AGGREGATE PRODUCTION PLANNING FOR MEDICAL DEVICES MANUFACTURING

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Thematic Paper
entitled

AGGREGATE PRODUCTION PLANNING FOR MEDICAL DEVICES MANUFACTURING

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ABSTRACT

The purpose of this thematic paper is to propose the optimized plan in the production of medical devices. The case study was conducted at a leading Original Equipment Manufacturing (OEM) company, which is a company that produces medical devices and exports the products to several countries in different regions. The data collected was formed into the model and solver tool and the concept of Simplex method was used to find the optimized plan.

The paper suggests that the labor policy during different levels of demand utilize overtime labor working hours from the current regular workers over the hiring of new temporary workers during a peak demand period. The result shows that the company could save from 0.1% up to 7.04% of the production cost by following the suggested model if the demand increased by 15% to 40%. The paper recommends the use of both overtime working hours and temporary workers when the demand increases up to a certain point where the regular workers reach their maximum capacity to supply overtime labor hours. The paper analyzed the sensitivity of raw materials prices and gave the recommendation to the plant, where prices have a significant impact on the total costs of production, for further planning to reduce production costs.

KEY WORDS: AGGREGATE PRODUCTION PLANNING (APP) /
OPTIMIZATION / SOLVER / MEDICAL DEVICE

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AGGREGATE PRODUCTION PLANNING FOR MEDICAL DEVICES MANUFACTURING

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บธ.ม. (การวิเคราะห์และสร้างตัวแบบธุรกิจ)

คณะกรรมการที่ปรึกษาสารนิพนธ์: อรลัชชา ศิวรักษ์, Ph.D., ยิ่งยศ เจียรวุฑธิ, Ph.D.

บทคัดย่อ

การศึกษาครั้งนี้เป็นการวิจัยเพื่อกำหนดแผนการผลิตรวมอย่างเหมาะสมของเครื่องมือและอุปกรณ์การแพทย์ โดยสารนิพนธ์เล่มนี้ได้ศึกษาการวางแผนการผลิตรวมของบริษัทผลิตและส่งออกอุปกรณ์การแพทย์แบบการรับจ้างผลิตสินค้าให้กับแบรนด์ต่างๆ หรือที่เรียกว่า Original Equipment Manufacturing (OEM) ข้อมูลที่ได้จากการสำรวจนั้นได้นำไปใช้ในการวิเคราะห์และสร้างตัวแบบธุรกิจในการวางแผนการผลิตรวม ซึ่งสารนิพนธ์ฉบับนี้ได้เลือกใช้โปรแกรม Solver ในการค้นหาแผนการผลิตอย่างเหมาะสมแบบกำหนดการเชิงเส้น

สารนิพนธ์เล่มนี้ได้เสนอแบบการวางแผนการใช้ทรัพยากรมนุษย์ในการผลิตอุปกรณ์การแพทย์เพื่อตอบสนองความต้องการอุปกรณ์การแพทย์ในปริมาณต่างๆ ทั้งนี้ สารนิพนธ์เล่มนี้ได้เปรียบเทียบค่าใช้จ่ายในการผลิตอุปกรณ์การแพทย์ระหว่างการทำงานล่วงเวลาของพนักงานประจำและการจ้างงานพนักงานชั่วคราว การศึกษาครั้งนี้ได้เสนอให้ใช้การทำงานล่วงเวลาของพนักงานประจำในเบื้องต้นของการเพิ่มในปริมาณความต้องการอุปการณ์การแพทย์ โดยบริษัทที่ใช้ในการศึกษาครั้งนี้สามารถลดต้นทุนการผลิตได้ 0.1% จนถึง 7.04% ในช่วงที่ปริมาณความต้องการของอุปกรณ์การแพทย์เพิ่มขึ้น 15% ถึง 40% จากความต้องการสินค้าในปัจจุบัน และเมื่อปริมาณความต้องการของอุปกรณ์การแพทย์เพิ่มขึ้นมากกว่ากำลังการผลิตของพนักงานประจำ ตัวแบบธุรกิจได้เสนอการวางแผนทรัพยากรณ์มนุษย์โดยการทำงานล่วงเวลาของพนักงานประจำและการจ้างงานพนักงานชั่วคราวร่วมกัน

ตัวแบบธุรกิจในสารนิพนธ์เล่มนี้ได้วิเคราะห์ความอ่อนไหวของราคาวัตถุดิบในการผลิตสินค้าและเสนอวัตถุดิบที่กระทบค่าใช้จ่ายในการผลิตอุปกรณ์การแพทย์ที่ได้ทำการศึกษาครั้งนี้มากที่สุดเพื่อการวางแผนในการลดราคาการผลิตต่อไป

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CHAPTER I
INTRODUCTION

1.1 Background and Problem

Owing to the continuing demand for medical devices around the world and where Thailand is also one of the major suppliers for medical technology, it would be challenging for medical devices manufacturers to plan how to best utilize their limited resources to meet the demands of their customers who are not only hospitals but also medical devices suppliers. One of the major factors in the production of medical devices is human capital wherein the cost to hire, develop and dismiss workers are very relevant and high to the manufacturers. Also the lead time to hire labor to work in the plant is also long due to most medical devices manufacturers are located in industrial zones as required by Thai law. The labor proximity or distance of the work place is also a considerable factor in the readiness of workers to work in the plant. Table 1 below shows how the minimum wage rate in Thailand increases during 2006 to 2010.

Table 1.1 Minimum Wage Rate in Chachoengsao

Year	Minimum Wage Rate (Baht)	% Increase
2006	159	
2007	160	0.63%
2008	165	3.13%
2009	173	4.85%
2010	180	4.05%

Not only the problem of availability of the workforce that the plant has to manage, but the medical device manufacturer also has to manage the fluctuation of demand of their products. As the major customers of the firm are hospitals and medical devices suppliers, their demands will depend on how their budget and new

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project will require the medical devices to be stocked in their inventory in each period of the year. Consequently, most leading medical devices manufacturers in Thailand supply their products in several countries around the world, it is critical for the plant to meet the customer demand timely to create creditworthiness and gain trust from their customers. The company being studied in this paper is also the leading Original Equipment Manufacturing (OEM) manufacturer capable of supplying a wide range of disposable medical devices in which it will not use its own brand but rather customize its products to meet the customer requirement. The problem of fluctuation in demand will become even more challenging for this type of manufacturer.

The research questions are whether the manufacturers have planned their production effectively in terms of cost and the utilization of its resources and whether there is any room for improvement.

1.2 Objectives

The objectives of this paper are firstly to find the production plan that minimize total production cost using limited resources in order to satisfy demand which significantly changes from time to time as part of the OEM business. Due to the nature of OEM whose company supplies the products to the customers upon their customization requirement, the demand could vary over the time horizon. The production cost for medical devices consist of labor costs including hiring and dismissing costs of labor and the wages, raw material cost, inventory holding cost, subcontracting cost (if required), and overhead costs.

The optimization model is subject to the following constraints due to the capacity of the manufacturing plant. The constraints would range from workforce production capacity which will vary between fulltime workers and temporary workers, available overtime hours from the labors, available materials, warehouses sizes, units of products demanded, safety stock and number of backorder unit (if required).

Another objective of this paper is to study company's current recruiting plan and compare it with the minimum cost planning based on this study to propose changes for the future implementation, if necessary i.e. whether the company should hire temporary workers during periods of high in demand or should they utilize

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overtime labor hours to meet with its demand while minimizing its total costs. The paper will also study which variable or production input has the most significant impact to the studying output or the total costs of production by using solver sensitivity analysis tool. This information would be helpful to the manufacturing plant to pay close monitoring on the factor that could significantly decrease or increase the total costs of production.

The method used in this paper to analyze the planning of resources used in manufacturing medical devices will be linear programming with the concept of optimization model. This paper will use spreadsheet solver to find the optimal solution to minimize the total costs of producing medical devices to meet the forecasted demand. The papers by Techawiboonwong and Yenradee (2002); which will be discussed later in the literature review session, supported the use of spreadsheet solver tool due to its simplicity, powerful and practicality with a good user interface and optimization capability. It can be used to solve forecasting problems with multiple constraints. It can also be used to perform sensitivity analysis of what will be the impact on the dependent variable being optimized if one independent variable is changed. For example, it could analyze the sensitivity of cost of hiring or dismissal of a labor to the total costs of production. This tool would be helpful for most manufacturing plant to monitor, plan and correct the controllable variables to meet its objective such as minimizing the costs of production.

This paper will analyze the planning model on monthly basis in a period of four months since this medical device manufacturing plans its production schedule on a monthly basis over a quarter based on most of its customer contracts. Normally, the contracts will be renewed upon the product delivery and then the new order will be placed.

1.3 Significance of the Study

This study is significant to the medical devices manufacturing industry in Thailand because the data was collected from one of the leading medical devices manufacturer in Thailand. The company chosen for this study is the leading OEM contract manufacturer capable of supplying a wide range of disposable medical

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devices. As the company is also a joint venture affiliated company which produces several types of products, the end user of this model or the planner of the plant could adjust the model suggested in this paper with the different information of manufacturing input when the plant shifts its production from one product to another due to various demands from its customers as the OEM contract manufacturer.

The limitation of the study is the information being used to form the model. The historical data collected by the studied firm had an assumption that this historical information will be used to plan the production resources of the plant i.e. workforce (both fulltime and temporary worker), overtime labor hours, and raw materials to meet the future demand which is one of the required information in the model will also be based on how the firm forecasts its future order to be from several customers, who are hospitals or other medical suppliers. Thus, the judgment of the planner who will use this model will be required to perform the planning.

1.4 Definition of terms

1.4.1 Medical device

Medical device is defined as a product that is used for medical purposes for patients who need diagnosis, therapy or surgery. Medical devices include a wide range of products such as infusion set that is used to contain any liquid or medicine that is injected to the human body. Another product is feeding bag, which is used to contain any nutrition or food for patients who need to consume nutrition via blood and lastly, Plasma transfer bag, which is used in carrying or transporting blood.

1.4.2 Aggregate Production Planning (APP)

A definition given in the paper "Aggregate production planning using spreadsheet solver: Model and Case study" by Techawiboonwong and Yenradee (2002) describes APP as a medium term capacity planning that determines minimum cost workforce and production plans to meet customer demands. The plan is to determine the production quantity and inventory level in aggregate term.

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1.4.3 Optimization

Optimization is the concept that is widely used in decision making for acquisition, utilization and allocation of limited resources to satisfy customer demands. The optimization model could minimize the production costs (as suggested in this paper) or to maximize the total revenue or profit of the firm

1.4.4 Production resources

Production resources are input used in the production process. This includes human capital, raw materials, electricity, or even warehouses to store the finished products.

1.4.5 Planning decisions

Planning decisions as described by Graves (1999) are controllable variables that the manufacturing plant could plan in meeting its objectives. This includes decisions on production units, number of labor to be hired or dismissed, number of overtime labor hours to use, and inventory quantities.

1.4.6 Relevant costs

Relevant costs is the cost related to the production of the medical devices such as Raw material cost, labor wages, labor hiring and dismissal costs, overtime wages during normal workday and during holiday, inventory holding costs, and the cost of unmet demand and backorder cost, which is the cost when the company decides to delay the production and meet the demand from the customers in the later month or months in order to reduce the cost of production or when the company has limited resources to meet all the demands.

This paper will be organized starting from the literature review of related papers which suggests several models used in manufacturing planning and control amongst various situations to meet different needs of each firm. The paper will then describe the process of data collection and research instrument. The model then will be developed based on the collected data wherein different levels of demand will be assumed to see how the recruiting policy in hiring temporary worker or using

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overtime labor hour will be utilized. Finally, the results on the major findings are discussed and concluded with recommendations for future study.

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CHAPTER II
LITERATURE REVIEW

In this part, related papers on Aggregate Production Planning (APP) and Manufacturing Planning and Control will be discussed to give an idea on how the previous study suggested the models which can be used in manufacturing planning under different situations to meet different needs of each industry or firm.

Techawiboonwong and Yenradee (2002) studied “Aggregate Production Planning Using Spreadsheet Solver: Model and Case Study” with objectives to propose a spreadsheet APP model to find the optimal solution that minimizes the total costs of production by giving several constraints to the model. It also gives the guideline for developing the optimal aggregate production plan using spreadsheet solver approach due to its simplicity to use and good user interface. This is a powerful tool in its optimization capability and analysis on sensitivity of the variables.

The model suggested in this paper has an objective to minimize the sum of permanent worker salary, temporary worker wages, overtime cost of permanent and temporary workers, hiring and laying off costs, subcontracting cost, and inventory holding cost. The overtime labor hour costs in this model will vary between permanent and temporary workers and different production capability rate is also applied between the normal workday and holiday.

The constraints to this manufacturing planning model are first the permanent worker constraint which if the optimal number of permanent workers is higher than the existing number of workers; additional permanent workers can be hired. However, if the optimal number of permanent workers is lower than the existing number, there will be no job lay off. Second constraint is the inventory constraint which states that all demands must be satisfied and the inventory level cannot be less than the specified safety stock level. Also, the inventory level cannot exceed the warehouse capacity.

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Third, overtime man hours must not exceed the maximum allowable limit which is the maximum overtime man-hours that can be applied during normal workday and holiday. Fourth, the temporary worker constraint does not allow number of temporary workers to exceed maximum allowable limit since the production line has limited number of workstations. Fifth constraint is the subcontracting constraint which could not exceed subcontractors' production capacity. Sixth, the production constraint forces the production quantities to equal to the sum of production quantities generated by both temporary workers and permanent workers during a regular and overtime plus subcontracted quantities minus loss of production during the undertime or idle time period. Lastly, the model treats all variables to be nonnegative and some variables such as number of workers should be integer value. However, to reduce the computation time, the authors suggested relaxing this constraint. The paper also suggests the guideline for developing optimal aggregate production planning using spreadsheet solver as suggested in the following figure.

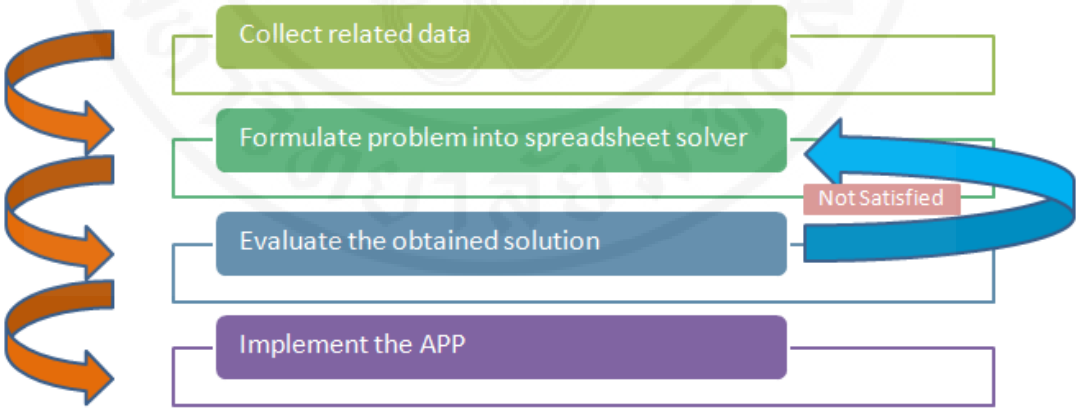

Figure 2.1 Guideline for Developing Optimal Aggregate Production Planning Using Spreadsheet Solver

The case study in this paper was conducted at the air conditioning manufacturing plant located in Thailand in which the obtained solution to minimize the total costs of production is to hire temporary workers as the first priority while applying overtime labor hours during workdays and the last priority is to apply overtime labor hour during holidays. The paper also suggests the utilization of

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undertime to be applied during low-demand periods in order to reduce the holding inventory costs.

Brandimarte, Eds, and Springer (1999) explained Aggregate Production Planning (APP) as the organization process of macro resources to meet the predicted demands over a medium term horizon typically one to several months. Linear programming is the most frequently used technique for solving the APP model where the problem is treated as static which the ordered structure of time does not directly matter. The limitation mentioned by Bitran and Tirupati (1993); however, is that the optimal result is actually related to the 1st period planning while the rolling horizon approach should be started again to update demand and production data into the model when there are important levels of uncertainty of future demands, raw materials availability, and production capacity.

Da Silva, Figueira, Lisboa and Barman (2006) support the use of APP concept in determining the optimum production, work force and inventory levels. As planning usually involves one product or a family of similar products, production planning from an aggregated viewpoint is justified. The author claimed that many APP models with various degrees of sophistication have been introduced in the past five decades starting with the Linear Decision Rule (LDR) as suggested by Holt (1955) and later on developed to a production plan in a paint factory using quadratic approximations. Silva (2002) extended this concept and developed a decision rule that considers a constant level of employment during the entire planning period. Haehling (1970) extended the linear cost structure model for multiproduct, multistage production systems in which optimal disaggregation decision is made under capacity constraints. Goodman (1974) further developed a goal programming (GP) model that approximates the original nonlinear cost of the LDR and solves it using a variant of the simplex method.

In Manufacturing Planning and Control, Graves (1999) discussed about the acquisition and allocation of limited resources to production activities to satisfy customer demand and minimizing total production costs or maximizing revenues net of relevant costs. This paper also used the concept of optimization with various models being suggested due to differences in the manufacturing and market context. The model treats demand as being known but the author suggested the end user of the

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model to revise and rerun the model to account for forecast updates. Various models were suggested in this paper so the readers could apply the right model that will match their industries or company. The objectives of all models are either to minimize total relevant costs in production which include inventory holding costs, variable production costs, setup costs, and any relevant resource acquisition costs or to maximize revenues net of the production, inventory and lost sales costs. The author also suggested that the model should include the costs associated with imperfect customer service such as when demand is backordered.

Basic model:

The basic linear programming models were first suggested in minimizing production cost and inventory cost.

Objective: Minimize variable production costs plus the inventory holding costs

$$\sum_{t=1}^{T}\sum_{i=1}^{I} cp_{it} \cdot p_{it} + cq_{it} \cdot q_{it} \qquad (1)$$

Subject to:

$$q_{i,\,t-1} + p_{it} - q_{it} = d_{it} \qquad \forall\, i, t \qquad (2)$$

$$\sum_{i=1}^{I} a_{ik} \cdot p_{it} \le b_{kt} \qquad \forall\, i, t \qquad (3)$$

$$p_{it}, q_{it} \ge 0 \qquad \forall\, i, t$$

where;

p_{it} = production of item i during time period t

q_{it} = inventory of item i at the end of time period t

T, I, K = number of time periods, items, resources, respectively

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a_{ik} = amount of resource k required per unit of production of item i

b_{kt} = amount of resource k available in period t

d_{it} = demand for item i in period t

cp_{it} = unit variable cost of production for item i in time period t

cq_{it} = unit inventory holding cost for item i in time period t

The constraints in this model are to produce the products to meet the demand in each period and the remaining inventory will be used to satisfy demand in the following periods. Another constraint is basically that the resources used in the production should not exceed the available resource in each period. This model then was extended to other models starting with demand planning with lost sales situation if production could not meet the expected demand in each period.

Demand Planning: Lost Sales:

The lost sales will result in reducing revenue due to a loss of customer goodwill. The optimized model is to maximize revenues net of production inventory, and lost sales costs in which the unmet demand would be planned.

Objective: Maximize revenues net of the production, inventory and lost sales costs

$$\sum_{t=1}^{T}\sum_{i=1}^{I}\left[r_{it}\cdot\left(d_{it}-u_{it}\right)-cp_{it}\cdot p_{it}-cq_{it}\cdot q_{it}-cu_{it}\cdot u_{it}\right] \qquad (4)$$

Subject to:

constraint in equation (3) and

$$q_{it-1}+p_{it}-q_{it}+u_{it}=d_{it} \qquad \forall\ i,\ t \qquad (5)$$

$$p_{it},\ q_{it},\ u_{it}\geq 0 \quad \forall\ i,\ t \qquad (6)$$

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where;

u_{it} = unmet demand of item i during time period t

r_{it} = unit revenue for item i in period t

cu_{it} = unit cost of not meeting demand for item i in time period t

The major difference between the basic model and demand planning is lost sale. Lost sale is the additional constraint in equation (5) that allows the option of not meeting demand which the demand in a period can be met from production or carrying inventory or not satisfied at all.

Another related problem is to include in the model the possibility of rescheduling or backordering demand. This is the situation when the manufacturing plant could defer the current demand and satisfying it in a later period(s). Similar to previous models, the linear equation is assumed in the Demand Planning: Backorders model.

Demand Planning: Backorders model:

When it is possible to reschedule or backorder the production plan, the current demand could be satisfied in the following period(s). However, there is a cost associated with this approach called “backorder cost”, which is similar to the lost sales costs due to the loss of customer goodwill. The paper assumes that this cost is linear in the number of backorders in each period.

Objective: Minimize the production cost, holding inventory cost and backorder cost.

$$\sum_{t=1}^{T}\sum_{i=1}^{I}\left[cp_{it}\cdot p_{it} + cq_{it}\cdot q_{it} + cv_{it}\cdot v_{it}\right] \qquad (7)$$

Subject to

constraint in equations (3) and

$$q_{i,\,t-1} - v_{i,\,t-1} + p_{it} - q_{it} + v_{it} = d_{it} \qquad \forall\, i, t \qquad (8)$$

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$$p_{it}, q_{it}, v_{it} \geq 0 \quad \forall\, i, t$$

where;

V_{it} = backorder level for item i at the end of time period t

CV_{it} = unit cost of backorder for item i in time period t

Equation 8 treats the backorders like negative inventory for the inventory balance equation. However, at the end of the last planning period, it is required to have $V_{it} = 0$ so over the planning horizon, all demands are met by the production plan.

The last model suggested by Graves (1999) which could be applied to this paper is regarding "Resource Planning". The model will be applied to the adjustment of resource levels over the planning horizon in which the resources could include workforce level that incorporates numbers of hiring and dismissal of labor. The model studied by Graves (1999); however, only includes one type of resource which is workforce, so this paper will elaborate more on other raw materials related in the production of medical devices.

Objective: Minimizing production costs together with costs for hiring and firing workers.

$$\sum_{t=1}^{T}\left[cw_t \cdot w_t + ch_t \cdot h_t + cf_t \cdot f_t\right] + \sum_{t=1}^{T}\sum_{i=1}^{I}\left[cp_{it} \cdot p_{it} + cq_{it} \cdot q_{it}\right] \quad (9)$$

Subject to:

constraint in equation 3 and

$$\sum_{i=1}^{I} a_i \cdot p_{it} - w_t \leq 0 \qquad \forall\, t \quad (10)$$

$$w_{t-1} + h_t - f_t - w_t = 0 \qquad \forall\, t \quad (11)$$

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$$p_{it}, q_{it}, w_t, h_t, f_t \geq 0 \quad \forall\ i, t \qquad (12)$$

where;

w_t = workforce level in time period t

h_t = change to workforce level by hiring in time period t

f_t = change to workforce level by firing in time period t

a_i = amount of workforce required per unit of production of item i

cw_t = variable unit cost of workforce in time period t

ch_t = variable hiring cost in time period t

cf_t = variable firing cost in time period t

This model then was extended to cover the different labor classes e.g. permanent employees and temporary employees. Due to the different costs and efficiency rate of each labor class, the model separates the two types of labor from each other.

Objective: Minimizing total costs of production including hiring and firing costs of different labor classes

$$\sum_{t=1}^{T}\sum_{j=1}^{2}\left[cw_{jt}\cdot w_{jt} + ch_{jt}\cdot h_{jt} + cf_{jt}\cdot f_{jt}\right] + \sum_{t=1}^{T}\sum_{i=1}^{I}\left[cp_{it}\cdot p_{it} + cq_{it}\cdot q_{it}\right] \qquad (13)$$

Subject to:

constraint in equation 2 and

$$p_{it} - \sum_{j=1}^{2} p_{ijt} = 0 \quad \forall\ i, t \qquad (14)$$

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$$\sum_{i=1}^{I} a_{ij} \cdot p_{ijt} - w_{jt} \leq 0 \qquad \forall j, t \tag{15}$$

$$w_{j,t-1} + h_{jt} - f_{jt} - w_{jt} = 0 \qquad \forall j, t \tag{16}$$

$$p_{it}, q_{it}, w_{jt}, h_{jt}, f_{jt} \geq 0 \quad \forall i, j, t$$

where;

w_{jt} = workforce level in time period t

h_{jt} = change to workforce level by hiring in time period t

f_{jt} = change to workforce level by firing in time period t

p_{ijt} = production of item i during time period t, using labor class j

a_{ij} = amount of labor required per unit of production of item i, using labor class j

cw_{jt} = variable unit cost for labor class j in time period t

ch_{jt} = variable hiring cost for labor class j in time period t

cf_{jt} = variable firing cost for labor class j in time period t

Equation 14 states that number of production unit should be equivalent to the production by employees in each class while equation 15 giving the constraint on the unit of products produced to be within the available labors on all labor classes i.e. the amount of labor required in the production cannot exceed the number of workforce available. The available workforce in the planning period is equal to the number of workforce at the beginning of the period plus hired labor minus fired labor.

Gallego (2001) studied Aggregate Production Planning and suggested using aggregate unit of production, such as the average item in terms of weight, volume, production time, or dollar value since it is usually impossible to consider all details associated with the production process while maintaining a long planning horizon. This paper suggested that the firm cope with demand fluctuations by changing the size of the workforce by hiring and firing labors, varying production rate

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by using overtime and/ or idle time or outside subcontracting company, accumulating seasonal inventories and using planning backorders.

The just-in-time production plan and production-smoothing plan were introduced and the tested result supports the just-in-time production plan due to the lower total production costs and inventory holding cost.

Lastly, the author mentioned about the advantage of linear cost models on its availability and efficiency codes. The shadow price as shown in the solver's sensitivity report also can be used to identify opportunities for capacity expansions, marketing penetration strategies, new product introductions, and etc. However, the disadvantage of failure to deal with demand uncertainties is still an ongoing problem for the end user of the model to forecast.

Lawrence & Pasternack (2001, p. 48) described the use of linear programming as many problems lend themselves as linear programming while other problems can also be closely approximated by linear model. The output generated from linear programming also provides useful "what-if" information to analyze the sensitivity of the optimal solution to changes in the model's coefficients.

Chase, Jacobs and Aquilano (1998, p.518) also suggested the use of *Chase Strategy* in production planning which is to match the production rate to the order rate by hiring and laying off employees as the order rate varies. They support this strategy when the company can hire labor easily; however, the limitation of employees' motivation still persists when backorder is high and employees may slow down their production as fear of being laid off.

From the literature reviews mentioned above, the concept of "Simplex Method" was applied to solve linear programming problem. Simplex Method as described by Albright and Winston (2006, p.74) is the algorithm for searching through the feasible region to find the optimal solution. It pushes the objective as far as possible in the maximizing and minimizing direction until it just touches the edge of the feasible region. The simplex method for linear programming works efficiently in searching through the finite number of corner points and with the application of software packages such as solver in excel, the optimal solution could be found easily.

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Based on the review of literatures, this paper will apply some of the concept mentioned earlier with the extension of relevant variables to be used in the planning of medical devices manufacturing in Thailand.

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CHAPTER III
RESEARCH METHODOLOGY

A case study was conducted at a leading medical devices OEM located in Thailand to see how the problem regarding medical devices production planning persists and to determine what relevant variables could possibly cause the problem. The blood tubing line, which is the product that the studied company receives the highest number of order with unstable demand, was selected in this case study. With the rising costs of production and the need to create creditworthiness and trust to the customers to meet its demand, the company's objective in this production planning is to minimize the total costs of production while meeting its customer demand upon request.

3.1 Overview

This section will explain the proposed model's objective and assumptions related to the model based on the information collected from the studied manufacturer. The problem identified by the plant was analyzed and transformed to the objective of the model together with the constraints that limit the production plant to certain circumstances. The mathematical formulation then will be explained together with the tools that will be used to solve the problems.

3.2 Problem Description

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As described in the introduction section, the studied plant which is in medical devices manufacturing business also faces with the rising cost of production mainly due to the rising labor cost after the adjustment of minimum wage rate in Thailand effective from 1 January 2010 and also the holding inventory and backorder

costs to meet the demand. If the demand is unmet, the plant needs to ship the blood tubing line on ad hoc basis to its customer which will incur higher shipping costs together with the insurance cost rather than shipping the products in large batch. The objective of the model is thus to minimize the total production costs resulting from a combination of labor costs, raw material costs, overhead costs, holding inventory costs and backorder costs.

3.3 Assumption

The model will assume that the temporary workers can be hired and fired immediately in the planning month without involving the lead time to get the labor ready to work in the plant or terminating the employees upon the job redundancy. Also, it is assumed here that the temporary worker's production capacity is similar to regular workers due to the simplicity of the job. Secondly, the model assumes that there is no lead time in the delivery of raw materials which may delay the production process. The raw material cost is assumed to be constant throughout the planning period. The planning decision related to labor only involves with the hiring and firing of temporary workers as the studied firm always runs at its maximum capacity with the need to maintain the exact numbers of fulltime employees in each platform. This is also to ensure that the majority of workers, who are fulltime employees and receive appropriate training with certain skills, are fully involve in the production process of medical devices as the products required high quality assurance. The model excludes fixed cost as the independent variable since it is irrelevant in comparing the production costs between the uses of overtime labor hours and hiring temporary worker. Lastly, this paper is focusing on the production expansion of the plant, thus percent increase in demand is added to the model for the sensitivity analysis.

3.4 Mathematical Formulation

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From the observation of the plant, the following equations on objectives and constraints were formed.

Given:

m = Number of monthly planning periods in the planning horizon

R_i = Raw material i required per one unit of product produced

CP_t = Unit production cost in period t (exclusive of labor costs)

Q_t = Units of product to be produced in period t

D_t = Forecasted demand in period t

CB_t = Backordered cost per unit of product carried from period t to t+1

B_t = Units of product backordered at the end of period t

$n(t)$ = Number of normal workdays in period t

CW = Average salary per month of a permanent worker

W = Number of Permanent Worker

TW = Number of Temporary Worker

COW_n = Overtime cost per man-hour of permanent worker during normal workday

OW_{nt} = Overtime man-hours of permanent worker during normal workday in period t

COW_h = Overtime cost per man-hour of permanent worker during holiday

OW_{ht} = Overtime man-hours of permanent worker during holiday in period t

CTW = Average wages per day of a temporary worker

TW_t = Total number of temporary workers in period t

n_t = Number of normal workdays in period

h_t = Number of holidays in period t

RH = Number of regular working hours per day

$COTW_n$ = Overtime cost per man-hour of temporary worker during normal workday

OTW_{nt} = Overtime man-hours of temporary worker during normal workday in period t

$COTW_h$ = Overtime cost per man-hour of a temporary worker during holiday

OTW_{ht} = Overtime man-hours of temporary a worker during holiday in period t

OH_n = Number of allowable overtime hours in each normal workday

OH_h = Number of allowable overtime hours in each holiday

CH = Hiring cost per person of temporary worker

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H_t = Number of temporary workers to be hired at the beginning of period t

F_t = Number of temporary workers to be fired at the beginning of period t

CL = Laying off cost per person of temporary worker

L_t = Number of temporary workers to be laid off at the end of period t

a = Amount of labor hour required per unit of product

CSub = Subcontracting cost per unit

Sub_t = Amount of subcontracted unit in period t

CI = Average inventory holding cost per month per unit of product

I_t = Inventory level in period *t*

Le_t = Leftover unit in period t

S_t = Shortage unit in period t

Objective: Minimize Total Costs of Production

$$\sum_{t=1}^{m}\Big[CP_t \cdot Q_t + CB_t \cdot B_t + CW \cdot (W) + COW_n \cdot \left(OW_{nt}\right) + COW_h \cdot \left(OW_{ht}\right) + CTW \cdot TW_t \cdot n(t) + COTW_n \cdot \left(OTW_{nt}\right) + COTW_h \cdot \left(OTW_{ht}\right) + CH \cdot H_t + CL \cdot L_t + CSub \cdot Sub_t + CI \cdot I_t\Big] \quad (17)$$

Subject to:

Raw material constraint: The raw material used should not exceed its availability.

$$R_i \cdot Q_t \leq \text{Max } R_i \quad (18)$$

Inventory constraint: to make the inventory in each period equivalent to the inventory from the previous period plus the production minus demand of that period plus leftover minus shortage.

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$I_t = I_{t-1} + Q_t - D_t + L_t - S_t$ *(19)*

The inventory level is also restricted not to exceed the warehouse capacity.

$I_t \leq \text{Max I for } t = 1, 2, \ldots, m$ *(20)*

Production constraint: The production unit in each period is equal to the sum of production by both permanent and temporary workers during regular time and overtime on normal workdays and holidays. However, the production units shall not exceed the labor's production capacity.

$Q_t \leq$ *(21)*

$$\frac{1}{a}\left[\left(Wt + \mathrm{TW}_{t-1} + H_t - F_t\right)\cdot\left(n_t + h_t\right)\cdot RH + \left(OH_n + OH_h\right)\right]$$

Overtime constraint: The applied overtime man-hours of permanent and temporary workers shall not exceed the maximum allowable limit. In this case study, the maximum overtime allowable during normal workday and holiday are differentiated since the labor who are not assigned on a shift during weekend can perform the 8 hours OT during weekend while the company policy limits the overtime during weekday to only 2 hours to ensure working efficiency performed by the labor which could impact the quality of the product.

$OW_{nt} + OTW_{nt} \leq \text{Max } O_{nt}$ for t=1, 2, …, m *(22)*

$OW_{ht} + OTW_{ht} \leq \text{Max } O_{ht}$ for t=1, 2, …, m *(23)*

where $\text{Max } O_{nt} = OH_n \cdot n_t \cdot (W + TW_t)$ for t=1, 2, …, m *(24)*

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$\text{Max } O_{ht} = OH_h \cdot h_t \cdot (W + TW_t)$ for t=1, 2, …, m *(25)*

Subconstracting constraints: The subcontractor production capacity is limited following the constraint below.

$Sub_t \leq$ Max Sub for t=1, 2, …., m *(26)*

Non-negativity and Integer conditions: Since all variables in the model cannot be negative numbers, the model treats numbers of products to be produced, overtime labor hours, number of hiring and firing labors to be non-negative. Consequently, the number of hiring and firing labors should also be integer values. However, this constraint can be relaxed to reduce the computation time.

Backorder constraint: The proposed model also recommends giving the flexibility for the plant to meet the customer's demand in subsequent months when the production cost decreases. This is shown in the model by having Leftover and Shortage as decision variables with the following constraint.

$Le_t - S_t = I_t$ *(27)*

To ensure that the customer's demand is met by the end of the contract term or in period of 4 months, the model forced ending inventory in Jan 10 to be positive value.

$I_4 \geq 0$ *(28)*

From the model above, excel spreadsheet solver tool is used to plan the numbers of temporary workers to be hired and fired during each month, numbers of overtime to be used during normal workday and holiday, and production units to minimize the total costs of production. The solver sensitivity report tool is used to analyze the sensitivity of the optimal solution when a variable in the model is changed for example, what will happen to the total production costs when raw material cost changes.

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CHAPTER IV
DATA ANALYSIS AND RESULTS

In this chapter, the collected information from the studied firm will be analyzed which includes the description and proportion of raw materials being used to manufacture Blood Tubing Line (BTL) together with the current practice on human capital usage. This information then was inputted into the suggested model described in chapter 3 to perform the optimization study in order to recommend the optimized production plan and human capital usage during different demands from the customers.

4.1 Case Study

The major components of the Blood Tubing Line (BTL) composes of 5 raw materials namely PVC DOP (Dioctyl Phthalate), PVC Non DOP, Polycarbonate (PC), Polypropylene (PP) and Elastomer. The plant uses the unit of Kilogram to measure how much each plastic type must be input into the production process to produce one set of BTL i.e. 0.2857 kg for PVC DOP, 0.0571 kg for PVC Non DOP, 0.0306 kg for PC, 0.0654 kg for PP and 0.0063 kg for Elastomer. This is shown in Table 4.1.

Table 4.1 Raw Material Required in Producing 1 Set of BTL

Raw Material	**KG**
Raw Material 1 per one unit produced R1 PVC DOP	0.2857
Raw Material 2 per one unit produced R2 PVC NON DOP	0.0571
Raw Material 3 per one unit produced R3 PC	0.0306
Raw Material 4 per one unit produced R4 PP	0.0654
Raw Material 5 per one unit produced R5 Elastomer	0.0063

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The available raw material in each period is 100,000 kg of PVC DOP, 20,000 kg of PVC Non DOP, 10,700 kg of PC, 22,900 kg of PP, and 2,200 kg of Elastomer. This is shown in table 4.2. These available materials are used as the constraint in limiting the number of product that can be produced in each period.

Table 4.2 Raw Materials Availability in KG

Raw Material	**Availability in KG**
PVC DOP	100,000
PVC Non DOP	20,000
PC	10,700
PP	22,900
Elastomer	2,200

The current workforce the company using is regular worker who performs the job 8 hours per day and 6 days per week and they also supplement overtime labor hours during peak demand period. The current numbers of regular workers are 400 employees which are maintained at this level even during the low demand period since the company can rotate the workers to other production platform. During peak demand period, temporary workers will be hired on ad hoc basis. In order to explore which alternative between using overtime labor hours from current regular worker and hiring temporary workers that could minimize total costs of production, the decision variables of numbers of temporary workers to be hired and fired are included in the model. The overtime labor hours to be used in each period are also included with the different allowable OT hours during weekdays and holidays i.e. 2 hours and 8 hours per day per worker respectively. The number of normal workdays and holidays are included in the model to calculate the number of normal working hours and maximum allowable OT in each period.

0.2 hour or approximately 12 minutes of labor hours are required in the assembling process which includes injection and extrusion of plastic, assembling joints and bolts to the tubes, and quality control. Average salary per day for regular worker and temporary worker are 180 Baht; however, temporary workers are not eligible for certain benefits that the company provides to regular worker e.g. sports

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club, medical expense reimbursement, and service year award. The hiring cost of temporary worker which includes medical check, criminal check, documentation and administrative costs, outfit cost, and training cost is 500 Baht. The firing cost of temporary worker is 800 Baht which involves documentation and administrative costs of terminating employees and severance pay. The overtime cost per hour for regular worker during normal workday and holiday is 13.75 Baht. This is summarized in Table 4.3. The model separates the average salary for regular worker and temporary worker into two fields even though they cost the same rate just to give flexibility in the model when being applied to other assembly line that may have different rates of labor costs. The overtime costs for regular worker on normal workday and holiday are similarly separated into two fields to give the flexibility to the model when this data might be changed in the future.

Table 4.3 Salary, Hiring, Firing and Overtime Labor Costs

Costs	**Baht**
Average salary per day for a regular worker CW	180
Average wages per day of a temporary worker CTW	180
Hiring cost of a temporary worker CH	500
Firing cost of a temporary worker CL	800
OT Cost per hour for a regular worker on normal workday COW_n	13.75
OT Cost per hour for a regular worker on holiday COW_h	13.75

From the current number of regular workers of 400 employees, total labor hours for production in October 2009, November 2009, December 2009, and January 2010 were 83,200 hours, 86,400 hours, 80,000 hours, and 86,400 hours respectively. The production capacity measured by number of BTL sets that could be produced by available labor hours during October 2009, November 2009, December 2009, and January 2010 were 416,000 sets, 432,000 sets, 400,000 sets, and 432,000 sets respectively. This information is summarized in Table 4.4.

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Table 4.4 Total Labor Hours for Production and Production Capacity by Available Labor Hours during October 2009 to January 2010

	Oct 09	Nov 09	Dec 09	Jan 10
Maximum regular labor hours for production	83,200.00	86,400.00	80,000.00	86,400.00
Production capacity (No. of BTL set) by available labors	416,000.00	432,000.00	400,000.00	432,000.00

Since one of the objectives in this paper is to propose how the workforce should be managed during the peak demand period, the higher demand than the capacity as shown in Table 4.4 will be used in the model to analyze the optimal solution in using over time labor hours versus hiring temporary worker.

4.2 Analysis on Worker Plan

From the model described in Chapter 3, the information observed from the production of blood tubing line (BTL) was input into the model using data during October 2009 to January 2010. The model suggests that with the current number of demand the company received per month of 350,000 units, the plant can easily satisfy its demand without hiring additional workers or employing overtime labor hours. This is true as described in Table 4.4 that the current capacity of 400 labors can produce at least 400,000 units of BTL assuming there are at least 25 workdays in a month. As the demand during the last quarter of the year could significantly increase due to the utilization of the remaining fiscal budget by the hospitals and the medical suppliers, the plant may need to produce more units of BTL, and thus they would require more labor hours to meet the customers' demand. Also, the demand for medical devices could be impacted by major unrest events such as when there is an unexpected natural disaster and war. The proposed model then would give benefits to the user in production planning. By adding percentage of increase in demand to the model, Solver Table was used to analyze how the worker plan between hiring temporary worker versus using overtime labor hour will respond to the changes in demand. This is shown in Appendix A.

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Holding other things constant, as percent increase in demand rises from 0% to 15%, the model recommended utilizing more of overtime labor hour especially in Dec 09 where there were only 25 normal workdays and no holiday which it means that the plant would need more supply on labor hours during this month which is 500 overtime labor hours. With the increasing in demand in 19%-43% range, the plant keeps suggesting to use more of overtime labor hours especially in October 2009 and December 2009 as there were less working days than other months. With the 44% increase in demand, the model recommends hiring temporary worker to assemble the products since it reaches the maximum production capacity of the available regular workers. Notice that the constraint on the integer value to be applied to number of temporary workers hired is relaxed here to reduce the system computation time.

The nature of number of temporary workers to hire is similar to the utilization of overtime labor hour which in October 2009 and December 2009, the model recommends hiring more temporary workers due to the lower number of working days as compare to other planning months in this period. With the increase in demand from 59 percent onwards, the plant can no longer utilize more of overtime labor hours since it exceeds the capacity of current regular employees and thus temporary workers becomes the only resource for the plant to expand its production capacity.

By comparing the total costs of production from the suggested model and the current practice of hiring temporary worker during peak demand period, the studied OEM could save the production expenses as demand increases. For example, if Demand increases by 15%, the plant could have saved 0.31% and 0.10% in December 2009 and January 2010 respectively. On the other hand, if demand increases by 40%, the plant could have saved 7.95%, 5.49%, 8.58%, and 6.21% during October 2009, November 2009, December 2009, and January 2010 respectively. The percentage of expenses that could be saved following the suggested model is 7.04% for the whole period. This is summarized in Table 4.5.

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Table 4.5 Percentage of Expenses Saved by the Suggested Model

	Expenses saved by suggested model				
% Increase in Demand	**Oct 09**	**Nov 09**	**Dec 09**	**Jan 10**	**Totals costs saved**
15%	0.00%	0.00%	0.31%	0.10%	0.10%
25%	2.48%	1.13%	4.30%	1.81%	2.42%
30%	4.40%	2.65%	5.80%	3.35%	4.03%
35%	6.22%	4.10%	7.22%	4.81%	5.57%
40%	7.95%	5.49%	8.58%	6.21%	7.04%

In Appendix B, as demand increases over 40%, regardless of how the hiring cost of temporary worker will be, the model recommends the plant hiring the constant number of temporary workers in October 2009 and December 2009 when there were only 26 working days. For example, the plant was recommended to hire 5, 38, 72, 106 and 139 temporary workers in October 2009 as demand increases by 50%, 60%, 70%, 80%, and 90% respectively regardless of how much hiring cost was reduced. In December 2009, the plant was recommended to hire 25, 53, 55, 58, and 60 temporary workers as demand increases by 50%, 60%, 70%, 80%, and 90% respectively regardless of how much hiring cost was reduced. The nature of temporary workers hiring in December 2009 is also similar to October 2009. This is as a result of the constraint in the model that ensures that the plant meets the customer demand in the planning period of four months while the use of overtime labor hour cannot be expanded due to the production capacity of the current workforce. From this analysis, it could be explained that the firm needs to improve its deal with the recruiting firm in negotiating the hiring costs of labor as more temporary workers need to be hired to support its production regardless of hiring costs. On the other hand, temporary workers were not recommended to be hired in November 2009 and January 2010 as there were enough working days for labor to meet the customer demand. The plant may also need to consider rotating idle labors from other production platforms, where the demand of that production line might not be high in order to save its cost from hiring new temporary workers. Table 4.6 shows the summary of this analysis.

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Table 4.6 Temporary Workers Hired During Oct 09 – Jan 10 in Response to Changes in Hiring Costs

		% Increase in demand										
Hiring cost	**Temp worker hired Oct 09**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	5	38	72	106	139	Not feasible
	50	0	0	0	0	0	5	38	72	106	139	173
	100	0	0	0	0	0	5	38	72	106	139	173
	150	0	0	0	0	0	5	38	72	106	139	173
	200	0	0	0	0	0	5	38	72	106	139	173
	250	0	0	0	0	0	5	38	72	106	139	173
	300	0	0	0	0	0	5	38	72	106	139	173
	350	0	0	0	0	0	5	38	72	106	139	173
	400	0	0	0	0	0	5	38	72	106	139	173
	450	0	0	0	0	0	5	38	72	106	139	173
	500	0	0	0	0	0	5	38	72	106	139	173
		% Increase in demand										
Hiring cost	**Temp worker hired Nov 09**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
Hiring cost	**Temp worker hired Dec 09**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	25	53	55	58	60	Not feasible
	50	0	0	0	0	0	25	53	55	58	60	63
	100	0	0	0	0	0	25	53	55	58	60	63
	150	0	0	0	0	0	25	53	55	58	60	63
	200	0	0	0	0	0	25	53	55	58	60	63
	250	0	0	0	0	0	25	53	55	58	60	63
	300	0	0	0	0	0	25	53	55	58	60	63
	350	0	0	0	0	0	25	53	55	58	60	63
	400	0	0	0	0	0	25	53	55	58	60	63
	450	0	0	0	0	0	25	53	55	58	60	63
	500	0	0	0	0	0	25	53	55	58	60	63

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Table 4.6 Temporary Workers Hired During Oct 09 – Jan 10 in Response to Changes in Hiring Costs (Cont.)

		% Increase in demand										
Hiring cost	**Temp worker hired Jan10**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0

In Appendix C and Appendix D, the optimized worker plan is shown in response to the changes in demand and overtime cost during normal workday and holiday respectively. When the overtime labor cost increases, number of temporary worker will be hired as the demand exceeds 50% from the current demand of 350,000 units. With less than 50% increase in demand, the current capacity can satisfy the demand from the customer and no overtime labor hour or temporary worker will be utilized during that period. The numbers of temporary worker being hired are constant in each percentage increase in demand above 50% regardless of how the overtime labor cost during normal workday would be. For example, beyond 50%, 60%, 70%, 80%, and 90% increase in demand, 5, 38, 72, 106, and 139 temporary workers were recommended to be hired in October 2009 respectively regardless of the overtime labor hour cost. This is following the condition in the model that all demands from the customers must be satisfied during the four-month period. Thus, temporary workers are required in order to meet this constraint regardless of how the overtime labor costs will be. This brings the attention of the plant manager to negotiate with the recruiting agency to find the best deal for the plant during the high demand period; otherwise, the plant needs to always take the overtime labor cost as being charged by the recruiting agency. The model also suggests the plan on how to adjust the usage of overtime labor hours during normal workday and holiday i.e. when the overtime labor hour cost

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during holiday increases, the model will suggest the plant to utilize more of overtime labor hour during normal workday and vice versa.

Appendix E shows the optimized plan in production units and labor source to be used in response to the changes in demand and number of regular worker. As the number of regular worker increases, there is less use of the temporary worker. For example, at 95% increase in current demand, 406, 344, 281, 219, 156, 94, and 31 temporary workers were recommended to be hired as number of regular workers increases to 200, 250, 300, 350, 400, 450, and 500 workers respectively. Consequently, when the demand increases, the model suggests the plant to utilize both temporary worker and overtime labor hours during October 2009 and December 2009 when there are fewer working days i.e. 26 days. This table also shows how the plant can adjust its labor source to increase its capacity to meet the demand required by the customers.

4.3 Analysis on Raw Material Plan

By using solver table tool to see the sensitivity of total costs of production to percentage changes in the price of each raw material, we could see that the total cost of production rises sharply as PVC DOP and PVC Non-DOP costs per unit increase.

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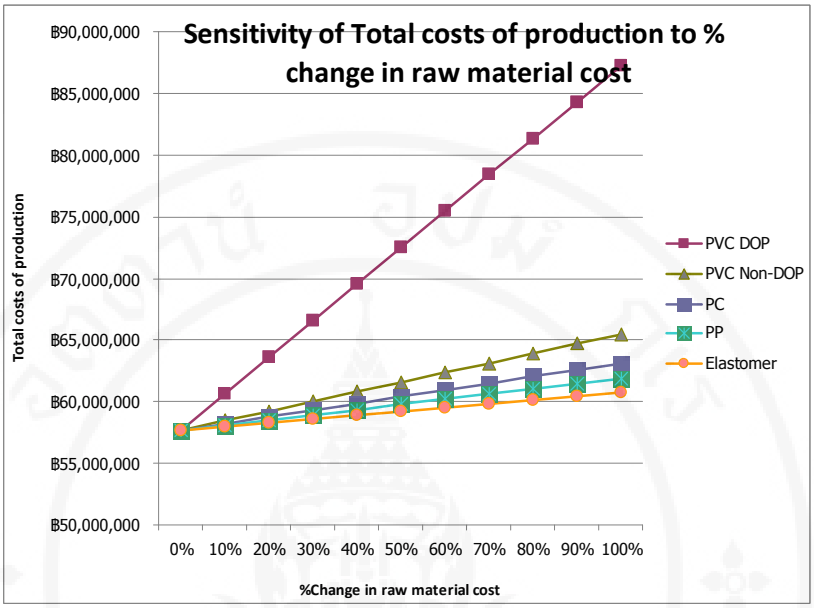
Figure 4.1 Sensitivity of Total Costs of Production to Percentage Change in Raw Material Cost



As shown in Figure 4.1, as the percent increase in cost of PVC DOP rises, the total costs of production increases sharply against other raw materials. This information is valuable to the plant as they can pay a close monitoring on these raw materials' usage. The lab chemist team can also work on the replacement of this material to other types of plastic that have the same quality as these raw materials e.g. similar viscosity and reaction against different temperature and contamination, but may have cheaper costs per unit. The plant can also use different combinations of raw materials and using this model (Appendix F) to determine which combination of the raw materials gives the lowest cost of production. From this information, we can learn that it is not always true that the raw material that has the highest cost per unit will have the highest impact to the total cost of production e.g. elastomer in this case. We have to also consider the relevant proportion of this raw material in producing a set of device. By using solver table in this model, we can easily determine this information.

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CHAPTER V
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From the concept of Aggregate Production Planning (APP) with the proposed models by several researchers, this paper proposes the optimization model in planning production input of medical devices, which are labor and raw materials. This paper also explores the opportunity to expand the production capacity of the medical devices manufacturer, and determine which human capital between hiring temporary workers and utilizing overtime labor hour during high demand periods will minimize total costs of production.

By comparing the total costs of production following the optimization plan from the model to the current practice of hiring temporary worker to support the production during peak demand period, the proposed model suggested the utilization of overtime labor hour during the increase in demand from the current maximum level (350,000 sets of Blood Tubing Line) by 15%-43%. The overtime labor hours will be required in the planning months that have low number of working days which overtime labor hours will be required during weekends and public holiday. If the demand increases from 43% and above of the current demand or in other words, if the demand exceeds 500,500 sets of BTL, the plant will reach its maximum capacity of overtime labor hours supplied by regular labor, and temporary worker will be hired from this point. The total costs of production that the plant can save by following the suggested model is from 0.1% to 7.04% as the demand increases from the current maximum level by 15% to 40%.

For the raw material analysis, solver table tool identified PVC DOP (Dioctyl Phthalate) as the raw material that has the highest sensitivity to the costs of production. As there are numbers of raw material used with different proportion in producing a single set of medical device, it might be difficult to determine which raw material has the highest impact to the costs of production without using solver table

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tool. The model found that it is not always the raw material that has the highest cost per unit that will have the highest impact to the costs of production, but the factor of its proportion to the total components of the product can also impact the sensitivity of the costs of production. This information will help the plant to pay close attention in purchasing this identified raw material. Also, the plant can design the new combination of raw materials that could satisfy the quality required by the customers while lowering the costs of production.

Although the blood tubing line (BTL) was the only product selected for this study, the three assembly plants being tested shows favorable result from the model against current practice. The developed model can also be applied to other types of products by changing the variable inputs such as raw material requirement, labor types and capacity, working hours, and corresponding costs.

5.2 Recommendations

It is recommended that further adjustments should be developed in this aggregate production planning models to match specific requirements of the products especially when the user of the model shifts the plan from one product to another. Further study on the use of idle workers from other production platform shall also be developed to test against the use of overtime labor hours. It is also recommended that the concept of rolling horizon approach to update the information in the model shall be continuously updated from time to time to ensure the model captures the latest information available.

The appropriate methods for disaggregating the aggregate plan into the master production plan should also be developed based on different situations and requirement by each product.

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APPENDICES

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APPENDIX A
SENSITIVITY OF LABOR POLICY IN RESPONSE TO CHANGES IN DEMAND

Sensitivity of labor policy to changes in Demand																
	Temp Worker Hired				Temp Worker Fired				Regular labor OT used during normal workday				Regular labor OT used during holiday			
% Demand Increase	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10
0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15%	-	-	0	-	-	-	-	-	-	-	500	-	-	-	-	-
16%	-	-	0	-	-	-	-	-	-	-	1,200	-	-	-	-	-
17%	-	-	0	-	-	-	-	-	-	-	1,900	-	-	-	-	-
18%	-	-	0	-	-	-	-	-	-	-	2,600	-	-	-	-	-
19%	-	0	-	-	-	-	-	-0	100	-	3,300	-	-	-	-	-
20%	-0	-	0	-	-	-	-	-	800	-	4,000	-	-	-	-	-
21%	0	0	0	-	-	-	-	-	1,500	-	4,700	-	-	-	-	-
22%	0	-	0	-	-	-	-	-	2,200	-	5,400	-	-	-	-	-
23%	-0	-	-0	-	-	-	-	-	2,900	-	6,100	-	-	-	-	-

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Appendix A Sensitivity of Labor Policy in Response to Changes in Demand (Cont.)

Sensitivity of labor policy to changes in Demand

	Temp Worker Hired				Temp Worker Fired				Regular labor OT used during normal workday				Regular labor OT used during holiday			
% Demand Increases	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10
24%	-	-	0	-	-	-	-	-	3,600	400	6,800	400	-	-	-	-
25%	0	-	-	-	-	-	0	-	4,300	-	7,500	-	-	1,100	-	1,155
26%	-	-	-	-	-	0	0	0	5,000	-	8,200	-	-	1,800	-	1,800
27%	-	-	-	-	-	0	0	-	5,700	0	8,900	2,500	-	2,500	-	0
28%	-	-	0	-	-	-	-	-	6,400	3,200	9,600	-	-	-	-	3,200
29%	-	0	0	-	-	-	-	-	7,100	700	10,300	3,900	-	3,200	-	-
30%	-0	0	-	-	-	-	-	0	7,800	1,400	11,000	4,600	-	3,200	-	-
31%	0	-0	0	-	-	-	-	-	8,500	2,100	11,700	5,300	-	3,200	-	-
32%	-	-	-	-	-	0	0	-	9,200	2,800	12,400	6,000	-	3,200	-	-
33%	0	-	0	-	-	-	-	-	9,900	6,700	13,100	6,700	-	-	-	-
34%	-	-	-	-	-	0	0	0	10,600	7,400	13,800	7,400	-	-	-	-
35%	-	-	-	-	-	0	0	0	11,300	4,900	14,500	-	-	3,200	-	8,100
36%	-	0	0	-	-	-	-	-	12,000	5,600	15,200	8,800	-	3,200	-	0
37%	0	-	-	-	-	-	0	-	12,700	9,500	15,900	-	-	-	-	9,500
38%	-	0	-	-	-	-	-	0	13,400	10,200	16,600	600	-	-	-	9,600
39%	-	0	-	-	-	-	-	0	14,100	10,900	17,300	1,300	-	-	-	9,600
40%	-	-	0	-	-	0	-	-	14,800	8,400	18,000	11,600	-	3,200	-	-
41%	-	-	0	-	-	0	-	-	15,500	12,300	18,700	12,300	-	-	-	-
42%	-	0	-	-	-	-	-	0	16,200	9,800	19,400	13,000	-	3,200	-	0
43%	-0	-	0	-	-	-	-	0	16,900	10,500	20,000	13,700	-	3,200	-	-
44%	-	-	4	-	-	0	-	4	17,600	11,200	20,000	14,400	-	3,200	-	-
45%	0	-	7	-	-	-	-	7	18,300	15,100	20,000	15,100	-	-	-	-
46%	-	-	11	-	-	0	-	11	19,000	15,800	20,000	15,800	-	-	-	-
47%	0	-	14	-	-	-	-	14	19,700	13,300	20,000	16,500	-	3,200	-	-
48%	-	-	18	-	-	0	-	18	20,400	14,000	20,000	7,834	-	3,200	-	9,366
49%	1	-	21	-	-	1	-	21	20,800	17,900	20,000	17,900	-	-	-	-
50%	5	-	25	-	-	5	-	25	20,800	15,400	20,000	18,600	-	3,200	-	-
51%	8	-	28	-	-	8	-	28	20,800	16,100	20,000	9,700	-	3,200	-	9,600
52%	12	-	32	-	-	12	-	32	20,800	16,800	20,000	19,200	-	3,200	-	800
53%	15	-	35	-	-	15	-	35	20,800	17,500	20,000	11,100	-	3,200	-	9,600
54%	18	-	39	-	-	18	-	39	20,800	18,200	20,000	19,200	-	3,200	-	2,200
55%	22	-	43	-	-	22	-	43	20,800	18,900	20,000	12,500	-	3,200	-	9,600
56%	25	-	46	-	-	25	-	46	20,800	19,600	20,000	19,200	-	3,200	-	3,600
57%	28	-	49	-	-	28	-	49	20,800	20,300	20,000	13,900	-	3,200	-	9,600
59%	35	-	52	-	-	31	-	56	20,800	20,800	20,000	19,200	-	3,200	-	5,700
60%	38	-	53	-	-	31	-	60	20,800	20,800	20,000	19,200	-	3,200	-	6,400

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Appendix A Sensitivity of Labor Policy in Response to Changes in Demand (Cont.)

Sensitivity of labor policy to changes in Demand

	Temp Worker Hired				Temp Worker Fired				Regular labor OT used during normal workday				Regular labor OT used during holiday			
% Demand Increases	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10
61%	42	-	53	-	-	31	-	64	20,800	20,800	20,000	19,200	-	3,200	-	7,100
62%	45	-	53	-	-	31	-	67	20,800	20,800	20,000	17,400	-	3,200	-	9,600
63%	49	-	53	-	-	31	-	70	20,800	20,800	20,000	19,200	-	3,200	-	8,500
64%	52	-	54	-	-	32	-	74	20,800	20,800	20,000	18,800	-	3,200	-	9,600
65%	55	-	54	-	-	32	-	76	20,800	20,800	20,000	19,200	-	3,200	-	9,600
66%	59	-	54	-	-	32	-	76	20,800	20,800	20,000	19,200	-	3,200	-	9,600
67%	62	-	54	-	-	32	-	77	20,800	20,800	20,000	19,200	-	3,200	-	9,600
68%	65	-	55	-	-	32	-	77	20,800	20,800	20,000	19,200	-	3,200	-	9,600
69%	69	-	55	-	-	32	-	77	20,800	20,800	20,000	19,200	-	3,200	-	9,600
70%	72	-	55	-	-	32	-	77	20,800	20,800	20,000	19,200	-	3,200	-	9,600
71%	75	-	55	-	-	32	-	78	20,800	20,800	20,000	19,200	-	3,200	-	9,600
72%	79	-	56	-	-	33	-	78	20,800	20,800	20,000	19,200	-	3,200	-	9,600
73%	82	-	56	-	-	33	-	78	20,800	20,800	20,000	19,200	-	3,200	-	9,600
74%	86	-	56	-	-	33	-	78	20,800	20,800	20,000	19,200	-	3,200	-	9,600
75%	89	-	56	-	-	33	-	79	20,800	20,800	20,000	19,200	-	3,200	-	9,600
76%	92	-	57	-	-	33	-	79	20,800	20,800	20,000	19,200	-	3,200	-	9,600
77%	96	-	57	-	-	33	-	79	20,800	20,800	20,000	19,200	-	3,200	-	9,600
78%	99	-	57	-	-	33	-	79	20,800	20,800	20,000	19,200	-	3,200	-	9,600
79%	102	-	58	-	-	33	-	80	20,800	20,800	20,000	19,200	-	3,200	-	9,600
80%	106	-	58	-	-	34	-	80	20,800	20,800	20,000	19,200	-	3,200	-	9,600
81%	109	-	58	-	-	34	-	80	20,800	20,800	20,000	19,200	-	3,200	-	9,600
82%	112	-	58	-	-	34	-	81	20,800	20,800	20,000	19,200	-	3,200	-	9,600
83%	116	-	59	-	-	34	-	81	20,800	20,800	20,000	19,200	-	3,200	-	9,600
84%	119	-	59	-	-	34	-	81	20,800	20,800	20,000	19,200	-	3,200	-	9,600
85%	123	-	59	-	-	34	-	81	20,800	20,800	20,000	19,200	-	3,200	-	9,600
86%	126	-	59	-	-	34	-	82	20,800	20,800	20,000	19,200	-	3,200	-	9,600
87%	129	-	60	-	-	34	-	82	20,800	20,800	20,000	19,200	-	3,200	-	9,600
88%	133	-	60	-	-	35	-	82	20,800	20,800	20,000	19,200	-	3,200	-	9,600
89%	136	-	60	-	-	35	-	82	20,800	20,800	20,000	19,200	-	3,200	-	9,600
90%	139	-	60	-	-	35	-	83	20,800	20,800	20,000	19,200	-	3,200	-	9,600
91%	143	-	61	-	-	35	-	83	20,800	20,800	20,000	19,200	-	3,200	-	9,600
92%	146	-	61	-	-	35	-	83	20,800	20,800	20,000	19,200	-	3,200	-	9,600
93%	150	-	61	-	-	35	-	83	20,800	20,800	20,000	19,200	-	3,200	-	9,600
94%	153	-	61	-	-	35	-	84	20,800	20,800	20,000	19,200	-	3,200	-	9,600
95%	156	-	62	-	-	35	-	84	20,800	20,800	20,000	19,200	-	3,200	-	9,600
96%	160	-	62	-	-	36	-	84	20,800	20,800	20,000	19,200	-	3,200	-	9,600
97%	163	-	62	-	-	36	-	84	20,800	20,800	20,000	19,200	-	3,200	-	9,600
98%	166	-	62	-	-	36	-	85	20,800	20,800	20,000	19,200	-	3,200	-	9,600

Appendix A Sensitivity of Labor Policy in Response to Changes in Demand (Cont.)

Sensitivity of labor policy to changes in Demand

	Temp Worker Hired				Temp Worker Fired				Regular labor OT used during normal workday				Regular labor OT used during holiday			
% Demand Increases	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10	Oct 09	Nov 09	Dec 09	Jan 10
99%	170	-	63	-	-	36	-	85	20,800	20,800	20,000	19,200	-	3,200	-	9,600
100%	Not feasible															

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APPENDIX B

SENSITIVITY OF LABOR POLICY IN RESPONSE TO CHANGES IN HIRING COST

		% Increase in demand										
Hiring cost	**Temp worker hired Oct 09**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	5	38	72	106	139	Not feasible
	50	0	0	0	0	0	5	38	72	106	139	173
	100	0	0	0	0	0	5	38	72	106	139	173
	150	0	0	0	0	0	5	38	72	106	139	173
	200	0	0	0	0	0	5	38	72	106	139	173
	250	0	0	0	0	0	5	38	72	106	139	173
	300	0	0	0	0	0	5	38	72	106	139	173
	350	0	0	0	0	0	5	38	72	106	139	173
	400	0	0	0	0	0	5	38	72	106	139	173
	450	0	0	0	0	0	5	38	72	106	139	173
	500	0	0	0	0	0	5	38	72	106	139	173
		% Increase in demand										
Hiring cost	**Temp worker hired Nov 09**	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Temp worker hired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	0	0	0	0	0	0	25	53	55	58	60	Not feasible
	50	0	0	0	0	0	25	53	55	58	60	63
	100	0	0	0	0	0	25	53	55	58	60	63
	150	0	0	0	0	0	25	53	55	58	60	63
	200	0	0	0	0	0	25	53	55	58	60	63

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Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
	Temp worker hired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	250	0	0	0	0	0	25	53	55	58	60	63
	300	0	0	0	0	0	25	53	55	58	60	63
	350	0	0	0	0	0	25	53	55	58	60	63
	400	0	0	0	0	0	25	53	55	58	60	63
	450	0	0	0	0	0	25	53	55	58	60	63
	500	0	0	0	0	0	25	53	55	58	60	63
		% Increase in demand										
	Temp worker hired Jan 10	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Temp worker fired Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0

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Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
Hiring cost	Temp worker fired Nov 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	5	31	32	34	35	Not feasible
	50	0	0	0	0	0	5	31	32	34	35	36
	100	0	0	0	0	0	5	31	32	34	35	36
	150	0	0	0	0	0	5	31	32	34	35	36
	200	0	0	0	0	0	5	31	32	34	35	36
	250	0	0	0	0	0	5	31	32	34	35	36
	300	0	0	0	0	0	5	31	32	34	35	36
	350	0	0	0	0	0	5	31	32	34	35	36
	400	0	0	0	0	0	5	31	32	34	35	36
	450	0	0	0	0	0	5	31	32	34	35	36
	500	0	0	0	0	0	5	31	32	34	35	36
		% Increase in demand										
Hiring cost	Temp worker fired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
Hiring cost	Temp worker fired Jan 10	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	25	60	77	80	83	Not feasible
	50	0	0	0	0	0	25	60	77	80	83	85
	100	0	0	0	0	0	25	60	77	80	83	85
	150	0	0	0	0	0	25	60	77	80	83	85
	200	0	0	0	0	0	25	60	77	80	83	85
	250	0	0	0	0	0	25	60	77	80	83	85
	300	0	0	0	0	0	25	60	77	80	83	85
	350	0	0	0	0	0	25	60	77	80	83	85
	400	0	0	0	0	0	25	60	77	80	83	85
	450	0	0	0	0	0	25	60	77	80	83	85
	500	0	0	0	0	0	25	60	77	80	83	85

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Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Oct 09	0%	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	0	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	Not feasible
	50	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	100	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	150	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	200	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	250	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	300	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	350	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	400	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	450	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	500	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
		% Increase in demand										
Hiring cost	**Regular labor OT used during normal workday Nov 09**	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0		0	0	4,600	8,400	18,600	20,800	20,800	20,800	20,800	Not feasible
	50		0	0	4,600	1,1600	15,400	20,800	20,800	20,800	20,800	20,800
	100		0	0	4,600	8,400	18,600	20,800	20,800	20,800	20,800	20,800
	150		0	0	1,400	1,1600	15,400	20,800	20,800	20,800	20,800	20,800
	200		0	0	4,600	8,400	18,600	20,800	20,800	20,800	20,800	20,800
	250		0	0	1,400	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	300		0	0	4,600	11,600	15,400	20,800	20,800	20,800	20,800	20,800
	350		0	0	1,400	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	400		0	0	1,400	11,600	18,600	20,800	20,800	20800	20,800	20,800
	450		0	0	1,400	11,600	18,600	20,800	20,800	20,800	20800	20,800
	500		0	0	1,400	11,600	15,400	20,800	20,800	20,800	20,800	20,800
		% Increase in demand										
Hiring cost	**Regular labor OT used during normal workday Dec 09**	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	Not feasible
	50	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	100	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	150	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	200	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000

Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	250	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	300	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	350	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	400	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	450	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	500	-	-	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
		% Increase in demand										
Hiring cost	**Regular labor OT used during normal workday Jan 10**	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	Not feasible
	50	-	-	-	4,600	11,600	9,047	16,000	19,200	19,200	19,200	19,200
	100	-	-	-	4,600	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	150	-	-	-	4,600	11,600	9,000	19,200	19,200	19,200	19,200	19,200
	200	-	-	-	4,600	2,096	18,600	16,000	19,200	19,200	19,200	19,200
	250	-	-	-	4,600	11,600	18,600	16,000	19,200	19,200	19,200	19,200
	300	-	-	-	4,600	11,600	9,047	16,000	19,200	19,200	19,200	19,200
	350	-	-	-	4,600	2,000	18,600	19,200	19,200	19,200	19,200	19,200
	400	-	-	-	4,600	2,000	18,600	16,000	19,200	19,200	19,200	19,200
	450	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	500	-	-	-	4,600	11,600	18,600	16,000	19,200	19,200	19,200	19,200
		% Increase in demand										
Hiring Cost	**Regular labor OT used during holiday Oct 09**	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0

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Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
Hiring cost	**Regular labor OT used during holiday Nov 09**	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	-	-	-	-	3,200	-	3,200	3,200	3,200	3,200	Not feasible
	50	-	-	-	-	-	3,200	3,200	3,200	3,200	3,200	3,200
	100	-	-	-	-	3,200	-	3,200	3,200	3,200	3,200	3,200
	150	-	-	-	3,200	-	3,200	3,200	3,200	3,200	3,200	3,200
	200	-	-	-	-	3,200	0	3,200	3,200	3,200	3,200	3,200
	250	-	-	-	3,200	-	-	3,200	3,200	3,200	3,200	3,200
	300	-	-	-	-	-	3,200	3,200	3,200	3,200	3,200	3,200
	350	-	-	-	3,200	-	-	3,200	3,200	3,200	3,200	3,200
	400	-	-	-	3,200	-	-	3,200	3,200	3,200	3,200	3,200
	450	-	-	-	3,200	-	-	3,200	3,200	3,200	3,200	3,200
	500	-	-	-	3,200	-	3,200	3,200	3,200	3,200	3,200	3,200
		% Increase in demand										
Hiring Cost	**Regular labor OT used during holiday Dec 09**	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	0	0	0	0	0	0	0	0	0	0	Not feasible
	50	0	0	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0	0	0
	200	0	0	0	0	0	0	0	0	0	0	0
	250	0	0	0	0	0	0	0	0	0	0	0
	300	0	0	0	0	0	0	0	0	0	0	0
	350	0	0	0	0	0	0	0	0	0	0	0
	400	0	0	0	0	0	0	0	0	0	0	0
	450	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Regular labor OT used during holiday Jan 10	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	0	-	-	-	-	-	-	6,400	9,600	9,600	9,600	Not feasible
	50	-	-	-	-	-	9,553	9,600	9,600	9,600	9,600	9,600
	100	-	-	-	-	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	150	-	-	-	-	-	9,600	6,400	9,600	9,600	9,600	9,600
	200	-	-	-	-	9,504	-	9,600	9,600	9,600	9,600	9,600
	250	-	-	-	-	-	-	9,600	9,600	9,600	9,600	9,600
	300	-	-	-	-	-	9,553	9,600	9,600	9,600	9,600	9,600
	350	-	-	-	-	9,600	-	6,400	9,600	9,600	9,600	9,600
	400	-	-	-	-	9,600	-	9,600	9,600	9,600	9,600	9,600

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Appendix B Sensitivity of Labor Policy in Response to Changes in Hiring Cost (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Jan 10	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hiring cost	450	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	500	-	-	-	-	-	-	9,600	9,600	9,600	9,600	9,600

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APPENDIX C
SENSITIVITY OF LABOR POLICY IN RESPONSE TO CHANGES IN OT COSTS DURING NORMAL WORKDAY

		% Increase in demand										
	Temp worker hired Oct 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	5	38	72	106	139	Not feasible
	7.5	0	0	0	0	0	5	38	72	106	139	173
	8	0	0	0	0	0	5	38	72	106	139	173
	8.5	0	0	0	0	0	5	38	72	106	139	173
	9	0	0	0	0	0	5	38	72	106	139	173
	9.5	0	0	0	0	0	5	38	72	106	139	173
	10	0	0	0	0	0	5	38	72	106	139	173
	10.5	0	0	0	0	0	5	38	72	106	139	173
	11	0	0	0	0	0	5	38	72	106	139	173
	11.5	0	0	0	0	0	5	38	72	106	139	173
	12	0	0	0	0	0	5	38	72	106	139	173
	12.5	0	0	0	0	0	5	38	72	106	139	173
	13	0	0	0	0	0	5	38	72	106	139	173
	13.5	0	0	0	0	0	5	38	72	106	139	173
	14	0	0	0	0	0	5	38	72	106	139	173
	14.5	0	0	0	0	0	5	38	72	106	139	173
	15	0	0	0	0	0	5	38	72	106	139	173
	15.5	0	0	0	0	0	5	38	72	106	139	173
	16	0	0	0	0	0	5	38	72	106	139	173
	16.5	0	0	0	0	0	5	38	72	106	139	173
	17	0	0	0	0	0	5	38	72	106	139	173
	17.5	0	0	0	0	0	5	38	72	106	139	173
	18	0	0	0	0	0	5	38	72	106	139	173
	18.5	0	0	0	0	0	5	38	72	106	139	173
	19	0	0	0	0	0	5	38	72	106	139	173
	19.5	0	0	0	0	0	5	38	72	106	139	173
	20	0	0	0	0	0	5	38	72	106	139	173
	20.5	0	0	0	0	0	5	38	72	106	139	173
	21	0	0	0	0	0	5	38	72	106	139	173
	21.5	0	0	0	0	0	5	38	72	106	139	173
	22	0	0	0	0	0	5	38	72	106	139	173
	22.5	0	0	0	0	0	25	60	95	130	165	200
	23	0	0	0	0	0	25	60	95	130	165	200
	23.5	0	0	0	0	9	42	74	106	139	171	204
	24	0	0	0	0	9	42	74	106	139	171	204
	24.5	0	0	0	0	9	42	74	106	139	171	204
	25	0	0	0	6	39	71	104	136	169	201	233
	25.5	0	0	0	6	39	71	104	136	169	201	233
	26	0	0	0	6	39	71	104	136	169	201	233

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker hired Nov 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker hired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	25	53	55	58	60	Not feasible
	7.5	0	0	0	0	0	25	53	55	58	60	63
	8	0	0	0	0	0	25	53	55	58	60	63
	8.5	0	0	0	0	0	25	53	55	58	60	63
	9	0	0	0	0	0	25	53	55	58	60	63
	9.5	0	0	0	0	0	25	53	55	58	60	63
	10	0	0	0	0	0	25	53	55	58	60	63
	10.5	0	0	0	0	0	25	53	55	58	60	63
	11	0	0	0	0	0	25	53	55	58	60	63
	11.5	0	0	0	0	0	25	53	55	58	60	63
	12	0	0	0	0	0	25	53	55	58	60	63
	12.5	0	0	0	0	0	25	53	55	58	60	63
	13	0	0	0	0	0	25	53	55	58	60	63
	13.5	0	0	0	0	0	25	53	55	58	60	63
	14	0	0	0	0	0	25	53	55	58	60	63
	14.5	0	0	0	0	0	25	53	55	58	60	63
	15	0	0	0	0	0	25	53	55	58	60	63
	15.5	0	0	0	0	0	25	53	55	58	60	63
	16	0	0	0	0	0	25	53	55	58	60	63
	16.5	0	0	0	0	0	20	22	23	24	26	27
	17	0	0	0	0	0	20	22	23	24	26	27
	17.5	0	0	0	0	0	20	22	23	24	26	27
	18	0	0	0	0	0	20	22	23	24	26	27
	18.5	0	0	0	0	0	20	22	23	24	26	27
	19	0	0	0	0	0	20	22	23	24	26	27
	19.5	0	0	0	0	0	20	22	23	24	26	27
	20	0	0	0	0	0	20	22	23	24	26	27
	20.5	0	0	0	0	0	20	22	23	24	26	27
	21	0	0	0	0	0	20	22	23	24	26	27
	21.5	0	0	0	0	0	20	22	23	24	26	27
	22	0	0	0	0	0	20	22	23	24	26	27
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker hired Jan 10	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker fired Oct 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker fired Nov 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	5	31	32	34	35	Not feasible
	7.5	0	0	0	0	0	5	31	32	34	35	36
	8	0	0	0	0	0	5	31	32	34	35	36
	8.5	0	0	0	0	0	5	31	32	34	35	36
	9	0	0	0	0	0	5	31	32	34	35	36
	9.5	0	0	0	0	0	5	31	32	34	35	36
	10	0	0	0	0	0	5	31	32	34	35	36
	10.5	0	0	0	0	0	5	31	32	34	35	36
	11	0	0	0	0	0	5	31	32	34	35	36
	11.5	0	0	0	0	0	5	31	32	34	35	36
	12	0	0	0	0	0	5	31	32	34	35	36
	12.5	0	0	0	0	0	5	31	32	34	35	36
	13	0	0	0	0	0	5	31	32	34	35	36
	13.5	0	0	0	0	0	5	31	32	34	35	36
	14	0	0	0	0	0	5	31	32	34	35	36
	14.5	0	0	0	0	0	5	31	32	34	35	36
	15	0	0	0	0	0	5	31	32	34	35	36
	15.5	0	0	0	0	0	5	31	32	34	35	36
	16	0	0	0	0	0	5	31	32	34	35	36
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker fired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Temp worker fired Jan 10	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	25	60	77	80	83	Not feasible
	7.5	0	0	0	0	0	25	60	77	80	83	85
	8	0	0	0	0	0	25	60	77	80	83	85
	8.5	0	0	0	0	0	25	60	77	80	83	85
	9	0	0	0	0	0	25	60	77	80	83	85
	9.5	0	0	0	0	0	25	60	77	80	83	85
	10	0	0	0	0	0	25	60	77	80	83	85
	10.5	0	0	0	0	0	25	60	77	80	83	85
	11	0	0	0	0	0	25	60	77	80	83	85
	11.5	0	0	0	0	0	25	60	77	80	83	85
	12	0	0	0	0	0	25	60	77	80	83	85
	12.5	0	0	0	0	0	25	60	77	80	83	85
	13	0	0	0	0	0	25	60	77	80	83	85
	13.5	0	0	0	0	0	25	60	77	80	83	85
	14	0	0	0	0	0	25	60	77	80	83	85
	14.5	0	0	0	0	0	25	60	77	80	83	85
	15	0	0	0	0	0	25	60	77	80	83	85
	15.5	0	0	0	0	0	25	60	77	80	83	85
	16	0	0	0	0	0	25	60	77	80	83	85
	16.5	0	0	0	0	0	25	60	77	80	83	85
	17	0	0	0	0	0	25	60	77	80	83	85
	17.5	0	0	0	0	0	25	60	77	80	83	85
	18	0	0	0	0	0	25	60	77	80	83	85
	18.5	0	0	0	0	0	25	60	77	80	83	85
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	6	30	30	30	30	30	30	30
	25.5	0	0	0	6	30	30	30	30	30	30	30
	26	0	0	0	6	30	30	30	30	30	30	30

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	-	-	800	7,800	14,800	20,800	20,800	20,762	20,800	20,800	Not feasible
	7.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	8	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	8.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	9	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	9.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	10	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	10.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	11	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	11.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	12	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	12.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	13	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	13.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	14	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	14.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	15	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	15.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	16	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	16.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	17	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	17.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	18	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	18.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	19	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	19.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	20	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	20.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	21	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	21.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	22	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	22.5	-	-	800	7,800	14,800	16,600	16,320	16,040	15,760	15,480	15,200
	23	-	-	800	7,800	14,800	16,600	16,320	16,040	15,760	15,480	15,200
	23.5	-	-	800	7,800	12,874	13,133	13,393	13,652	13,911	14,170	14,430
	24	-	-	800	7,800	12,874	13,133	13,393	13,652	13,911	14,170	14,430
	24.5	-	-	800	7,800	12,874	13,133	13,393	13,652	13,911	14,170	14,430
	25	-	-	800	6,452	6,711	6,970	7,230	7,489	7,748	8,007	8,267
	25.5	-	-	800	6,452	6,711	6,970	7,230	7,489	7,748	8,007	8,267
	26	-	-	800	6,452	6,711	6,970	7,230	7,489	7,748	8,007	8,267

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Nov 09	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	Not feasible
	7.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	8	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	8.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	9	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	9.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	10	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	10.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	11	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	11.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	12	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	12.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	13	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	13.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	14	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	14.5	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	15	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	15.5	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	16	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	16.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	17	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	17.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	18	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	18.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	19	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	19.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	20	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	20.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	21	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	21.5	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Nov 09	0 %	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	22	-	-	-	1,400	8,400	14,362	14,092	13,823	13,554	13,285	13,015
	22.5	-	-	-	1,400	8,400	10,000	9,440	8,880	8,320	7,760	7,200
	23	-	-	-	1,400	8,400	10,000	9,440	8,880	8,320	7,760	7,200
	23.5	-	-	-	1,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
	24	-	-	-	1,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
	24.5	-	-	-	1,400	6,400	6,400	6,400	6,400	6,400	6,400	6,400
	25	-	-	-	-	-	-	-	-	-	-	-
	25.5	-	-	-	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-	-	-	-
		% Increase in demand										
	Regular labor OT used during normal workday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	Not feasible
	7.5	0	0	4,000	11,000	18,000	20000	20,000	20,000	20,000	20,000	20,000
	8	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	8.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	9	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	9.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	10	0	0	4,000	11,000	18,000	20000	20,000	20,000	20,000	20,000	20,000
	10.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	11	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	11.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	12	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	12.5	0	0	4,000	11,000	18,000	20000	20,000	20,000	20,000	20,000	20,000
	13	0	0	4,000	11,000	18,000	20,000	20000	20000	20000	20000	20000
	13.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	14	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	14.5	0	0	4,000	11,000	18,000	20000	20,000	20,000	20,000	20,000	20,000
	15	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	15.5	0	0	4,000	11,000	18,000	20,000	20000	20000	20000	20000	20000
	16	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	16.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	17	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	17.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000

Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	18	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	18.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	19	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	19.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	20	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	20.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	21	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	21.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	22	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	22.5	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	23	0	0	4,000	11,000	18,000	20,000	20,000	20,000	20,000	20,000	20,000
	23.5	0	0	4,000	11,000	16,148	16,667	17,185	17,704	18,222	18,741	19,259
	24	0	0	4,000	11,000	16,148	16,667	17,185	17,704	18,222	18,741	19,259
	24.5	0	0	4,000	11,000	16,148	16,667	17,185	17,704	18,222	18,741	19,259
	25	0	0	4,000	9,704	10,222	10,741	11,259	11,778	12,296	12,815	13,333
	25.5	0	0	4,000	9,704	10,222	10,741	11,259	11,778	12,296	12,815	13,333
	26	0	0	4,000	9,704	10,222	10,741	11,259	11,778	12,296	12,815	13,333
		% Increase in demand										
	Regular labor OT used during normal workday Jan 10	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	Not feasible
	7.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	8	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	8.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	9	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	9.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	10	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	10.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	11	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	11.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	12	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	12.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	13	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	13.5	0	0	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	14	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
OT Cost during normal workday	14.5	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	15	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	15.5	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	16	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	16.5	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	17	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	17.5	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	18	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	18.5	0	0	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	19	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	19.5	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	20	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	20.5	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	21	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	21.5	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	22	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	22.5	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	23	0	0	-	-	2,000	3,600	3,040	2,480	1,920	1,360	800
	23.5	0	0	-	-	-	-	-	-	-	-	-
	24	0	0	-	-	-	-	-	-	-	-	-
	24.5	0	0	-	-	-	-	-	-	-	-	-
	25	0	0	-	-	-	-	-	-	-	-	-
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Oct 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Nov 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	3200	3200	3200	3200	Not feasible
	7.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	8	0	0	0	0	0	0	3200	3200	3200	3200	3200
	8.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	9	0	0	0	0	0	0	3200	3200	3200	3200	3200
	9.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	10	0	0	0	0	0	0	3200	3200	3200	3200	3200
	10.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	11	0	0	0	0	0	0	3200	3200	3200	3200	3200
	11.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	12	0	0	0	0	0	0	3200	3200	3200	3200	3200
	12.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	13	0	0	0	0	0	0	3200	3200	3200	3200	3200
	13.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	14	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	14.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	15	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	15.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	16	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	16.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	17	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	17.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	18	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	18.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	19	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	19.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	20	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	20.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	21	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	21.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	22	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	22.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	23	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	23.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	24	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	24.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	25	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	25.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	26	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix C Sensitivity of Labor Policy in Response to Changes in OT Costs during normal workday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Jan 10	0%	10 %	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost during normal workday	7	0	0	0	0	0	0	6,400	9,600	9,600	9,600	Not feasible
	7.5	0	0	0	0	0	0	6,400	9,600	9,600	9,600	9,600
	8	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	8.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	9	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	9.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	10	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	10.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	11	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	11.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	12	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	12.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	13	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	13.5	0	0	0	-	-	-	6,400	9,600	9,600	9,600	9,600
	14	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	14.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	15	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	15.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	16	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	16.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	17	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	17.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	18	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	18.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	19	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	19.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	20	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	20.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	21	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	21.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	22	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	22.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	23	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	23.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	24	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	24.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	25	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	25.5	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	26	0	0	0	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600

APPENDIX D

SENSITIVITY OF LABOR POLICY IN RESPONSE TO CHANGES IN OT COSTS DURING HOLIDAY

		% Increase in demand										
	Temporary Workers hired Oct 09	0%	10%	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	5	38	72	106	139	Not feasible
	7.5	0	0	0	0	0	5	38	72	106	139	173
	8	0	0	0	0	0	5	38	72	106	139	173
	8.5	0	0	0	0	0	5	38	72	106	139	173
	9	0	0	0	0	0	5	38	72	106	139	173
	9.5	0	0	0	0	0	5	38	72	106	139	173
	10	0	0	0	0	0	0	38	72	106	139	173
	10.5	0	0	0	0	0	0	38	72	106	139	173
	11	0	0	0	0	0	0	38	72	106	139	173
	11.5	0	0	0	0	0	0	38	72	106	139	173
	12	0	0	0	0	0	0	38	72	106	139	173
	12.5	0	0	0	0	0	0	38	72	106	139	173
	13	0	0	0	0	0	0	38	72	106	139	173
	13.5	0	0	0	0	0	0	38	72	106	139	173
	14	0	0	0	0	0	0	38	72	106	139	173
	14.5	0	0	0	0	0	0	38	72	106	139	173
	15	0	0	0	0	0	5	38	72	106	139	173
	15.5	0	0	0	0	0	5	38	72	106	139	173
	16	0	0	0	0	0	5	38	72	106	139	173
	16.5	0	0	0	0	0	5	38	72	106	139	173
	17	0	0	0	0	0	5	38	72	106	139	173
	17.5	0	0	0	0	0	5	38	72	106	139	173
	18	0	0	0	0	0	5	38	72	106	139	173
	18.5	0	0	0	0	0	5	38	72	106	139	173
	19	0	0	0	0	0	5	38	72	106	139	173
	19.5	0	0	0	0	0	5	38	72	106	139	173
	20	0	0	0	0	0	5	38	72	106	139	173
	20.5	0	0	0	0	0	5	38	72	106	139	173
	21	0	0	0	0	0	5	38	72	106	139	173
	21.5	0	0	0	0	0	5	38	72	106	139	173
	22	0	0	0	0	0	5	38	72	106	139	173
	22.5	0	0	0	0	0	5	38	72	106	139	173
	23	0	0	0	0	0	5	38	72	106	139	173
	23.5	0	0	0	0	0	5	38	72	106	139	173
	24	0	0	0	0	0	5	38	72	106	139	173
	24.5	0	0	0	0	0	5	38	72	106	139	173
	25	0	0	0	0	0	5	38	72	106	139	173
	25.5	0	0	0	0	0	5	38	72	106	139	173
	26	0	0	0	0	0	5	38	72	106	139	173

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers hired Nov 09	0%	10%	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers hired Dec 09	0%	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	25	53	55	58	60	Not feasible
	7.5	0	0	0	0	0	25	53	55	58	60	63
	8	0	0	0	0	0	25	53	55	58	60	63
	8.5	0	0	0	0	0	25	53	55	58	60	63
	9	0	0	0	0	0	25	53	55	58	60	63
	9.5	0	0	0	0	0	25	53	55	58	60	63
	10	0	0	0	0	0	0	53	55	58	60	63
	10.5	0	0	0	0	0	0	53	55	58	60	63
	11	0	0	0	0	0	0	53	55	58	60	63
	11.5	0	0	0	0	0	0	53	55	58	60	63
	12	0	0	0	0	0	0	53	55	58	60	63
	12.5	0	0	0	0	0	0	53	55	58	60	63
	13	0	0	0	0	0	0	53	55	58	60	63
	13.5	0	0	0	0	0	0	53	55	58	60	63
	14	0	0	0	0	0	0	53	55	58	60	63
	14.5	0	0	0	0	0	0	53	55	58	60	63
	15	0	0	0	0	0	25	53	55	58	60	63
	15.5	0	0	0	0	0	25	53	55	58	60	63
	16	0	0	0	0	0	25	53	55	58	60	63
	16.5	0	0	0	0	0	25	38	40	43	46	48
	17	0	0	0	0	0	25	38	40	43	46	48
	17.5	0	0	0	0	0	25	38	40	43	46	48
	18	0	0	0	0	0	25	38	40	43	46	48
	18.5	0	0	0	0	0	25	38	40	43	46	48
	19	0	0	0	0	0	25	38	40	43	46	48
	19.5	0	0	0	0	0	25	38	40	43	46	48
	20	0	0	0	0	0	25	38	40	43	46	48
	20.5	0	0	0	0	0	25	38	40	43	46	48
	21	0	0	0	0	0	25	38	40	43	46	48
	21.5	0	0	0	0	0	25	38	40	43	46	48
	22	0	0	0	0	0	25	38	40	43	46	48
	22.5	0	0	0	0	0	25	38	40	43	46	48
	23	0	0	0	0	0	25	38	40	43	46	48
	23.5	0	0	0	0	0	25	38	40	43	46	48
	24	0	0	0	0	0	25	38	40	43	46	48
	24.5	0	0	0	0	0	25	38	40	43	46	48
	25	0	0	0	0	0	25	38	40	43	46	48
	25.5	0	0	0	0	0	25	38	40	43	46	48
	26	0	0	0	0	0	25	38	40	43	46	48

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers hired Jan 10	0%	10 %	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers fired Oct 09	0%	10%	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers fired Nov 09	0%	10%	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	5	31	32	34	35	Not feasible
	7.5	0	0	0	0	0	5	31	32	34	35	36
	8	0	0	0	0	0	5	31	32	34	35	36
	8.5	0	0	0	0	0	5	31	32	34	35	36
	9	0	0	0	0	0	5	31	32	34	35	36
	9.5	0	0	0	0	0	5	31	32	34	35	36
	10	0	0	0	0	0	0	31	32	34	35	36
	10.5	0	0	0	0	0	0	31	32	34	35	36
	11	0	0	0	0	0	0	31	32	34	35	36
	11.5	0	0	0	0	0	0	31	32	34	35	36
	12	0	0	0	0	0	0	31	32	34	35	36
	12.5	0	0	0	0	0	0	31	32	34	35	36
	13	0	0	0	0	0	0	31	32	34	35	36
	13.5	0	0	0	0	0	0	31	32	34	35	36
	14	0	0	0	0	0	0	31	32	34	35	36
	14.5	0	0	0	0	0	0	31	32	34	35	36
	15	0	0	0	0	0	5	31	32	34	35	36
	15.5	0	0	0	0	0	5	31	32	34	35	36
	16	0	0	0	0	0	5	31	32	34	35	36
	16.5	0	0	0	0	0	5	16	17	19	20	21
	17	0	0	0	0	0	5	16	17	19	20	21
	17.5	0	0	0	0	0	5	16	17	19	20	21
	18	0	0	0	0	0	5	16	17	19	20	21
	18.5	0	0	0	0	0	5	16	17	19	20	21
	19	0	0	0	0	0	5	16	17	19	20	21
	19.5	0	0	0	0	0	5	16	17	19	20	21
	20	0	0	0	0	0	5	16	17	19	20	21
	20.5	0	0	0	0	0	5	16	17	19	20	21
	21	0	0	0	0	0	5	16	17	19	20	21
	21.5	0	0	0	0	0	5	16	17	19	20	21
	22	0	0	0	0	0	5	16	17	19	20	21
	22.5	0	0	0	0	0	5	16	17	19	20	21
	23	0	0	0	0	0	5	16	17	19	20	21
	23.5	0	0	0	0	0	5	16	17	19	20	21
	24	0	0	0	0	0	5	16	17	19	20	21
	24.5	0	0	0	0	0	5	16	17	19	20	21
	25	0	0	0	0	0	5	16	17	19	20	21
	25.5	0	0	0	0	0	5	16	17	19	20	21
	26	0	0	0	0	0	5	16	17	19	20	21

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers fired Dec 09	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Temporary Workers fired Jan 10	0%	10%	20 %	30%	40 %	50 %	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	25	60	77	80	83	Not feasible
	7.5	0	0	0	0	0	25	60	77	80	83	85
	8	0	0	0	0	0	25	60	77	80	83	85
	8.5	0	0	0	0	0	25	60	77	80	83	85
	9	0	0	0	0	0	25	60	77	80	83	85
	9.5	0	0	0	0	0	25	60	77	80	83	85
	10	0	0	0	0	0	0	60	77	80	83	85
	10.5	0	0	0	0	0	0	60	77	80	83	85
	11	0	0	0	0	0	0	60	77	80	83	85
	11.5	0	0	0	0	0	0	60	77	80	83	85
	12	0	0	0	0	0	0	60	77	80	83	85
	12.5	0	0	0	0	0	0	60	77	80	83	85
	13	0	0	0	0	0	0	60	77	80	83	85
	13.5	0	0	0	0	0	0	60	77	80	83	85
	14	0	0	0	0	0	0	60	77	80	83	85
	14.5	0	0	0	0	0	0	60	77	80	83	85
	15	0	0	0	0	0	25	60	77	80	83	85
	15.5	0	0	0	0	0	25	60	77	80	83	85
	16	0	0	0	0	0	25	60	77	80	83	85
	16.5	0	0	0	0	0	25	60	77	80	83	85
	17	0	0	0	0	0	25	60	77	80	83	85
	17.5	0	0	0	0	0	25	60	77	80	83	85
	18	0	0	0	0	0	25	60	77	80	83	85
	18.5	0	0	0	0	0	25	60	77	80	83	85
	19	0	0	0	0	0	25	30	33	36	38	41
	19.5	0	0	0	0	0	25	30	33	36	38	41
	20	0	0	0	0	0	25	30	33	36	38	41
	20.5	0	0	0	0	0	25	30	33	36	38	41
	21	0	0	0	0	0	25	30	33	36	38	41
	21.5	0	0	0	0	0	25	30	33	36	38	41
	22	0	0	0	0	0	25	30	33	36	38	41
	22.5	0	0	0	0	0	25	30	33	36	38	41
	23	0	0	0	0	0	25	30	33	36	38	41
	23.5	0	0	0	0	0	25	30	33	36	38	41
	24	0	0	0	0	0	25	30	33	36	38	41
	24.5	0	0	0	0	0	25	30	33	36	38	41
	25	0	0	0	0	0	25	30	33	36	38	41
	25.5	0	0	0	0	0	25	30	33	36	38	41
	26	0	0	0	0	0	25	30	33	36	38	41

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	Not feasible
	7.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	8	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	8.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	9	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	9.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	10	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	10.5	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	11	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	11.5	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	12	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	12.5	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	13	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	13.5	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	14	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	14.5	-	-	800	7,800	14,800	-	20,800	20,800	20,800	20,800	20,800
	15	-	-	800	7,800	14,800	20,799	20,800	20,800	20,800	20,800	20,800
	15.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	16	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	16.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	17	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	17.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	18	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	18.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	19	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	19.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	20	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	20.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	21	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	21.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	22	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	22.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	23	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	23.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	24	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	24.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	25	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	25.5	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800
	26	-	-	800	7,800	14,800	20,800	20,800	20,800	20,800	20,800	20,800

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Nov 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	Not feasible
	7.5	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	8	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	8.5	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	9	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	9.5	-	-	-	1,400	8,400	15,400	20,800	20,800	20,800	20,800	20,800
	10	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	10.5	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	11	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	11.5	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	12	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	12.5	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	13	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	13.5	-	-	-	1,400	8,400	-	20,800	20,800	20,800	20,800	20,800
	14	-	-	-	4,600	11,600	-	20,800	20,800	20,800	20,800	20,800
	14.5	-	-	-	4,600	11,600	-	20,800	20,800	20,800	20,800	20,800
	15	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	15.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	16	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	16.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	17	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	17.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	18	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	18.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	19	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	19.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	20	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	20.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	21	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	21.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	22	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	22.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Nov 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	23	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	23.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	24	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	24.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	25	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	25.5	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
	26	-	-	-	4,600	11,600	18,600	20,800	20,800	20,800	20,800	20,800
		% Increase in demand										
	Regular labor OT used during normal workday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	4000	11000	18000	20000	20000	20000	20000	20000	Not feasible
	7.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	8	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	8.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	9	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	9.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	10	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	10.5	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	11	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	11.5	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	12	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	12.5	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	13	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	13.5	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	14	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	14.5	0	0	4000	11000	18000	0	20000	20000	20000	20000	20000
	15	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	15.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	16	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	16.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	17	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	17.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	18	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	18.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	19	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000

Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	19.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	20	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	20.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	21	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	21.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	22	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	22.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	23	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	23.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	24	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	24.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	25	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	25.5	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000
	26	0	0	4000	11000	18000	20000	20000	20000	20000	20000	20000

		% Increase in demand										
	Regular labor OT used during normal workday Jan 10	0 %	10 %	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	Not feasible
	7.5	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	8	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	8.5	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	9	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	9.5	-	-	-	-	2,000	9,000	16,000	19,200	19,200	19,200	19,200
	10	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	10.5	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	11	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	11.5	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	12	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Jan 10	0 %	10 %	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	12.5	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	13	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	13.5	-	-	-	-	2,000	-	16,000	19,200	19,200	19,200	19,200
	14	-	-	-	4,600	11,600	-	19,200	19,200	19,200	19,200	19,200
	14.5	-	-	-	4,600	11,600	-	19,200	19,200	19,200	19,200	19,200
	15	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	15.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	16	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	16.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	17	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	17.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	18	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	18.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	19	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	19.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	20	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	20.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	21	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	21.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	22	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	22.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during normal workday Jan 10	0 %	10 %	20 %	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	23	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	23.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	24	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	24.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	25	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	25.5	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200
	26	-	-	-	4,600	11,600	18,600	19,200	19,200	19,200	19,200	19,200

		% Increase in demand										
	Regular labor OT used during holiday Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0
	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Oct 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Regular labor OT used during holiday Nov 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	3200	3200	3200	3200	3200	3200	3200	Not feasible
	7.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	8	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	8.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	9	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	9.5	0	0	0	3200	3200	3200	3200	3200	3200	3200	3200
	10	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	10.5	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	11	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	11.5	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	12	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	12.5	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	13	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	13.5	0	0	0	3200	3200	0	3200	3200	3200	3200	3200
	14	0	0	0	0	0	0	3200	3200	3200	3200	3200
	14.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	15	0	0	0	0	0	0	3200	3200	3200	3200	3200
	15.5	0	0	0	0	0	0	3200	3200	3200	3200	3200
	16	0	0	0	0	0	0	3200	3200	3200	3200	3200
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Nov 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Regular labor OT used during holiday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	0	0	0	0	0	0	0	0	0	0	Not feasible
	7.5	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0
	8.5	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	0	0	0
	9.5	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0
	10.5	0	0	0	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0	0	0
	11.5	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	0	0
	13.5	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0
	14.5	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0
	15.5	0	0	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	0	0	0	0	0
	16.5	0	0	0	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	0	0	0	0

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Dec 09	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	17.5	0	0	0	0	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	0	0	0
	18.5	0	0	0	0	0	0	0	0	0	0	0
	19	0	0	0	0	0	0	0	0	0	0	0
	19.5	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	0	0	0	0	0	0
	20.5	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0
	21.5	0	0	0	0	0	0	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	0
	22.5	0	0	0	0	0	0	0	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0
	23.5	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0
	24.5	0	0	0	0	0	0	0	0	0	0	0
	25	0	0	0	0	0	0	0	0	0	0	0
	25.5	0	0	0	0	0	0	0	0	0	0	0
	26	0	0	0	0	0	0	0	0	0	0	0
		% Increase in demand										
	Regular labor OT used during holiday Jan 10	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	7	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	Not feasible
	7.5	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	8	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	8.5	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	9	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	9.5	-	-	-	4,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
	10	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	10.5	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	11	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	11.5	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	12	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	12.5	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	13	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600
	13.5	-	-	-	4,600	9,600	-	9,600	9,600	9,600	9,600	9,600

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Appendix D Sensitivity of Labor Policy in Response to Changes in OT Costs during holiday (Cont.)

		% Increase in demand										
	Regular labor OT used during holiday Jan 10	0 %	10 %	20%	30%	40%	50%	60%	70%	80%	90%	100%
OT Cost per hour for regular worker on holiday COWh	14	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	14.5	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	15	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	15.5	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	16	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	16.5	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	17	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	17.5	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	18	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	18.5	-	-	-	-	-	-	6,400	9,600	9,600	9,600	9,600
	19	-	-	-	-	-	-	-	-	-	-	-
	19.5	-	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-	-
	20.5	-	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-	-
	21.5	-	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-	-
	22.5	-	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-	-
	23.5	-	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-	-
	24.5	-	-	-	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-	-	-	-
	25.5	-	-	-	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-	-	-	-

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APPENDIX E

SENSITIVITY OF LABOR POLICY IN RESPONSE TO CHANGES IN % INCREASE IN DEMAND AND NUMBER OF AVAILABLE REGULAR WORKER

		Number of regular worker												
	Temporary Workers hired Oct 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	87	24	0	-	-	0	-	0	-	-	-	0	0
	5%	103	41	0	-	-	-	-	-	-	-	-	0	0
	10%	120	58	-	0	-	-	-	-	-	-	-	0	0
	15%	137	75	12	0	-	-	-	-	-	-	-	0	0
	20%	154	91	29	-	-	-	-	-	-	-	-	0	0
	25%	171	108	46	-	0	-	-	-	-	-	-	0	0
	30%	188	125	63	0	-	-	-	-	-	-	-	0	0
	35%	204	142	79	17	0	0	-	-	-	-	-	0	0
	40%	221	159	96	34	0	0	-	-	-	-	-	0	0
	45%	238	175	113	50	-	0	-	-	-	-	-	0	0
	50%	255	192	130	67	5	-	0	-	-	-	-	0	0
	55%	272	209	147	84	22	-	0	-	-	-	-	0	0
	60%	288	226	163	101	38	-	-	-	-	-	-	0	0
	65%	305	243	180	118	55	-	0	0	-	-	-	0	0
	70%	322	260	197	135	72	10	-	-	-	-	-	0	0
	75%	339	276	214	151	89	26	0	0	-	-	-	0	0
	80%	356	293	231	168	106	43	0	-	0	-	-	0	0
	85%	373	310	248	185	123	60	0	0	-	-	-	0	0
	90%	389	327	264	202	139	77	14	-	0	-	-	0	0
	95%	406	344	281	219	156	94	31	0	-	-	-	0	0
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Temporary Workers hired Nov 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	0	-	0	0	0	-	-	-	
	5%	-	-	-	-	-	0	-	-	-	-	0	-	
	10%	-	-	0	0	-	0	-	-	-	-	0	-	
	15%	-	-	-	0	-	-	-	-	-	-	0	-	
	20%	-	-	-	-	0	-	-	-	-	-	0	-	
	25%	-	-	-	0	-	-	-	-	-	-	0	-	

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers hired Nov 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	30%	-	-	-	-	-	-	-	-	-	-	0	-	-
	35%	-	-	-	-	-	-	-	-	-	-	0	-	-
	40%	-	-	-	-	-	-	-	-	-	-	0	-	-
	45%	-	-	-	-	-	-	-	-	-	-	0	-	-
	50%	-	-	-	-	-	-	-	-	-	-	0	-	-
	55%	-	-	-	-	-	-	0	-	-	-	0	-	-
	60%	-	-	-	-	-	0	0	-	-	-	0	-	-
	65%	-	-	-	-	-	-	0	-	-	-	0	-	-
	70%	-	-	-	-	-	-	-	-	-	-	0	-	-
	75%	-	-	-	-	-	-	-	-	-	-	0	-	-
	80%	-	-	-	-	-	-	-	-	-	-	0	-	-
	85%	-	-	-	-	-	-	0	-	0	-	0	-	-
	90%	-	-	-	-	-	-	-	-	-0	-	0	-	-
	95%	-	-	-	-	-	-	-	0	-	0	0	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible
		Number of regular worker												
	Temporary Workers hired Dec 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	31	33	0	0	0	-	0	0	-0	-0	-	-	-
	5%	33	34	-	-	0	-	0	-	-	-	-	-	-
	10%	34	35	10	0	0	-	0	-	-	-	-	-	-
	15%	35	37	28	-	-	-0	0	-	-	-	-	-	-
	20%	37	38	39	0	-	-	-0	-	-	-	-	-	-
	25%	38	39	41	-0	-	-	-0	-	-	-	-	-	-
	30%	39	41	42	18	0	0	0	0	0	-	-	-	-
	35%	41	42	43	35	0	-	-0	0	0	-	-	-	-
	40%	42	43	45	46	0	-	0	-0	0	-	-	-	-
	45%	43	45	46	47	8	-	0	-0	0	-	-	-	-
	50%	44	46	47	49	25	-	-0	0	-0	-	-	-	-
	55%	46	47	49	50	43	-	-	-0	0	-	-	-	-
	60%	47	48	50	51	53	-	0	-0	-	-	-	-	-
	65%	48	50	51	53	54	15	-	0	-	-	-	-	-
	70%	50	51	52	54	55	32	-	-	-	-	-	-	-
	75%	51	52	54	55	56	50	-	0	0	-	-	-	-
	80%	52	54	55	56	58	59	5	0	0	-	-	-	-
	85%	54	55	56	58	59	60	23	0	-	-	-	-	-
	90%	55	56	58	59	60	62	40	-	0	-0	-	-	-
	95%	56	57	59	60	62	63	57	0	0	0	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers hired Dec 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Temporary Workers hired Jan 10	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	-	-	-	-	-	-	-	-	
	5%	-	-	-	-	-	-	-	-	-	-	-	-	
	10%	-	-	-	-	-	-	-	-	-	-	-	-	
	15%	-	-	-	-	-	-	-	-	-	-	-	-	
	20%	-	-	-	-	-	-	-	-	-	-	-	-	
	25%	-	-	-	-	-	-	-	-	-	-	-	-	
	30%	-	-	-	-	-	-	-	-	-	-	-	-	
	35%	-	-	-	-	-	-	-	-	-	-	-	-	
	40%	-	-	-	-	-	-	-	-	-	-	-	-	
	45%	-	-	-	-	-	-	-	-	-	-	-	-	
	50%	-	-	-	-	-	-	-	-	-	-	-	-	
	55%	-	-	-	-	-	-	-	-	-	-	-	-	
	60%	-	-	-	-	-	-	-	-	-	-	-	-	
	65%	-	-	-	-	-	-	-	-	-	-	-	-	
	70%	-	-	-	-	-	-	-	-	-	-	-	-	
	75%	-	-	-	-	-	-	-	-	-	-	-	-	
	80%	-	-	-	-	-	-	-	-	-	-	-	-	
	85%	-	-	-	-	-	-	-	-	-	-	-	-	
	90%	-	-	-	-	-	-	-	-	-	-	-	-	
	95%	-	-	-	-	-	-	-	-	-	-	-	-	
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers fired Oct 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	-	-	-	-	-	-	-	-	
	5%	-	-	-	-	-	-	-	-	-	-	-	-	
	10%	-	-	-	-	-	-	-	-	-	-	-	-	
	15%	-	-	-	-	-	-	-	-	-	-	-	-	
	20%	-	-	-	-	-	-	-	-	-	-	-	-	
	25%	-	-	-	-	-	-	-	-	-	-	-	-	
	30%	-	-	-	-	-	-	-	-	-	-	-	-	
	35%	-	-	-	-	-	-	-	-	-	-	-	-	
	40%	-	-	-	-	-	-	-	-	-	-	-	-	
	45%	-	-	-	-	-	-	-	-	-	-	-	-	
	50%	-	-	-	-	-	-	-	-	-	-	-	-	
	55%	-	-	-	-	-	-	-	-	-	-	-	-	
	60%	-	-	-	-	-	-	-	-	-	-	-	-	
	65%	-	-	-	-	-	-	-	-	-	-	-	-	
	70%	-	-	-	-	-	-	-	-	-	-	-	-	
	75%	-	-	-	-	-	-	-	-	-	-	-	-	
	80%	-	-	-	-	-	-	-	-	-	-	-	-	
	85%	-	-	-	-	-	-	-	-	-	-	-	-	
	90%	-	-	-	-	-	-	-	-	-	-	-	-	
	95%	-	-	-	-	-	-	-	-	-	-	-	-	
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers fired Nov 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	18	19	-	0	-	-	-	-	-	0	0	-	-
	5%	19	20	-	-	-	-	-	-	-	-	-	-	-
	10%	19	21	-	-	-	-	-	-	-	-	-	-	-
	15%	20	21	12	-	-	-	-	-	-	-	-	-	-
	20%	21	22	23	-	-	-	-	-	-	-	-	-	-
	25%	21	23	24	-	-	-	-	-	-	-	-	-	-
	30%	22	23	25	0	-	-	-	-	-	-	-	-	-
	35%	22	24	25	17	-	-	-	-	-	-	-	-	-
	40%	23	24	26	27	-	-	-	-	-	-	-	-	-
	45%	24	25	26	28	-	-	-	-	-	-	-	-	-
	50%	24	26	27	28	5	0	-	-	-	-	-	-	-
	55%	25	26	28	29	22	-	-	-	-	-	-	-	-
	60%	25	27	28	30	31	-	-	-	-	-	-	-	-
	65%	26	28	29	30	32	-	0	-	-	-	-	-	-
	70%	27	28	30	31	32	10	-	0	-	-	-	-	-
	75%	27	29	30	32	33	26	0	-	-	-	-	-	-
	80%	28	29	31	32	34	35	-	-	-	-	-	-	-
	85%	29	30	31	33	34	36	-	0	-	-	-	-	-
	90%	29	31	32	33	35	36	14	0	-	-	-	-	-
	95%	30	31	33	34	35	37	31	-	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Temporary Workers fired Dec 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	-	0	-	-	-	-	0	-	-
	5%	-	-	0	-	-	-	-	0	-	-	-	-	-
	10%	-	-	-	-	-	-	-	0	-	-	-	-	-
	15%	-	-	-	-	-	-	-	0	-	-	-	-	-
	20%	-	-	-	-	-	-	-	0	-	-	-	-	-
	25%	-	-	-	-	0	-	-	0	-	-	-	-	-
	30%	-	-	-	-	-	-	-	-	-	-	-	-	-
	35%	-	-	-	0	-	0	-	-	-	-	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers fired Dec 09	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	40%	-	-	-	-	-	0	-	-	-	-	-	-	-
	45%	-	-	-	-	-	0	-	-	-	-	-	-	-
	50%	-	-	-	-	-	0	-	-	-	-	-	-	-
	55%	-	-	-	-	-	-	-	-	-	-	-	-	-
	60%	-	-	-	-	-	-	-	-	-	-	-	-	-
	65%	-	-	-	-	-	-	0	-	-	-	-	-	-
	70%	-	-	-	-	-	-	-	0	-	-	-	-	-
	75%	-	-	-	-	-	-	-	0	-	-	-	-	-
	80%	-	-	-	-	-	-	-	-	-	-	-	-	-
	85%	-	-	-	-	-	-	-	-	-	-	-	-	-
	90%	-	-	-	-	-	-	-	-	-	-	-	-	-
	95%	-	-	-	-	-	-	-	-	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Temporary Workers fired Jan 10	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	43	38	-	-	-	-	-	-	-	-	-	-	-
	5%	44	48	-	-	-	-	-	0	0	0	-	-	-
	10%	45	49	10	-	-	-	-	0	0	0	-	-	-
	15%	46	51	28	0	0	-	-	0	0	0	-	-	-
	20%	48	52	45	-	0	-	-	0	0	0	-	-	-
	25%	49	53	57	-	0	-	-	0	0	0	-	-	-
	30%	50	55	59	18	-	-	-	-	-	0	-	-	-
	35%	52	56	60	35	-	-	-	-	-	0	-	-	-
	40%	53	57	61	53	-	0	-	-	-	0	-	-	-
	45%	54	58	63	67	8	0	-	-	-	0	-	-	-
	50%	56	60	64	68	25	-	-	-	-	0	-	-	-
	55%	57	61	65	69	43	-	0	-	-	0	-	-	-
	60%	58	62	66	71	60	0	-	-	0	0	-	-	-
	65%	59	64	68	72	76	15	-	-	0	0	-	-	-
	70%	61	65	69	73	77	32	-	0	0	0	-	-	-
	75%	62	66	70	75	79	50	-	-	-	0	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Temporary Workers fired Jan 10	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	80%	63	68	72	76	80	68	5	0	-	0	-	-	-
	85%	65	69	73	77	81	85	23	0	0	0	-	-	-
	90%	66	70	74	78	83	87	40	0	-	-	-	-	-
	95%	67	71	76	80	84	88	57	-	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible
		Number of regular worker												
	Regular labor OT used during normal workday Oct 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	104	130	76	-	-	-	-	-	-	-	-	-	-
	5%	104	130	111	7	-	-	-	-	-	-	-	-	-
	10%	104	130	146	42	-	-	-	-	-	-	-	-	-
	15%	104	130	156	77	-	-	-	-	-	-	-	-	-
	20%	104	130	156	112	8	-	-	-	-	-	-	-	-
	25%	104	130	156	147	43	-	-	-	-	-	-	-	-
	30%	104	130	156	182	78	-	-	-	-	-	-	-	-
	35%	104	130	156	182	113	9	-	-	-	-	-	-	-
	40%	104	130	156	182	148	44	-	-	-	-	-	-	-
	45%	104	130	156	182	183	79	-	-	-	-	-	-	-
	50%	104	130	156	182	208	114	10	-	-	-	-	-	-
	55%	104	130	156	182	208	149	45	-	-	-	-	-	-
	60%	104	130	156	182	208	184	80	-	-	-	-	-	-
	65%	104	130	156	182	208	219	115	11	-	-	-	-	-
	70%	104	130	156	182	208	234	150	46	-	-	-	-	-
	75%	104	130	156	182	208	234	185	81	-	-	-	-	-
	80%	104	130	156	182	208	234	220	116	12	-	-	-	-
	85%	104	130	156	182	208	234	255	151	47	-	-	-	-
	90%	104	130	156	182	208	234	260	186	82	-	-	-	-
	95%	104	130	156	182	208	234	260	221	117	13	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during normal workday Nov 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	104	130	52	-	-	-	-	-	-	-	-	-	-
	5%	104	130	63	-	-	-	-	-	-	-	-	-	-
	10%	104	130	122	14	-	-	-	-	-	-	-	-	-
	15%	104	130	133	49	-	-	-	-	-	-	-	-	-
	20%	104	130	156	56	-	-	-	-	-	-	-	-	-
	25%	104	130	156	119	11	-	-	-	-	-	-	-	-
	30%	104	130	156	154	14	-	-	-	-	-	-	-	-
	35%	104	130	156	182	81	-	-	-	-	-	-	-	-
	40%	104	130	156	182	116	8	-	-	-	-	-	-	-
	45%	104	130	156	182	151	43	-	-	-	-	-	-	-
	50%	104	130	156	182	186	42	-	-	-	-	-	-	-
	55%	104	130	156	182	189	112	5	-	-	-	-	-	-
	60%	104	130	156	182	208	112	40	-	-	-	-	-	-
	65%	104	130	156	182	208	183	35	-	-	-	-	-	-
	70%	104	130	156	182	208	182	110	2	-	-	-	-	-
	75%	104	130	156	182	208	234	145	-	-	-	-	-	-
	80%	104	130	156	182	208	234	140	72	-	-	-	-	-
	85%	104	130	156	182	208	234	175	107	-	-	-	-	-
	90%	104	130	156	182	208	234	250	142	34	-	-	-	-
	95%	104	130	156	182	208	234	260	133	69	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Regular labor OT used during normal workday Dec 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in	0%	100	125	100	-	-	-	-	-	-	-	-	-	-
	5%	100	125	135	35	-	-	-	-	-	-	-	-	-
	10%	100	125	150	70	-	-	-	-	-	-	-	-	-
	15%	100	125	150	105	5	-	-	-	-	-	-	-	-
	20%	100	125	150	140	40	-	-	-	-	-	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during normal workday Dec 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	25%	100	125	150	175	75	-	-	-	-	-	-	-	-
	30%	100	125	150	175	110	10	-	-	-	-	-	-	-
	35%	100	125	150	175	145	45	-	-	-	-	-	-	-
	40%	100	125	150	175	180	80	-	-	-	-	-	-	-
	45%	100	125	150	175	200	115	15	-	-	-	-	-	-
	50%	100	125	150	175	200	150	50	-	-	-	-	-	-
	55%	100	125	150	175	200	185	85	-	-	-	-	-	-
	60%	100	125	150	175	200	220	120	20	-	-	-	-	-
	65%	100	125	150	175	200	225	155	55	-	-	-	-	-
	70%	100	125	150	175	200	225	190	90	-	-	-	-	-
	75%	100	125	150	175	200	225	225	125	25	-	-	-	-
	80%	100	125	150	175	200	225	250	160	60	-	-	-	-
	85%	100	125	150	175	200	225	250	195	95	-	-	-	-
	90%	100	125	150	175	200	225	250	230	130	30	-	-	-
	95%	100	125	150	175	200	225	250	265	165	65	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Regular labor OT used during normal workday Jan 10 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	96	120	52	-	-	-	-	-	-	-	-	-	-
	5%	96	120	15	-	-	-	-	-	-	-	-	-	-
	10%	96	120	52	14	-	-	-	-	-	-	-	-	-
	15%	96	120	143	49	-	-	-	-	-	-	-	-	-
	20%	96	120	120	84	-	-	-	-	-	-	-	-	-
	25%	96	120	144	119	-	-	-	-	-	-	-	-	-
	30%	96	120	144	72	46	-	-	-	-	-	-	-	-
	35%	96	120	144	168	-	-	-	-	-	-	-	-	-
	40%	96	120	144	168	116	8	-	-	-	-	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during normal workday Jan 10 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	45%	96	120	144	168	151	43	-	-	-	-	-	-	-
	50%	96	120	144	168	186	-	-	-	-	-	-	-	-
	55%	96	120	144	168	192	5	5	-	-	-	-	-	-
	60%	96	120	144	168	192	40	-	-	-	-	-	-	-
	65%	96	120	144	168	192	183	75	-	-	-	-	-	-
	70%	96	120	144	168	192	110	-	2	-	-	-	-	-
	75%	96	120	144	168	192	216	145	-	-	-	-	-	-
	80%	96	120	144	168	192	180	62	-	-	-	-	-	-
	85%	96	120	144	168	192	215	95	107	-	-	-	-	-
	90%	96	120	144	168	192	216	240	142	34	-	-	-	-
	95%	96	120	144	168	192	216	167	45	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Regular labor OT used during holiday Oct 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	-	-	-	-	-	-	-	-	-
	5%	-	-	-	-	-	-	-	-	-	-	-	-	-
	10%	-	-	-	-	-	-	-	-	-	-	-	-	-
	15%	-	-	-	-	-	-	-	-	-	-	-	-	-
	20%	-	-	-	-	-	-	-	-	-	-	-	-	-
	25%	-	-	-	-	-	-	-	-	-	-	-	-	-
	30%	-	-	-	-	-	-	-	-	-	-	-	-	-
	35%	-	-	-	-	-	-	-	-	-	-	-	-	-
	40%	-	-	-	-	-	-	-	-	-	-	-	-	-
	45%	-	-	-	-	-	-	-	-	-	-	-	-	-
	50%	-	-	-	-	-	-	-	-	-	-	-	-	-
	55%	-	-	-	-	-	-	-	-	-	-	-	-	-
	60%	-	-	-	-	-	-	-	-	-	-	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during holiday Oct 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	65%	-	-	-	-	-	-	-	-	-	-	-	-	-
	70%	-	-	-	-	-	-	-	-	-	-	-	-	-
	75%	-	-	-	-	-	-	-	-	-	-	-	-	-
	80%	-	-	-	-	-	-	-	-	-	-	-	-	-
	85%	-	-	-	-	-	-	-	-	-	-	-	-	-
	90%	-	-	-	-	-	-	-	-	-	-	-	-	-
	95%	-	-	-	-	-	-	-	-	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Regular labor OT used during holiday Nov 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	16	20	-	-	-	-	-	-	-	-	-	-	-
	5%	16	20	24	-	-	-	-	-	-	-	-	-	-
	10%	16	20	-	-	-	-	-	-	-	-	-	-	-
	15%	16	20	24	-	-	-	-	-	-	-	-	-	-
	20%	16	20	24	28	-	-	-	-	-	-	-	-	-
	25%	16	20	24	-	-	-	-	-	-	-	-	-	-
	30%	16	20	24	-	32	-	-	-	-	-	-	-	-
	35%	16	20	24	7	-	-	-	-	-	-	-	-	-
	40%	16	20	24	28	-	-	-	-	-	-	-	-	-
	45%	16	20	24	28	-	-	-	-	-	-	-	-	-
	50%	16	20	24	28	-	36	-	-	-	-	-	-	-
	55%	16	20	24	28	32	1	-	-	-	-	-	-	-
	60%	16	20	24	28	32	36	-	-	-	-	-	-	-
	65%	16	20	24	28	32	-	40	-	-	-	-	-	-
	70%	16	20	24	28	32	36	-	-	-	-	-	-	-
	75%	16	20	24	28	32	19	-	37	-	-	-	-	-
	80%	16	20	24	28	32	36	40	-	-	-	-	-	-
	85%	16	20	24	28	32	36	40	-	-	-	-	-	-

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during holiday in Nov 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	90%	16	20	24	28	32	36	-	-	-	-	-	-	-
	95%	16	20	24	28	32	36	25	44	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

		Number of regular worker												
	Regular labor OT used during holiday Dec 09 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	-	-	-	-	-	-	-	-	-	-	-	-	-
	5%	-	-	-	-	-	-	-	-	-	-	-	-	-
	10%	-	-	-	-	-	-	-	-	-	-	-	-	-
	15%	-	-	-	-	-	-	-	-	-	-	-	-	-
	20%	-	-	-	-	-	-	-	-	-	-	-	-	-
	25%	-	-	-	-	-	-	-	-	-	-	-	-	-
	30%	-	-	-	-	-	-	-	-	-	-	-	-	-
	35%	-	-	-	-	-	-	-	-	-	-	-	-	-
	40%	-	-	-	-	-	-	-	-	-	-	-	-	-
	45%	-	-	-	-	-	-	-	-	-	-	-	-	-
	50%	-	-	-	-	-	-	-	-	-	-	-	-	-
	55%	-	-	-	-	-	-	-	-	-	-	-	-	-
	60%	-	-	-	-	-	-	-	-	-	-	-	-	-
	65%	-	-	-	-	-	-	-	-	-	-	-	-	-
	70%	-	-	-	-	-	-	-	-	-	-	-	-	-
	75%	-	-	-	-	-	-	-	-	-	-	-	-	-
	80%	-	-	-	-	-	-	-	-	-	-	-	-	-
	85%	-	-	-	-	-	-	-	-	-	-	-	-	-
	90%	-	-	-	-	-	-	-	-	-	-	-	-	-
	95%	-	-	-	-	-	-	-	-	-	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Regular labor OT used during holiday Jan 10 in hundreds	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	48	40	-	-	-	-	-	-	-	-	-	-	-
	5%	48	60	72	-	-	-	-	-	-	-	-	-	-
	10%	48	60	70	-	-	-	-	-	-	-	-	-	-
	15%	48	60	14	-	-	-	-	-	-	-	-	-	-
	20%	48	60	72	-	-	-	-	-	-	-	-	-	-
	25%	48	60	72	-	11	-	-	-	-	-	-	-	-
	30%	48	60	72	82	-	-	-	-	-	-	-	-	-
	35%	48	60	72	21	81	-	-	-	-	-	-	-	-
	40%	48	60	72	56	-	-	-	-	-	-	-	-	-
	45%	48	60	72	84	-	-	-	-	-	-	-	-	-
	50%	48	60	72	84	-	78	-	-	-	-	-	-	-
	55%	48	60	72	84	29	108	-	-	-	-	-	-	-
	60%	48	60	72	84	64	108	40	-	-	-	-	-	-
	65%	48	60	72	84	96	-	-	-	-	-	-	-	-
	70%	48	60	72	84	96	108	110	-	-	-	-	-	-
	75%	48	60	72	84	96	37	0	37	-	-	-	-	-
	80%	48	60	72	84	96	108	118	72	-	-	-	-	-
	85%	48	60	72	84	96	108	120	-	-	-	-	-	-
	90%	48	60	72	84	96	108	10	-	-	-	-	-	-
	95%	48	60	72	84	96	108	118	132	69	-	-	-	-
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Units of product produce Oct 09 in 00s	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
	5%	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
	10%	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850
	15%	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025
	20%	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
	25%	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375
	30%	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550
	35%	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725
	40%	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900
	45%	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075
	50%	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
	55%	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425
	60%	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
	65%	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775
	70%	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950
	75%	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125
	80%	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300
	85%	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475
	90%	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650
	95%	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Units of product produce in Nov 09 in 00s	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
	5%	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
	10%	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850
	15%	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025
	20%	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
	25%	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375
	30%	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550
	35%	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725
	40%	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900
	45%	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075
	50%	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
	55%	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425
	60%	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
	65%	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775
	70%	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950
	75%	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125
	80%	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300
	85%	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475
	90%	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650
	95%	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825
	100 %	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Units of product produced in Dec 09 in 00s	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
	5%	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
	10%	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850
	15%	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025
	20%	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
	25%	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375
	30%	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550
	35%	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725
	40%	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900
	45%	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075
	50%	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
	55%	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425
	60%	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
	65%	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775
	70%	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950
	75%	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125
	80%	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300
	85%	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475
	90%	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650
	95%	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825
	100%	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible	Not Feasible

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Appendix E Sensitivity of Labor Policy in Response to Changes in % Increase in Demand and Number of Available Regular Worker (Cont.)

		Number of regular worker												
	Units of product produce in Jan 10 in 00s	200	250	300	350	400	450	500	550	600	650	700	750	800
% increase in demand	0%	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
	5%	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675	3,675
	10%	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850
	15%	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025	4,025
	20%	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
	25%	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375	4,375
	30%	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550	4,550
	35%	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725	4,725
	40%	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900
	45%	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,075
	50%	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
	55%	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425	5,425
	60%	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
	65%	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775	5,775
	70%	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950	5,950
	75%	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125	6,125
	80%	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300
	85%	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475	6,475
	90%	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650	6,650
	95%	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825	6,825
	100%	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible	Not feasible

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APPENDIX F

PROPOSED MODEL

M.E. Meditek Production Planning for Blood Tubing Line							
INPUT DATA							
Raw Material (in KG)							
Raw Material 1 per one unit produced R1 PVC DOP	0.2857		Raw Material 1 cost per unit CP1	฿74.00			
Raw Material 2 per one unit produced R2 PVC NON DOP	0.0571		Raw Material 2 cost per unit CP2	฿97.67			
Raw Material 3 per one unit produced R3 PC	0.0306		Raw Material 3 cost per unit CP3	฿127.50			
Raw Material 4 per one unit produced R4 PP	0.0654		Raw Material 4 cost per unit CP4	฿46.00			
Raw Material 5 per one unit produced R5 Elastomer	0.0063		Raw Material 5 cost per unit CP5	฿344.00			
Raw Material 1 Availability	100,000						
Raw Material 2 Availability	20,000						
Raw Material 3 Availability	10,700						
Raw Material 4 Availability	22,900						
Raw Material 5 Availability	2,200						
Labor							
Beginning regular worker	400						
Beginning temporary worker	0						
Number of normal workdays in Oct 09 n1	26		Average salary per day for regular worker CW	฿180.00			
Number of normal workdays in Nov 09 n2	26		Average wages per day of a temporary worker CTW	฿180.00			

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Appendix F Proposed Model (Cont.)

M.E. Meditek Production Planning for Blood Tubing Line							
INPUT DATA							
Labor							
Number of normal workdays in Dec 09 n3	25		Hiring cost of temporary worker CH	฿500			
Number of normal workdays in Jan 10 n4	24		Firing cost of temporary worker CL	฿800			
Number of regular working hours in each workday RH	8		OT Cost per hour for regular worker on normal workday COW_n	฿13.75			
Number of allowable OT hours on normal workday per worker Oh_n	2		OT Cost per hour for regular worker on holiday COW_h	฿13.75			
Number of allowable OT hours on holiday Oh_h	8		OT Cost per hour for temp worker on normal workday $COTW_n$	N/A			
Number of holiday in Oct 09 h1	0		OT Cost per hour for temp worker on holiday $COTW_h$	N/A			
Number of holiday in Nov 09 h2	1						
Number of holiday in Dec 09 h3	0						
Number of holiday in Jan 10 h4	3						
Labor hours required/ unit of product produced	0.2						

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Appendix F Proposed Model (Cont.)

M.E. Meditek Production Planning for Blood Tubing Line							
		% Change in demand					
Demand		0%					
Demand Oct 09 D1	350,000						
Demand Nov 09 D2	350,000						
Demand Dec 09 D3	350,000						
Demand Jan 10 D4	350,000						
Inventory							
Beginning inventory	0		Inventory holding cost per month per unit CI	20			
Maximum allowable inventory level MAX I	800,000		Subcontracting cost per unit Csub	N/A			
Maximum allowable subcontracting units Max Sub	N/A		Backorder cost per unit	60			
Worker plan	**Oct 09**	**Nov 09**	**Dec 09**	**Jan 10**			
Beginning Regular workers	400	400	400	400			
Beginning Temporary workers	0	0	0	0			
Temporary Workers hired	0	0	0	0			
Temporary Workers fired	0	0	0	0			
Workers available after hiring and firing	400	400	400	400			
Total Temporary workers	0	0	0	0			
Regular-time hours available	83,200	86,400	80,000	86,400			
Regular labor OT used during normal workday	0	0	0	0			
	<=	<=	<=	<=			
Maximum OT for regular worker available during normal workday	20,800	20,800	20,000	19,200			

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Appendix F Proposed Model (Cont.)

M.E. Meditek Production Planning for Blood Tubing Line							
Worker plan	**Oct 09**	**Nov 09**	**Dec 09**	**Jan 10**			
Regular labor OT used during holiday	0	0	0	0			
	<=	<=	<=	<=			
Maximum OT for regular worker available during holiday	0	3200	0	9600			
Total labor hours for production	83,200	86,400	80,000	86,400			
Production plan	**Oct 09**	**Nov 09**	**Dec 09**	**Jan 10**			
Units of product produced	350,000	350,000	350,000	350,000			
	<=	<=	<=	<=			
Production capacity by available labor hours	416,000	432,000	400,000	432,000			
						Available Raw material	
Raw Material 1 used	100,000	100,000	100,000	100,000	<=	100,000	
Raw Material 2 used	20,000	20,000	20,000	20,000	<=	20,000	
Raw Material 3 used	10,700	10,700	10,700	10,700	<=	10,700	
Raw Material 4 used	22,900	22,900	22,900	22,900	<=	22,900	
Raw Material 5 used	2,200	2,200	2,200	2,200	<=	2,200	
Inventory after production	350,000	350,000	350,000	350,000			
				>=			
Forecasted demand	350,000	350,000	350,000	350,000			
Leftover	0	0	0	0			
Shortage	0	0	0	0			
Leftover minus shortage	0	0	0	0			
	=	=	=	=			
Ending inventory	0	0	0	0			
	<=	<=	<=	<=			
Warehouse Capacity	800,000	800,000	800,000	800,000			

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Appendix F Proposed Model (Cont.)

M.E. Meditek Production Planning for Blood Tubing Line						
Costs of Production						
Monetary outputs in 00s	**Oct 09**	**Nov 09**	**Dec 09**	**Jan 10**	**Totals**	
Hiring cost	฿0	฿0	฿0	฿0	฿0	
Firing cost	฿0	฿0	฿0	฿0	฿0	
Regular-time wages for Regular worker	฿18,720	฿19,440	฿18,000	฿19,440	฿75,600	
Regular-time wages for Temporary worker	฿0	฿0	฿0	฿0	฿0	
Overtime wages	฿0	฿0	฿0	฿0	฿0	
Raw material cost	฿125,279	฿125,279	฿125,279	฿125,279	฿501,114	
Holding cost	฿0	฿0	฿0	฿0	฿0	
Shortage cost	฿0	฿0	฿0	฿0	฿0	
Totals	฿143,999	฿144,719	฿143,279	฿144,719	฿576,714	

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BIOGRAPHY

NAME	Miss Pinyada Sukavathanakul
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