0.197338	16228		
38364	2	0.273366	16452	32088	35392
38328	6	0.312282	1248		16228
1304	6	0.510661	1248	35040	16228
1248	6	1	1248		
13148	6	0.182786		15162	11408
35156	6	0.88905	16354	35040	35144
33436	6	0.286835	35040	11408	
33360	6	0.613743	1248	38082	1292
4142	6	0.450725	1248	38082	43092
33412	6	0.346393	1248	38082	1292
46052	2	0.583406	16452	35288	1292

15412	6	0.213239	23164	15162	35040
17428	6	0.172317	11408	16228	
23260	6	0.175912	15162	23164	35040
48240	6	0.430399	1248	33120	43092
38068	6	0.604719	35040	35144	16228
25016	6	0.149561	35040	23164	15162
36268	6	0.206242	1248	33120	43092
6222	6	0.211086	35040	11408	
15084	6	0.167682	23164	35040	15162
11512	6	0.28122			1300
16228	6	1	16228		
13112	6	0.005343	15162	23164	
15162	6	1	15162		
36144	6	0.247837	11408		
25252	6	0.239493	35040	15162	23164
23092	6	0.297839	23164	35040	
15308	6	0.32539	15162	35040	23164
38038	6	0.363426	1248	1292	38082
38096	6	0.335089	35144	16354	32380
4016	6	0.147282	1248	13328	
38248	6	0.381936	15162	35040	35144
36020	6	0.106197	15162	15468	
17040	6	0.194559	1248	43092	1292
42412	6	0.316688	11408	1292	35040
35040	6	1	35040		
16324	6	0.713364	1248	15468	1292
31024	2	0.255657	32088	1292	38082
42216	6	0.340979	35040	23164	15162
4296	6	0.38204	1248	1292	43092
16020	6	0.242381			1300
17520	6	0.21821	27012		32380
11540	6	0.406443	16228		
18144	2	0.489614		1292	43092
46328	6	0.47736	1248	1292	43092
42088	6	0.258365	35040	15162	
48128	6	0.260613	1248	33120	1292
5496	6	0.09303	1248	1292	38082
17380	6	0.840319	23164		
16292	6	0.204244	35040	16228	
40056	6	0.364237	35040		16228
35373	6	0.221162	38082	1292	
16048	6	0.305819	16228		1292
23308	6	0.093176	27012	23164	1300

25180	6	0.123261	23164	35040	
13348	6	0.107728	15162	42136	27012
35144	6	1	35144		
41072	6	0.493084		15162	1300
42116	6	0.294514	1248	1292	43092
4308	6	0.161617	1248	1292	38082
1092	6	0.593961	1248	1292	43092
1156	6	0.109114	1248	1292	38082
18050	2	0.536892	1292	35392	38082
35321	6	0.218187	1248	1292	38082
4044	6	0.25631	1248	1292	43092
46412	6	0.390699	23164	35040	
46300	6	0.178814	1292		15162
36080	6	0.665807	23164	1300	
15448	6	0.058247	11408	1292	35040
33290	6	0.317971	11408	35040	1292
23164	6	1	23164		
4036	6	0.320074	35040	16228	
25388	6	0.147966	23164	11408	
24012	6	0.603251	35040	23164	
46266	6	0.781631	1248	1292	38082
16354	6	1	16354		
25440	6	0.612705	23164		
17110	6	0.358875	35040	1292	
40176	2	0.894289	1292	35288	16452
24155	6	0.444808	1248	1292	43092
48072	6	0.40628	1248	1292	38082
25164	6	0.525138		1300	1292
33284	6	0.635848			35144
48076	2	0.611931	35392	1292	43092
48176	6	0.222819	1248	1292	38082
43900	2	0.099866	16452	1292	38082
24304	6	0.145526	15162	42136	1292
43256	3	0.225347	43092	1292	42196
17028	6	0.409294	23164		1292
33464	6	0.577389	1248	1292	38082
48110	6	0.173881	1248	1292	38082
24316	6	0.429446	1248	1292	38082
25108	6	0.024415	15162	1300	43092
27012	6	1	27012		
1212	6	0.732466		23164	
38088	6	0.429114	35040	1300	16228
36256	2	0.72293	1292	35288	16452

27088	6	0.63522	48160		42136
42012	6	0.715645	23164		1292
36322	6	0.4458		1292	15162
24189	6	0.17013	1248	1292	38082
24008	6	0.407867	35040	1292	23164
42136	6	1	42136		
27384	6	0.801583	16354	1300	
4116	6	0.157209	1248	1292	43092
17204	6	0.23559	1300	1248	15468
48160	6	1	48160		
17336	6	0.688837	23164	1292	
17072	6	0.213886	23164	1292	
1104	6	0.482774	1248	1292	43092
42028	6	0.41495	23164	35040	1292
46196	6	0.273134	35040	1292	16228
48060	6	0.126847	1292		15162
1303	6	0.757449		23164	
1084	6	0.352049	1300	16228	35040
1044	6	0.100018	16228	1292	15162
24064	6	0.502391	16228	1292	1300
46182	6	0.171678	1292	1248	38082
42272	6	0.212888	1292		11408
42424	6	0.515376	23164	1292	
43092	8	1	43092		
42060	6	0.342573	1292	23164	35040
1107	6	0.376666	15162	1292	48214
40160	6	0.745099	1292	23164	35040
48048	6	0.367063	1300	1292	35040
17289	6	0.297031	1292	43660	33120
1244	6	0.822415		1292	48214
33009	6	0.474674	1292	16228	48214
40020	6	0.23931	1292	23164	
48144	6	0.100982	1292	15162	16228
48100	6	0.44178	1292	35040	23164
1300	6	1	1300		
17420	6	1	17420		
48214	6	1	48214		
24206	6	0.298896	1292	15468	
1292	6	1	1292		

Appendix E: Yang and Paradi Results

			Reference sets		
DMUs		**Score**	**1**	**2**	**3**
26036	1	0.122415993	25150	35384	40104
7028	6	4.53E-02	30124	35384	
7078	6	4.73E-02	30124	35384	
7040	6	9.44E-04	25150	35384	40104
30110	6	0.050465139	30124	35384	40104
30244	6	5.58E-02	25150	35384	40104
7152	6	1.25E-02	25150	35384	40104
30213	6	7.56E-02	25150	35384	40104
7064	6	0.169391022	25150	35384	40104
30216	6	0.228985326	30124	35384	40104
5276	2	4.78E-02	30124	35384	
5378	5	0.279191573	43336	35384	
30120	6	4.49E-03	30124	35384	
30124	2	1	30124		
30190	2	3.76E-02	25150	35384	40104
5052	2	0.04631543	30124	35384	
5058	6	5.05E-02	30124	35384	
7020	2	2.60E-02	25150	35384	40104
42428	6	7.27E-02	25150	35384	40104
32236	5	0.111179504	43336	35384	
30088	6	0.11754447	25150	35384	40104
7124	6	2.88E-02	25150	35384	40104
32442	8	0.159998584	25150	35384	40104
13140	6	7.30E-02	25150	35384	40104
30140	8	0.199853406	43336	35384	
9004	5	0.15926631	43336	35384	
5068	6	7.54E-02	25150	35384	40104
5023	6	5.84E-02	25150	35384	40104
46348	2	5.65E-02	25150	35384	40104
47116	5	0.244630179	43336	35384	
46248	2	0.19381156	30124	35384	
33380	6	0.176647952	25150	35384	40104
5503	4	0.826709461	43336	32500	
43156	3	3.90E-03	30124	35384	
21115	6	7.48E-02	25150	35384	40104
46024	2	0.127971462	25150	40104	
30176	8	0.089561677	43336	35384	
32397	5	9.86E-02	30124	35384	
30220	6	9.45E-02	25150	35384	40104
21501	4	0.307724667	43336	32500	

5264	4	0.484493797	43336	35384	
22196	2	0.078136385	25150	35384	40104
5388	6	0.051365592	25150	35384	40104
21127	6	5.93E-02	25150	35384	40104
35112	6	6.74E-02	25150	35384	40104
23280	8	0.106991225	43336	35384	
38216	2	0.121593732	30124	35384	
29092	2	6.83E-02	25150	35384	40104
20016	6	5.29E-02	25150	35384	40104
46008	6	4.51E-02	25150	40104	
1236	6	0.04147634	25150	35384	40104
7115	2	2.33E-02	25150	35384	40104
30036	3	8.84E-02	25150	35384	40104
30116	8	8.70E-02	43336	35384	
22332	2	0.101135953	25150	35384	40104
46464	6	9.52E-02	25150	35384	40104
5468	3	0.338426821	30124	35384	
32102	2	3.86E-02	25150	40104	
5380	2	0.204240692	25150	35384	40104
30172	3	3.03E-02	25150	35384	40104
5310	3	0.110573845	30124	35384	40104
46454	6	8.00E-02	25150	35384	40104
23193	5	0.327544973	25150	43336	35384
5232	2	3.73E-02	25150	35384	40104
2030	2	7.03E-02	30124	35384	40104
33430	3	0.133865274	25150	35384	40104
2012	6	5.31E-02	25150	35384	40104
20032	6	5.41E-02	25150	35384	40104
23044	6	3.59E-02	25150	35384	40104
5022	2	3.01E-02	25150	40104	
7038	8	8.23E-02	25150	43336	
7068	6	7.09E-02	25150	35384	40104
2017	6	2.39E-02	30124	35384	40104
5414	6	4.92E-02	30124	35384	
32380	6	4.67E-02	30124	35384	
7054	6	4.33E-02	25150	35384	40104
13302	7	0.80835414	25150	43336	
21125	3	3.39E-02	30124	35384	
46148	6	4.51E-02	30124	35384	
20064	8	0.133441375	30124	35384	
11378	4	0.655835199	25150	43336	
32336	3	0.188498258	25150	43336	
54004	8	6.30E-02	25150	43336	35384

20044	2	0.221051485	25150	35384	40104
46168	2	7.13E-02	25150	35384	40104
29044	2	5.35E-02	25150	35384	40104
10198	8	0.260842328	25150	35384	40104
7114	3	1.63E-02	25150	35384	40104
35272	6	7.56E-02	25150	35384	40104
30067	8	8.84E-02	30124	35384	
10048	2	3.50E-02	25150	35384	40104
29036	6	3.06E-02	30124	35384	
47012	6	0.119862128	25150	35384	40104
6166	4	0.286545902	25150	43336	35384
43129	8	7.00E-02	25150	35384	40104
47128	3	0.100434945	30124	35384	40104
5120	2	3.06E-02	25150	35384	40104
5348	4	0.187375724	43336	32500	
20012	4	0.234494112	25150	43336	
21244	8	0.100543013	30124	35384	40104
22322	4	0.421536575	25150	43336	
23294	2	3.41E-02	25150	35384	40104
5280	5	7.40E-02	43336	35384	
2032	6	0.07364988	25150	35384	40104
33181	8	0.198058698	43336	35384	
23336	2	7.15E-02	25150	35384	40104
21114	6	2.10E-02	30124	35384	
46372	8	0.149817828	25150	43336	35384
21064	2	4.33E-02	25150	35384	40104
35180	2	3.25E-02	30124	35384	
21066	3	0.528048027	25150	35384	40104
30040	3	9.01E-02	30124	35384	40104
30076	2	0.0772813	25150	35384	40104
38360	4	0.561914837	43336	32500	
5300	2	4.98E-02	25150	35384	40104
7072	6	5.83E-02	25150	35384	40104
22288	2	0.100836892	25150	35384	40104
35136	6	3.63E-02	25150	35384	40104
5340	6	3.60E-02	30124	35384	
5376	2	0.013994289	25150	35384	40104
43200	4	0.331500582	25150	43336	
38100	6	5.19E-02	25150	35384	40104
14296	6	0.110370219	30124	35384	
29020	2	8.21E-02	25150	35384	40104
20072	6	5.12E-02	25150	35384	40104
10188	6	6.20E-02	25150	35384	40104

43068	2	8.04E-02	25150	35384	40104
5180	7	0.682694881	43336	32500	
35412	6	3.62E-02	25150	35384	40104
33188	2	0.125308945	25150	40104	
8004	8	9.25E-02	25150	43336	35384
38256	6	7.23E-02	25150	35384	40104
15080	3	9.29E-02	25150	35384	40104
5483	6	5.84E-02	30124	35384	
17552	6	2.97E-02	25150	35384	40104
14164	5	0.065754735	25150	43336	35384
7113	2	5.67E-02	30124	35384	40104
7144	2	5.73E-02	25150	35384	40104
46456	6	0.079185581	25150	35384	40104
5368	2	3.18E-02	25150	35384	40104
43812	5	7.48E-02	25150	43336	35384
37104	5	0.114301488	25150	43336	
14392	6	3.29E-02	25150	35384	40104
49344	6	0.049260966	25150	35384	40104
6164	2	4.42E-02	30124	35384	
25150	5	1	25150		
46441	8	7.93E-02	25150	35384	40104
13290	2	0.328446673	30124	35384	40104
5497	3	6.08E-02	30124	35384	
25062	6	6.34E-02	25150	35384	40104
49314	6	0.11705692	25150	35384	40104
44084	8	0.332947357	30124	35384	
35232	2	4.14E-02	30124	35384	40104
22178	3	6.62E-02	25150	35384	40104
5332	5	0.119349885	43336	35384	
23352	6	2.93E-02	25150	35384	40104
47170	6	6.66E-02	25150	35384	40104
10228	8	0.101971287	43336	35384	
43336	4	1	43336		
21134	6	7.25E-02	25150	35384	40104
32500	7	1	32500		
11148	6	3.10E-02	25150	40104	
31096	6	0.105798053	30124	35384	
49110	5	0.176824908	25150	43336	
10030	6	6.62E-02	25150	35384	40104
10029	5	6.36E-02	25150	43336	35384
22124	6	3.81E-02	30124	35384	
5132	3	0.02324501	25150	35384	40104
21156	2	5.28E-02	25150	35384	40104

10120	2	2.08E-02	25150	35384	40104
47028	2	0.142573237	25150	35384	40104
44022	2	7.23E-02	25150	35384	40104
41208	2	0.213454894	25150	35384	40104
49064	3	4.02E-02	43336	35384	
25380	5	0.362739487	25150	43336	
17184	6	4.02E-02	25150	35384	40104
49232	2	7.70E-02	25150	35384	40104
44006	2	0.198215098	25150	35384	40104
42344	2	4.96E-02	25150	35384	40104
3008	4	0.183170086	25150	43336	35384
25036	6	4.98E-02	25150	35384	40104
22232	6	6.68E-02	25150	35384	40104
30044	6	3.44E-02	30124	35384	
47140	2	2.42E-02	25150	40104	
6204	3	0.546169405	30124	35384	
28066	3	0.110017338	25150	35384	40104
23050	2	8.43E-02	25150	35384	40104
32002	2	7.43E-02	25150	35384	40104
47138	3	3.03E-02	30124	35384	
27234	2	4.72E-02	25150	35384	40104
11242	6	8.13E-02	25150	35384	40104
39004	8	1.91E-02	25150	35384	40104
32404	6	0.381996566	30124	35384	40104
14364	6	8.34E-02	25150	35384	40104
5360	3	5.95E-02	25150	35384	40104
16236	6	0.091892204	25150	35384	40104
35072	5	0.486694435	25150	43336	
46036	6	5.84E-02	25150	35384	40104
44012	6	6.46E-02	30124	35384	40104
21188	6	4.89E-02	30124	35384	
33152	2	5.45E-02	25150	35384	40104
35240	6	9.72E-02	25150	35384	40104
46081	2	4.35E-02	25150	35384	40104
35384	3	1	35384		
32416	2	8.29E-02	25150	35384	40104
27186	3	8.82E-02	25150	35384	40104
43322	6	5.71E-02	25150	35384	40104
41214	6	3.56E-02	25150	35384	40104
6144	3	0.239682812	30124	35384	
14010	6	6.07E-02	25150	35384	40104
35352	6	2.03E-02	25150	35384	40104
38196	8	0.126146113	25150	43336	35384

13164	6	5.29E-02	25150	35384	40104
40048	3	9.18E-03	25150	35384	40104
38444	2	0.240826164	25150	35384	40104
36316	6	0.057507415	25150	35384	40104
42036	2	0.199984223	25150	35384	40104
5324	5	2.13E-02	25150	35384	40104
28016	5	2.82E-02	30124	35384	
34118	2	0.146759352	30124	35384	
19104	2	2.22E-02	25150	35384	40104
40032	2	3.13E-02	25150	35384	40104
13056	2	7.26E-02	25150	35384	40104
47018	2	6.85E-02	25150	35384	40104
38400	6	1.97E-02	25150	40104	
35086	8	0.145383596	25150	43336	35384
22108	3	3.64E-02	25150	35384	40104
15198	2	0.127513517	25150	35384	40104
33092	6	0.246181835	25150	35384	40104
23264	6	5.12E-02	25150	35384	40104
11024	2	4.48E-02	30124	35384	40104
21336	6	0.106048617	25150	35384	40104
33304	6	0.104838312	25150	35384	40104
29010	6	8.42E-02	25150	35384	40104
10276	2	0.141123965	25150	35384	40104
29024	6	2.94E-02	30124	35384	
10164	3	8.13E-02	25150	35384	40104
38212	3	5.47E-03	25150	43336	35384
35400	6	0.067741932	25150	35384	40104
10024	5	5.31E-02	43336	35384	
36064	2	6.88E-02	25150	35384	40104
41016	6	7.07E-02	25150	35384	40104
37142	2	0.114019456	25150	35384	40104
33432	6	4.95E-02	25150	35384	40104
17048	2	9.12E-02	30124	35384	40104
32400	3	7.86E-02	25150	35384	40104
34116	6	1.69E-02	30124	35384	
1192	2	0.145274629	25150	35384	40104
25152	2	1.60E-02	25150	35384	40104
33322	3	9.92E-02	25150	40104	
35248	2	4.96E-02	25150	35384	40104
40196	2	3.71E-02	25150	35384	40104
47152	2	0.103622901	25150	35384	40104
22240	6	0.222223489	25150	35384	40104
32004	8	3.04E-02	25150	35384	40104

49152	6	4.12E-02	25150	35384	40104
38081	6	6.77E-02	25150	35384	40104
37036	6	0.129346954	25150	35384	40104
40120	2	7.24E-02	25150	35384	40104
42296	8	7.43E-02	43336	35384	
42298	6	7.33E-02	25150	35384	40104
35284	6	7.29E-02	25150	35384	40104
33208	6	7.20E-02	25150	35384	40104
46212	6	6.97E-02	25150	35384	40104
22234	3	3.07E-02	25150	43336	35384
22172	2	0.153276282	25150	35384	40104
29032	6	6.67E-02	25150	35384	40104
49162	2	1.20E-02	25150	35384	40104
25060	6	8.68E-02	25150	35384	40104
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10296	2	2.74E-02	25150	35384	40104
23304	6	3.54E-02	25150	35384	40104
45061	2	0.117604011	25150	35384	40104
16034	6	3.09E-02	25150	35384	40104
46176	6	3.40E-02	25150	35384	40104
5428	3	6.83E-02	25150	35384	40104
14224	6	0.06164761	25150	35384	40104
11472	2	0.435810743	25150	40104	
14084	2	0.227782216	25150	35384	40104
43333	2	0.100454936	25150	35384	40104
14200	6	7.22E-02	25150	35384	40104
14066	6	5.23E-02	25150	35384	40104
47120	6	0.109627662	25150	35384	40104
11418	2	2.91E-02	25150	35384	40104
35170	3	8.19E-02	25150	35384	40104
46380	2	7.86E-02	25150	35384	40104
13378	2	8.03E-02	30124	35384	40104
13052	6	3.33E-02	25150	35384	40104
33130	2	0.097072832	25150	35384	40104
13392	2	9.47E-02	25150	35384	40104
17496	6	3.79E-02	25150	35384	40104
14208	6	6.73E-02	25150	35384	40104
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35438	6	5.54E-02	25150	35384	40104
40008	6	6.11E-02	25150	35384	40104

5314	3	0.040301655	25150	35384	40104
24045	3	0.501624983	30124	35384	40104
22192	6	9.07E-02	25150	35384	40104
14006	3	7.35E-02	25150	35384	40104
35100	6	0.018335537	25150	40104	
49096	6	7.10E-02	25150	35384	40104
15348	6	4.89E-02	25150	35384	40104
38024	2	7.78E-02	25150	35384	40104
5492	6	5.48E-02	25150	35384	40104
33468	2	4.81E-02	25150	40104	
43784	2	8.17E-02	25150	35384	40104
16213	2	2.69E-02	25150	35384	40104
42264	8	8.19E-02	25150	40104	
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30004	2	5.98E-02	25150	35384	40104
45020	2	4.67E-02	25150	35384	40104
46108	6	2.63E-02	25150	35384	40104
35106	3	0.156242314	25150	43336	
49176	6	0.402589475	30124	35384	40104
29042	6	6.03E-02	25150	35384	40104
19112	2	0.223628059	25150	35384	40104
46198	2	0.111456871	25150	40104	
14160	6	5.17E-02	25150	35384	40104
38052	2	7.25E-02	25150	35384	40104
23072	6	4.46E-02	25150	35384	40104
35168	5	0.198911208	25150	43336	
35288	6	0.224794164	25150	35384	40104
38300	5	6.79E-02	43336	35384	
1216	3	3.07E-02	25150	43336	35384
38098	6	7.83E-02	25150	35384	40104
13096	6	8.38E-02	25150	35384	40104
49248	6	0.055300397	25150	35384	40104
38004	6	6.26E-02	25150	35384	40104
5495	2	6.17E-02	25150	35384	40104
42184	6	4.95E-02	25150	35384	40104
13054	2	0.533684718	30124	35384	
13364	2	0.462135232	30124	35384	
43916	6	0.058043717	25150	35384	40104
49264	6	6.99E-02	25150	35384	40104
35344	6	7.96E-02	25150	35384	40104
23028	6	7.81E-02	25150	35384	40104
14244	6	9.30E-02	25150	35384	40104
17340	8	0.16569437	25150	43336	

11412	2	5.83E-02	25150	35384	40104
38368	2	7.46E-02	25150	35384	40104
38160	6	3.21E-02	25150	35384	40104
22304	2	2.89E-02	30124	35384	
46028	6	6.19E-02	25150	35384	40104
14036	6	7.08E-02	25150	35384	40104
49180	6	6.53E-02	25150	35384	40104
49296	6	4.93E-02	25150	35384	40104
16274	3	9.52E-02	25150	43336	35384
43746	5	5.56E-02	25150	43336	35384
13012	2	6.43E-02	25150	35384	40104
32120	6	7.15E-02	25150	35384	40104
16214	6	2.40E-02	30124	35384	
32140	8	6.45E-02	25150	43336	35384
43596	3	3.01E-02	25150	35384	40104
49288	6	5.66E-02	25150	35384	40104
35424	6	7.03E-02	25150	35384	40104
41284	6	1.78E-02	25150	40104	
21254	3	6.20E-02	25150	35384	40104
4244	3	4.24E-02	25150	35384	40104
5404	2	5.88E-02	25150	35384	40104
14088	2	7.23E-02	30124	35384	
32105	6	3.77E-02	25150	35384	40104
13004	6	8.84E-02	25150	35384	40104
35068	6	5.92E-02	25150	35384	40104
31061	3	8.97E-02	43336	35384	
5344	3	0.117357966	25150	35384	40104
4304	2	8.33E-02	25150	35384	40104
6140	6	3.73E-02	25150	35384	40104
11552	6	0.044091523	25150	35384	40104
48036	2	0.088556625	25150	35384	40104
20088	2	5.99E-02	25150	35384	40104
38420	6	5.13E-02	30124	35384	40104
14300	6	0.036447629	25150	35384	40104
22168	2	5.83E-02	25150	35384	40104
35280	6	2.83E-02	25150	35384	40104
42020	6	5.54E-02	25150	35384	40104
23186	6	2.89E-02	25150	35384	40104
36308	3	0.140005353	25150	43336	35384
14328	2	3.38E-02	25150	35384	40104
46450	6	5.66E-02	25150	35384	40104
38108	6	4.26E-02	25150	35384	40104
46304	6	6.01E-03	30124	35384	

21036	6	2.02E-02	30124	35384	
38424	6	3.63E-02	25150	35384	40104
40104	3	1	40104		
11364	2	5.09E-02	30124	35384	
35436	6	3.90E-02	25150	35384	40104
24136	6	8.46E-02	25150	35384	40104
13120	6	0.015985824	25150	35384	40104
16298	6	7.59E-02	25150	35384	40104
46201	6	5.88E-02	25150	35384	40104
43552	2	0.115323603	30124	35384	40104
33029	2	0.122799753	25150	35384	40104
33424	6	4.30E-02	25150	35384	40104
1019	8	0.373256931	25150	43336	35384
38116	2	2.07E-02	30124	35384	40104
16108	6	3.95E-02	25150	35384	40104
11164	6	0.049657863	25150	35384	40104
47024	6	4.60E-02	25150	35384	40104
15148	6	6.79E-02	25150	35384	40104
17381	6	4.97E-02	25150	35384	40104
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35152	6	3.50E-02	25150	40104	
13186	6	5.50E-02	25150	35384	40104
22020	2	0.329288949	30124	35384	40104
33334	6	4.30E-02	25150	35384	40104
49228	2	6.51E-02	25150	35384	40104
33252	6	0.039832882	25150	35384	40104
35332	6	3.86E-02	25150	35384	40104
50060	3	3.91E-02	25150	35384	40104
32440	6	6.48E-02	25150	35384	40104
10022	3	7.42E-02	25150	35384	40104
42196	3	0.282589598	25150	35384	40104
13260	6	4.38E-02	25150	35384	40104
33216	6	0.114853565	30124	35384	40104
4108	6	0.067986021	25150	35384	40104
16352	6	7.68E-02	25150	35384	40104
43072	6	5.76E-02	25150	35384	40104
16364	6	6.44E-02	25150	35384	40104
16340	6	0.238510914	25150	35384	40104
1315	6	8.13E-02	25150	35384	40104
20084	6	5.34E-02	25150	35384	40104
47148	6	7.16E-02	25150	35384	40104
42256	6	4.34E-02	25150	35384	40104
32036	2	0.973745562	30124	35384	

32256	6	4.59E-02	25150	35384	40104
27172	6	5.49E-02	25150	35384	40104
32420	2	5.64E-02	25150	35384	40104
15241	6	4.00E-02	25150	35384	40104
23222	2	0.295321425	25150	40104	
14156	6	6.70E-02	25150	35384	40104
38240	6	4.35E-02	25150	35384	40104
43484	6	7.04E-02	25150	35384	40104
37060	2	7.80E-02	25150	35384	40104
12024	8	0.042697111	25150	43336	35384
23104	6	6.65E-02	25150	35384	40104
23348	6	6.63E-02	25150	35384	40104
4100	6	4.11E-02	25150	35384	40104
33168	2	5.44E-02	30124	35384	40104
35012	6	6.73E-02	25150	35384	40104
16272	6	3.51E-02	25150	35384	40104
36176	6	6.08E-02	25150	35384	40104
33348	6	6.14E-02	25150	35384	40104
35142	6	6.14E-02	25150	35384	40104
11298	2	0.088712778	25150	35384	40104
30196	6	8.16E-02	25150	35384	40104
10060	5	0.222750734	43336	35384	
35060	2	6.58E-02	25150	35384	40104
19010	6	0.329910597	30124	35384	40104
35196	6	3.40E-02	25150	35384	40104
10091	5	0.112488699	25150	43336	35384
13216	6	7.11E-02	25150	35384	40104
16066	6	3.14E-02	25150	35384	40104
43330	6	3.51E-02	25150	35384	40104
23136	6	4.30E-02	25150	35384	40104
10240	3	0.162588675	30124	35384	40104
15320	6	6.81E-02	25150	35384	40104
14308	6	3.18E-02	25150	35384	40104
13328	6	0.148902323	25150	35384	40104
22072	6	5.68E-02	25150	35384	40104
47015	2	8.86E-02	25150	35384	40104
23084	6	0.033579218	25150	35384	40104
22216	6	0.150887983	25150	35384	40104
22052	6	0.297621954	30124	35384	40104
14248	6	5.25E-02	25150	35384	40104
42056	6	5.95E-02	25150	35384	40104
46236	6	3.45E-02	30124	35384	
16252	6	4.66E-02	25150	35384	40104

33264	6	5.32E-02	25150	35384	40104
43064	2	7.03E-02	25150	35384	40104
49336	6	4.57E-02	25150	35384	40104
14026	3	0.217016936	25150	35384	40104
38132	6	7.46E-02	25150	35384	40104
43390	2	7.32E-02	25150	35384	40104
41028	6	2.32E-02	25150	35384	40104
32208	6	4.41E-02	25150	35384	40104
43332	6	0.065212823	25150	35384	40104
47066	3	9.63E-03	25150	35384	40104
14386	2	5.34E-02	30124	35384	
43142	3	5.95E-02	25150	35384	40104
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38208	6	6.68E-02	25150	35384	40104
46280	6	6.70E-02	25150	35384	40104
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38436	6	3.52E-02	25150	35384	40104
47036	6	7.74E-02	25150	35384	40104
14256	2	0.222428259	30124	35384	40104
22044	2	0.164934861	25150	35384	40104
24205	2	6.11E-02	25150	35384	40104
42048	6	0.065026904	25150	35384	40104
43436	6	3.37E-02	25150	35384	40104
34180	6	0.01835314	25150	35384	40104
27252	6	2.82E-02	25150	35384	40104
11542	6	4.38E-02	25150	35384	40104
11468	6	6.18E-02	25150	35384	40104
13240	6	4.50E-02	25150	35384	40104
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35076	6	6.57E-02	25150	35384	40104
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3060	8	1.00E-01	30124	35384	
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23190	6	6.09E-02	25150	35384	40104
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46408	6	0	25150	35384	40104
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1168	6	7.19E-02	25150	35384	40104
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16354	6	2.86E-02	30124	35384	40104
25440	6	3.29E-02	25150	35384	40104
17110	6	2.97E-02	25150	35384	40104
40176	2	0.112341596	25150	35384	40104
24155	6	5.84E-02	25150	35384	40104
48072	6	5.93E-02	25150	35384	40104
25164	6	3.74E-02	25150	35384	40104
33284	6	0.040826256	25150	35384	40104
48076	2	9.43E-02	25150	35384	40104
48176	6	4.69E-02	25150	35384	40104
43900	2	4.24E-02	25150	35384	40104
24304	6	3.22E-02	30124	35384	
43256	3	0.174098286	25150	35384	40104
17028	6	4.35E-02	25150	35384	40104
33464	6	7.33E-02	25150	35384	40104
48110	6	4.21E-02	25150	35384	40104
24316	6	6.68E-02	25150	35384	40104
25108	6	6.13E-03	30124	35384	
27012	6	2.28E-02	30124	35384	
1212	6	2.64E-02	25150	35384	40104
38088	6	0.045910403	25150	35384	40104
36256	2	0.110300886	25150	35384	40104
27088	6	2.48E-02	30124	35384	
42012	6	2.06E-02	25150	40104	

36322	6	3.83E-02	25150	35384	40104
24189	6	4.22E-02	25150	35384	40104
24008	6	2.61E-02	25150	35384	40104
42136	6	5.14E-02	30124	35384	
27384	6	0.023968449	25150	35384	40104
4116	6	1.92E-02	25150	40104	
17204	6	0.032861864	25150	35384	40104
48160	6	2.38E-02	30124	35384	
17336	6	3.35E-02	25150	35384	40104
17072	6	7.58E-03	25150	35384	40104
1104	6	0.039421342	25150	35384	40104
42028	6	3.42E-02	25150	35384	40104
46196	6	0.034809882	25150	35384	40104
48060	6	2.77E-02	25150	35384	40104
1303	6	3.30E-02	25150	35384	40104
1084	6	4.43E-02	25150	35384	40104
1044	6	2.01E-02	30124	35384	
24064	6	5.47E-02	25150	35384	40104
46182	6	4.20E-02	25150	35384	40104
42272	6	0.037030487	25150	35384	40104
42424	6	1.94E-02	25150	35384	40104
43092	8	0.57607282	25150	35384	40104
42060	6	0.023555481	25150	35384	40104
1107	6	3.50E-02	25150	35384	40104
40160	6	2.69E-02	25150	40104	
48048	6	3.71E-02	25150	35384	40104
17289	6	4.51E-02	25150	35384	40104
1244	6	2.51E-02	25150	35384	40104
33009	6	4.25E-02	25150	35384	40104
40020	6	0.010641681	25150	35384	40104
48144	6	0.018189831	30124	35384	
48100	6	0.020141004	25150	40104	
1300	6	5.91E-02	25150	35384	40104
17420	6	1.87E-02	30124	35384	
48214	6	2.91E-02	25150	35384	40104
24206	6	2.95E-02	30124	35384	
1292	6	3.11E-02	30124	35384	40104

Appendix F: Ruggiero 1996 Excel Solver

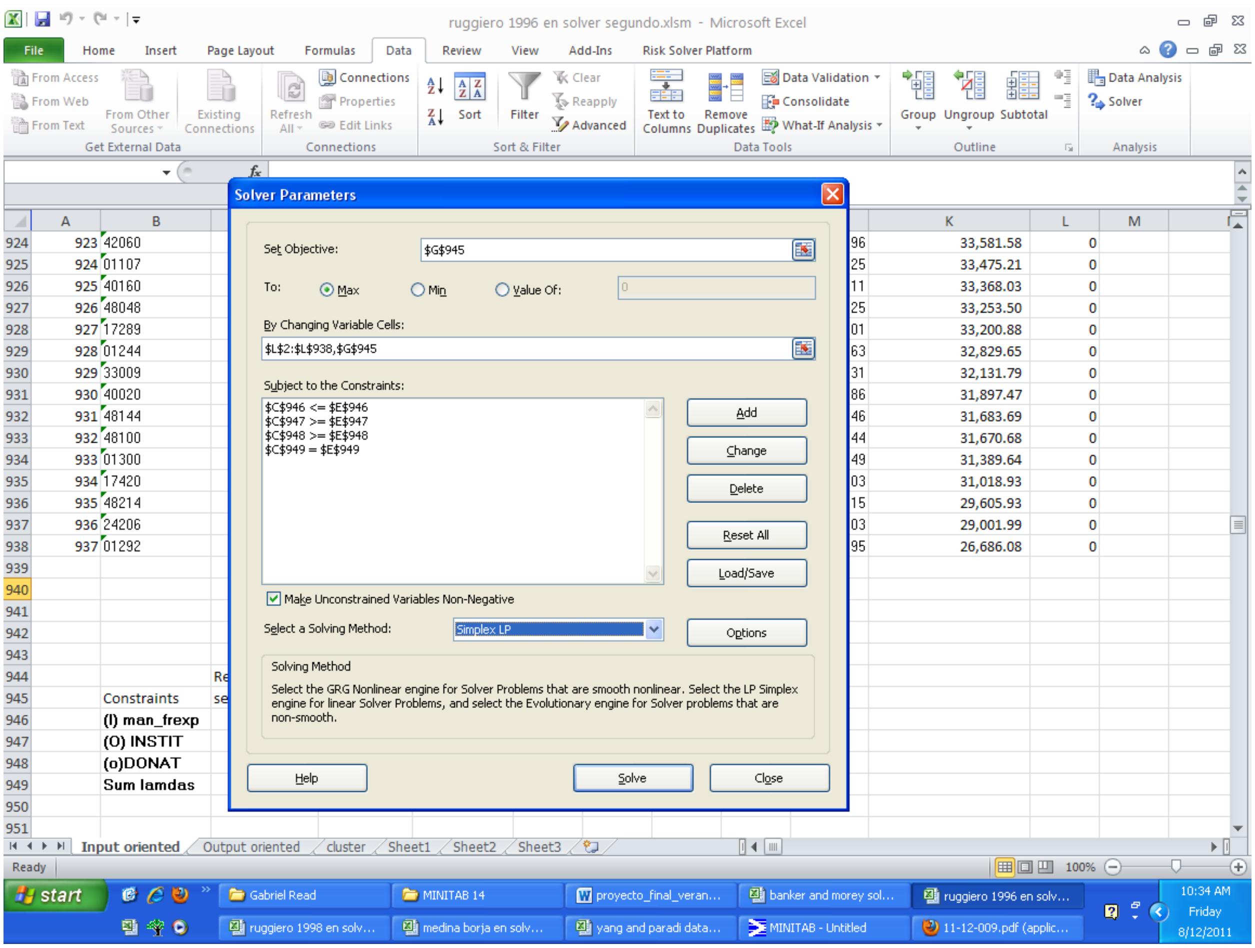
All models were resolve with the same approach

For the DEA reference set (left-hand-side of the envelopment model), we enter the following formulas that calculate the weighted sums of inputs and outputs across all DMUs, respectively.

Cell B946=SUMPRODUCT(C2:C938,$G$2:$G$938)
Cell B947 ==SUMPRODUCT(D2:D938,$G$2:$G$938)
Cell B948=SUMPRODUCT(E2:E938,$G$2:$G$938)
Cell B949 ==SUM(G2:G938)

For the DMU under evaluation, we enter the following formulas

Cell E946 =INDEX(C2:C938,F945,1)
Cell E947=$G$945*INDEX(D2:D938,F945,1)
Cell E948=$G$945*INDEX(E2:E938,F945,1)
Cell E949==1
Colum G=IF(AND(J816>INDEX($J$2:$J$938,$F$945),K816>INDEX($K$2:$K$938,$F$945)),0,L816)



Appendix G: Banker and Morey Excel Solver

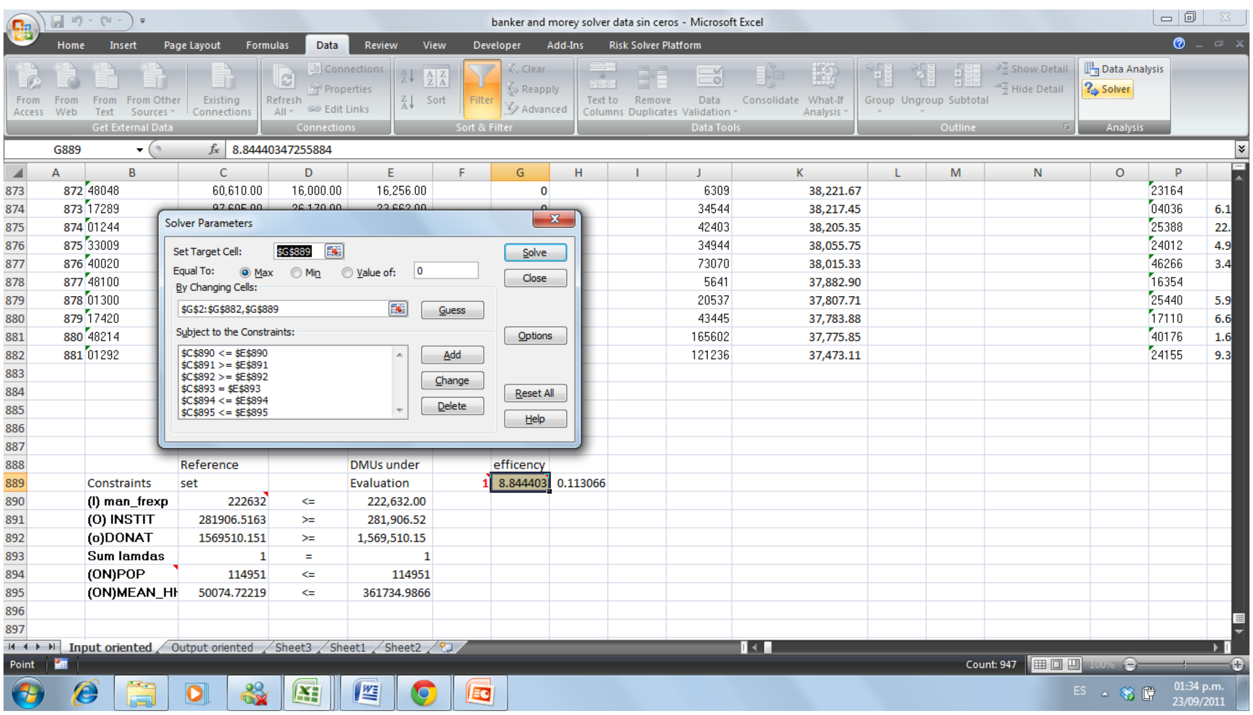
All models were resolve with the same approach

For the DEA reference set (left-hand-side of the envelopment model), we enter the following formulas that calculate the weighted sums of inputs and outputs across all DMUs, respectively.

Cell B946=SUMPRODUCT(C2:C938,$G$2:$G$938)
Cell B947 ==SUMPRODUCT(D2:D938,$G$2:$G$938)
Cell B948=SUMPRODUCT(E2:E938,$G$2:$G$938)
Cell B949 =SUM(G2:G938)
Cell B950=SUMPRODUCT(J2:J938,$G$2:$G$938)
Cell B951=SUMPRODUCT(K2:K938,$G$2:$G$938)

For the DMU under evaluation, we enter the following formulas

Cell E946 =INDEX(C2:C938,F945,1)
Cell E947=$G$945*INDEX(D2:D938,F945,1)
Cell E948=$G$945*INDEX(E2:E938,F945,1)
Cell E949=1
Cell E950=INDEX(J2:J938,$F$945,1)
Cell E951= INDEX(K2:K938,F945,1)



Appendix H: Ruggiero 1998 Regression results.

Regression Analysis: Score versus Population, Median household income

The regression equation is
Score = 0.0796 + 0.00000044 Population + 0.0000012 Median household income

Predictor	Coef	SE Coef	T	P
Constant	0.07961	0.01256	6.34	0.000
Population	0.00000012	0.00000001	19.18	0.000
Median household income	0.00000044	0.00000024	1.86	0.044

S = 0.122837   R-Sq = 29.8%   R-Sq(adj) = 29.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	5.9931	2.9965	198.59	0.000
Residual Error	934	14.0932	0.0151		
Total	936	20.0862			

Source	DF	Seq SS
Population	1	5.9411
Median household income	1	0.0520

Appendix I: Ruggiero 1998 Excel Solver

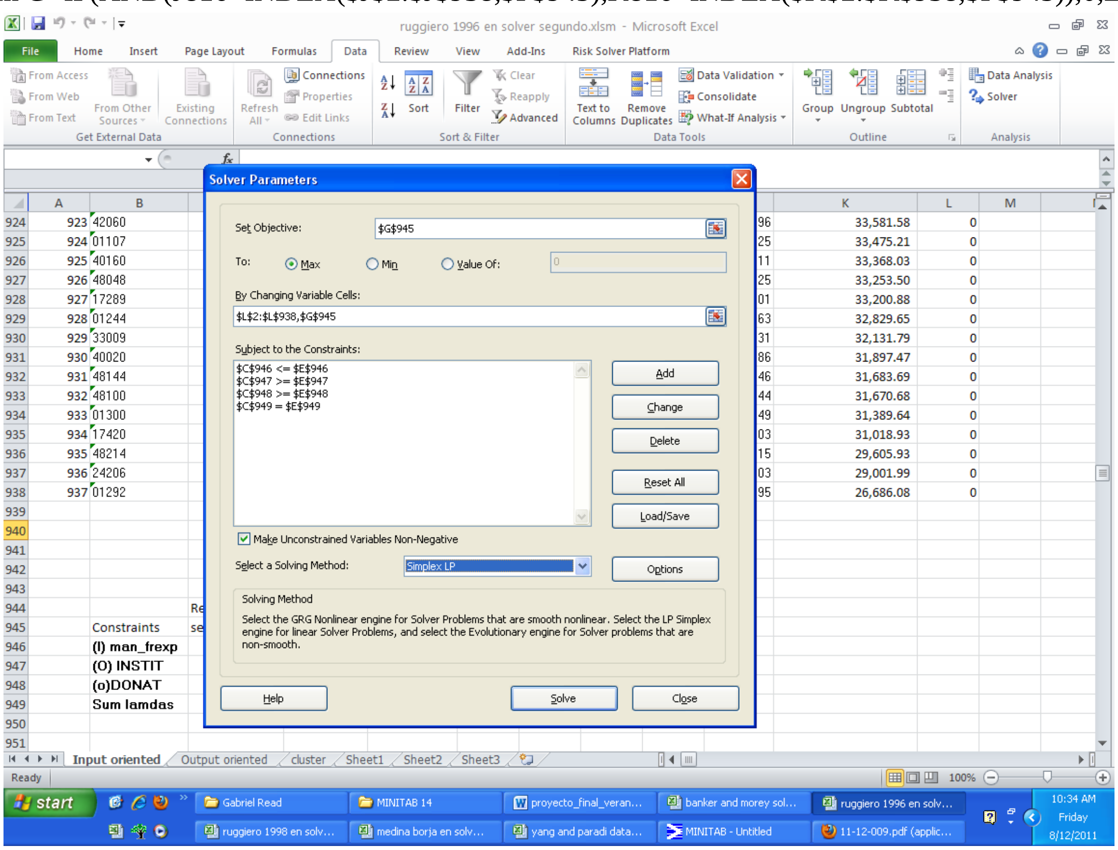
All models were resolve with the same approach

For the DEA reference set (left-hand-side of the envelopment model), we enter the following formulas that calculate the weighted sums of inputs and outputs across all DMUs, respectively.

Cell B946=SUMPRODUCT(C2:C938,$G$2:$G$938)
Cell B947 ==SUMPRODUCT(D2:D938,$G$2:$G$938)
Cell B948=SUMPRODUCT(E2:E938,$G$2:$G$938)
Cell B949 ==SUM(G2:G938)

For the DMU under evaluation, we enter the following formulas

Cell E946 =INDEX(C2:C938,F945,1)
Cell E947=$G$945*INDEX(D2:D938,F945,1)
Cell E948=$G$945*INDEX(E2:E938,F945,1)
Cell E949==1
Colum G=IF(AND(J816>INDEX($J$2:$J$938,$F$945),K816>INDEX($K$2:$K$938,$F$945)),0,L816)



Appendix J: Medina-Borja Excel Solver

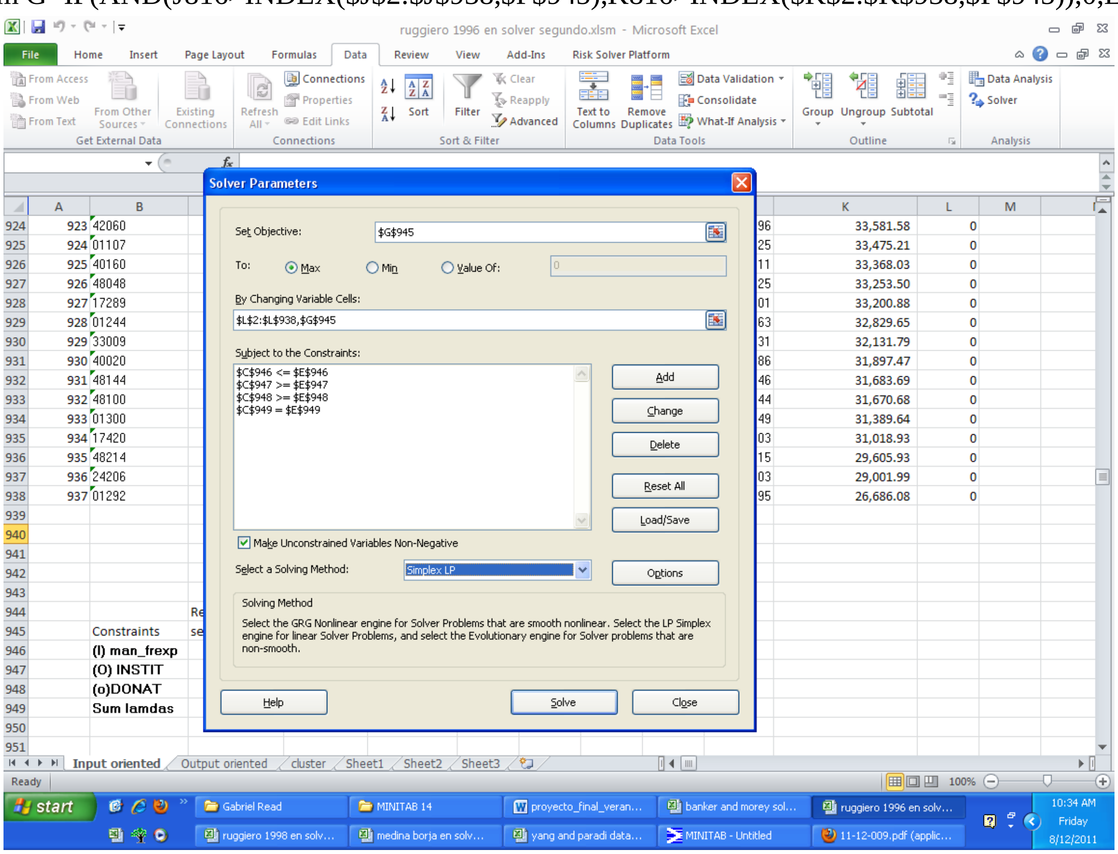
All models were resolve with the same approach

For the DEA reference set (left-hand-side of the envelopment model), we enter the following formulas that calculate the weighted sums of inputs and outputs across all DMUs, respectively.

Cell B946=SUMPRODUCT(C2:C938,$G$2:$G$938)
Cell B947 ==SUMPRODUCT(D2:D938,$G$2:$G$938)
Cell B948=SUMPRODUCT(E2:E938,$G$2:$G$938)
Cell B949 =SUM(G2:G938)
Cell B950=SUMPRODUCT(J2:J938,$G$2:$G$938)
Cell B951=SUMPRODUCT(K2:K938,$G$2:$G$938)

For the DMU under evaluation, we enter the following formulas

Cell E946 =INDEX(C2:C938,F945,1)
Cell E947=$G$945*INDEX(D2:D938,F945,1)
Cell E948=$G$945*INDEX(E2:E938,F945,1)
Cell E949=1
Cell E950=INDEX(J2:J938,$F$945,1)
Cell E951= INDEX(K2:K938,F945,1)
Colum G=IF(AND(J816>INDEX($J$2:$J$938,$F$945),K816>INDEX($K$2:$K$938,$F$945)),0,L816)



Appendix K: Yang and paradi Excel Solver

All models were resolve with the same approach

For the DEA reference set (left-hand-side of the envelopment model), we enter the following formulas that calculate the weighted sums of inputs and outputs across all DMUs, respectively.

Cell B946=SUMPRODUCT(C2:C938,$G$2:$G$938)
Cell B947 ==SUMPRODUCT(D2:D938,$G$2:$G$938)
Cell B948=SUMPRODUCT(E2:E938,$G$2:$G$938)
Cell B949 ==SUM(G2:G938)

For the DMU under evaluation, we enter the following formulas

Cell E946 =INDEX(C2:C938,F945,1)
Cell E947=$G$945*INDEX(D2:D938,F945,1)
Cell E948=$G$945*INDEX(E2:E938,F945,1)
Cell E949==1

Appendix L: VBA code solver automatization

```
Sub DEA1()


Dim DMUNo As Integer

For DMUNo = 1 To 937


Range("f945") = DMUNo

solveroptions assumelinear = True, assumenonneg:=True

SolverSolve UserFinish:=True


Range("q" & DMUNo + 1) = Range("g945")


Range("g2:g938").Select


Selection.Copy

Range("r" & DMUNo + 1).Select

Selection.PasteSpecial Paste:=xlPasteValues, Transpose:=True

Next DMUNo

End Sub
```

Appendix M: K-means example

Source (http://www.croce.ggf.br/dados/K%20mean%20Clustering1.pdf)

Suppose we have several objects (4 types of medicines) and each object have two attributes or features as shown in table below. Our goal is to group these objects into K=2 group of medicine based on the two features (pH and weight index).

Object	Feature 1 (X): weight index	Feature 2 (Y): pH
Medicine A	1	1
Medicine B	2	1
Medicine C	4	3
Medicine D	5	4

Each medicine represents one point with two features (X, Y) that we can represent it as coordinate in a feature space as shown in the figure below.

1. *Initial value of centroids*: Suppose we use medicine A and medicine B as the first centroids. Let $\mathbf{c}_1$ and $\mathbf{c}_2$ denote the coordinate of the centroids, then $\mathbf{c}_1 = (1,1)$ and $\mathbf{c}_2 = (2,1)$
2. *Objects-Centroids distance*: we calculate the distance between cluster centroid to each object. Let us use Euclidean distance, then we have distance matrix at iteration 0 is

$$\mathbf{D}^0 = \begin{bmatrix} 0 & 1 & 3.61 & 5 \\ 1 & 0 & 2.83 & 4.24 \end{bmatrix} \begin{matrix} \mathbf{c}_1 = (1,1) & group-1 \\ \mathbf{c}_2 = (2,1) & group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

$$\begin{bmatrix} 1 & 2 & 4 & 5 \\ 1 & 1 & 3 & 4 \end{bmatrix} \begin{matrix} X \\ Y \end{matrix}$$

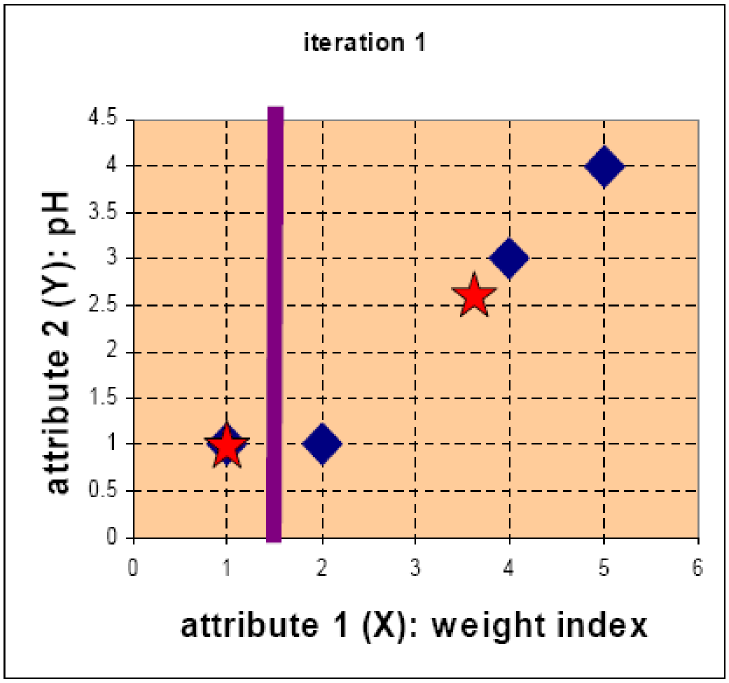
Each column in the distance matrix symbolizes the object. The first row of the distance matrix corresponds to the distance of each object to the first centroid and the second row is the distance of each object to the second centroid. For example, distance from medicine C = (4, 3) to the first centroid $\mathbf{c}_1 = (1,1)$ is $\sqrt{(4-1)^2 + (3-1)^2} = 3.61$, and its distance to the second centroid $\mathbf{c}_2 = (2,1)$ is $\sqrt{(4-2)^2 + (3-1)^2} = 2.83$, etc.

3. *Objects clustering*: We assign each object based on the minimum distance. Thus, medicine A is assigned to group 1, medicine B to group 2, medicine C to group 2 and medicine D to group 2. The element of Group matrix below is 1 if and only if the object is assigned to that group.

$$\mathbf{G}^0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix} \begin{matrix} group-1 \\ group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

4. *Iteration-1, determine centroids*: Knowing the members of each group, now we compute the new centroid of each group based on these new memberships. Group 1 only has one member thus the centroid remains in $\mathbf{c}_1 = (1,1)$. Group 2 now has three members, thus the centroid is the average coordinate among the three members: $\mathbf{c}_2 = (\frac{2+4+5}{3}, \frac{1+3+4}{3}) = (\frac{11}{3}, \frac{8}{3})$.



5. *Iteration-1, Objects-Centroids distances*: The next step is to compute the distance of all objects to the new centroids. Similar to step 2, we have distance matrix at iteration 1 is

$$\mathbf{D}^1 = \begin{bmatrix} 0 & 1 & 3.61 & 5 \\ 3.14 & 2.36 & 0.47 & 1.89 \end{bmatrix} \quad \begin{matrix} \mathbf{c}_1 = (1,1) & group-1 \\ \mathbf{c}_2 = (\frac{11}{3}, \frac{8}{3}) & group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

$$\begin{bmatrix} 1 & 2 & 4 & 5 \\ 1 & 1 & 3 & 4 \end{bmatrix} \quad \begin{matrix} X \\ Y \end{matrix}$$

6. *Iteration-1, Objects clustering:* Similar to step 3, we assign each object based on the minimum distance. Based on the new distance matrix, we move the medicine B to Group 1 while all the other objects remain. The Group matrix is shown below

$$\mathbf{G}^1 = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix} \quad \begin{matrix} group-1 \\ group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

7. *Iteration 2, determine centroids:* Now we repeat step 4 to calculate the new centroids coordinate based on the clustering of previous iteration. Group1 and group 2 both has two members, thus the new centroids are $\mathbf{c}_1 = (\frac{1+2}{2}, \frac{1+1}{2}) = (1\frac{1}{2}, 1)$ and $\mathbf{c}_2 = (\frac{4+5}{2}, \frac{3+4}{2}) = (4\frac{1}{2}, 3\frac{1}{2})$

8. *Iteration-2, Objects-Centroids distances*: Repeat step 2 again, we have new distance matrix at iteration 2 as

$$\mathbf{D}^2 = \begin{bmatrix} 0.5 & 0.5 & 3.20 & 4.61 \\ 4.30 & 3.54 & 0.71 & 0.71 \end{bmatrix} \quad \begin{matrix} \mathbf{c}_1 = (1\frac{1}{2}, 1) & group-1 \\ \mathbf{c}_2 = (4\frac{1}{2}, 3\frac{1}{2}) & group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

$$\begin{bmatrix} 1 & 2 & 4 & 5 \\ 1 & 1 & 3 & 4 \end{bmatrix} \begin{matrix} X \\ Y \end{matrix}$$

9. *Iteration-2, Objects clustering:* Again, we assign each object based on the minimum distance.

$$\mathbf{G}^2 = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix} \quad \begin{matrix} group-1 \\ group-2 \end{matrix}$$

$$\begin{matrix} A & B & C & D \end{matrix}$$

We obtain result that $\mathbf{G}^2 = \mathbf{G}^1$. Comparing the grouping of last iteration and this iteration reveals that the objects does not move group anymore. Thus, the computation of the k-mean clustering has reached its stability and no more iteration is needed. We get the final grouping as the results

Object	Feature 1 (X): weight index	Feature 2 (Y): pH	Group (result)
Medicine A	1	1	1
Medicine B	2	1	1
Medicine C	4	3	2
Medicine D	5	4	2

Appendix N: Environmental variables

DMU	ONPOP	HH	AGHHI	MEAN_HH_INC
01019	1019875	400903	19817760	49432.81
01032	111249	45079	1970804	43718.89
01044	24516	9986	349595	35008.51
01070	43582	17483	716582	40987.36
01084	37404	15603	548745	35169.2
01092	78324	31150	1197438	38441.03
01104	65869	25722	914211	35541.99
01107	20225	8167	273392	33475.21
01120	102829	41497	1687098	40655.9
01156	54636	21996	845537	38440.49
01168	88509	36454	1649494	45248.64
01176	119178	47487	2145259	45175.71
01180	67036	25273	1116422	44174.49
01192	362210	144112	7722205	53584.75
01208	545644	208275	9170456	44030.52
01212	24123	9363	344045	36745.17
01216	424264	160904	8232917	51166.64
01220	147079	57803	2679454	46354.93
01236	44368	15642	1142517	73041.62
01244	22763	8817	289459	32829.65
01248	49175	19590	794557	40559.32
01288	232613	91250	4176096	45765.44
01292	24095	8996	240068	26686.08
01300	18249	6796	213324	31389.64
01303	18223	6201	218251	35196.1
01304	36071	14565	591338	40599.93
01315	106203	42996	2100753	48859.27
02012	72670	27700	1921387	69364.15
02017	14015	4465	306557	68657.78
02030	383513	139579	9764212	69954.74
02032	94493	34119	2172401	63671.3
03008	3307316	1219669	69412074	56910.58
03060	1146726	445537	20928401	46973.43
03066	107221	31140	1372782	44084.2
04016	68173	28158	1116540	39652.67
04036	34544	13042	498432	38217.45
04044	91600	35428	1360617	38405.13
04100	88644	32894	1596307	48528.82
04108	89477	38379	1877896	48930.3

04116	73771	29655	1066409	35960.51
04142	83687	30339	1219547	40197.34
04236	76399	28879	1229234	42564.98
04244	448619	181152	9111515	50297.62
04296	74026	29444	1154958	39225.58
04304	363346	138487	6938608	50102.96
04308	68382	25611	988368	38591.54
05022	348739	110441	7625176	69042.98
05023	53958	19383	1659483	85615.38
05052	205238	73721	7045009	95563.12
05058	33862	14833	1409683	95036.94
05068	34217	11371	997002	87679.36
05088	27155	9019	402785	44659.61
05112	939205	293152	12964261	44223.68
05120	217650	80029	5211760	65123.39
05132	781264	259412	14944125	57607.69
05147	634740	197615	8511111	43069.15
05152	59581	24454	1126787	46077.82
05180	5849029	1967157	1.19E+08	60640.06
05220	233915	72070	3377733	46867.39
05232	378583	108921	7626475	70018.41
05264	2906259	950529	73059735	76862.18
05276	241212	81317	8816356	108419.59
05280	1434432	438592	27945062	63715.39
05300	232128	65250	4050511	62076.8
05310	467786	175291	12374727	70595.34
05314	686628	195886	10167301	51904.17
05324	1605209	523562	28667286	54754.33
05332	1851599	688771	40395047	58648.01
05340	56578	16804	1031084	61359.44
05344	694133	211309	10594575	50137.83
05348	3006996	1049392	67965483	64766.53
05360	580622	186669	10445936	55959.67
05368	251601	94615	5646423	59677.88
05376	403301	137457	8430119	61329.14
05378	1466927	491379	51932463	105687.18
05380	259423	92207	6593222	71504.57
05388	84357	44592	3384303	75894.85
05404	211165	79028	3972511	50267.13
05414	126431	46039	3158137	68596.99
05416	43168	18102	742845	41036.63

05428	459919	148701	7784387	52349.26
05468	769687	248029	17760209	71605.37
05483	79931	32524	1953481	60062.75
05492	134159	47010	2430816	51708.49
05495	316902	105097	5368052	51077.12
05496	67163	23312	906630	38891.13
05497	674044	199428	11757743	58957.33
05503	4594335	1703779	1.4E+08	81882.76
06140	45169	17959	899452	50083.63
06144	562717	210296	11633327	55318.82
06164	223297	86829	5138434	59178.78
06166	2552428	1001592	65714019	65609.57
06204	643124	237169	13475125	56816.55
06216	167383	64920	2931671	45158.21
06222	46848	17690	705709	39893.1
07020	235010	85177	8079689	94857.64
07028	19853	6675	1183355	177281.65
07038	1019186	395374	27294983	69035.86
07040	61700	23569	3480301	147664.35
07054	94975	36968	2526125	68332.75
07064	152818	59246	6612172	111605.37
07068	52608	21201	1456290	68689.68
07072	36436	14030	870032	62012.26
07078	19656	6919	1069186	154528.98
07113	283951	109934	6583970	59890.21
07114	526394	203991	13512364	66240
07115	310364	112928	8227599	72857.03
07124	118458	46174	4241057	91849.46
07144	199462	77595	4643137	59838.1
07152	135814	51633	5863131	113553.95
08004	933717	359778	21761439	60485.74
09004	1601007	623865	54813334	87860.89
10004	221296	88954	3945492	44354.3
10022	482104	200818	9865160	49124.88
10024	1670921	671281	36149672	53851.77
10029	1486923	555737	32195307	57932.63
10030	144290	65115	3773445	57950.47
10048	263772	108125	7131095	65952.32
10060	2381010	826002	39941275	48354.94
10061	1298786	544848	25603380	46991.78
10090	493268	190892	7768179	40694.1

10091	2309102	970979	46841814	48241.84
10120	312220	128985	7403772	57400.26
10164	455209	194837	10548371	54139.47
10180	271494	115551	5335252	46172.27
10188	129635	56594	3434698	60690.14
10198	1071025	397236	26364763	66370.53
10228	1241393	512094	30002862	58588.58
10240	628640	242454	11662071	48100.14
10276	364404	163468	8871028	54267.67
10296	382070	148258	7794162	52571.61
11004	125225	45609	2123795	46565.26
11008	33480	12185	495597	40672.71
11024	291236	106181	5777906	54415.63
11054	79495	28492	1287619	45192.3
11072	57249	21341	887832	41602.17
11134	42802	15812	643096	40671.39
11148	93729	33111	1928288	58237.08
11164	85105	29901	1476280	49372.26
11184	45313	17341	705735	40697.48
11189	313858	117843	5267809	44701.93
11242	68006	27526	1551749	56373.94
11256	58657	21694	959327	44220.84
11298	160443	58675	2841122	48421.34
11364	247182	93562	4640933	49602.76
11378	3735139	1371820	92076980	67120.31
11408	38289	13967	584921	41878.79
11412	225991	82296	4181247	50807.41
11418	394896	141454	7394237	52273.09
11468	91866	34592	1630221	47127.11
11472	295541	112455	5886848	52348.48
11512	43987	16903	673911	39869.31
11516	38724	14086	619813	44002.06
11530	84327	32266	1319668	40899.65
11540	27771	10831	422938	39048.84
11542	97050	34461	1624728	47146.86
11552	65304	22998	1150539	50027.79
12024	1299824	472949	22977252	48582.94
13004	67991	26748	1342982	50208.69
13012	173107	67359	3402094	50506.9
13036	35418	14157	633797	44769.16
13052	21519	8339	435184	52186.59

13054	382515	149887	7650030	51038.65
13056	198637	78229	4275157	54649.26
13096	91022	32408	1656692	51119.85
13112	19473	7777	309765	39830.91
13120	34473	13102	649200	49549.69
13140	119190	40931	3670219	89668.44
13148	45077	17705	717664	40534.54
13164	38107	14522	799722	55069.69
13172	20093	8065	338285	41944.82
13186	56386	22402	1103128	49242.39
13188	31642	12337	536360	43475.72
13200	40126	15414	682057	44249.19
13204	21276	7962	361339	45382.94
13216	103482	38071	1836508	48239.03
13224	63459	25198	1159686	46022.94
13232	35914	13211	599572	45384.3
13240	33634	12186	574030	47105.7
13260	113983	46312	2269145	48996.91
13287	32778	12310	554809	45069.78
13288	53357	21140	952057	45035.81
13290	157142	59348	3499819	58971.14
13302	8126020	2914729	1.99E+08	68320.34
13316	55804	21589	1001932	46409.38
13328	67183	27384	1315286	48031.19
13348	17217	6807	263295	38680.04
13364	324478	129636	6615347	51030.17
13378	369965	141164	7368780	52200.14
13392	347277	139289	7260121	52122.72
13424	48569	19039	862786	45316.77
13428	23800	9522	398204	41819.37
13448	83292	33178	1503701	45322.23
14004	33812	11955	552376	46204.6
14006	429210	166948	8653352	51832.62
14010	87558	34503	1905472	55226.27
14026	484214	182824	8719318	47692.41
14032	41258	15926	687042	43139.65
14036	97794	39625	2010106	50728.23
14066	52529	19454	1017055	52279.99
14084	186360	67751	3545735	52334.8
14088	192300	78709	3954959	50247.86
14116	32773	13042	593268	45489.04

14124	72876	28322	1305798	46105.43
14128	33230	13490	585754	43421.35
14156	101785	41682	2027099	48632.48
14160	38179	14383	738009	51311.2
14164	1341374	530391	31772529	59903.97
14168	41623	16281	757815	46545.97
14180	31941	12327	569217	46176.44
14196	54255	21784	933721	42862.7
14200	75173	27853	1456655	52297.96
14208	110211	41361	2154047	52079.18
14212	46032	18737	858595	45823.5
14220	133260	53407	2413256	45186.14
14224	45457	16731	875845	52348.63
14244	121341	47595	2420462	50855.38
14248	37811	14743	705290	47838.97
14256	159891	64083	3031377	47303.92
14296	148383	55679	3397181	61013.69
14300	27192	10322	515721	49963.28
14308	36580	12673	608816	48040.4
14316	26782	10003	445022	44488.85
14328	266469	101701	5056552	49719.79
14364	150747	56317	3156995	56057.58
14384	34955	13307	605376	45493.05
14386	161124	62161	2954154	47524.24
14392	53237	19901	1181238	59355.71
14400	78190	31376	1350939	43056.44
15048	21202	7999	321233	40159.14
15068	14651	6122	259061	42316.4
15072	18255	7192	338375	47048.8
15080	511480	200739	12121861	60386.18
15084	12911	5344	213120	39880.24
15112	61850	24678	1142816	46309.1
15140	42109	17214	777209	45149.82
15148	100334	38159	1882837	49341.89
15162	16760	6629	264024	39828.63
15198	361129	143568	7815771	54439.51
15226	207157	81150	3769281	46448.32
15236	10527	4373	184175	42116.4
15241	44842	18882	919886	48717.61
15308	21782	8678	345129	39770.57
15320	87740	34098	1639153	48071.82

15348	54115	20477	1059510	51741.47
15394	103329	39664	1830271	46144.39
15412	13144	5176	207618	40111.67
15422	203409	75641	3508914	46389.05
15431	18766	7517	320720	42665.96
15436	117643	44460	2192912	49323.26
15448	45647	17347	664142	38285.7
15468	47683	19497	793381	40692.47
15476	20813	8130	346722	42647.23
15488	67772	27127	1169292	43104.36
16004	19410	7955	333787	41959.4
16016	16346	6570	296141	45074.73
16020	46439	17778	697118	39212.4
16034	67569	24971	1307790	52372.35
16036	15425	6199	253406	40878.53
16048	22767	9504	367757	38694.97
16066	31924	10853	523386	48225.01
16072	9105	3752	164085	43732.68
16108	101357	39222	1937153	49389.45
16120	27373	11198	530175	47345.51
16144	27743	10425	488221	46831.75
16146	49106	20185	843614	41794.1
16213	244005	97219	5017654	51611.87
16214	33108	11033	556807	50467.42
16228	22587	9131	363935	39857.08
16236	69360	23423	1309181	55892.97
16252	36166	13810	659366	47745.55
16272	29176	10699	518876	48497.62
16274	530658	207074	10482085	50620
16292	34928	14103	547856	38846.77
16298	53655	21524	1065597	49507.39
16299	19629	7389	324168	43871.7
16320	5937	2481	101232	40802.9
16324	53712	22189	875506	39456.76
16340	64832	25605	1251308	48869.67
16352	62750	22244	1088224	48922.14
16354	5641	2357	89290	37882.9
16364	41706	13334	651647	48871.08
16398	43086	16427	737096	44871.01
16416	8147	3229	140562	43531.12
16452	157852	59777	2429505	40642.81

17028	36713	14798	550053	37170.77
17040	142595	55702	2203310	39555.31
17046	110317	43652	1922961	44052.07
17048	345877	142699	7650734	53614.49
17052	141806	54804	2500546	45627.07
17056	49455	20002	852165	42603.99
17072	19064	7530	268146	35610.36
17088	34381	14035	598759	42661.85
17110	43445	17055	644404	37783.88
17120	72100	24890	1081224	43440.1
17184	48335	20305	1158616	57060.63
17204	50256	20418	729058	35706.63
17216	36773	14592	595235	40791.87
17240	74493	29493	1220091	41368.83
17252	46281	18829	782362	41550.91
17289	120101	48881	1622892	33200.88
17336	26717	10615	378414	35648.99
17340	1046719	418888	21302689	50855.33
17372	47825	19336	787254	40714.42
17380	16703	6848	266321	38890.33
17381	65423	27849	1373825	49331.21
17420	14003	4806	149077	31018.93
17428	38634	14480	580528	40091.71
17496	34636	12636	658222	52091.01
17520	12916	5374	210668	39201.34
17552	23460	9044	542589	59994.36
18006	478254	177508	7533247	42438.92
18040	270785	100308	4332684	43193.8
18050	315757	115146	4424206	38422.58
18125	735644	267640	12274111	45860.53
18142	543208	207412	9225517	44479.19
18144	310532	115246	4499442	39042.07
18172	66619	25024	1302901	52066.06
18206	1667038	624728	28853774	46186.14
19001	261617	107186	4791115	44699.07
19010	82525	34001	1640627	48252.32
19052	116430	49173	2222061	45188.64
19096	279757	114643	4773847	41640.98
19104	245344	100693	5509606	54716.87
19112	171109	68736	3531079	51371.61
20004	130951	51532	2110277	40950.81

20012	2530514	971484	62798501	64641.83
20016	77342	26538	1956365	73719.38
20032	123831	43107	2988934	69337.56
20044	201223	72578	4844976	66755.44
20064	811290	291626	19599685	67208.29
20072	87519	31340	1906166	60822.14
20084	132918	50426	2463706	48857.85
20088	158455	61720	3086202	50003.27
21036	134396	55898	2774260	49630.76
21064	237680	101121	6349994	62796
21066	646812	245498	15359805	62565.91
21114	33818	14025	884568	63070.8
21115	79293	30938	2506433	81014.71
21125	605266	215720	14707453	68178.44
21127	58571	23156	1727958	74622.47
21134	119992	43538	2548854	58543.2
21156	278280	107197	6171960	57575.86
21188	15349	6559	365862	55780.15
21244	825809	302359	19433692	64273.57
21254	425001	163969	8251257	50322.05
21336	56206	20850	1133714	54374.77
21501	2693799	1058195	82187071	77667.23
22020	251933	103633	5100453	49216.49
22036	109743	43920	2024561	46096.56
22044	162604	63784	3016306	47289.38
22052	138175	54271	2599169	47892.41
22072	38624	13545	650493	48024.58
22108	527317	202315	11030935	54523.56
22124	101079	39871	2307728	57879.86
22164	96075	35828	1663421	46427.96
22168	207094	76469	3820634	49963.17
22172	354320	137708	7282247	52881.8
22178	764655	281045	16484243	58653.39
22192	99618	36325	1884181	51870.09
22196	163693	57913	4403819	76041.98
22216	122264	49386	2366742	47923.34
22220	65292	26517	1197827	45172.04
22224	64586	24184	1099812	45476.84
22232	109845	42833	2434680	56841.22
22234	561765	214429	11353537	52947.77
22240	147453	54514	2906674	53319.77

22252	247558	91863	4176933	45469.16
22288	250807	86155	5336670	61942.66
22300	209252	80348	3776956	47007.47
22304	166016	62908	3192871	50754.61
22322	4039394	1549744	99499500	64203.83
22328	76453	28100	1209525	43043.59
22332	331453	129077	9265917	71785.96
23028	98455	36943	1883381	50980.73
23032	28614	11290	521792	46217.18
23044	73329	25529	1764417	69114.22
23050	234092	83827	4744672	56600.76
23072	84442	34267	1758008	51303.24
23084	33433	13625	653275	47946.79
23092	16037	6631	263855	39791.13
23100	32550	13431	621820	46297.37
23104	44454	17210	835886	48569.79
23136	41041	15973	768678	48123.58
23144	14121	6005	279297	46510.74
23164	6309	2621	100179	38221.67
23168	25460	9784	458709	46883.59
23184	21574	9032	382693	42370.79
23186	35028	13586	677148	49841.6
23190	88480	35268	1642224	46564.14
23193	1529622	605802	42462526	70093.08
23200	38928	15785	733072	46441.05
23212	39592	15528	659236	42454.66
23222	304934	126415	6158418	48715.88
23260	17133	6815	273130	40077.77
23264	81148	28283	1539272	54423.93
23280	1028908	392340	29207490	74444.33
23294	166568	64072	4095107	63914.14
23304	34319	13167	691921	52549.63
23308	9949	3728	144244	38692.06
23332	19675	7159	327522	45749.69
23336	165110	61323	3873877	63171.68
23348	50239	18986	921900	48556.83
23352	93976	33073	1937803	58591.69
24008	33938	13571	489884	36097.86
24012	34944	14439	549487	38055.75
24045	502935	183218	9507613	51892.35
24064	41516	15498	540289	34861.85

24136	152609	55307	2742829	49592.8
24155	121236	45292	1697232	37473.11
24158	157243	60044	2452391	40843.23
24180	125585	48530	2095539	43180.28
24189	86063	32733	1197529	36584.76
24192	99426	37501	1750869	46688.59
24205	285629	108556	5130620	47262.43
24206	49903	16575	480708	29001.99
24224	43633	16311	686134	42065.72
24277	184909	68305	2977607	43592.81
24304	25814	9981	371957	37266.51
24306	61469	22486	1053772	46863.47
24316	96015	31424	1161386	36958.57
25004	25078	9745	424545	43565.42
25016	38013	14673	587037	40007.97
25036	137896	54247	3085191	56873.03
25040	161243	61450	2654312	43194.66
25052	32370	11338	507216	44735.93
25060	69252	27296	1437079	52647.97
25062	109621	41267	2430596	58899.27
25108	21865	8521	314098	36861.64
25150	1468930	583284	34501867	59151.06
25152	242598	99200	5311552	53543.87
25164	22295	9286	347372	37408.14
25180	37639	14968	579003	38682.72
25212	33206	12695	533119	41994.41
25252	28011	10992	437605	39811.23
25288	50719	19450	884559	45478.61
25320	39788	15753	690571	43837.43
25352	34509	13118	571140	43538.65
25380	2221771	870444	49672941	57066.21
25388	42403	16659	636463	38205.35
25440	20537	8014	302991	37807.71
25470	121338	48049	2048157	42626.42
26036	114951	45043	16293629	361734.99
27004	47136	18826	870953	46263.31
27012	7047	2816	103784	36855.11
27034	11872	4699	213241	45380.08
27044	59325	22702	1075778	47386.93
27088	11705	4813	176258	36621.23
27100	24601	8887	379728	42728.48

27144	16889	7073	294269	41604.55
27148	23058	9392	382287	40703.47
27172	63022	23972	1168328	48737.19
27186	637332	245962	13701846	55707.17
27234	254685	101487	5728832	56448.92
27240	34809	14242	641263	45026.19
27252	41706	15808	745392	47152.83
27270	44784	18080	804707	44508.13
27300	56526	21530	966156	44874.87
27384	9574	3348	120435	35972.22
27396	14454	5697	240484	42212.39
28016	1472443	549553	30076754	54729.49
28066	522899	202511	11483176	56703.96
29010	121922	48400	2629091	54320.06
29020	161469	62579	3815232	60966.65
29024	18108	7851	425118	54148.26
29032	110071	43998	2326544	52878.4
29036	12888	2965	195162	65821.92
29042	140876	58317	2995943	51373.41
29044	272130	102013	6774899	66412.11
29092	190149	71841	5305855	73855.53
30004	402001	145179	7475684	51492.87
30036	427757	156340	11378629	72781.3
30040	508256	185670	11580044	62368.96
30044	102617	42315	2405052	56836.87
30067	1254064	433560	28614395	65998.7
30076	257992	92043	5726891	62219.73
30088	124023	44447	4120126	92697.5
30110	19982	7069	994722	140716.08
30116	1145299	431906	31315122	72504.48
30120	46576	17575	1845861	105027.65
30124	410913	148797	15302627	102842.31
30140	890717	333095	29583178	88813.04
30172	513213	179735	12690410	70606.23
30176	1137854	405748	32633069	80426.94
30190	200117	74440	7529640	101150.46
30196	63956	24191	1169834	48358.23
30213	55632	19818	2232322	112641.13
30216	70210	26090	2869135	109970.68
30220	146171	51624	4034327	78148.28
30244	36320	13081	1618221	123707.74

31008	60759	22374	943065	42150.04
31016	64122	23917	1007908	42141.91
31024	176977	60442	2377619	39337.2
31053	55314	19700	833604	42314.92
31061	721073	278771	13980247	50149.57
31090	99843	34106	1579070	46298.89
31096	150407	61295	3568955	58225.87
32002	340574	132966	7514542	56514.76
32004	847187	339822	18112434	53299.77
32010	46966	16917	696826	41190.87
32036	306835	122028	5952831	48782.5
32048	81705	30530	1423698	46632.75
32060	138899	54231	2266197	41787.85
32064	109842	42315	1910822	45157.08
32072	17979	6458	290623	45002.01
32076	154982	56642	2687854	47453.37
32088	97447	38634	1733297	44864.55
32092	48419	18178	849590	46737.26
32102	284501	101191	7242871	71576.24
32105	83065	32111	1612532	50217.43
32106	111201	40318	1770654	43917.21
32120	59986	22663	1143910	50474.78
32124	65386	24746	1134453	45843.89
32140	1063827	425400	21466968	50463.02
32176	138064	49904	2212623	44337.59
32208	81012	29965	1426829	47616.52
32216	44080	15343	663776	43262.46
32221	62154	24794	1054956	42548.84
32236	1344534	450226	42121508	93556.37
32248	102163	41622	1836811	44130.77
32256	50739	17403	848482	48754.93
32336	710260	278536	18633274	66897.18
32340	66205	25255	1186034	46962.34
32380	2247	1003	68749	68543.37
32397	1433968	474268	37509435	79089.11
32400	579651	226487	12139430	53598.79
32404	96623	36552	2051068	56113.7
32416	179322	68234	3801339	55710.34
32420	158914	61409	2992658	48733.22
32422	25567	10419	455518	43719.93
32440	93783	34963	1718192	49143.15

32442	932355	339868	31080452	91448.6
32449	43215	14866	697392	46911.88
32450	24634	9031	406144	44972.21
32500	8922583	3323900	1.94E+08	58449.49
33008	158041	61745	2821028	45688.36
33009	22931	8832	283788	32131.79
33029	263721	109079	5398294	49489.76
33040	45147	18446	766614	41559.9
33064	90376	35015	1476504	42167.76
33068	146595	55579	2922088	52575.4
33072	78508	31245	1271011	40678.86
33088	179696	70445	3231420	45871.53
33092	120464	46849	2550117	54432.69
33120	97771	37650	1586772	42145.34
33130	175456	69717	3634042	52125.62
33132	386678	137993	6062566	43933.87
33152	278746	108481	6050748	55777.03
33168	192411	74875	3632165	48509.72
33181	848001	332536	21083283	63401.51
33188	341290	137430	8328862	60604.39
33200	223642	84345	3613176	42838.06
33208	91428	38390	2036861	53057.07
33216	132201	52242	2558400	48972.09
33252	49549	18634	916776	49199.1
33256	59371	23780	1103774	46416.06
33260	129352	50981	2334026	45782.27
33264	65232	24597	1174185	47736.92
33284	25478	9994	373450	37367.42
33290	42787	16894	646044	38241.03
33304	76472	31436	1708559	54350.39
33322	428521	172292	9221338	53521.57
33324	152275	48887	2316414	47383.03
33334	76532	30020	1477309	49210.83
33344	36349	14401	610765	42411.29
33348	136168	53575	2596022	48455.85
33352	18773	8109	372118	45889.51
33356	160240	62610	2786799	44510.45
33360	92201	37149	1502631	40448.76
33380	109248	41066	3367480	82001.66
33382	120210	46045	2077845	45126.4
33384	63566	25494	1081564	42424.26

33396	36157	13486	562123	41681.97
33408	58743	22476	975139	43385.79
33412	71981	28725	1153930	40171.63
33424	29728	12521	619610	49485.66
33430	723331	278209	19300343	69373.54
33432	131899	46282	2483170	53653.04
33436	43652	16487	667055	40459.45
33452	43125	16760	766726	45747.37
33456	113805	42835	1920783	44841.44
33457	54805	23479	1002257	42687.38
33464	77462	31786	1178213	37067.04
33468	331834	136686	7059398	51646.83
33472	93554	35640	1596748	44802.13
34026	24015	9916	430801	43445.04
34032	95274	38115	1962754	51495.58
34072	85534	33369	1557788	46683.69
34116	8414	3283	175919	53584.83
34118	176875	71571	3916929	54727.88
34180	22305	8871	418424	47167.62
34204	58158	22962	1071965	46684.3
34210	24982	9642	396215	41092.62
35012	111579	41829	2028972	48506.35
35016	66844	25365	1097145	43254.29
35020	52786	19594	922745	47093.24
35024	102730	39349	1604618	40779.13
35028	62790	22724	982959	43256.42
35040	27820	11472	453581	39538.09
35060	204400	80548	3892252	48322.14
35068	39209	15068	755938	50168.44
35072	1562637	614252	34330223	55889.48
35076	143969	56297	2645715	46995.67
35086	1151422	468366	25543831	54538.18
35092	36802	14387	587080	40806.28
35096	22243	8905	384009	43122.85
35100	10901	4241	219546	51767.51
35104	53177	20376	949217	46585.05
35106	744454	298314	15346486	51444.07
35108	39197	15024	707014	47058.97
35112	118215	42598	3175812	74553.08
35136	125109	46202	2860693	61917.08
35142	136170	52801	2557329	48433.34

35144	13860	5536	213933	38643.97
35152	42335	15562	767546	49321.81
35156	13552	5685	230145	40482.85
35168	1476546	598574	30708427	51302.64
35170	615899	243780	12731783	52226.53
35180	218223	76853	4814603	62646.91
35184	68156	26650	1401217	52578.5
35188	31946	11946	504091	42197.47
35196	29089	10884	525155	48250.18
35212	39144	11377	483448	42493.45
35224	72704	29922	1246988	41674.62
35228	55249	20213	940863	46547.42
35232	227324	89621	5259139	58681.99
35240	149079	56944	3174658	55750.53
35244	46115	17980	812487	45188.38
35248	285799	106270	5682620	53473.42
35256	281847	112623	5164856	45859.69
35260	65639	24335	1123674	46175.22
35272	131813	47074	3107257	66007.92
35280	40886	14749	736774	49954.17
35284	99329	38605	2048780	53070.33
35288	75691	30219	1549269	51268.04
35308	32321	11747	545769	46460.29
35311	126401	49605	2190147	44151.74
35312	133958	50996	2154487	42248.16
35318	72378	27207	1174524	43169.92
35321	54949	20639	792833	38414.31
35332	52841	17619	866529	49181.51
35344	153055	56869	2901108	51013.87
35352	34742	12218	674740	55225.08
35356	127649	49014	2250259	45910.54
35360	73437	27143	1189148	43810.49
35368	65503	25243	1130656	44790.87
35373	106411	41083	1590340	38710.42
35384	516516	206523	11512371	55743.77
35392	183281	72435	3313916	45750.2
35400	40917	14335	774395	54021.28
35404	26194	10230	468786	45824.63
35412	22905	8793	533051	60622.2
35420	52058	20348	929270	45668.86
35424	112556	40720	2051419	50378.66

35436	39200	15099	748844	49595.6
35438	129756	51071	2654173	51970.26
36020	49008	18820	744863	39578.27
36044	91256	36109	1475690	40867.65
36064	266609	101995	5489320	53819.5
36072	122325	42747	1955534	45746.7
36080	15040	5659	217124	38367.91
36104	80896	31639	1357660	42910.96
36144	47297	18039	718168	39811.96
36176	34636	12685	615013	48483.48
36208	69447	26517	1132088	42692.91
36232	711983	286911	12336495	42997.64
36244	33658	13150	552712	42031.33
36252	80045	31418	1435988	45705.9
36256	242715	93946	3444115	36660.58
36264	35368	14082	576813	40961.01
36268	102960	38809	1550974	39964.29
36296	49615	20047	875192	43657.01
36300	29908	10914	443510	40636.8
36308	790082	310862	15483759	49809.11
36316	49082	20253	1110838	54848.07
36322	18404	7243	265046	36593.4
36328	18301	7084	318857	45010.87
37004	41054	16648	734636	44127.58
37036	121269	48214	2565582	53212.39
37056	20680	7354	319553	43452.95
37060	261164	104763	5089837	48584.3
37072	72764	29114	1282788	44060.86
37080	325581	132343	5748965	43439.89
37104	1623899	638021	37952133	59484.14
37120	71772	25712	1173804	45651.99
37128	7126	3007	122708	40807.45
37132	47335	18804	770527	40976.76
37142	353434	127310	6844045	53758.9
38004	84303	30916	1580001	51106.26
38008	71987	28895	1207283	41781.73
38012	179292	71838	3233474	45010.64
38024	377870	143143	7405985	51738.37
38032	128071	51171	2185129	42702.49
38036	43466	16897	760973	45035.98
38038	61442	24080	956229	39710.51

38040	52865	20364	870135	42729.08
38052	175851	66631	3418764	51308.91
38068	21324	8685	347606	40023.72
38081	106726	39334	2093407	53221.31
38082	53942	21705	1010294	46546.6
38088	34696	13925	511289	36717.34
38096	12693	4836	191765	39653.64
38098	91776	34495	1763439	51121.58
38100	21354	8331	509391	61144.04
38108	25501	10306	512034	49683.1
38116	271366	102715	5074893	49407.52
38132	96225	37804	1802416	47677.92
38152	24638	10162	416804	41015.94
38160	49005	19436	987226	50793.68
38168	70464	29201	1200881	41124.65
38180	89236	34084	1480279	43430.32
38194	235760	93186	3857022	41390.57
38196	937772	360151	19865104	55157.71
38204	94174	36968	1585359	42884.63
38208	120835	46829	2217694	47357.28
38212	635868	246605	13328034	54046.08
38216	374774	137380	10196362	74220.13
38220	119436	46844	2053828	43843.99
38236	119543	46477	1981549	42635.05
38240	26423	10464	508821	48625.86
38248	21171	8555	338615	39580.95
38256	153003	54474	3289807	60392.24
38292	193593	75222	3218362	42784.85
38300	1427727	596152	30528704	51209.6
38328	40235	16292	661511	40603.42
38332	196176	79355	3544042	44660.6
38352	37427	13637	577996	42384.4
38360	3378116	1286377	79898760	62111.46
38364	184214	74653	3031734	40611.01
38368	160950	58825	2988245	50798.9
38380	29419	12076	506015	41902.53
38384	37684	14754	678402	45980.89
38388	41303	15939	670650	42076.04
38400	41741	13239	722700	54588.72
38412	40937	16610	716274	43123.06
38420	87440	33569	1678081	49989.01

38424	32600	12702	630381	49628.48
38428	294283	119590	5576840	46633
38436	27887	10727	507738	47332.71
38440	249541	102131	4302896	42131.15
38444	345191	133865	7346972	54883.44
39004	1100769	431791	24317445	56317.63
40008	144443	56675	2943688	51939.8
40016	195116	77509	3395064	43802.19
40020	16586	6154	196297	31897.47
40032	167925	62307	3409143	54715.25
40048	556391	212266	11681959	55034.53
40050	798707	301807	15877619	52608.52
40056	34444	13117	509440	38838.15
40100	57109	22384	1032977	46148.01
40104	458698	180519	8957993	49623.55
40108	66625	25994	1160525	44645.88
40116	194005	73801	3349183	45381.27
40120	205247	85989	4572036	53170.01
40128	54126	20890	954978	45714.6
40136	61944	23575	985069	41784.48
40160	28611	10480	349697	33368.03
40172	67385	27957	1238050	44284.08
40176	165602	62401	2357251	37775.85
40184	112441	42194	1938606	45945.06
40186	286553	111578	5232608	46896.41
40196	170088	63458	3389588	53414.67
41016	89210	35087	1887325	53789.87
41024	28608	10878	481431	44257.31
41028	35152	14603	695667	47638.64
41072	22039	8796	339813	38632.67
41168	17057	6800	303718	44664.41
41208	177813	69164	3952055	57140.35
41214	19319	7690	427796	55630.17
41284	21680	8231	414503	50358.77
42012	16615	6943	254160	36606.65
42020	107943	43782	2184875	49903.5
42028	29583	11891	422204	35506.18
42036	309227	125736	6891452	54808.9
42048	138524	49900	2354410	47182.57
42056	100704	39582	1891253	47780.63
42060	34096	14091	473198	33581.58

42061	94361	36860	1647751	44702.96
42068	48185	20250	878116	43363.75
42088	37574	14941	581913	38947.39
42116	64075	26439	1020944	38615.08
42126	58777	23616	1050520	44483.4
42136	25766	10582	381013	36005.76
42170	175915	69257	3087355	44578.24
42184	108746	45155	2306160	51072.09
42192	160047	66669	3041725	45624.28
42196	498136	205244	10079799	49111.3
42204	40251	15692	637444	40622.23
42216	31864	12791	502453	39281.76
42248	27262	10538	450190	42720.63
42252	35241	13828	568543	41115.35
42256	70238	26849	1309939	48789.12
42264	1189233	445554	22978670	51573.25
42272	40480	16045	554227	34542.04
42296	891226	358443	19030765	53092.86
42298	73546	30954	1643155	53083.77
42324	63130	25332	1178781	46533.28
42344	228521	84035	4782844	56914.9
42412	38858	15510	613353	39545.65
42424	23398	9409	321019	34118.29
42428	133819	47513	4486644	94429.82
43044	238841	89162	4006295	44932.76
43064	336066	113885	5435626	47729.08
43068	249158	84549	5129708	60671.42
43072	155880	56443	2761079	48918.01
43088	37931	14402	616320	42794.06
43092	1009765	282811	9528878	33693.45
43129	1200084	458209	29998385	65468.78
43142	441484	154345	7327658	47475.84
43156	651214	241751	19700309	81490.08
43200	2960852	1069206	65494538	61255.3
43256	692085	213908	7970730	37262.42
43322	84436	30201	1680464	55642.66
43330	22282	8607	414388	48145.46
43332	113213	43828	2086210	47599.94
43333	220745	83056	4345567	52320.93
43336	4750864	1665172	97516818	58562.61
43390	233526	86552	4125495	47664.93

43436	23618	9199	433905	47168.71
43484	74329	30238	1470090	48617.3
43504	49177	19353	811751	41944.45
43550	149272	56964	2633543	46231.71
43552	333503	124641	6168822	49492.72
43580	37965	13915	609985	43836.51
43596	422198	149369	7537122	50459.75
43636	46162	16838	742999	44126.32
43652	8983	3247	150175	46250.38
43660	100215	37334	1663949	44569.27
43746	1415170	496716	25108443	50548.89
43784	177489	66707	3443568	51622.29
43812	1621336	593902	35438634	59670.84
43828	171185	65589	2721395	41491.64
43900	200158	52608	1960739	37270.74
43916	130735	48074	2453140	51028.41
44006	405717	128255	7307310	56974.85
44012	92790	28027	1564359	55816.14
44022	401406	109774	6273077	57145.38
44084	1093039	356793	20963671	58755.84
45010	102389	42550	2020062	47475.02
45020	230274	92915	4784014	51488.07
45061	325091	125584	6591254	52484.82
46008	132678	64160	4690816	73111.22
46010	30962	13018	553341	42505.84
46024	191047	87245	7044258	80741.11
46028	64049	25129	1275192	50745.83
46036	68424	27165	1517942	55878.59
46052	254263	105214	4224766	40154.03
46081	204584	79831	4450293	55746.43
46108	47844	17368	893713	51457.45
46148	64002	23428	1595558	68104.75
46164	48373	19522	857055	43902.01
46168	277099	97698	6491841	66448.04
46176	35238	13354	699305	52366.71
46182	54445	22718	787325	34656.44
46196	37262	15071	533245	35382.19
46198	356606	135554	6961387	51355.08
46201	109781	39147	1937695	49497.92
46212	56235	19614	1039982	53022.43
46236	20389	7996	382047	47779.76

46248	189324	67022	5536728	82610.61
46266	73070	30463	1158061	38015.33
46274	148392	58399	2703095	46286.67
46280	84676	31545	1493627	47349.09
46300	52303	21034	807306	38381
46304	12436	5578	276925	49645.93
46328	109879	45403	1769341	38969.69
46348	327054	110191	9115242	82722.2
46364	51005	20607	911288	44222.25
46372	819421	323539	20403892	63064.71
46380	241794	101165	5281212	52203.94
46408	35799	14658	679355	46347.05
46412	33106	13587	521490	38381.54
46418	126341	47627	1992786	41841.52
46428	65990	24215	1131691	46735.12
46441	809729	294464	17390912	59059.55
46450	74372	29356	1458714	49690.49
46454	62013	23518	1650990	70201.12
46456	84742	32954	1969371	59761.21
46464	68819	24590	1763329	71709.19
47012	33087	14534	954120	65647.45
47015	175189	62378	2995649	48024.13
47018	208661	72951	3985362	54630.67
47024	91085	39314	1940507	49359.19
47028	356004	131503	7540678	57342.25
47036	118063	46776	2213524	47321.79
47064	67238	26890	1114403	41443.03
47066	542896	212974	10132191	47574.78
47076	34018	13704	589035	42982.71
47084	69056	26564	1161883	43739.01
47096	42374	16046	664628	41420.17
47116	1680747	702161	58084113	82721.93
47120	87587	33048	1727653	52277.08
47128	622045	231571	15113416	65264.72
47138	715733	267342	15097917	56474.17
47140	238929	93614	5320570	56835.2
47148	58825	21253	1037867	48833.91
47152	169216	65639	3500648	53331.83
47160	224406	74528	3404713	45683.68
47170	73286	28597	1675527	58591.01
48012	78508	30656	1296811	42302.03

48036	234865	99526	4978979	50026.92
48048	47625	19014	632282	33253.5
48060	48205	20418	722261	35373.74
48072	68024	27689	1036685	37440.32
48076	249589	102504	3827722	37342.17
48084	43214	16618	770696	46377.18
48100	36644	14545	460650	31670.68
48110	56156	23550	872040	37029.3
48119	98428	40859	1734309	42446.19
48128	111438	45229	1761223	38940.13
48140	15372	6346	263833	41574.69
48144	26346	10689	338667	31683.69
48160	7443	2868	102293	35667.02
48176	78443	31625	1180864	37339.57
48214	27615	11135	329662	29605.93
48240	151576	61655	2467700	40024.33
49064	478955	194302	11090856	57080.5
49084	238325	91628	4284444	46759.11
49096	105137	39232	2030563	51757.83
49110	1529320	598841	34779104	58077.36
49152	127889	49801	2650605	53223.93
49162	360467	140123	7380976	52674.98
49166	437755	163848	8528981	52054.23
49176	118359	46022	2365569	51400.83
49180	126381	48045	2434994	50681.53
49184	62099	25769	1102612	42788.31
49228	157607	61083	3005892	49209.96
49232	168257	63205	3605765	57048.73
49248	67494	25260	1291083	51111.76
49264	134184	52459	2676808	51026.67
49288	113265	43907	2215270	50453.69
49296	75904	30422	1541433	50668.36
49314	59112	24061	1414817	58801.26
49336	42659	16359	780705	47723.27
49344	58567	22268	1320339	59293.11
50060	494988	194849	9580454	49168.61
54004	1211960	405561	27113186	66853.53