# THE THESIS TITLE*

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Department of Economics

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## ABSTRACT

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**Keywords**: keyword 1, keyword 2

**JEL Codes**: J02, R10

*We thank someone for excellent research assistance. We thank someone for their comments and suggestions.
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# 1 Introduction

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# 2 Model

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**Theorem 1** (Envelope Theorem)**.** *Only the direct effects of a change in an exogenous variable need be considered, even though the exogenous variable may enter the maximum value function indirectly as part of the solution to the endogenous choice variables. The proof is in Appendix B.*

The competition can be illustrated with the following graph with the implementation is presented in Listing 1:

Figure 1: This is a graph

*Note:* some notes. The graph should be self-contained. Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

# 3 Comparative Statics

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This is also demonstrated in Figure 1. Download this template at the Github repository.

Listing 1: Long short-term memory

```
class network_LSTM(nn.Module):
   def __init__(self, input_size=1, hidden_size=256, output_size=1):
      super().__init__()
      self.hidden_size = hidden_size
      self.lstm = nn.LSTM(input_size, hidden_size)

      # fully-connected
      self.linear = nn.Linear(hidden_size, output_size)

      self.hidden = (
         torch.zeros(1, 1, self.hidden_size),
         torch.zeros(1, 1, self.hidden_size)
      )

   def forward(self,vec):
      lstm_output, self.hidden = self.lstm(vec.view(len(vec),1,-1), self.hidden)
      prediction = self.linear(lstm_output.view(len(vec),-1))
      return prediction[-1]
```

# 4 Empirical Results

We follow the approach from Harding and Lamarche (2019). Quisque facilisis auctor sapien. Pellentesque gravida hendrerit lectus. Mauris rutrum sodales sapien. Fusce hendrerit sem vel lorem. Integer pellentesque massa vel augue. Integer elit tortor, feugiat quis, sagittis et, ornare non, lacus. Vestibulum posuere pellentesque eros. Quisque venenatis ipsum dictum nulla. Aliquam quis quam non metus eleifend interdum. Nam eget sapien ac mauris malesuada adipiscing. Etiam eleifend neque sed quam. Nulla facilisi. Proin a ligula. Sed id dui eu nibh egestas tincidunt. Suspendisse arcu. By using this approach, comparable results can be obtained (Chen, Esteban and Shum, 2013).

To calculate the ELBO[3], we start from using the property of the KL-divergence. Nulla ac nisl. Nullam urna nulla, ullamcorper in, interdum sit amet, gravida ut, risus. Aenean ac enim. In luctus. Phasellus eu quam vitae turpis viverra pellentesque. Duis feugiat felis ut enim. Phasellus pharetra, sem id porttitor sodales, magna nunc aliquet nibh, nec blandit nisl mauris at pede. Suspendisse risus risus, lobortis eget, semper at, imperdiet sit amet, quam. Quisque

[3]More information about the evidence lower bound (ELBO) can be found on the Wikipedia.

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The data can be summarized by the tables with decimal alignment below:

Table B.1a: First Table

| Category | Total | Shares (%) | Female | Male | Asian | Black/AA | His./Latino | White/Cau. | Zeros (%) |
|---|---|---|---|---|---|---|---|---|---|
| child care | 19.39 | 0.08 | 12.32 | 20.12 | 23.14 | 63.78 | 20.24 | 19.00 | 0.07 |
| eating | 30.35 | 6.12 | 35.97 | 6.23 | 24.61 | 21.58 | 38.18 | 2.02 | 0.00 |
| education | 9.91 | 0.04 | 9.94 | 90.54 | 9.69 | 7.99 | 10.64 | 10.14 | 0.90 |
| entertainment (not TV) | 26.05 | 0.10 | 29.19 | 26.60 | 33.36 | 26.13 | 4.43 | 25.15 | 0.45 |

*Note:* This is the first table.

Table B.1b: Second Table

| Category | Total | Shares (%) | Female | Male | Asian | Black/AA | His./Latino | White/Cau. | Zeros (%) |
|---|---|---|---|---|---|---|---|---|---|
| child care | 19.39 | 0.08 | 39.32 | 40.12 | 23.14 | 18.78 | 20.24 | 19.00 | 0.07 |
| personal care | 13.92 | 0.06 | 24.00 | 23.14 | 16.12 | 1.76 | 15.15 | 13.66 | 0.00 |
| sports/exercise | 20.44 | 0.08 | 20.38 | 31.00 | 24.99 | 25.48 | 20.71 | 20.07 | 0.53 |
| TV | 28.61 | 0.12 | 48.47 | 9.93 | 2.35 | 63.70 | 29.22 | 80.20 | 0.46 |

*Note:* This is the second table.

In the following, we present the algorithm:

# 5 Algorithm

**Algorithm 1:** Euclid's algorithm for finding the greatest common divisor of two nonnegative integers

function Euclid $(a, b)$;
**Input :** Two nonnegative integers $a$ and $b$
**Output :** $\gcd(a, b)$
**if** $b = 0$ **then**
  return $a$;
**else**
  return Euclid$(b, a \mod b)$;
**end**

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molestie non, scelerisque at, vestibulum eu, nulla. Ut odio nisl, facilisis id, mollis et, scelerisque nec, enim. Aenean sem leo, pellentesque sit amet, scelerisque sit amet, vehicula pellentesque, sapien.

Table 2: Summary Statistics

| | Cohort | | |
|---|---|---|---|
| | 2006 | 2007 | 2008 |
| **Students registered** | 1535 | 1584 | 1767 |
| **Gender (%)** | | | |
| Male | 61.1 | 64.5 | 57.7 |
| Female | 38.9 | 35.5 | 42.3 |
| **Race (%)** | | | |
| White | 43.3 | 43.4 | 40.6 |
| Black | 29.8 | 33.4 | 34.8 |

*Note:* Source: UCT Institutional Planning Department

# 6 Conclusion

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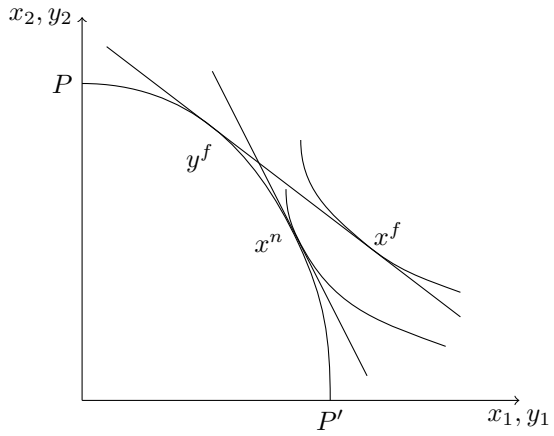
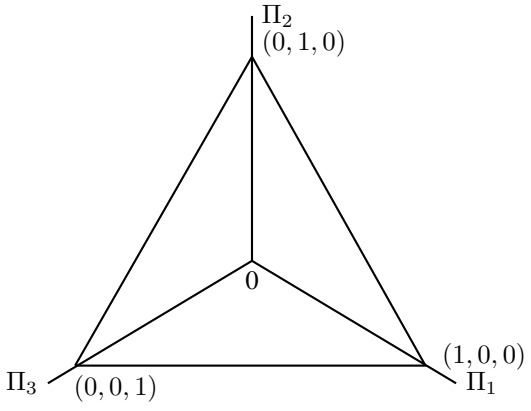
We graph with `tikz` in LaTeX:



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# Appendices

## A Additional Discussion

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## B Proof of Theorem 1

We will proof the following equation:

*Proof.* Given $y$, $x$, $\Delta$, $\nu$, $\eta$, $\mathcal{L}$= $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 & 7 \end{pmatrix}$, and $\prod = \begin{vmatrix} A & B & C \\ D & E & F \end{vmatrix}$, if

$$\begin{cases} \text{trade}, & p(\text{trade}) = \dfrac{y}{v} \\ \text{no trade}, & p(\text{no trade}) = 1 - \dfrac{y}{v} \end{cases}$$

then we have

$$\begin{aligned} y &= \mathop{\mathbb{E}}_{\pi}\Big(\beta x + \epsilon\Big) \\ &\neq \sum_{i} \beta_i (\underbrace{\alpha + \xi}_{\text{variables}}) + \epsilon \qquad (1) \\ &\Longrightarrow \int_0^{10} r\left(\frac{r}{50}\right) dr \overset{\text{text here}}{=\!=\!=} \frac{r^3}{150}\bigg|_0^{10}, \forall x \in (a,b) \qquad (2) \end{aligned}$$

So from $\widehat{ABCD}$, $\widetilde{ABCD}$, $\widehat{ABCD}$, $\overrightarrow{ABCD}$, and $\overline{ABCD}$, we get the desire result. ■

Consider $g(x) = f(x) - x$, since $f(x)$ and $x$ are continuous, then $g : [a, b] \to \mathbb{R}$ is continuous. Then

$$g(a) = f(a) - a > 0,\ g(b) = f(b) - b < 0$$

By IVT: $\exists c \in (a, b)$ s.t. $g(c) = 0 \implies \exists c \in (a, b)$ s.t. $f(c) - c = 0 \implies f(c) = c$.