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PENNSYLVANIA ECONOMIC REVIEW  
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Drs. Thomas Tohin & Orhan Kara, Co-Editors  
Pennsylvania Economic Review  
Department of Economics and Finance  
Anderson Hall, 309  
West Chester University  
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INVESTMENT DECISIONS AND MARKET STRUCTURE UNDER INCOMPLETE INFORMATION

Cristian Pardo
Saint Joseph’s University

ABSTRACT

This paper sheds some light on the factors behind the timing of investment decisions under asymmetric information. Firms receive signals through which they build beliefs on the state of demand. The timing of investment and the resulting market structure depends on how quickly uncertainty is resolved and the significance of asymmetries in information. Inefficient outcomes could result as firms may “suspect” stronger competition or if uncertainty leads them to postpone projects, due to the irreversible nature of investment. Simulations tend to confirm the differences in time to invest and market structure discussed for the cases analyzed in the model.

INTRODUCTION

Informational frictions as a source of inefficiencies in aggregate investment have been an extensive area of economic research. Since investment involves fixed costs and is usually irreversible, increased uncertainty may naturally cause investors to become more cautious and consider options like postponing investment decisions until some uncertainties are resolved. Under the context of the current economic crisis, for instance, it could make sense for potential investors to “wait” until there are clearer signs regarding, say, the extent to which the crisis may affect relevant variables, such as price and demand. In general, an investor would not only compare the present discounted value of investing versus its most profitable current alternative, but also the value of investing today versus the value of investing sometime in the future. That is, the investor will try to evaluate his or her “value of waiting” (McDonald and Siegel, 1986).

The value of waiting can be affected by how quickly and effectively new relevant information arrives, which may include policy adjustments (interest rates, taxes, government programs, etc), changes in market conditions (demand and prices), changes in the structure of the industry (competition), and other factors. Note that information on competitors involves, for instance, observing action and inaction by other investors, as information rarely “arrives uniformly and comprehensively to every potential investor” (Caballero, 1999). That is, given that some information remains undisclosed during periods of inaction, the value of waiting gains relevance as the arrival of new information from others becomes more likely.

Consequently, incomplete information and/or information asymmetries may lead to suboptimal solutions, including postponing or not taking advantage of profitable investment opportunities. If this is the case, investments could evolve very slowly or even collapse (Caballero, 1999), potentially dragging down the rest of the economy. The aftermath of a recession is a common example of an environment in which uncertainty contributes to the
slowdown of investment decisions. In particular, firms may tend to postpone investment and hiring decisions during recessionary periods until concrete positive news arrives, thus delaying the recovery of the economy. This outcome could be particularly common in developing countries, where economic activity and investment, in particular, may exhibit stronger responses to shocks and, therefore, more volatility and uncertainty than more developed economies. Naturally, uncertainty about future economic conditions and ineffective normative and institutional conditions can further add to uncertainty. In addition, recessions are in many cases followed by the re-architecture of part of the labor market, capital market and fiscal position (Belke, 2009). Not surprisingly, many firms may decide to wait for stronger signals to confirm that it is a good idea to resume investments.

The flipside scenario, where investment grows very quickly in a short period of time, is also possible. That is, incomplete information could also lead to a decline in the value of waiting if other firms invest earlier and successfully capture a significantly large market share, thus potentially dramatically reducing the expected profitability of a project. That is, incomplete information could also imply the creation of incentives for firms to embark upon projects earlier than optimal. An illustrative case is that of periods of rapid technological progress, where numerous potentially attractive investment opportunities may present themselves to investors, though uncertainties on their profitability, feasibility and the structure of the competition may still be high.

One example of such a situation is the so-called “Dot com bubble” of the 1990’s. In its embryonic period, the general belief of high profitability in the information technology sector encouraged a large number of entrepreneurs to start new businesses over a short span of time. Uncertainty, however, remained high, including doubts about the resulting market structure. A few investors who entered early found profitable niches which allowed them to establish themselves and to obtain high market shares, recognition, efficiency and profitability. Others that entered later, and could not consolidate critical market shares, failed. Those who entered the market later and were able to survive, on the other hand, did so by offering newer, innovative or vastly improved services (e.g. Google, Netflix, Facebook, etc.).

A natural question is which of these two conflicting forces, at any point in time, will eventually prevail. Factors like uncertainty, unobservable preferences, competition, and expected returns, are likely to come to play in addressing this matter. The objective of this paper is to examine some of the factors that can affect the timing of investment decisions and the resulting market structure. In this framework, incomplete information could lead to inefficient equilibriums, in which investment projects may be executed either “too early” or “too late,” relative to the benchmark of perfect information.

Several papers have dealt with irreversible investment under uncertainty. Caplin and Leahy (1993), for instance, develop a macroeconomic model in which investors' actions are sub-optimal because they “fail to take into account the social value of the information that their investment reveals.” As information on the profitability of their industries is asymmetrically distributed among the participating investors, projects that succeed send positive signals to potential investors, who may respond by entering the industry. Equivalently, industries and economies will slowly recover from adverse shocks as inaction reduces the flow of hidden information. In Caplin and Leahy (1994), investors also possess private information but, due to adjustment costs in investment, will only respond to changes in information when they are highly convincing. Prior to that, however, information accumulates and no major changes in investment take place (“business as usual”), up until a certain threshold of information is reached (“market crash”). At that point, significant information is transmitted to other investors, who may respond accordingly (“wisdom after the fact”), usually producing magnified responses. Decisions by investors are also suboptimal, as they do not have incentives to share information with other investors.
Chamley and Gale (1994) develop a model in which a recession could last longer than it optimally would in equilibrium, as investors delay investment until they receive convincing positive information. Given that the higher the number of investors that decide to act, the more information is transmitted about the profitability of investments, investors have the incentive to be “the last to decide,” resulting in delays. This outcome occurs because the action of others only transmits information, but it does not affect the payoffs from investing. Finally, Drazen and Sakellaris (1995) introduce a model where the timing of investment decisions is affected by the likelihood of receiving new information at any point in time. The authors emphasize the distinction between uncertainty about the returns to investments and on when “uncertainty itself may be resolved.”

This paper adds to the existing literature by introducing the fact that investors may also face incentives to enter the market before it is optimal due to uncertainty about the resulting market structure. That is, as firms may exploit new markets or niches, they may temporarily enjoy monopolistic profits if they are active in the market before others. In particular, by using a simple monopolistic competition model with uncertainty regarding the true state of demand, a firm may earn positive profits if it enters the market alone. Profits would quickly fall when other firms enter the market after observing the realization of true demand, once the “first firm” starts selling. In this paper, firms also have incentives to wait as they will not invest before they have received convincing information about the state of demand. As firms receive random signals about the state of demand every period, one firm’s action and inaction reveals information about the number of positive signals it has received. Therefore, waiting may have the added benefit of investing with complete information.

This paper is structured as follows. In the next section, I comment about the method I employ in this paper. Next, I include a description of the model and how investors form their beliefs. The following section introduces and presents the implications of the benchmark case of no asymmetries in information. The fourth part conducts the equivalent analysis but for the realistic case where there is asymmetry in information, including uncertainty about the other firms’ opportunity costs. I then conduct simulation exercises to explore differences with respect to the average time it takes for investment to take place and the resulting market structure. The last section presents some concluding remarks.

**METHODS**

Traditional methods of investment planning like the net present value (NPV) suggest that a project should be executed if the net present discounted value of its future expected cash flows is positive. Probably due to its tractability, NPV is a widely used method in economics, finance, and accounting. A common drawback of this methodology, however, is that “just because an initiative has a positive NPV or provides an optimal return on investment does not mean that is the best usage of the funding” (Damodaran, 1999). That is, a positive NPV should not be a sufficient condition as it should be contrasted with the other alternatives that investors have. Real options analysis (ROA), on the other hand, is a valuation methodology that accounts for the value of options, such as the possibilities of expansion, contraction, altering the project along the way, building in stages, postponing, cancelling, etc.

The analysis I conduct in this paper is a mix of both techniques. For instance, this model employs the NIV technique in order to provide a necessary (but not sufficient) condition for executing an investment project. Given that investors evaluate the possibility of executing an irreversible all-or-nothing project, investment in stages, an ROA element, cannot be applied. However, I do incorporate valuable ROA elements as sufficient conditions for determining the optimal timing for investing. First, the value of postponing: a project may have a positive net
present value but still not be accepted right away, because the firm may gain by accepting the project in a future period. Second, the value of waiting: entrepreneurs may delay in order to obtain more information and thus reduce the risk.

To sum up, this model uses the NPV method only as a necessary condition for investing, while it applies some pertinent ROA elements into the model in order to provide sufficient conditions and, thus, to make the analysis more realistic and complete.

THE MODEL

Consider a simple model of two firms that produce the same good in an industry whose demand (and thus price) remains uncertain until at least one of the firms is actually in the market selling it. In addition, suppose for simplicity that demand for this product exhausts after two periods of activity. Therefore, the second firm still has the chance to enter the market once uncertainty has been resolved after the first firm has decided to invest. This assumption should not be crucial for the results when compared with demand that lasts arbitrarily longer.

Investment is irreversible and involves a fixed sunk cost \( I_0 \), which is constant across firms and over time. Projects take one period to finish, thus once a firm decides to invest, it becomes operational at the beginning of the following period. Figure 1 summarizes the timing of events that follow the first investment decision.

Let us consider the case in which only one firm decides to initially invest. Without loss of generality, let us refer to such a firm as "firm 1," and let \( t_0 \) be the period that it decides to start the investment. Then, in period \( t_0 + 1 \), firm 1 starts selling in the market and firm 2 makes its investment decision, conditional on the certain realization of true demand, which

**Figure 1: Timing of investment decisions**

```
- Investment decisions
- Firm 1 starts investing
- Firm 2's investment decision
- Firm 2 starts selling (if H)
- If \( L \), both firms exit the market
- Demand is exhausted (if H)

\( t_0 \) \hspace{1cm} \( t_0 + 1 \) \hspace{1cm} \( t_0 + 2 \) \hspace{1cm} \( t_0 + 3 \)

- Firm 1's investment process
- Firm 1 sells alone in the market
- Firm 2's investment process (if applies)
- Both firms sell in the market
```

can be either high (H) or low (L). If demand turns out to be high, firm 2 starts investing and both firms sell in the market in period \( t_0 + 2 \). In period \( t_0 + 3 \) the demand is exhausted. If demand is low, then firm 2 does not invest and firm 1 stops selling.4

Firms form their expectations on the state of demand through both the arrival of signals, which can either be positive (+) or negative (−), and by observing the action (or inaction) taken by the other firm. In particular, firms hold an initial belief (\( \pi_0 \)) that demand will be high and they update it each period upon receiving the signals. Therefore, everything else constant, the probability that the state of demand is high (low) perceived by firms depends positively on the
number of good (bad) signals received. The true state of demand is revealed once the project is running.

Both firms are risk-neutral and maximize expected profits. In addition, assume that firms hold a reserve utility $r_0$ equal to the expected present discounted value of profits from the next best alternative investment available to them. Assume that both firms have the same reserve utility in order to isolate the effects of asymmetry in information only on the state of demand. This assumption is relaxed later in the paper.

The equilibrium price and quantity depend on the resulting market structure. That is, unlike in Chamley and Gale (1999), firms also have the incentive to be “first” in the market. Namely, a firm can have temporary monopolistic power if it sells alone, while firms would have to share the market if both operate at the same time. For simplicity, I assume that in such a case, firms would behave as duopolists, and price and quantities are set as in a Cournot solution.

Therefore, each firm decides whether to invest (“in”) or not (“out”) in period $t_0$. Their payoffs will depend on their own and the other firm’s decisions, and on the actual state of demand. Figure 2 summarizes the payoff structure in period $t_0+1$ if demand turns out to be low. Basically, the payoffs are $-I_0$ if the firm decides to invest, and 0 otherwise. The game ends after period at $t_0 + 1$.

**Figure 2: Payoffs in period $t_0+1$ (demand L)**

<table>
<thead>
<tr>
<th></th>
<th>IN</th>
<th>OUT</th>
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<tbody>
<tr>
<td>1 IN</td>
<td>$-I_0, -I_0$</td>
<td>$-I_0, 0$</td>
</tr>
<tr>
<td>OUT</td>
<td>$0, -I_0$</td>
<td>$---$</td>
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</table>

On the other hand, if demand is high, then the payoff structure in period $t_0+1$ is shown in Figure 3.

**Figure 3: Payoffs in period $t_0+1$ (demand H)**

<table>
<thead>
<tr>
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<th>IN</th>
<th>OUT</th>
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<tbody>
<tr>
<td>1 IN</td>
<td>$\pi_{Cournot} - I_0, \pi_{Cournot} - I_0$</td>
<td>$\pi_{Monopolistic} - I_0, 0$</td>
</tr>
<tr>
<td>OUT</td>
<td>$0, \pi_{Monopolistic} - I_0$</td>
<td>$---$</td>
</tr>
</tbody>
</table>

If demand is revealed to be high, then in period $t_0+2$, both firms continue to share the market in a Cournot solution if both firms invest together in period $t_0$, or produce as in a Stackelberg solution if only one firm decides to start the investment at $t_0$, resulting in higher profits for the “leader” (firm 1) than for the “follower” (firm 2). The game ends after period $t_0+2$. Payoffs are summarized in Figure 4.
Figure 4: Payoffs in period $t_0 + 2$ (demand H)

<table>
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<th>IN</th>
<th>OUT</th>
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</thead>
<tbody>
<tr>
<td>1 IN</td>
<td>$\pi_{Cournot} - I_0$, $\pi_{Cournot} - I_0$</td>
<td>$\pi_{Leader} - I_0$, $\pi_{follower} - I_0$</td>
</tr>
<tr>
<td>OUT</td>
<td>$\pi_{follower} - I_0$, $\pi_{Leader} - I_0$</td>
<td>---</td>
</tr>
</tbody>
</table>

In order to compute prices, quantities and profits, let us assume a simple linear demand function $p = a - b q$, where $b$ is a positive parameter that is fixed and known to both investors. Parameter $a$, on the other hand, is ex ante unknown and captures the state of demand. Namely, demand can be high when $a = a_H$ with probability $\pi$, or low and $a = 0$ with probability $1 - \pi$. Under a low state of demand, the price level would be zero for any quantity, and firms will not find it profitable to invest. Suppose also for simplicity that production involves zero operating costs.

Therefore, firms maximize expected present discounted value of profits:

$$\max_{\{\pi, q, \beta\}} E_i \left( \pi_i \cdot \left( \beta \cdot p_{i_1}(Q_{i_1}) \cdot q_{i_1} + \beta^2 \cdot p_{i_2}(Q_{i_2}) \cdot q_{i_2} \right) - I_i \right)$$

where $\beta \in [0, 1]$ is the factor through which firms discount future revenues, and $Q = q^1 + q^2$.

Firm $i$'s participation constraint as of the period of the investment is given by:

$$\pi_i \left[ \beta \cdot p_{i_1}(Q_{i_1}^*) \cdot q_{i_1}^*(E[Q_{j_1}^*]) + \beta^2 \cdot p_{i_2}(Q_{i_2}^*) \cdot q_{i_2}^*(E[Q_{j_2}^*]) \right] \geq I_i + r_0 \tag{2}$$

where $q_{i}(E[Q_{j}^*])$ represents the optimal quantity response by firm $i$ given an expected strategy $q_{-i}$ from the other firm, and $Q^* = q_i^*(E[Q_{j}^*]) + E[Q_{j}^*]$ is the industry's total expected production.

As mentioned earlier, the equilibrium price level $p_{i_1}$ depends on the market structure resulting from investment decisions in previous periods. Specifically, if a firm produces alone in the market, then the resulting price and quantities are the standard monopoly solution, i.e., $p_{i_1} = a^H/2$ and $q_{i_1} = a^H/2b$, with implied revenues (and operational profits) $\Pi_{i_1} = (a^H/2)^2/4b$. If both firms invest in the same period, the result is a standard Cournou solution, where price, quantity produced and revenues are $p_{i_1} = a^H/2$, $q_{i_1} = a^H/3b$ and $\Pi_{i_1} = (a^H/3)^2/9b$, respectively. Finally, if only one firm operates in the first period (firm 1), and the demand turns out to be high, then firm 2 enters the market with probability one, observe firm 1's outcome and act as a follower on a Stackelberg game. Consequently, the price drops in the second period to $p_{i_2} = a^H/4$, firms 1 and 2 produce $q_{i_1} = a^H/2b$ and $q_{i_2} = a^H/4b$ and receive per-period revenues of $\Pi_{i_1} = (a^H)^2/8b$ and $\Pi_{i_2} = (a^H)^2/16b$, respectively.

Note that the Stackelberg two-period expected profits for the firm that first enters the market is:

$$\pi_i \cdot \beta \cdot \left( 1 + \frac{\beta}{2} \right) \cdot \frac{(a^H)^2}{4b} - I_i \tag{3}$$

while if both firms start their investments in the same period, then the two-period Cournot's expected profits are:
\[ \pi_t, \beta \cdot (1 + \beta) \left( \frac{a^n}{9b} \right)^2 = I_t \]

Consequently, as of period \( t \) (when neither firm has made investment decisions yet), the necessary condition for a firm \( i \) to decide to invest is such that the 2-period present discounted value of the flow of profits is not lower than the investor's opportunity cost of funds:

\[ \pi_{i, t} \cdot \gamma^{-1} \cdot \beta(1 + \beta) \left( \frac{a^n}{4b} \right)^2 + \pi_{i, t} \cdot (1 - \gamma^{-1}) \cdot \beta(1 + \beta) \left( \frac{a^n}{9b} \right)^2 = I_t + r_o \geq r_o \]

where \( \gamma^{-1} \) is the probability that the other firm finds it unprofitable to invest in period \( t \). In addition, parameters \( a_{it}, b, \beta, I_t, \) and \( r_o \) must satisfy that if \( \pi_t = 1 \), then profits from equations (3) and (4) are greater than \( r_o \) for both firms.

Note that equation (5) is not a sufficient condition for a firm to start investing in period \( t \) since it does not consider the option value, i.e., the value that a firm gives to waiting and hoping that the next period will bring more convincing information on the future state of demand. In particular, a firm may want to wait until the period after the first firm starts investing in order to have certainty on the state of demand, even if that decision involves giving up one period of potential profits as a Cournot duopolist. That is, investment decisions are more likely to be postponed if investors believe that new information will soon become public.

Consequently, an \textit{ex-ante} sufficient condition for a firm to invest in period \( t \) would take the form:

\[ \gamma^{-1} \cdot \left( \pi_{i, t} \cdot \beta(1 + \beta) \left( \frac{a^n}{4b} \right)^2 \right) + (1 - \gamma^{-1}) \cdot \pi_{i, t} \cdot \beta(1 + \beta) \left( \frac{a^n}{9b} \right)^2 - (I_t + r_o) \geq \]

\[ (1 - \gamma^{-1}) \cdot \pi_{i, t} \left[ \beta^2 \cdot \left( \frac{a^n}{16b} \right)^2 - (\beta I_t + r_o) \right] \]

where the left-hand side of equation (6) captures the expected profits (net from the opportunity cost of funds) from investing in period \( t \), while the right-hand side represents the expected net profits from waiting one period and observing true demand following firm 2's investment.

Put differently, investors are faced each period with a trade-off between investing that period and potentially earning two periods of profits if demand is high (captured by the left-hand-side of equation 6), and waiting one period and taking advantage of more information and earning one period of potential profits, particularly if the firm sells alone. Note that the above condition is different from condition (5) in that it contains a second term on the right-hand side. This term captures the concept of option value or the value of waiting, which is the extra value that firms require on top of their reserve utility in order to start a new investment in period \( t \).

Note also that the term \( (\beta I_t + r_o) \) on the right-hand side of inequality (6) is multiplied by \( \pi_t \), too, which reflects the fact that the firm has the option of incurring no costs if demand turns out to be low. Consequently, the expected present discounted value of staying uncommitted in period \( t \) and waiting for certain information in period \( t + 1 \) is captured by the term \( (1 - \gamma) (1 - \pi_t) (\beta I_t + r_o) \), or the expected present discounted value of savings from not losing the investment cost and reserve utility if demand is low.
Figure 5: Signals' conditional probability of occurrence

<table>
<thead>
<tr>
<th>Belief</th>
<th>Demand</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \pi_t )</td>
<td>( H )</td>
<td>Positive (+)</td>
</tr>
<tr>
<td>( 1 - \pi_t )</td>
<td>( L )</td>
<td>Negative (-)</td>
</tr>
<tr>
<td>( u )</td>
<td>( 1 - u )</td>
<td></td>
</tr>
<tr>
<td>( v )</td>
<td>( 1 - v )</td>
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**How do the firms model their beliefs?**

Assume that the initial belief that demand will be high (\( \pi_0 \)) is exogenous and equal for both firms. Firms then update their beliefs based upon the signals they receive at the end of each period. Figure 5 presents the probability of occurrence for signals, given the true (though still unrevealed) state of demand.

If the true state of demand is high (\( H \)), then investors will receive a positive signal with probability \( u \in [0, 1] \), and a negative signal with probability \( 1 - u \). Similarly, if the true state of demand is low (\( L \)), firms will receive a positive signal with probability \( v \in [0, 0.5] \), and a negative signal with probability \( 1 - v \). Assume that \( u \) and \( v \) are exogenous and commonly known, and that investors receive these signals independently and privately over time.

Consequently, upon receiving a positive signal at the end of each period, both firms update their beliefs through Bayes' rule. That is:

\[
\pi_{t+1} = prob_{t+1}(H|+) = \frac{prob_t(H) \cdot prob(+|H)}{prob_t(H) \cdot prob(+|H) + prob_t(L) \cdot prob(+|L)} \tag{7}
\]

or equivalently,

\[
\pi_{t+1} = \frac{\pi_t \cdot u}{\pi_t \cdot u + (1 - \pi_t) \cdot v} \tag{8}
\]

Then, probability \( \pi_{t+1} \) will be higher the greater the prior belief \( \pi_t \); the greater probability \( u \) is (that is, the probability of receiving a good signal if demand is high) and the lower \( v \) is (i.e., the probability of receiving a false good signal). Note that upon receiving a positive signal, it is true that \( \pi_{t+1} \geq \pi_t \). That is, investors are more likely to start investments upon receiving positive signals. Note that the evolution of \( \pi_t \) over time determines the value of waiting. That is, given that the higher the value of \( u \) and the lower the value of \( v \), the more information about the true state of demand is revealed, firms have the incentive to wait for stronger information about demand before deciding to invest.
Similarly, upon receiving a negative signal:

\[
\pi_{t+1}^{\ast} = \frac{\pi_t \cdot (1-u)}{\pi_t \cdot (1-u) + (1-\pi_t) \cdot (1-v)}
\]

which implies that \(\pi_{t+1} \leq \pi_t\).

THE BENCHMARK CASE: COMPLETE INFORMATION

Let us first discuss the benchmark case of asymmetric information. In this framework, signals that firms receive every period are common knowledge. Therefore, investors observe the same signals that both firms receive and, consequently, they update their beliefs in the same way. That is, the game is symmetric and:

\[
\pi_{1,t} = \pi_{2,t} = \pi_t \quad \forall t
\]

(10)

Naturally, under perfect information, a firm knows the other firm’s investment decision in any period, considering all the information captured up until then. Therefore, symmetric information implies neither a monopolist nor a Stackelberg solution. As a consequence, the first term on the right-hand side and the entire left-hand side of equation (6) drop out (also \(\gamma^d = 0\)) and the necessary participation constraint for both firms under a Cournot solution is:

\[
\pi_t \cdot (1 + \beta) \left(\frac{\alpha^h}{\beta h}\right)^2 - I_0 \geq r_0
\]

(11)

In principle, the investment condition above may not necessarily be a sufficient condition since it must be compared to the expected present discounted value of profits if a firm decides to wait, hoping that new information will reduce uncertainty. Therefore, a sufficient condition is such that \(\beta E_{\ast} \Pi_{s+1} < E_\Pi_s\) for all \(s \in [1, \infty)\). That is, waiting additional periods would imply an expected present discounted value of profits being no greater than the ones expected for the current period.

\[
\pi_{t+1}^s \cdot (1 + \beta) \left(\frac{\alpha^h}{\beta h}\right)^2 - \beta I_0 \leq \left(\pi_t \cdot (1 + \beta) \left(\frac{\alpha^h}{\beta h}\right)^2 - I_0\right)
\]

(12)

PROPOSITION. Under symmetric information, a firm whose Cournot solution participation constraint (equation 11) is satisfied would not postpone investment for future periods.

PROOF. Both firms would wait at least one more period when \(\beta \Pi_{t+1} > \Pi_b\), which is positive only when \(\beta r_{t+1}^s > \pi_t\).

Note that since the next signal is unknown as of the current period, then

\[
\pi_{t+1}^s = \text{prob}(+) \cdot \pi_{t+1}^s + [1 - \text{prob}(+)] \cdot \pi_{t+1}^a
\]

(13)
where the probability of receiving a positive signal is \( \text{prob}(+) = q \cdot \pi + s(1 - \pi) \). Using Bayes’ rule (equations 8 and 9), it follows that

\[
\pi_{t+1} = \pi_t
\]  

(14)

That is, a firm’s best guess about next period’s \( \pi \) is the current \( \pi \). Then, equation (12) implies the following condition

\[
\pi_t \cdot (1 + \beta) \frac{(a^n)^2}{9b} - I_s \geq 0
\]  

(15)

which is positive following the participation constraint from equation (11). Therefore, firms will not postpone investment for one period.

In addition, since the result in equation (14) applies for any future period, firms will not consider postponing investment for any period beyond \( t+1 \). ■

THE ASYMMETRIC INFORMATION CASE

Under asymmetric information, signals are not common knowledge and so firms’ beliefs may evolve differently over time. Therefore, given that there is uncertainty about the other firm’s investment decision, action or inaction from one firm constitutes valuable information for the other.

Note that a firm \( i \)'s sufficient condition for investment in period \( t \) (equation 6) is \textit{ex-ante} symmetric. Following the result from equation (14), and due to asymmetries in information, each firm’s best conjecture about the other firm’s \( \pi \) is \( \pi_0 \). Equation (6) is then transformed to:

\[
\gamma \left[ \pi_0 \cdot (1 + \beta) \frac{(a^n)^2}{4b} \right] + (1 - \gamma) \pi_0 \cdot (1 + \beta) \frac{(a^n)^2}{9b} - (I_s + r_o) \geq 0
\]  

(16)

\[
(1 - \gamma) \cdot \pi_0 \left[ \beta \cdot \frac{(a^n)^2}{16b} - (\beta I_s + r_o) \right]
\]

Equation (16) represents firms’ \textit{ex-ante} investment participation constraint. Note that this condition is symmetric in that it implies that the probability of participation is the same for both firms. That is, \( \gamma^1 = \gamma^2 = \gamma \). Therefore, since \( \gamma \) represents the probability that neither firm is investing, and since the game only makes sense when at least one firm invests, it follows that both firms take \( \gamma = 0 \) and, thus, each firm assumes \textit{ex-ante} that the other firm will invest as well. Therefore, the sufficient condition for a firm \( i \) to also invest in period \( t \) is:

\[
\pi_{t,i} \cdot (1 + \beta) \frac{(a^n)^2}{9b} - (I_s + r_o) \geq \pi_{t,i} \left[ \beta \cdot \frac{(a^n)^2}{16b} - (\beta I_s + r_o) \right]
\]  

(17)
That is, the expected two-period duopolist discounted revenues, net of the certain (and sunk) investment cost and reserve utility \((l_1 + r_0)\), are greater than the one-period Stackelberg follower’s net expected discounted profits.

Note that the result from the previous proposition also applies to the asymmetric information scenario. That is, although firms may postpone investment in order to obtain certain information on demand from the action of the other firm, they will not postpone investment with the objective of reducing uncertainty by receiving more signals in future periods.

Therefore, a firm will choose to invest in period \(t\) when its \(\pi_{it}\) reaches a cutoff \(\pi^*\); that is, when

\[
\pi_{it} \geq \frac{I_1 + r_0}{\beta \cdot \frac{(a^H)^2}{9b} \left[ \frac{16 + 7\beta}{144} \right] + \beta I_1 + r_0} = \pi^* 
\]  

(18)

The impacts of parameter changes to the investment cutoff in equation (16) are unambiguous and straightforward. First, increases in the state of demand \((a^H)\) and reductions in the demand slope parameter \((\beta)\) increase the probability of investing today (i.e., they reduce \(\pi^*\)). Though a higher \(a^H\) or lower \(\beta\) raise the expected revenues both today and in the next period, the impact on investing in the current period is stronger, as it affects expected revenues for two periods instead of just one. Second, the discount factor \((\beta)\) positively impacts investment in the current period. Though investors are more patient and the value of waiting goes up, the present discounted value of investing today also (and more strongly) increases.

Finally, the greater the value of the initial investment \((I_1)\) and the higher the value of the next best alternative that investors have \((r_0)\), the less likely it is for the investment to be undertaken, as the present discounted value of the project (net of the reserve utility) falls. Though increases in investment also reduce the attractiveness of investing in the second period, the net effect is positive towards not investing in the current period, given that investment (and its opportunity cost) can be avoided in the event that demand turns out to be low.

**Firm 2’s investment decisions**

Recall that we refer to firm 2 as the firm that makes its investment decision after observing firm 1’s decision. Naturally, if the investment condition (equation 18) is satisfied for both firms, then both firms make their investment decisions simultaneously. However, if the investment condition is satisfied for firm 1 but not firm 2, then firm 1 invests while firms 2 waits.

Note that the concept of waiting does not only mean that firm 2 would remain inactive in period \(t\) to then contemplate investing in period \(t+1\). Since the decision of inaction is irreversible, firm 2 could and would re-evaluate its initial choice given the fact that firm 1’s action is providing more information to firm 2. In particular, given that both firms have the same reserve utility \((r_0)\), firm 2 knows exactly the net number of positive signals over negative signals that firm 1 received. Consequently, firm 2 has the advantage over firm 1 of having complete information about the likely state of demand before making its investment decision.

Let \(\pi_{1,1}^* > \pi_{1,2}^*\) be the updated belief held by firm 2 about the state of demand after observing firm 1’s action. Then, if \(\pi_{1,2} < \pi_{1,1}^* < \pi_{1,2}^*\), firm 2 would invest and firm 1’s action would be crucial for firm 2’s decision in period \(t\). However, the acquisition of more positive signals from firm 1 does not guarantee that firm 2 will invest, as it could have received enough negative signals so that the investment condition is still not satisfied. That is, firm 2 will not invest if \(\pi_{1,2} < \pi_{1,2}^* < \pi_0^*\). In this case, note that firm 1 also gets to know that, given that firm 2 has complete information about signals, \textit{ex-post}, not investing would have been a better decision.
However, unlike the choice to wait, investment decisions are irreversible. Note that since the game is symmetric and firm 1's best guess about firm 2's \( \pi_{2,2} \) is \( \pi_{2,0} \), firm 1's best guess is that firm 2 will also invest after observing its action. Therefore, unlike in Chamley and Gale (1994), firm 1 has no ex-ante incentive to be “last” and obtain more information from the other firm, even if firm 2 receives ex-post benefits from being last.

**The case of heterogeneity in preferences**

So far we have assumed that the firms' reserve utilities are the same, which seems to be a priori a reasonable assumption. However, it is also reasonable to assume that due to, say, differences in their ownership structure, firms may take a different approach to risk and have different opportunity costs of funds. Pardo (2012) points out that even though entrepreneurs are commonly modeled in the literature as risk-neutral agents for the sake of simplicity, risk aversion could be a more realistic assumption for private entrepreneurs. As Gale and Hellwig (1985) put it, risk neutrality among larger investors “can be justified as a consequence of risk-pooling.” However, as Moskowitz and Vissing-Jorgensen (2002) find, privately-owned companies are typically small and owned by few or just one entrepreneur. They also show that private entrepreneurs usually invest at least 50 percent of their assets in a single private company. Therefore, smaller private entrepreneurs are less likely to have access to complete risk-pooling for their idiosyncratic risks, and thus tend to be more vulnerable to project-specific, uninsurable risk.

Pardo (2012) shows that risk-averse entrepreneurs require a private equity premium, or a premium that entrepreneurs demand due to the stochastic nature of their investment returns. Though not explicitly modeled in this paper, an extra risk premium for investment can be interpreted as an investor requiring an expected present discounted value of investing to be higher for risk-averse than for the case of risk-neutral entrepreneurs. Therefore, differences in reserve utility among firms could also be understood as differences in the degree of risk aversion, since some would require greater expected present discounted value of profits in order to remain indifferent between investing or not in each period.

In addition, differences in \( r_0 \) could be interpreted as differences in optimism about variables that investors may consider to be relevant to their decision-making. An increase in \( r_0 \) could be equivalent to an increase in optimism, and so it could positively affect the probability of undertaking the firm's investment project. Therefore, periods of optimism may lead to earlier investment schedules, which could be expected to take place during economic booms. In that case, firms would tend to be less cautious about operating in niches where they could obtain higher profits. This phenomenon is also consistent with previous literature. Pardo (2012) finds that a countercyclical private equity premium can magnify the impact of shocks over time. Shocks that lead to reductions in entrepreneurial wealth would increase entrepreneurs' effective level of risk aversion. Consequently, a higher private equity premium would increase (equivalently in this section, \( r_0 \) would increase) and, as a response, entrepreneurs would optimally cut investment and therefore, in general equilibrium, aggregate production.9

If we assume that firms differ only in their reserve utility (i.e., \( r_{0,1} \neq r_{0,2} \)), and these parameters are common knowledge, then the game is no longer symmetric, though the market structure would again depend on the receipt of signals and the parameters of the model. In general, if firm \( i \) decides to invest, since the \( r_0 \)'s are known, it will again provide the other firm \((-i)\) with clear information about all the signals received by both firms. Firm \(-i\) will have the benefit of receiving more signals and thus a better estimate of the true state of demand: . Therefore, the general rule \( \gamma^{1/2} \) remains simple. Given firm \( i \)'s decision to invest in period \( t \), the probability of not investing for firm \(-i\) is
\[ \gamma^* = \begin{cases} 0 & \text{if } \pi_{i,c}^* < \pi_d^* \\ 1 & \text{if } \pi_{i,c}^* \geq \pi_d^* \end{cases} \]  

(19)

where \( \pi_d^* \) is the cutoff value of the probability of high demand for firm \(-i\) to also invest.

In particular, given that the \( r_0\)'s are known and that each firm's best guess about the other's current \( \pi \) is its initial \( \pi \) (i.e., \( \pi_0 \)), if without loss of generality we assume that \( r_{0,1} < r_{0,2} \), then if firm 1 decides to invest, then in expectations the net number of positive signals it reveals will not be enough for firm 2 to invest (due to firm 2's higher reserve utility) and thus \( \gamma^1 = 1 \). In contrast, if firm 2 invests, then in expectations the number of positive signals reveals will be enough for firm 1 to invest. Thus, \( \gamma^2 = 0 \). Therefore, the critical values for the probability of high demand for each firm to invest are:

\[ \pi_i^* = \frac{I_i + r_{0,1}}{\beta (1 + \frac{\beta}{2}) \left( \frac{a^H}{a^L} \right)^2 + \frac{4b}{4b}} \]  

(20)

and

\[ \pi_i^* = \frac{I_i + r_{0,2}}{\beta \left( \frac{a^H}{a^L} \right)^2 + \frac{16 + 7\beta}{144} + \beta I_i + r_{0,3}} \]  

(21)

If the \( r_0\)'s are unknown, on the other hand, then a firm's decision to invest does not provide clear information about the actual positive signals received until then, but about the expected number of positive signals received by it. In particular, if firms have the same expected reserve utility (say, \( r_0 \)), then the game is again ex-ante symmetric and equivalent to the case of equal \( r_0\)'s. Similarly, if the reserve utilities are unknown and the expected values differ between firms (again due to differences in their ownership structure), then the resulting game is once more asymmetric and equivalent to the case of different, but known, \( r_0\)'s. Even though individual responses may significantly vary as a consequence of introducing unknown \( r_0\)'s, in the aggregate by the law of large numbers, these differences may evaporate.

SIMULATIONS

This section presents some simulation exercises. The objective is to examine the differences in terms of the amount of time to invest and market structure that results from the different cases analyzed in the theoretical model.

I conduct a Monte Carlo simulation by randomly generating the signals that firms receive each period from which they form their beliefs with respect to the expected state of demand. Positive signals arrive with probability \( \alpha \) if the actual state of demand is high and with probability \( 1 - \alpha \) if demand is low. I then follow the firms' responses in terms of their probability updates (\( \pi_{it} \)) and investment decisions for each of the following cases:

Case 1: symmetric information, same reserve utility \( (r_0) \)
Case 2: asymmetric information, same \( r_0\)'s
Case 3: different \( r_0\)'s, observed
Case 4: different \( r_0 \)'s, unobserved, same mean
Case 5: different \( r_0 \)'s, unobserved, different mean

I execute 50,000 replications of the experiment for each case, and then aggregate the responses and observe the average number of periods it takes for the first firm to invest as well as the response from the other firm.

Initially, I assume the following parameter values (base scenario): initial belief \((r_0) = 0.1\); discount factor \((\beta) = 1/1.05\); demand in high states \((d^H) = 5\); price elasticity of demand parameter \((b) = 0.05\); initial investment \((I) = 25\); reserve utility \((r_0) = 5\%\) of investment; low reserve utility \((r_{0,1}) = 3\%\) of investment; high reserve utility \((r_{0,2}) = 7\%\) of investment; probability of high demand (if actual demand is high) \((u) = 0.6\); and probability of high demand (if actual demand is low) \((v) = 1 - u\). I also conduct a sensitivity analysis to this parameter selection. Simulation results are presented in Table 1.

In case 1, both firms always invest at the same time as both signals are observed simultaneously every period. In the asymmetric information case, each firm processes less information about the actual state of demand and, consequently, investment postponement is considerably longer than in case 1. Case 3 is also a case of asymmetric information but, unlike case 2, firms differ in their reserve utilities \((r_0)\). Therefore, while equal information sharing takes place in case 2 regardless of which firm invest first (therefore a two-firm outcome is more likely), in case 3, the firm with the lower reserve utility (which tends to invest first) shares less information about the state of demand than when the firm with the highest reserve utility invests first. Consequently, two firms investing simultaneously is a considerably less frequent solution than in case 2.

There is a slight increase in the outcome of both firms investing when the \( r_0 \)'s are unknown (case 4) relative to when they are known (case 2). In case 4, firms expect ex-ante that the other firm has the average \( r_0 \) regardless of its actual one. Thus, there will be discrepancies between the number of signals transmitted and that which is received. That is, as investors are uncertain about the others' reserve utility, under some circumstances (in this case, relatively higher expected profits due to high \( d^H \) and/or low \( I \)), firms are more likely to follow others, consistent with "herd behavior" in investment. In case 5, however, results are very similar to case 3. It seems that the ex-ante differences in reserve utility influence the resulting market structure more strongly than the added uncertainty does.

Naturally, the resulting time to invest and market structure in all five cases are sensitive to the parameter selection. For instance, the more information signals provide about the actual state of demand \((u)\), the more quickly firms find it profitable to invest. In terms of the market structure, however, results are less clear. On one hand, firms may tend to act more quickly as signals provide more information (which makes the one-firm solution more likely). On the other hand, improvements in the quality of signals imply stronger information sharing (which makes the two-firm solution more likely). Neither of these two conflicting forces appears to dominate uniformly as \( u \) increases.

Similarly, as expected, increases in demand in high states \((d^H)\) and reductions in investment amounts \((I)\) tend to accelerate the timing of investment. In addition, both higher \( d^H \) and lower \( I \) raise the expected investment profitability for both firms, thus making the two-firm solution more likely to occur in cases 2 and 3. Higher \( d^H \) and/or lower \( I \), however, causes investment to take place sooner, increasing the likelihood that any firm in particular could invest before the other, and increasing the likelihood of a one-firm solution. It appears that neither effect offsets the other in case 4.
Table 1: Simulation results and sensitivity analysis

<table>
<thead>
<tr>
<th>Case</th>
<th>Base</th>
<th>$u = 0.55$</th>
<th>$u = 0.7$</th>
<th>$d^H = 3.5$</th>
<th>$d^H = 6$</th>
<th>$I = 15$</th>
<th>$I = 35$</th>
<th>$\pi_0 = 0.2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of periods to invest</td>
<td>9.96</td>
<td>40.04</td>
<td>2.50</td>
<td>14.99</td>
<td>4.93</td>
<td>5.02</td>
<td>14.93</td>
<td>4.99</td>
</tr>
<tr>
<td>Case 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># of periods to invest</td>
<td>32.74</td>
<td>122.08</td>
<td>8.54</td>
<td>36.79</td>
<td>24.96</td>
<td>24.89</td>
<td>36.75</td>
<td>25.09</td>
</tr>
<tr>
<td>one firm invest (%)</td>
<td>24.8%</td>
<td>22.7%</td>
<td>17.5%</td>
<td>18.0%</td>
<td>32.9%</td>
<td>32.6%</td>
<td>18.1%</td>
<td>31.4%</td>
</tr>
<tr>
<td>both firms invest (%)</td>
<td>75.2%</td>
<td>77.3%</td>
<td>82.6%</td>
<td>82.0%</td>
<td>67.1%</td>
<td>67.4%</td>
<td>81.9%</td>
<td>68.6%</td>
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<tr>
<td>Case 3</td>
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<td></td>
<td></td>
</tr>
<tr>
<td># of periods to invest</td>
<td>8.67</td>
<td>34.31</td>
<td>2.23</td>
<td>16.89</td>
<td>4.21</td>
<td>4.24</td>
<td>12.85</td>
<td>4.25</td>
</tr>
<tr>
<td>one firm invest (%)</td>
<td>91.2%</td>
<td>91.4%</td>
<td>94.0%</td>
<td>79.1%</td>
<td>95.1%</td>
<td>95.1%</td>
<td>88.4%</td>
<td>95.1%</td>
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<tr>
<td>both firms invest (%)</td>
<td>8.8%</td>
<td>8.6%</td>
<td>6.0%</td>
<td>20.9%</td>
<td>4.9%</td>
<td>4.9%</td>
<td>11.6%</td>
<td>4.9%</td>
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<tr>
<td>Case 4</td>
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<tr>
<td># of periods to invest</td>
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<td>8.52</td>
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<td>25.11</td>
<td>36.71</td>
<td>25.12</td>
</tr>
<tr>
<td>one firm invest (%)</td>
<td>15.1%</td>
<td>22.5%</td>
<td>17.4%</td>
<td>17.8%</td>
<td>18.9%</td>
<td>19.6%</td>
<td>18.5%</td>
<td>18.9%</td>
</tr>
<tr>
<td>both firms invest (%)</td>
<td>84.9%</td>
<td>77.5%</td>
<td>82.6%</td>
<td>82.2%</td>
<td>81.1%</td>
<td>80.4%</td>
<td>81.5%</td>
<td>81.1%</td>
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<tr>
<td>Case 5</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td># of periods to invest</td>
<td>8.70</td>
<td>33.97</td>
<td>2.23</td>
<td>16.83</td>
<td>4.15</td>
<td>4.21</td>
<td>12.84</td>
<td>4.26</td>
</tr>
<tr>
<td>one firm invest (%)</td>
<td>91.3%</td>
<td>91.9%</td>
<td>94.1%</td>
<td>79.8%</td>
<td>95.6%</td>
<td>95.5%</td>
<td>88.9%</td>
<td>95.4%</td>
</tr>
<tr>
<td>both firms invest (%)</td>
<td>8.7%</td>
<td>8.1%</td>
<td>5.9%</td>
<td>20.2%</td>
<td>4.4%</td>
<td>4.5%</td>
<td>11.1%</td>
<td>4.6%</td>
</tr>
</tbody>
</table>
Finally, the higher the initial belief about future high demand ($\pi_0$), the faster investment takes place. In addition, as any particular firm reaches its probability cutoff ($\pi^*$) more quickly, the one-firm outcome becomes more likely to occur across all five cases.

CONCLUSIONS

This paper explores some factors behind investment decisions in the context of asymmetries in information. Firms' actions are ultimately determined by private signals that they independently receive and through which they build on their beliefs about the future state of demand. That is, the timing of investment choices depends critically on how fast uncertainty is resolved over time, and the resulting market structure depends on how important the ex-post asymmetry in information is.

In the benchmark case of complete information, where both firms build their beliefs equally, firms act together as soon as it is optimal to invest. In contrast, when asymmetry in information is introduced, important differences in market structure may result. In particular, the timing of investment could change in two opposing ways. On the one hand, the greater the perceived probability that the other firm will invest in the current period, the greater the competition effect and, thus, the sooner a firm would tend to invest, including the possibility of generating suboptimal decisions (i.e., investment earlier than in the benchmark case). On the other hand, information "noise" may cause the value of waiting to gain importance in the optimal timing of investment, as firms may choose to postpone investment in order to collect more information, both from signals and from actions by others.

I also examine in this paper the effects of unobservable differences in preferences, as captured by each firm's reserve utility, on investment decisions, the timing of investment and the resulting market structure. Due to differences in ownership structure, firms may hold a distinct approach towards risk and thus have different opportunity costs of funds. For instance, risk aversion could be a more realistic assumption for private entrepreneurs due to their more constrained access to complete risk-pooling for their idiosyncratic risks. Though not explicitly modeled in this paper, the private equity premium can be interpreted as an investor requiring a higher reserve utility given his higher vulnerability to project-specific, uninsurable risk. Changes in reserve requirements can affect the probability of undertaking the firm's investment project. In particular, when a firm's reserve utility is unknown, one firm's decision to invest does not provide clear information about the actual signals received, rather only about the expected number of signals received. Under some circumstances, uncertainty about each other's preferences may make "herd behavior" in investment more likely due to the discrepancy between signals transmitted and signals received.

Lastly, I conduct simulation of the model by randomly generating the signals that firms receive each period, following the probability updates by firms, and then aggregating the responses over 50,000 replications of the experiment for each case analyzed in the theoretical model. Simulation exercises tend to confirm the models' predictions regarding time to investment and the resulting market structure for the different cases.

To sum up, incomplete information and/or information asymmetries may lead to suboptimal solutions, including postponing, not taking advantage of profitable investment opportunities or, contrarily, embarking upon projects earlier than optimal. Therefore, in terms of policy implications, improvements in information technology and transparency could alleviate the welfare costs imposed by information problems, which are particularly important in times when an economy tries to recover from a recession.
ENDNOTES

1 Prasad, Agenor & McDermott (1999), Backus & Kehoe (1992), among many others, provide empirical evidence supporting much higher average output volatility in emerging economies than in industrialized economies.
2 Some examples are Yahoo among search engines, Amazon.com among booksellers, CDNow among music stores.
3 Examples of failures are much more abundant than those of success, but some notable examples include Excite.com, Pets.com, latminute.com, etc.
4 The special case that both firms invest in period $t_0$ can be captured in Figure 1 as if both firms are firm 1.
5 See Drazen and Sakellaris (1999).
6 Parameter $u$ and $v$ have a restricted set of values so that firms are more likely to receive positive signals if demand is high than if it is low. In the absence of these restrictions, signals would give the opposite information and investors would consider $u$ as $v$ and vice-versa.
7 In contrast, the closer probabilities $u$ and $v$ are to 0.5, the less information signals provide to investors. In the extreme, where both $u$ and $v$ are 0.5, signals are useless in that signals arrive with same probability regardless of the true demand. Consequently, $\pi_t = \pi_{t+1}$, for any $s$.
8 Other examples include Angeletos and Calvet (2006) and Meh and Quadrini (2004).
9 Given the large number of replications, the average reserve utility approaches its mean, which is what firms assume ex-ante about the other firm’s $r_0$.
10 Scharfstein and Stein (1990) find that under some conditions, firms may imitate the investment decisions made by others, “ignoring substantive private information.”

REFERENCES


DYNAMIC FIRM LINKAGES

Ezatollah Abbasian
Bu-Ali Sina University
G. R. Rokni Lamooki
University of Tehran

ABSTRACT

This paper considers modalities and mechanisms through which SMEs (Small and Medium Enterprises) could forge horizontal links between them and vertical linkages with larger manufacturing and service industries for increased market access, enhanced investment flows, skills development and technological advancements. As a consequence, it is not a question of the positioning of the firms on a single upgrading ladder, but more accurately it is different upgrading ladders that have been climbed in each firm. There is no single pattern for all of them. According to Sengenberger and Pyke (1992: 11)\textsuperscript{1}, "the main problem for small enterprises is not being small, but being lonely". The focus of this study is the entrepreneur's relationships with the external environment.

INTRODUCTION

The basic actor in a market economy is the entrepreneur, normally embedded in a legal unit – the private firm. Entrepreneurs or firms are profit oriented and survive and prosper by their ability to spot economic opportunities, take actions, including mobilizing resources, taking risks, and innovating. In short, the entrepreneurs look at the world from the point-of-view of economic opportunities. This view of the firm is very much in line with the Austrian School of Economics (Reekie 1989)\textsuperscript{2}. The World Bank (1991)\textsuperscript{3}, in analyzing constraints on private sector development, has identified the following four types of firms: The micro enterprise; The SME; The large domestic firm, and the multinational enterprise. The second component of the market economy is the market itself the function of which is to match supply and demand at any given time. The role of the Small Scale Enterprises (SSEs) - the micro enterprise and the SME - has become very significant in this recent trend, particularly with regard to flexible specialization. In addition, it has recently become difficult to speak of economic development, without considering the effects of market and economic internationalization and globalization. Within these internationalization and globalization trends, the role of small firms is also very significant in developing countries.

There is no single and clear definition of small and medium scale enterprises because, for example, a "small" firm in, say, the petrochemical industry is likely to have much higher levels of capitalization, sales and possibly employment, than a small firm in the car repair trades (Storey 1994)\textsuperscript{4}. For example, the Bolton Committee (1971)\textsuperscript{5} tried to overcome the problem of definition by formulating two categories of definition; an 'economic' definition and a 'statistical' definition.
According to the economic definition, there are three criteria for understanding a small firm: small firms had a relatively small share of their market place; they were managed by owners or part owners; and thirdly they were independent, in the sense of not forming part of a large enterprise. Meanwhile, the statistical definition was designed to address three main issues. The first is to quantify the current size of the small firm sector and its contribution to economic aggregates. The second purpose is to compare the extent to which the small firm sector has changed its economic contribution over time. Finally, the statistical definition has to enable a comparison to be made between the contributions of small firms in one country with that of other nations (Storey 1994).

Small Scale Enterprises (SSEs) take advantage of globalization by turning increasingly to the new resources offered by the opening-up of international borders and in some cases by increasing exports either directly or indirectly (Julien 1996)\(^a\). Nevertheless, small firms are unable to achieve their goals by themselves alone. To do so, small firms need supports and resources from 'outsiders' such as other firms, supporting institutions, and relatives and friends. These network relationships allow entrepreneurs to identify opportunities and resources rapidly (Sadler and Chetty 2000)\(^iii\). Therefore, networks are particularly valuable to the small businesses.

**FIRMS' EXTERNAL LINKAGES**

In this study, networks are defined as personal relationships between an entrepreneur and his 'external actors' (Aldrich and Zimmer 1986)\(^iii\). The external actors (outsiders) can be individuals or organizations. They are not directly employed by the entrepreneur. Entrepreneurs build up such network relationships (contacts) in order to obtain necessary resources and to perform activities. In this view, entrepreneurial networks consist of four major components, namely: actors, resources, activities and linkages. Collaborative linkages and networks, as an important strategy for the development of small business sector, are increasingly the focus of attention for entrepreneurs and managers, public policy makers and academics (Gibb and Haas 1996)\(^a\). The concept of networks and networking here is that entrepreneurship has been conceptualized as a dynamic process that requires linkages or networks between key components of the process for its successful development. In other words, network is here defined as long-term contacts between small business owners and external actors (persons or organizations) in order to obtain information, moral supports and other resources. Szarka (1990)\(^b\) categorized entrepreneurial networks into three components: (1) exchange networks, (2) communication networks and (3) social networks. The exchange network is defined as the commercial transaction between small firms and other organizations, and it is formed by the trading partners of the firm. The communication network is the collection of those organizations and individuals with which the small firm has non-trading links that inform its business activities such as consultants and banks, the local and central government and its agents. The social network is formed by family, friends and acquaintances. Such contacts are important because they have an impact upon the development of the small firm. The core actor is here the small firm, the entrepreneur. The main theme is to understand the behavior of an organization in relation to its external environment.

When one discusses the firm's environment, there are two concepts: its internal environment, and external environment. In this study, we always consider the firm's external environment.

The external environments of firms are important for understanding actors of networks. Since a discussion on all theories about external linkages is beyond the scope of this study, we have chosen to mention some of the most relevant theoretical approaches to the study, such as transaction cost approach (TCA), resource dependence approach (RDA), social network approach (SNA), and the Swedish network model (SNM). These theories look at networking from different perspectives and provide insight into the causes as well as the structure of small enterprise networking (Uzzi 1999)\(^a\). According to the existing literature, a transaction means a transfer of a good or a service between technologically separable interfaces. Thus, the transaction costs simply
means all costs involved in a transfer of goods and services from one unit to another. Transactions are, therefore, characterized by high asset specificity, small numbers bargaining and uncertainty. Given these characteristics, market transactions tend to become prohibitively costly. In such a situation, firms attempt to overcome transaction costs by vertical integration or of looking for other alternatives to the market (Williamson 1991).

According to RDA, in order to survive, any organization requires some sort of transactions with its external environment. Successful performance of a firm depends on resources and supporting networks. The resources and supports are, particularly for small firms, controlled by outside actors of the firms. Thus, firms are linked to their environments by federations, associations, customer-supplier relationships, competitive relationships, and a social-legal apparatus that define and control the nature and limits of these relationships as well (Butler and Sohod 1995).

As we discussed above, the role of entrepreneurial personal networks, by its nature, in relation to new business development is a dynamic process. The need for networking also differs, depending upon the phases of a business venture. Accordingly, the actors of entrepreneurial networks also become dynamic. Different types of networks have to be developed according to the functional and strategic needs of firms. On the other hand, professional or business-oriented networks include all those individual relationships that are primarily concerned with business. In the start-up phase of a firm, the entrepreneur needs initial capital, influence, and encouragement. In this phase, social network is the most important because it is the network through which entrepreneurial opportunities are communicated. The identification of opportunities is developed through social networks. At latter stages, more business-focused relationships are considered very important. For an on-going business firm, links with other organizations, particularly links with other firms become important because inter-organizational networks that include supporting agencies (government institutions, NGOs, banks, and other small business supporting institutes) and other firms (large and small firms) are a way for entrepreneurs to secure information about market relationships as well as to ensure resource channels. This enhances their position and allows them to compete more effectively. During the on-going phase, the strategic network is important because this is the stage where a firm attempts to reduce its risk of failure. As an isolated unit advantages such as reduced risk for a small firm would not be obtainable. Consequently, links with other firms such as competitors, customers, and suppliers become more important and predominant at the on-going phase (Aldrich and Zimmer 1986). However, empirical studies to test the dynamic nature of entrepreneurial networks are limited. To do so, here we introduce theoretical aspects of this dynamic nature which can be applied in empirical studies without any difficulties.

**DYNAMIC NATURE OF ENTREPRENEURIAL NETWORKS**

In line with many other studies, this study believes too that the behavior of a firm is difficult to analyze without considering its external environment. As discussed before, firms always have to develop their relationships with the outsiders (external actors) in order to perform economic activities. These outsiders can be individuals, organizations, and other business firms. These groups are external actors who have direct or indirect links with the owner or entrepreneur of the firm. As Figure 1 shows, an entrepreneur, which is the main composer of network elements, is embedded in his business and in external environment. The entrepreneur has to enter into relationships with other parties in his business as well as in his external environment.
Figure 1: The Entrepreneur and its Environment

In a market situation, relations are established to get access to resources possessed by other markets actors and an exchange on commercial terms take place. By relationship is meant some degree of dependency or interdependency between two or more actors. The relationship can be looked upon from a structural point of view, i.e. how is the relationship organized, or from a behavioral point of view, i.e. how do the actors interact. One of the actors in external environment is government. It is apparent that a government can relate to the firms through five components and markets. A government may choose to strike the conduct of the firm or the structure of the market. It may single out one component or market, e.g. the capital market or the R&D-component, as the engine of growth or it may develop a more comprehensive approach to intervention. Finally, it may choose to formulate general policies which affect all companies or single out specific growth industries for special treatment.

THE SIGNIFICANCE OF CONNECTION

One of the main determinants for the success of SME development is the establishment of useful linkages between LEs and SMEs through subcontracting arrangements (Berry, 1997). According to Hendai (as quoted in Hayashi, 2002), the main benefits SMEs can obtain from subcontracting transactions with large scale parent firms are:

- the reduction of information and transaction costs through subcontracting ties, which includes easy and cheap acquisition from large scale parent firms of new technologies,
product designs, production processes, management methods, marketing and input materials,
• the reduction of risks and uncertainty and an increase in expected rate of profit as a consequence of stable orders and better payment conditions, and
• the improvement of credit worthiness.

While Hayashi (2002) showed that vertical inter-firm linkage, in the form of subcontracting has increased productivity of SMEs, the measurement used for subcontracting is only the subcontracting ratio, which is the ratio of sales through subcontracting over the total international competition has reached such a level that it leaves little room for firms other than to cope with the new challenges as quickly as they can. Today they have to determine their market niches more rapidly than they used to and develop innovation cultures within the firm.

A further element for a sustained strategy of continuous innovation and of keeping up with new technologies is engaging in national and/or international networks, including production, innovation, distribution, or other networks. To achieve these, firms need to put some effort into accumulation of technological capabilities and various skills. Upgrading at the firm level embraces the internal and external dynamics of the firm, as it is a crucial factor in the achievement of growth of the firm. The resource-based view of the firm highlights the internal determinants of its growth. Acknowledging the functional and strategic capabilities of the firm to compete for market share and profits, the internal dynamic is provided by the organizational capabilities of the firm to continue its growth.

TYPES OF EXTERNAL CONNECTIONS

Here we present different possible connection of a small firm to its external environment each of which depends on the nature of firm and its activities. Assume we are dealing with the space $\omega$ of r SMEs $B = [B_1, B_2, \cdots B_r]$ and that $Q_k$ is the set of all factors affecting the $k^{th}$ enterprise. We let

$$Q = \bigcup_{k=1}^{r} Q_k$$

The set $Q$ is called the space of qualitative parameters of space $\omega$. Suppose that $n_k$ quantitative variables $x_k = (x_k^j)_{j=1}^{n_k}$ describes the behavior of the $k^{th}$ SME and $\Omega$, is the outside world affecting on $\omega$, through some gateway. Then the dynamical model of $\omega$, takes the form

$$x' = f(x, y, u, t, \alpha, P), \quad y = g(x, t, \alpha) \quad (1)$$

Where

$$x = \bigcup_{k=1}^{r} x_k, \quad x, y \in \mathbb{R}^{n_x}, \quad n_x = \sum_{k=1}^{r} n_k,$$

and $y$ is the measurable output, $t$ is the time, $\alpha \in \mathbb{R}^s$ is a vector of parameters, $u$ is the controller, and $P$ is the effect of $\Omega$. The differential operator in model (1) could be continuous or discrete depends on the method of modeling. We need the following map

$$T : Q \rightarrow \mathbb{R}^s, \quad q \rightarrow \alpha = T(q) \quad (2)$$
We call $T$ the qualitative/quantitative map. The structure of $f$ is of great importance since it determines the behavior of the system. The block diagram of such model is illustrated in Figure (2).

The outside world $\Omega$ has capital interaction with $B$ and generally possesses a slower dynamics with a higher inertia than $B$. That is why we ignored the dynamical equations of $\Omega$ in the model (1). Nevertheless, we cannot ignore the effect of $\Omega$, on $\omega$. There are many methods to consider such effects. We propose four types of connections: Affine, Feedback, Infinite Gate Connection, and slow-fast regime.

**Figure 2:** The block diagram of system (1) and (2).

![Block Diagram](image)

**Affine**

This is one of the possible method to apply the effect of $\Omega$ on $\omega$ in which $P$ appears on the vector field $f$ of model (1) as the argument of an affine nonlinear term.

$$f(x, y, u, t, \alpha, P) = f_1(x, y, u, t, \alpha, P) + \Psi(P)$$  \hspace{1cm} (3)

If $\Omega$ is heavy enough, one can assume that effect of $\Omega$ can be summarized by a feedback from the outside of $B$, namely $\Psi(P) = \psi(y)$. This is illustrated in Figure (2.b).

This approach is computationally tractable within the class of affine point processes. An affine point process is flexible enough to account for cyclical dependence in the economy, market contagion and uncertain recovery. Further, that supports transform based pricing, hedging and calibration.
Feedback

If $\Omega$ is heavy enough, one can assume that effect of $\Omega$ in equation (3) can be summarized by a feedback from the outside of $B$, namely $\Psi(P) = \psi(y)$. This is illustrated in Figure 2.b.

Figure 3: The affine method of the effect of $\Omega$ on $\omega$ presented in equation (3).

Gate Connection

Another method is the infinite gate connection. In this method we look at $\Omega$ as an infinite gate with variables which are unchangeable under interaction with $\omega$. This method is illustrated in Figure (4).

Figure 4: The infinite bus representation of $\Omega$ and its interaction with $\omega$.

In this case the effect of $\Omega$ appears in $f$ as an extra set of parameters. Two sets of parameters $\alpha$ and $P$ are distinguished from each other by the fact that $\alpha$ depends on the characterization of system $\omega$ while $P$ depends on dynamics of $\Omega$.
Slow-Fast Regime

Realistically, in gate connection, the time scale of any change in $\Omega$ will be considerably longer than the time scale of any change in $\alpha$. In this case we can more precisely model $\Omega$ with slow-fast dynamic techniques where the dynamic of $B$ will be given by

$$x' = f(x, y, u, \tau, \alpha, P), \quad P' = \varepsilon \Phi(x, P, \tau).$$

Here $\varepsilon$ is a small parameter which slows down the dynamics of $P$.

CONCLUSION AND SUMMARY

This paper focused on the dynamical nature of firms' connection when the connection to the outside of the firms is considered. The general form of connections is discussed each of which corresponds to specific economics situation. The details of connections are left for further research. One can observe that the delay of data transferring has not been taken into account. This can be justified by arguing that the contemporary electronic nature of data transferring made it considerably fast. Nevertheless, one might spot delay in other parts of the model. For example, there could be delay when various components included in variable $x$ act on each other. Such delay is different from possible delay caused by data transferring. That has its origin on the dynamical nature of the system. Another issue which needs to be taken into account is the interconnections of firms which is not included in this paper and left for future work.

REFERENCES


AN ANALYSIS OF THE LINK BETWEEN A COMMUNITY BANK'S PROFITABILITY 
AND THE ABSOLUTE AND RELATIVE SIZE OF ITS LOAN PORTFOLIO

John S. Walker
Kutztown University of Pennsylvania

Henry F. Check, Jr.
Penn State Lehigh Valley

ABSTRACT

This paper revisits research done by Walker and Buetow (2005) in an unpublished article where they found no relationship between a community bank’s return on average equity and the relative size of its loan portfolio, as measured by the total-loans-to-total-assets ratio. However, they did find a connection between the return on average equity and the absolute size of the loan portfolio, which our research confirms. The link between profitability and size is not surprising as one would expect that a bank would generate economies of scale as it grows in size. In contrast to Walker and Buetow’s findings, we find that there is a connection between a bank’s return on average equity and its total-loans-to-total-assets ratio. In addition to realizing higher yields on loans than other earning assets (e.g., investments), we postulate that banks increased their cross-selling efforts in anticipation and after the passage of the Financial Services Modernization Act in 1999. This could have generated greater economies of scope, which enabled banks to improve their profitability. A high total-loans-to-total-assets ratio suggests more loan customers, providing a bank with more cross-selling opportunities. The business strategy implication of our findings suggests that banks will be more profitable if they can maintain or increase an asset allocation that favors loans over investments. Since the financial crisis and Great Recession, banks have been criticized for their reluctance to write more loans. Our research provides evidence that banks that lend more will be more profitable than those that do not, although we did not test this in the post-Great Recession period.

INTRODUCTION

The motivation for this research surfaced when the lead author was working in industry in a consulting capacity to community banks. He would discuss strategic planning issues with bank executives and boards of directors, as they were frequently updating and revising their banks’ strategic plans. Not only are bank managers concerned about the effectiveness of their plans to generate shareholder returns, but having a sound strategic plan is important for regulatory exams. Indeed, the Office of the Comptroller of the Currency (OCC) includes “strategic risk” in its handbook (2007) as one of the categories of risk examined during its bank supervisory process.

During discussions held at a particular bank’s strategic planning session, board members expressed concern that their bank could not perform as well as its peers because its total-loans-to-
total-assets ratio (L/A) was below the industry average. Correspondingly, the bank’s proportion of investments was higher than average. Generally, bank loan portfolios generate higher gross yields than investment portfolios; thus, it’s understandable why bank board members and executives would be concerned about the proportion of loans on the balance sheet. Moreover, since the Great Recession, banks have been criticized for not writing more loans. Thus, research into the profitability of a community bank in relation to the size of the loan portfolio and the proportion of loans is a timely topic.

Specifically, this research looks at a bank’s loan strategy from two angles. First, we examine the link between a bank’s profitability, using the accounting-based measure of return on average equity (ROAE) and the size of the bank’s loan portfolio. A bank’s ROAE is its net income as a percentage of average equity. As a bank increases the size of its loan portfolio, does that tend to increase profitability, as measured by ROAE? Second, we examine the link between a bank’s profitability and the proportion of the bank’s loan portfolio as measured by the total-loans-to-total-assets ratio. As a bank increases the proportion of its loan portfolio, does that tend to increase profitability?

In the literature review section, we discuss an unpublished article written by Walker and Buetow (2005). They found that a bank’s ROAE rises as the absolute size of its loan portfolio increases, but also found that the relative size of the loan portfolio does not correlate to performance. At the time, the finding that profitability is independent of the proportion of loans conflicted with conventional wisdom. A clear understanding of the causality between loan portfolio size, the proportion of loans, and profitability has important implications for goal-setting and strategic planning at a community bank. In this paper we revisit this topic, applying what we believe is a more rigorous analytical methodology than used in the unpublished article. We also use a larger dataset. The outline of the remainder of this paper is (1) a review of literature, (2) discussion of the community bank operating model, (3) description of data and analytical approach, (4) data analysis and results, and (5) discussion of results, conclusions, and ideas for future research.

REVIEW OF LITERATURE

Walker and Buetow (2005) investigated the relationship between the absolute size of the loan portfolio, the proportion of total loans to total assets, and profitability, as measured by ROAE. The purpose of their paper was to test the relationship between loan portfolio size—both magnitude and relative to assets—and the ROAE. The Walker and Buetow (henceforth, W&B) study found that banks with larger loan portfolios, in terms of absolute size, tend to produce higher ROAEs than banks with smaller portfolios; but when controlling for the size of the loan portfolio, the proportion of loans to assets—namely, the L/A ratio—did not correlate to performance.

The implication of these findings was noteworthy because it meant that a bank of a given asset size could perform as well as another bank of similar asset size regardless of the relative size of its loan portfolio. One explanation offered by W&B in their paper is that overhead costs grow as the proportion of loans increases and this offsets the higher yields generated by loans. Also, as the proportion of loans grows, loan losses expand, which diminishes profitability. Overheads and loan losses could also increase as the absolute size of the portfolio increases; but if costs grow at a diminishing rate, this might explain why banks with larger loan portfolios have higher ROAEs. The size of the loan portfolio is a proxy for the overall size of the bank and it might correlate to economies of scale. Hein, Koch and MacDonald (2005, p. 20) discuss how a growing bank shifts from relationship lending to transactional lending and that “transactional banking is generally associated with economies of scale because unit costs fall with increasing bank size.”

Other researchers have published studies related to our research. Haslem (1968) studied 64 operating ratios from 1963–1964 for all member banks of the Federal Reserve System. For
each year, an average was computed for each ratio and tested for management, size, location, and time effects using analysis of variance. Although summary statistics are not provided in their paper, profitability is claimed to be "generally" related to asset composition (p. 173), but not related to the total-loans-to-total-assets ratio (p. 172).

Holdren (1991) studied a sample of 251 Tennessee community banks using data from 1983–1987. At the time, the accepted size limit for community banks was $1 billion and Tennessee was chosen due to the diversification of the state's economy and its community banks (p. 1). The data for the five years were averaged. Sample banks were segmented into high performers (based on return on average assets) and high L/A ratio groups, and then further subdivided into three asset size groups. Fifty-four banking variables were tested for significant differences between the high-performer group and all other banks using univariate tests of means. Average loans-to-average assets ratios were found to be significant at the 1% level (p. 2).

Demirgüç-Kunt and Huizinga (2000) used data from the BankScope database compiled by Fitch IBCA covering all Organization for Economic Co-operation and Development (OECD) countries as well as many other developing countries (a total of 44 countries) for the 1990–1997 period. Averaging observations by country, they ran six structural models differentiated by the size of the economy (small, medium, and large) and whether the economy was banked-based (dominated by its central bank) or market-based (dominated by its stock market). The total-loans-to-total-assets ratio regression coefficient was found to be positively related to profitability and significant in three of these models.

DeYoung, Spong, and Sullivan (2001) used data from 1,414 state chartered banks in the Tenth Federal Reserve District from 1994. Using adjusted net income (net income before taxes, provisions for loan losses, and extraordinary items) as their measure of profitability, they found that total loans were not significantly related to profitability.

Altunbas and Marqués (2008) examined the pre- and post-merger performance of merged banks in the European Union using data from 262 such mergers between 1992 and 2001. One of the financial characteristics they found to have a significant effect on post-merger profitability was the total-loans-to-total-assets ratio. For domestic mergers they found that the difference in total-loans-to-total-assets ratio was negatively related to increases in profitability, indicating the difficulty of integrating dissimilar bank strategies. But, for cross-border mergers they found that the difference in the total-loans-to-total-assets ratio was positively related to increases in profitability, evidencing the benefits of economies of scope.

If a bank strives to increase its ROAE by increasing the absolute size of its loan portfolio and/or by increasing its loans as a proportion of assets, an obvious question is, how would implementation of such a strategy affect the bank’s risk? Emmons, Gilbert and Yeager (2004) addressed the limitations on a community bank’s ability to limit credit risk through diversification. Logically, community banks do not exhaust the benefits of idiosyncratic diversification (many similar borrowers) or sectoral diversification (many different types of borrowers) because of their small size and regional nature. However, the large number of extant community banks suggests that this potential limitation has not overly deterred the ongoing start up of community banks. Emmons et al. contend that market concentration merger guidelines might be responsible for what they see as an excessive number of extant community banks, but we know that this circumstance (i.e., many community banks in the United States, including Pennsylvania) continues to the present day in spite of greatly reduced limitations on mergers.

Acharya, Hasan, and Saunders (2006) mention the “winner’s curse” aspect of expanding the loan portfolio (p. 4). This circumstance occurs when a bank attempts to enter sectors or locales already being served by other banks. The loan customers which would be available to the new entrant would provide low returns and high risk due to the increased competition.
A DISCUSSION OF THE COMMUNITY BANK OPERATING MODEL

While there are various operating strategies used by banks to generate profits (see DeYoung and Rice, 2004), the basic business model of community banking involves collecting deposits and using those funds to write loans. A bank's primary revenue component is net interest income, which is determined by the difference between the interest income earned on loans and other earning assets, and the interest expense paid on deposits and other sources of funding. When comparing banks of different asset sizes, analysts will often examine spreads and margins. A bank's net interest spread is determined by the difference between the yield on earning assets (YEA) and the cost of funds (COF). Net interest margin is an alternative performance measure also related to a bank's net interest income; it is calculated as the difference between interest income and interest expense, as a percentage of total assets or total earning assets.

In addition to monitoring their spreads and stock performance over time, banks tend to track several accounting-based profitability measures, such as return on average assets (ROAA) and return on average equity (ROAE), to assess their overall performance. ROAA is defined as the bank's net income as a percentage of average assets, while ROAE is net income as a percentage of average equity. Banks' strategic plans will usually have ROAA and ROAE goals and growth targets for assets, loans, and deposits. One financial benchmark that is of particular interest to bankers is the total-loans-to-total-assets ratio (L/A). If a bank has a lower-than-average L/A ratio, then its proportion of investments, cash-equivalents and/or nonearning assets is higher than average. For example, if a bank has a much lower-than-average proportion of loans and a higher-than-average proportion of investments, then much of the asset side of the bank's balance sheet resembles a fixed-income mutual fund containing Treasury, agency, mortgage-backed, municipal, and other fixed-income securities. At the other end of the spectrum, a bank could have a sizable loan portfolio that represents as much as 80% or more of its earning assets. Figure 1 shows the average asset allocation for community banks in 2006 as a percentage of earning assets.

Figure 1: Asset Allocation for Community Banks (2006)

Investments, 19%
Cash, 8%
Loans, 73%

Source: SNL Financial

One concern when a bank operates with a much higher-than-average proportion of loans on the balance sheet is that its liquidity might be low. Typically, investments and cash-equivalents are far more liquid than a bank's loans, so liquidity needs can constrain a bank's L/A ratio. Nevertheless, many banks strive for a high L/A ratio because loans tend to produce higher gross yields than investments, because of greater credit risk. Plus, writing loans often generates deposit accounts.
Since the Great Recession, banks have found themselves in a challenging situation. Stovall and Kaajani (2012) explain how regulators have put a lot of pressure on community banks to expand their “core” deposits. The push for more core deposits came after regulators found that recently failed banks often had higher proportions of their funding coming from noncore funding sources, such as brokered CDs. This source of funding leaves banks vulnerable to rapid withdrawal of funding, which can force them to contract their balance sheets quickly through asset sales, potentially when asset prices might be depressed. The problem is that in today’s economy, loan growth remains slow; thus, banks that follow regulators’ instructions to expand core deposits are finding it difficult to deploy those funds at profitable spreads and margins. If a bank elects to raise deposits and directs those funds into investments and cash-equivalents, the proportion of loans on the balance sheet will fall.

In today’s operating environment, a bank could pursue one of two strategies. The first would be to pursue core deposits only as needed to fund new loan growth. This strategy would enable a bank to maintain a relatively stable L/A ratio while the economy improves. A second strategy would be to aggressively attract new core deposits, as the supply is plentiful in most markets. In the short term, these funds would likely flow into investments and cash-equivalents, pushing down the bank’s L/A ratio. However, when loan demand strengthens in the future, a portion of the deposits could be redeployed to finance new loans. Margins will likely improve, and banks that build core deposits now should be able to retain a high portion of those deposits in the future, which serves to enhance franchise value.

DESCRIPTION OF DATA AND ANALYTICAL APPROACH

The data used for this research were obtained from SNL Financial. 4 We collected total assets, total loans, and ROAE data for all of the banks in the SNL Financial database for the calendar years 1993 to 2007. Our choice of that timeframe was based upon our desire to overlap that of the W&B study, to include the time of the enactment of two significant pieces of legislation, the Financial Services Modernization Act (1999) and the Sarbanes-Oxley Act (2002), and to avoid the obvious complications of the financial meltdown that occurred in 2008. We filtered out banks for which there was incomplete data and banks that had total assets greater than $5 billion, as this is the size limit we’ve set in our definition of community banks. The filtering was done for each year rather than for the dataset as a whole, thus the number of banks in the dataset varies by year. Table 1 shows the size of each year’s sample.

<table>
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Source: SNL Financial

Our study specifically focuses on community banks. While there is no clear definition of a community bank in terms of asset size, typical attributes of a community bank include (1) that
“they tend to obtain deposits from local individuals and businesses and lend them out to local borrowers, (2) they specialize in ‘relationship banking,’ as opposed to ‘transactional banking,’ and (3) they make most of their money from loans” (Weber, 2010). We chose banks with $5 billion or less in assets because our consulting experience with community banks tells us that these banks meet the three criteria listed above. Also, the Independent Community Bankers Association states that community banks have assets of $10 billion and less (J. McNair, personal communication, October 3, 2010). The fact that the banks in our sample fall well within that benchmark also gives us confidence that they exhibit the attributes listed above. Moreover, there are relatively few banks in the total assets range between $5 billion and $10 billion.

There are at least two approaches we can apply to this research—ANOVA and regression analysis. We opt to use the ANOVA approach rather than a multiple regression for two main reasons. First, we design a more robust sorting method than used by W&B and are interested to see how this might affect the results. Second, there are two risks when specifying the model for a bank’s ROAE. Given the many factors that influence a bank’s ROAE, the model could easily be underspecified, and omitting important independent variables from the regression could bias the remaining estimates. The temptation would be to specify the model similar to a DuPont equation, but that runs the risk of testing a tautology. (These two reasons could explain why other researchers have also used ANOVA rather than regression for research similar to ours.) By using the ANOVA, we are in essence looking at our sample as categories, e.g., quintiles delineated by loan portfolio size and proportion of L/A. The ANOVA methodology effectively serves to answer the primary question we want to explore in this paper: Do banks with a smaller proportion of loans to assets tend to generate the same level of ROAE as banks with a higher proportion?

Using the total assets and total loans data, we calculate each bank’s L/A ratio for each year. Then each year’s data are double-sorted—sorted first on total loans (and assigned a total loans quintile bucket number) and then sorted on L/A ratio (and assigned a L/A quintile bucket number). It should be noted that this process achieves rankings that are independent of the sequence of the sorting. Figure 2 shows an example for 2006 of the five-by-five matrix obtained from this process. The dataset is disaggregated by year because ROAE is sensitive to year-to-year fluctuations in the economy. For example, credit losses tend to increase when the economy slows and this can lead a bank to step up its provisioning, which in turn lowers ROAE.

**Figure 2: Example Double-Sort Matrix**

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For each year and each of the 25 quintile “buckets,” the bucket size (number of banks), bucket mean ROAE, and bucket standard deviation of the ROAEs are calculated. Corresponding calculations yield row and column sizes, means, and standard deviations. Differences of means hypothesis tests are conducted to test for significant differences between rows (loan portfolio size) and columns (L/A ratio). Figure 3 shows an example of the output obtained, including t-statistics.
and p-values. The test statistics of greatest interest lie on the diagonals, as these are based on adjacent or contiguous quintile comparisons (i.e., one versus two, two versus three, three versus four, and four versus five), and significant differences (at 5%) are indicated in bold. For 2006, all of the p-values for loan portfolio size are significant, while seven out of ten p-values for L/A ratios are significant.

Figure 3: Example of Bucket Statistics Calculation and Difference of Means Hypothesis Tests (2006)

In addition to the differences of means hypothesis tests, two-way ANOVA tests, with and without interaction, were conducted for each year. Since the bucket sizes are typically all different (an unbalanced design) a regression technique was applied to obtain ANOVA results. This process can be found in Kleinbaum, Kupper, Nizam, and Muller (2008). Summary tables of the ANOVA tests can be found in the Appendix.

DATA ANALYSIS AND RESULTS

Figure 4 shows the effect of increasing loan portfolio size on ROAE for each year of the study. Each year has five bars, one for each quintile, representing the differences between the quintiles’ average ROAEs and that year’s average ROAE. The bars for each year are arranged from the lowest to highest quintile based on loan portfolio size. The solid bars with black fill above 0.0% (denoting what we are terming “positive excess returns”) represent quintiles that outperformed the year’s average. The unfilled bars below 0.0% (denoting negative excess returns) represent quintiles that underperformed the year’s average.

For every year in our study, there is a positive relationship between loan portfolio size and ROAE—as the loan portfolio size increases (i.e., moving from quintile one to two, two to three, and so on), the excess return increases consistently. This relationship between loan size and
ROAE is seen graphically and is verified by comparing the p-values across the quintiles. The p-values based on comparing the mean ROAEs between the first size quintile to the second, the second to the third, the third to the fourth, and the fourth to the fifth are all listed in Table A1 of the Appendix. For the 15-year period examined (1993–2007), 57 out of 60 p-values are significant at the 95% confidence level.

**Figure 4: The Effect of an Increasing Loan Size on ROAE**

Figure 5 shows the effect of an increasing L/A ratio on ROAE for each year of the study using the same layout as Figure 4. Each year has five bars representing the differences between the quintiles’ average ROAEs and that year’s average ROAE. The bars for each year are arranged from the lowest to highest quintile based on the L/A ratio. The bars with solid black fill above 0.0% (denoting positive excess returns) represent quintiles that outperformed the year’s average. The unfilled bars below 0.0% (denoting negative excess returns) represent quintiles that underperformed the year’s average.

**Figure 5: The Effect of an Increasing Total-Loans-to-Total-Assets Ratio on ROAE**

For every year in our study, there is a positive relationship between the proportion of loans to assets and ROAE—as the L/A ratio increases (i.e., moving from quintile one to two, two to three, and so on), the excess returns increase fairly consistently. This relationship between L/A and ROAE is seen graphically and is verified by comparing the p-values across the quintiles. The p-values based on comparing the mean ROAEs between the first L/A quintile to the second, the
second to the third, the third to the fourth, and the fourth to the fifth are all listed in Table A2 of the Appendix. For the period examined (1993–2007), 32 out of 60 p-values are significant at the 95% confidence level. The p-values are not as consistently significant for the L/A variable as for the loan variable. However, when we compare p-values for quintile one versus two (seven out of 15 are significant), quintile one versus three (12 out of 15), quintile one versus four (14 out of 15), and quintile one versus five (14 out of 15), we find growing consistency in the significance of the p-values. This supports the conclusion that as a bank’s L/A ratio increases, so does its ROAE.

Given that the data support the conclusion that a higher L/A ratio tends to increase a bank’s ROAE, a question of interest is, by how much does ROAE increase as a bank’s L/A ratio increases and is the change significant? Unlike when using regression, a linear relationship is not assumed with ANOVA; nevertheless, the means and variances for each quintile enable us to calculate confidence intervals for the ROAE differences across quintiles. The 15 years of data with five L/A quintiles per year provide the opportunity to create 60 confidence intervals, just using contiguous quintile means (e.g., quintile one versus two, two versus three, and so on for all 15 years). If noncontiguous quintiles are also used (e.g., one versus three), the potential number of confidence intervals expands to 150.6

In order to give an idea as to the ROAE gain from going from a low L/A to a high L/A, two confidence intervals are reported: one for 1993 and one for 2003, using the data for the first and fifth quintiles for those two years. The reason that these two years are selected is that the difference between the quintile one and quintile five ROAEs is the smallest for 1993 and the largest for 2003, with the p-values significant between these quintiles. Furthermore, we use the first and fifth quintiles because this gives the range in ROAE across the quintiles and a sense as to the magnitude of ROAE improvements that could be achieved for a bank that moves from the lowest to the highest L/A quintile. The confidence intervals help quantify whether ROAE gains across quintiles are meaningful from a practical point of view.

For 1993, the confidence interval (assuming unknown population variances) for the ROAE gain is 0.50% to 2.40% between quintile one and five with 95% confidence. For comparison, for 2003, the confidence interval for the ROAE gain is 3.27% to 4.77%. A complete summary of the confidence intervals for 1993–2007 is given in Table A3 of the Appendix. These intervals suggest that a bank moving from the lowest quintile to the highest quintile can markedly improve its ROAE ceteris paribus. In community banking, a 10-basis-point gain in ROA or a 100-basis-point gain in ROAE is viewed as a material improvement in performance. Of course, the ROAE gains from quintile one to two, two to three, three to four, or four to five for any particular year are less than the gain that results from jumping from quintile one to five. Also, bank ROAEs are sensitive to the year of operation and, thus, so are the improvements seen as we move to higher L/A quintiles.

DISCUSSION OF RESULTS, CONCLUSIONS, AND IDEAS FOR FUTURE RESEARCH

For the time period from 1993 to 2007, we consistently find significance between the loan portfolio size variable and ROAE. Prior research has shown that larger banks are more efficient than smaller banks, because they enjoy greater economies of scale and scope as the size of their balance sheet grows. Therefore, the finding that there is a positive connection between a bank’s loan portfolio size and ROAE is not a surprise. We also consistently find significance between the L/A ratio variable and ROAE. While we found a positive connection between loan size and ROAE and also loan proportion and ROAE, the interaction effect is minimal (see Tables A4 and A5).7 The connection between a bank’s L/A ratio and ROAE is noteworthy for two reasons. First, it is not consistent with W&B’s findings when they found that ROAE does not depend on the relative proportion of loans to assets for the period 1991 to 2003.8 Second, our finding suggests a strategy whereby a community bank might improve its ROAE without
increasing its absolute size. Such a strategy may be easier to implement than a pure growth strategy, especially during periods when deposit growth is slow. The passage of the Financial Services Modernization Act (FSMA) in 1999 makes it easier to pursue such a strategy because it opens the door to cross-selling of various financial services, meaning that banks can increase revenue from what are termed noninterest income sources.

Figure 6 shows a scattergram for all community banks’ L/A ratios and total assets for 2006. Recall from Table 1 that there are 6,661 banks in the 2006 sample. Clearly the great majority of those banks have total assets of less than $1 billion. Recall from Figure 1 that the average loans-to-earning-assets ratio in 2006 is 73%. Our results indicate that there are thousands of community banks that potentially could increase their ROAE by growing the size of their loan portfolio and/or increasing their L/A ratio. Growing the loan portfolio might be somewhat difficult for some banks because it would require additional deposits, borrowing, or equity. In contrast, increasing a bank’s L/A ratio would be somewhat easier because this merely requires an exchange of assets. Both growing the absolute and relative size of the loan portfolio requires credit analysis and a decision by management as to whether there is sufficient expected return for assuming added credit risk. Because each community bank has its own unique set of circumstances, such as location, mix of products and services, and competitive environment, we cannot make a sweeping statement that increasing the size or proportion of loans will raise a bank’s ROAE. Nevertheless, the data for the time period examined, prior to the financial crisis, do show that banks with larger loan portfolios tend to achieve higher ROAEs than banks with smaller loan portfolios, and banks with higher proportions of loans to assets tend to achieve higher ROAEs than banks with smaller proportions of loans to assets.

Figure 6: Community Banks’ Total-Loans-to-Total-Assets Ratio versus Total Assets (2006)

Source: SNL Financial

The Banking Act of 1933—also known as the Glass-Steagall Act—separated banking and securities activities. This was an historic change to the banking industry that was aimed at making the financial industry more stable after the run on banks in 1929 by reducing conflicts of interest. The FSMA essentially repealed the Glass-Steagall Act and gave banks permission to sell securities and insurance as well as other financial services, opening the door for more cross-selling. Now banks are able to market themselves as one-stop shopping sources for financial
services. Economies of scope are potentially realized when a bank offers more services. The L/A ratio could be a proxy for the size of a bank's customer base. Consider a bank with a low L/A ratio. This would be a bank with few loans and a lot of investments, cash-equivalents and/or nonearning assets. There is an obvious correlation between a bank's loans and number of customers, whereas the volume of investments on a bank's balance sheet has no connection to the number of customers, as the investments are transactions between a bank and the capital markets. With the passage of the FSMA, banks are now permitted to cross-sell more services to their customers. The ability to sell more services created the opportunity to achieve greater economies of scope. Banks with greater L/A ratios likely have more customers, more cross-selling of services, and more economies of scope. DeYoung and Rice (2004, p. 57) make the point that while the FSMA "completely relaxed the restrictions on the permissible volumes of nonbanking activities and allowed commercial banks to engage in completely new activities such as merchant banking," the restrictions were being relaxed incrementally all during the 1990s. Thus, banks did not have to wait until 1999 to shift to another business model. Indeed, a bank's transition could have started earlier in the decade, with an acceleration once the FSMA went into law.

Another explanation as to why there is a potential statistical link between the L/A ratio and ROAE is the potential increased profitability of loans relative to investments. You could see that happening particularly if credit spreads were widening, as that would give loans a yield advantage over investments. In the banking industry, investments typically found on the balance sheet of a bank have minimal credit risk, as banks can only purchase investment grade bonds. In contrast, there is a potentially greater credit risk component found in banks' loan portfolios.

As a bank increases in size, we might expect both economies of scale (unit costs go down with increasing size) and economies of scope (unit costs go down with expanding business offerings). Evenoff and Israilevich (1991) summarize the findings of various researchers on scale efficiency and concluded that "scale advantages are fully exhausted once an institution achieves a size of approximately $100-200 million."

We want to point out that our study did not control for risk. Some research (see Demsetz and Strahan, 1997) suggests that as banks becomes larger, their firm-specific risk does not go up. They explain that banks can lower risk through diversification of activities, but they then use that diversification benefit to leverage more and to pursue riskier lending. So the net risk change is approximately neutral. This would suggest that controlling for risk offers no significant advantage.

The results of this paper suggest three additional lines of research. First, an examination of stockholder returns and systematic risk could determine whether banks with larger loan portfolios and/or higher L/A ratios have higher absolute market returns and/or higher risk-adjusted market returns. Thus, does the market reward banks which follow our recommended strategies? Second, a cursory examination of Table A2 in the Appendix reveals that a high L/A ratio is more likely to have an effect on ROAE than a low L/A ratio. This implication can be examined formally with non-parametric testing methods. Further, division of the L/A ratio data into deciles might reveal more details regarding this observation. Third, an examination of Tables A1 and A2 reveals that the year 2007 (the most recent year in our study) did not follow the trend present in the earlier years of this study. A comparison of 2007 versus the prior years, perhaps via an event study methodology, might indicate that the 2008 financial meltdown was being predicted by diminishing bank profitability in 2007 that was reflected in bank ROAEs at the time.

ENDNOTES

1 Return on average assets (ROAA) is similar to return on average equity (ROAE)—it's net income as a percentage of average assets.
To clarify the term “unpublished” in the context used, the Walker and Buetow article was printed and circulated to corporate clients, but was never reviewed and published in a peer-reviewed journal.

In banking, the sizes of the loan and investment portfolios are alternatively given as a percentage of total assets or earning assets. Whether total assets or earning assets are used is determined by preference and makes little difference quantitatively.

SNL Financial LC was founded in 1987. The bank data used in this study are obtained by SNL from the U.S. government. Each quarter, all FDIC-insured institutions are required to submit a Report of Condition and Income (known in the industry as a “call report”) to the FDIC. While in industry, the lead author of this research used data from SNL Financial and call reports extensively and found SNL’s data to be quite reliable.

Note that our dataset of community banks up to $5 billion in total assets exceeds the $3 billion limit applied by W&B in their study. The $5 billion upper limit more completely reflects the community bank sector.

The noncontiguous comparisons include quintile one to quintile three, one to four, one to five, two to four, two to five, and three to five.

The interaction term included in the two-way ANOVA tests were significant at the 5% level for just two of the 15 years studied.

In addition to using a larger dataset, there are two significant differences in methodology between W&B and our work that could account for the disparity in findings: (1) W&B aggregated all years of data into a single test of means hypothesis, while our paper treats each year separately; and (2) the sequential sort method used by W&B masked the L/A effect which is readily identified by this paper’s simultaneous sort method. For documentation on the difference between the sort methodologies used in this paper versus W&B, contact the lead author at walker@kutztown.edu.

Investment grade bonds are denoted as Baa3 or higher by Moody’s or BBB or higher by S&P and Fitch.

REFERENCES


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<td></td>
<td>Loan-to-Assets</td>
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<tr>
<td></td>
<td>Interaction</td>
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</table>

44
THE ECONOMIC IMPACT OF ALVERNIA UNIVERSITY

Tufan Tiglioğlu
Alvernia University

Lisa Cooper, Bari Dzomba, Rachel Gifford, and Joseph Hess
Alvernia University

ABSTRACT

Research has shown that the economic impact of colleges and universities on local, regional, and state economies are greater than their direct spending. This paper examines the direct, indirect, and induced economic impact of Alvernia University on the local and regional economies. The university's total spending on goods, services, payroll expenditures, capital investment, ancillary spending by students, visitors, and employees are analyzed using the IMPLAN input output model quantifying the direct, indirect, and induced economic impact on Berks County, Pennsylvania. Qualitative measures such as employee and student volunteer hours, institution sponsored sporting, and community events are analyzed. This paper supports Alvernia University’s impact on the local and regional economic sustainability and growth.

INTRODUCTION

Economic impact analysis has been used to analyze the direct, indirect, and induced economic impact that universities and colleges have on the local economy where they are located. Direct effects include transactions directly attributable to the university, such as employee salaries. Indirect and induced effects are those that result from associated university spending, for example, the university purchasing food at a local restaurant and that restaurant hiring additional staff to accommodate purchasing demand. In addition to these quantitative measurements, qualitative measures such as employee and student volunteer hours, as well as institution sponsored events including lectures, concerts, and sporting events should also be considered for a more comprehensive analysis.

In a report released in 2009 by the Association of Independent Colleges and Universities of Pennsylvania, it was estimated that the total state wide economic impact of independent higher education institutes was $16,133 million. Of this, $8,259 million was estimated to have come from institutional expenditures, $955 million from construction, $1,814 million from students spending, $5,022 million from faculty and staff spending, and an additional $83 million from visitor spending (Association, 2009).

In 2011, the economic impact of the University of Scranton on the city of Scranton and Northeastern Pennsylvania was determined to be $382 million overall, with over $182 direct expenditures coming from the university alone (The University of Scranton, 2011). In another study, Bucknell University was found to have impacted the surrounding six county region,
consisting of Union, Columbia, Lycoming, Montour, Northumberland, and Snyder, by $206
million and the state of Pennsylvania by $263 million during the 2009-2010 academic year
(Roue, 2011). The university spent over $164 million in wages, construction costs, and operating
expenses. An economic impact analysis conducted in 2005 indicates that the University of
Pennsylvania, which is comprised of 12 graduate and professional schools, provided a $9.6 billion
direct and indirect impact on the state of Pennsylvania, as well as a $9.8 billion impact on the 11
county region, and $6.5 billion for the city of Philadelphia (Econsult Corporation, 2006).
Similarly, an economic analysis conducted for Penn State University’s 24 campuses on each of
Pennsylvania’s counties was conducted in 2008, which reports a total direct and indirect impact of
$8.46 billion (Tripp Umbach, 2009). The total economic impact of Dickinson College for
Cumberland County in Pennsylvania equals an estimated $150,431,937 (Bellinger at al., 2010).
Lastly, Hope College contributed a total impact of $213 million on the city of Holland, Michigan,
as reported in the 2011 economic impact study by Stokes (2011).

The purpose of this paper is to analyze the direct, indirect, and induced economic impact of
Alvernia University on Berks County, Pennsylvania. According to the 2010 U.S. Census, the
largest city located in Berks County is Reading, which is also the poorest city in the U.S., with the
median household income at $28,197 annually. In 2010, the population of Berks County was
411,442 people, with 88,082 individuals residing in Reading (QuickFacts, 2012). Additional
demographic and economic information on Berks County, obtained from the IMPLAN modeling
software for the model year 2009, is provided in the Appendix in Table 1. In an effort to improve
economic competitiveness, eight principal stakeholder organizations involved in the promotion of
the economic prosperity of the Greater Reading Area and Berks County, analyzed past economic
development strategies and recommendations and identified five key issues needing attention:
entrepreneurship and innovation, workforce/talent development, industry clustering, sites and
infrastructure, and quality of place. By developing these areas, it is hoped that residents would be
more prosperous and happier to live in the area, and local businesses would have more
opportunity, innovation, and would grow faster (Ride to Prosperity, 2010). Local colleges and
universities have the opportunity to support and improve upon these key areas, and Alvernia
University is committed to doing so through integrated, community-based, inclusive, and ethical
learning.

This paper is organized as follows. The first section provides a review of the literature of
economic impact analysis methods. The second section provides a description of the
methodologies utilized for determining the direct, indirect, and induced impact of Alvernia
University on Berks County, Pennsylvania. The third section provides the results of the
analysis. The fourth section provides a discussion of the analysis results as well as conclusions.

LITERATURE REVIEW

Communities possess a solid sense of place and a university's presence within an area
serves as a central hub for providing quality of place for the citizens within the communities it
serves. From arts and cultural events, to sporting events and lecture series, a university's identity
enhances the well-being of the community. The most trusted way for universities to determine the
impact of their presence on the local community is to conduct an economic impact analysis.
These studies are usually designed as unique research projects to meet local and regional needs
(Caffrey & Isaacs 1979). Economic impact analyses are a critical tool for universities to
demonstrate the value of their presence in a particular geographic area on local businesses and
policies. Since the introduction of university economic impact studies by Caffrey and Isaacs in
1971, a number of studies have been conducted using various methods to quantify the economic
benefits of a university in a particular area. The most common methods employed in impact
studies include, the American Counsel of Education (ACE) method, the Ryan Short-Cut method, the Input Output method or IMPLAN model, and the skills based approach.

The ACE method, developed by Caffrey and Isaacs (1971) is the oldest method of calculating economic impact and is still used extensively by universities today including Bucknell (Rousu, 2011) and Penn State (Tripp Umbach, 2009). The ACE method consists of a series of models created by a review of economic impact previously conducted by several American colleges and universities. The primary objective of their study was to derive models for which data could be obtained from the normal records kept by universities, local governments, and businesses; from statistical publications of the federal government. The ACE method tracks the flow of money from the university through a designated area or community to show the ways in which funds derived from the university benefit the local community (Tripp Umbach, 2009). These models consisted of business models, government models, and individual models (Caffrey & Isaacs, 1971). Specifically, the ACE method examines a university’s impact on local businesses, local individuals, and local government. A university’s impact on local business is measured by the amount of money a university spends on supplies and services. A university’s impact on individuals is assessed by how many individuals are employed by the university, and how those individuals affect the local economy by producing goods and services. The impact on local government is measured by examining how much the university contributes to local government in the form of various taxes and revenue derived from the university (Garrido-Yserte & Gallo-Rivera, 2010). The ACE methodology gathers specific cash flow data from the university’s financial documentation, which is needed to assess the impact on each of the three areas outlined above. Financial documents generally used include tax and income statements, as well as specific documentation related to purchases within the specified geographic area. The ACE method also employs surveys to measure the spending of university employees and students within the local community. Once the data has been gathered a regional economic multiplier is applied to the spending data in order to determine the total economic impact (Tripp Umbach, 2009). The models are limited to use in estimation of short-term economic impact, i.e. over a given period of time, such as an academic school year. They are not able to assess the ultimate economic impact of the university upon the community and they do not embody considerations such as what a community might have been like without the college (Caffrey & Isaacs, 1979). It is necessary to note that the ACE method provides a built-in understatement: the actual economic impacts are probably greater than the models suggest. Caffrey and Isaacs (1979) reasoned that it is better to err on the side of too little than too much, particularly when a public relations function is being served and it is impractical to account for all the real expenditures of every individual and group associated with the university.

The Ryan Short-Cut method, developed in 1981 by J.G. Ryan, is a simplified version of the ACE method. According to Ryan, there are three major problems with the ACE method when employing it for smaller universities and community colleges. First, the economic estimates suggested by the ACE method are inappropriate for small schools. Second, the development and administration of surveys to measure student and employee spending are too time consuming and expensive for small colleges and the response rate is often too low to obtain accurate results. Finally, the retail gravity method used by the ACE model, which measures individual non-housing expenditures, has been found to be too mathematically complex. Additionally, it is difficult for small universities and colleges to operationalize a retail sales area and obtain appropriate retail sales information. The Ryan Short-Cut method remedies these problems by replacing survey information with readily available, nationally produced datasets identified for substitution of the retail gravity model. The Ryan Short-Cut method also uses a more conservative multiplier which is more appropriate for smaller institutions (Ryan & Malgieri, 1992).
The Input Output method or IMPLAN model is similar to the ACE and Ryan Short-Cut methods, in that it measures the impact of university spending on a number of different industries. The major difference in the IMPLAN model is that it measures the forward and backward linkages in an economy rather than linear cash flow. Forward and backward linkages are examined through inter and intra industry transactions by looking at the direct, indirect, and induced effects of university spending (Caroll & Smith, 2006). The model measures the total annual economic activity that results from inter and intra industry transactions. As mentioned previously, direct effects measure university spending on items such as payroll. Indirect effects measure university spending on goods and services for production. The model also quantifies indirect impacts of the university in the form of employee spending as a result of the income they earn from the university. Once accurate financial information is compiled, it is analyzed through the use of IMPLAN commercial software that utilizes input output data for over 500 industries to create industry specific multipliers for states and communities. The data used by IMPLAN comes from federal government sources and is used to create appropriate multipliers to estimate economic impact (Morgan, 2010). IMPLAN has been widely used as a method for economic impact assessment by universities such as the University of Pennsylvania (Econsult Corporation, 2006), Bowling Green State University (Carroll, 2006), the University of Phoenix (CBRE Consulting, 2009), and the University of North Carolina (Walden, 2009). The popularity of the IMPLAN model is due to its ease of use and accuracy in creating multipliers compared to other economic impact analysis methods. Other economic impact methods, such as ACE, involve complex calculations to determine multipliers which may result in multipliers that are too large, thus overestimating the impact of a university on a particular area. The benchmarked economic models and multipliers used by the IMPLAN software allow for greater accuracy in calculating impact and reduce the chance of error (Morgan, 2010). The outputs could result in multipliers that are too large or small thus over or underestimating the economic impact.

Though the IMPLAN model has been found to be one of the most accurate models in assessing quantitative economic impact data, it lacks the capability to assess the qualitative impacts universities often have on their communities. Scoble, Dickson, Hanney, and Rodgers (2010) suggest that the inclusion of qualitative measures, such as volunteer hours and social programs can be a valuable addition to any economic impact report. The use of both qualitative and quantitative data provides a thorough understanding of all of the ways a university impacts a community.

The skills based approach developed by Elliott, Levin, and Meisel (1988), was created to measure some of the qualitative impacts of a university in order to compliment the quantitative data utilized by the methods previously described. The skills based approach assumes that, in addition to providing employment and increased industry spending to an area, universities are also providing a community with a more educated population. It is reasoned that the highly educated students they produce have greater skill sets than non-educated community members and will therefore earn more substantial incomes, thus contributing more taxes to the local government. In addition to spending more in taxes, university alumni are also expected to spend more money in the local economy through the purchase of goods and services which provides further stimulation to other local businesses (Brown & Heaney, 1997).

The weakness of the skills based approach, which has led to much criticism, is that it often overestimates the impact of alumni on the local community. There is often little data available to provide an accurate estimate of the true impact as a result of alumni. Additionally, research suggests that the attainment of a college degree increases the chance of migration of
college students, making them less likely to stay in the area where they gained their education. Researchers are not able to accurately predict the rate of migration, resulting in the skills based approach being viewed as a highly subjective method of calculating impact (Brown & Heaney, 1997).

The skills based approach is not the only method that has received criticism relating to the reliability and truth of statistics. Siegfried, Sanderson, and McHenry (2008), claim that almost all methods of calculating economic impact are in some way inaccurate since they fail to account for counterfactual information in their analysis. The authors define the counterfactuals as the businesses, industries, or people which may have been present in a community if the university never existed. By determining what the community’s economy would look like if a university did not exist in the defined area, researchers are able to more accurately isolate the specific economic benefits that only the university can and does provide to the community (Siegfried, Sanderson, & McHenry, 2008).

Based on the information provided in the literature on the various methods of determining local economic impact by universities, the Input Output method was determined to be most appropriate to assess Alvernia University’s impact on Berks County. Alvernia University resides inside the city boundaries of Reading, Pennsylvania, an economic area which is recovering at a pace faster than the rest of the Commonwealth of Pennsylvania and nation. While Reading lacks employment diversity and high-value-added service positions, it is an attractive area to focus on with strengths such as below-average cost of living, lower than average foreclosure rates, and affordable housing and business costs. Prior to the recession, the unemployment rate in the Reading area was under 4%. As of December 2011, the unemployment rate in the Reading area was 7.9%, well under the national average of 8.5% (Moody’s, 2012). Loss of manufacturing jobs are the root cause for the decline in employment rates in the area, thus showing that a local university within Reading that is well established and focused on the constituents within the community could provide economic and quality of life opportunities for the residents of Berks County, Pennsylvania.

METHODOLOGY

The most widely used and accepted methodology for measuring the economic impacts of a university on a local economy is the Input Output method, which is used to describe economic transactions between various sectors in a defined economy within a given time period (Cooperatives, 2012). The IMPLAN model was utilized for this analysis of Alvernia University’s economic impact on Berks County, Pennsylvania during the 2010-2011 academic year. IMPLAN economic modeling software utilizes multiplier models to estimate the direct, indirect, and induced effects of the university on the local area. Direct effects measured by the model include transactions directly attributable to the university, such as employee salaries. Indirect effects assessed include transactions made to the local area by the university on items such as supplies, services, and labor. Induced effects assessed are the re-spending that occurs as a result of the indirect spending.

The average of total liabilities and net assets reported in Alvernia University’s publically available 2009 Form 990, approximately $90 million, was inferred as 2010-2011 academic year total operating costs. Additionally, approximately $11 million in construction costs was reported in 2009 and was also inferred for 2010. These data were analyzed by the IMPLAN software, using the Shannon-Weaver Index of 0.7992 and Industry 392, private junior colleges, colleges, universities, and professional schools, to determine total direct, indirect, and induced effects, as well as direct, indirect, and induced effects without construction costs. These effects were also analyzed for construction costs alone.
In 2011, 2,450 students attended Alvernia University’s main campus, with 839 students living on campus. We assume, therefore, that 1,611 students lived off campus, of which approximately 75%, or 1,208 students, commute to the university approximately 150 days of the year. We estimate that each of these commuting students spend $11 each day they commute; $2 for beverages, $1 for candy, $3 for gas, and $5 for food. Therefore, $2 million was used to assess the direct, indirect, and induced effects of student spending. Finally, the impact of student volunteer hours during the 2010-2011 academic year was quantified by multiplying the number of hours volunteered by the 2010 Pennsylvania minimum wage rate of $7.25 per hour.

RESULTS

Total operating expenses of Alvernia University for the 2010-2011 was approximately $90 million. This total amount includes $23 million spent by the university on employee salaries and wages, of which only 80% was likely retained in Berks County after accounting for taxes and other deductions, as well as the small percentage of employees located at satellite offices outside of Berks County. Therefore, the resulting salary/wage estimate is $16 million. The total benefits paid during the 2010-2011 academic year were approximately $6 million. Though Alvernia provides several types of benefits, key benefits included current employee and retirement medical benefits. In addition to paying significant amounts of money toward salaries and benefits which were used by employees throughout the region, the university also had a significant impact on the community in the form of local taxes, amounting to $158 thousand during the 2010-2011 academic year.

Additionally, the 2010-2011 total expenditures includes $4 million spent on Aladdin, the food service provider for the campus, as well as other key areas of spending including repairs and maintenance, consulting/professional fees, insurance, library books and materials, equipment and technology, travel and entertainment, utilities, and postage and shipping. Specifically, a total of $549 thousand was spent by Alvernia University on repairs and maintenance. To account for purchase of materials outside of Berks County, only 90% of that total was used. Alvernia University spent $421 thousand in consulting and professional fees. We assume that half (50%) of these services were fulfilled locally. The university also paid $232 thousand in insurance during the 2010-2011 academic year, of which only 10% is assumed to have been retained in Berks County. Approximately $106 thousand was spent on library books and materials and $277 thousand was spent on equipment and technology. Only 10% of each is assumed to have been retained in Berks County. During the 2010-2011 academic year, $334 thousand was spent on travel and entertainment expenses of which 35% is assumed to have been spent at local businesses such as hotels and restaurants. Over $1.7 million was spent on utilities of which 20% is assumed to have been retained in Berks County. Finally, approximately $252 thousand was paid by Alvernia University in postage and shipping, 80% of which was likely retained in Berks County. These key areas of spending are outlined in the Appendix, Table 2.

Federa. and state grants obtained for local spending, equaling approximately $1 million, are also included in the total expenditures. Alvernia University also provided $83 thousand in local donations. Finally, over the last few years, Alvernia University has been updating existing structures, as well as rapidly expanding its campus. The 2009 Form 990 lists construction costs at $11 million.

For this study, the impact of annual operating expenditures was examined using a total operating budget of $90 million as described above. The resulting total effect was $127 million, with $72 million resulting from direct effects, $25.5 million from indirect effects, and $29 million from induced effects (see Table 3). The top ten industries impacted financially by the university are outlined in Table 4, and includes private junior colleges, colleges, universities, and
professional schools ($72 million), real estate establishments ($5.5 million), imputed rental activity for own-occupied dwellings ($4 million), and other industries (total $15 million).

Approximately $11 million of the total operating budget was spent on construction. It is important to differentiate operations and construction in economic analysis because operations spending is an annual reoccurrence while construction spending is only made for the duration of the project. Therefore, the impact of university expenditures excluding construction spending (capital investment) was analyzed and the total effect was approximately $111 million (Table 5). The top ten industries impacted financially by the university are outlined in Table 6, and includes private junior colleges, colleges, universities, and professional schools ($63 million), real estate establishments ($4.8 million), other state and local government enterprises ($3.1 million), wholesale trade business ($2.1 million), private hospitals ($1.9 million), food services and drinking places ($1.8 million), and other industries (total $34 million).

The total effect of construction was approximately $18 million, with $11 million resulting from direct effects, $2.6 million from indirect effects, and $4.5 million from induced effects (see Table 7). The top ten industries impacted by employment are presented in Table 8, and include construction of new nonresidential commercial and health care structures (83 employees), food services and drinking places (5 employees), architectural, engineering, and related services (5 employees), as well as an additional 16 employees from other industries. Table 8 also illustrates the top ten industries impacted financially by construction. Financially impacted industries include the construction of new nonresidential commercial and health care structures ($11 million), food services and drinking places ($280 thousand), architectural, engineering, and related services ($714 thousand), as well as approximately $1.6 million from other industries.

The impact of student spending in Berks County was also assessed, with the total effect $2.9 million. Direct effects seen were $1.9 million, indirect effects were $603 thousand, and induced effects were $430 thousand. These results are provided in the Appendix, Table 9. As presented in Table 10, the top ten industries impacted financially by student spending included food services and drinking places ($932 thousand), petroleum refineries ($541 thousand), soft drink and ice manufacturing ($226 thousand), and an additional $575 thousand from other industries. Table 10 also lists the top ten industries impacted by employment by student spending, including food services and drinking places (17 employees), wholesale trade business (0.5 employees), real estate establishments (0.4 employees), with an additional 1.6 employees from other industries.

Finally, during the 2010-2011 academic year, over 1200 students contributed 20,623 hours of service to the local community, much of which was through the Holleraan Center for Community Engagement at Alvernia University. In order to provide a quantified metric for impact, the volunteer hours are multiplied by the minimum wage rate in 2010, $7.25 per hour. Therefore, Alvernia University’s students provided approximately $150 thousand in free labor to the local community during the 2010-2011 academic year.

CONCLUSION

This study indicates that Alvernia University has a major economic impact on the local economy of Berks County. The study focused the impact of total operating expenditures, operating expenditures without construction costs, construction costs alone, student spending, and student volunteer hours. The full extent of Alvernia University’s economic impact cannot be realized by analyzing only these areas. However, they do offer insight into role Alvernia University plays in ensuring continued and future economic success of Reading and Berks County through existing and new opportunities for purchasing and employment.
Alvernia University's impact on Reading and Berks County is significant, with a total effect of $130 million (effects from total operating expenditures and student spending). This is approximately half of that seen from similar, small universities such as Bucknell ($206 million) and Scranton University ($382 million). It is unclear why such a large difference is seen, however, it is likely that differences in assumptions as well as validity of data sources may play a role. Future studies analyzing Alvernia University's impact should include other variables such as employee and visitor spending.

Few studies include an analysis of the impact of volunteer hours, yet the impact from this alone is significant to a community. Quantifying volunteer hours by multiplying hours by minimum wage only touches on the true impact that such generosity generates. It is even more difficult to quantify the emotional, educational, and spiritual returns such volunteers may provide. Alvernia University was named in the President's Higher Education Community Service Honor Roll, with Distinction, by the Corporation for National and Community Service (CNCS) and the U.S. Department of Education. The honor recognizes the university's commitment to the local community through community service. Additionally, Alvernia University sponsored numerous cultural, sporting, and educational events open to the community.

While Alvernia University's impact is great, to more accurately portray its impact, counterfactual should also be considered. Although it is impossible to know what may have existed on the land Alvernia University currently occupies, it is likely that the land may have been used for housing or other small businesses, similar to what exists on the property surrounding the university. Any alternative options short of a large corporation would be unlikely to produce the magnitude of economic impact that Alvernia University provides to the community. As an institute of higher education, Alvernia University offers a variety of unique benefits to the community. Specifically, it is increasing entrepreneurship and innovation, workforce/talent development, infrastructure, and quality of place, by not only providing well-paying jobs to an otherwise economically depressed area, but also by preparing the next generation for the workforce.

In addition to Alvernia University's ability to provide quality employment to area residents as well as workforce development, the university is able to draw hundreds of people to the area that may not have been attracted otherwise. The university has brought numerous highly skilled professors from around the country and around the world to Berks County, who regularly use their talents and skills to benefit the community. These talented professors often conduct valuable research for community organizations securing grants and other funding to improve the area. The university also draws hundreds of students and their families to the area on a regular basis. Each day these students spend money on food, gas, and other items generating over $2 million dollars to the local economy. This indirect effect spending no doubt has created induced effects to the economy in the form of more jobs to produce the food and other services that are demanded by commuting students.

Alvernia University is recognized as one of the leading Catholic colleges in the South East region of Pennsylvania. In addition, the university is recognized for their commitment to service learning and community engagement through the Holleran Center for Community Engagement. This study has added to the available literature stating that colleges and universities provide a significant impact on the local economies where they are located, and Alvernia University provides similar benefit.
APPENDIX

Table 1 Berks County Economic Information for 2009 Model Year

<table>
<thead>
<tr>
<th>Model Year</th>
<th>2009</th>
<th>Value Added</th>
</tr>
</thead>
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<tr>
<td>Gross Regional Product</td>
<td>$15,521,300,942</td>
<td>Employee Compensation $8,683,467,143</td>
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<tr>
<td>Total Personal Income</td>
<td>$14,457,430,000</td>
<td>Proprietor Income $961,653,961</td>
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<tr>
<td>Total Employment</td>
<td>207,069</td>
<td>Other Property Type Income $4,802,555,156</td>
</tr>
<tr>
<td>Number of Industries</td>
<td>300</td>
<td>Indirect Business Taxes $1,073,624,682</td>
</tr>
<tr>
<td>Land Area (Sq. Miles)</td>
<td>859</td>
<td>Total Value Added $15,521,300,942</td>
</tr>
<tr>
<td>Population</td>
<td>407,125</td>
<td>Final Demand</td>
</tr>
<tr>
<td>Total Households</td>
<td>162,503</td>
<td>Households 11,966,796,349</td>
</tr>
<tr>
<td>Average Household Income</td>
<td>$88,967</td>
<td>State/Local Government $2,208,570,383</td>
</tr>
<tr>
<td>Federal Government</td>
<td>$253,421,577</td>
<td></td>
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<tr>
<td>Capital</td>
<td>$1,852,405,232</td>
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</tr>
<tr>
<td>Exports</td>
<td>$14,565,006,983</td>
<td></td>
</tr>
<tr>
<td>Imports</td>
<td>-$14,095,477,693</td>
<td></td>
</tr>
<tr>
<td>Institutional Sales</td>
<td>-$1,229,421,850</td>
<td></td>
</tr>
<tr>
<td>Total Final Demand:</td>
<td>$15,521,300,982</td>
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Top 10 Industries

<table>
<thead>
<tr>
<th>Description</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary battery manufacturing</td>
<td>4,067</td>
<td>$248,671,200</td>
<td>$2,359,493,000</td>
</tr>
<tr>
<td>Iron and steel mills and ferroalloy manufacturing</td>
<td>1,822</td>
<td>$167,960,600</td>
<td>$2,030,181,000</td>
</tr>
<tr>
<td>Imputed rental activity for owner-occupied dwellings</td>
<td>7,034</td>
<td>$483,771,300</td>
<td>$1,267,336,000</td>
</tr>
<tr>
<td>Wholesale trade businesses</td>
<td>7,206</td>
<td>$446,926,800</td>
<td>$952,643,600</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>3,024</td>
<td>$205,105,900</td>
<td>$807,553,900</td>
</tr>
<tr>
<td>Monetary authorities and depository credit intermediation activities</td>
<td>3,555</td>
<td>$432,738,200</td>
<td>$796,593,900</td>
</tr>
<tr>
<td>Management of companies and enterprises</td>
<td>525</td>
<td>$55,859,720</td>
<td>$768,677,600</td>
</tr>
<tr>
<td>Natural gas distribution</td>
<td>5,902</td>
<td>$444,181,100</td>
<td>$748,020,100</td>
</tr>
<tr>
<td>Offices of physicians, dentists, and other health practitioners</td>
<td>11,496</td>
<td>$607,348,500</td>
<td>$689,956,600</td>
</tr>
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</table>
Table 2 Other Key Areas of Spending During the 2010-2011 Academic Year

<table>
<thead>
<tr>
<th>Expense</th>
<th>Total Amount</th>
<th>Amount Spent in Berks County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairs and maintenance</td>
<td>$548,871</td>
<td>$493,984</td>
</tr>
<tr>
<td>Consulting/professional fees</td>
<td>$421,407</td>
<td>$210,704</td>
</tr>
<tr>
<td>Insurance</td>
<td>$232,190</td>
<td>$23,219</td>
</tr>
<tr>
<td>Library books and materials</td>
<td>$106,290</td>
<td>$10,629</td>
</tr>
<tr>
<td>Equipment and technology</td>
<td>$276,761</td>
<td>$27,676</td>
</tr>
<tr>
<td>Travel and entertainment</td>
<td>$334,211</td>
<td>$116,974</td>
</tr>
<tr>
<td>Utilities</td>
<td>$1,770,449</td>
<td>$354,090</td>
</tr>
<tr>
<td>Postage and shipping</td>
<td>$252,245</td>
<td>$20,180</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3,942,424</strong></td>
<td><strong>$1,257,456</strong></td>
</tr>
</tbody>
</table>

Table 3 Direct, Indirect and Induced Effects of Total Operating Costs

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effect</td>
<td>928.2</td>
<td>$31,915,374</td>
<td>$72,000,000</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>161.4</td>
<td>$6,713,608</td>
<td>$25,526,114</td>
</tr>
<tr>
<td>Induced Effect</td>
<td>265.4</td>
<td>$10,014,634</td>
<td>$29,365,425</td>
</tr>
<tr>
<td><strong>Total Effect</strong></td>
<td><strong>1,355</strong></td>
<td><strong>$48,643,616</strong></td>
<td><strong>$126,891,540</strong></td>
</tr>
</tbody>
</table>

Table 4 Top 10 Industries Impacted Financially by Total Operating Costs

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private junior colleges, colleges, universities, and professional schools</td>
<td>931.8</td>
<td>$32,032,366</td>
<td>$72,263,932</td>
</tr>
<tr>
<td>Real estate establishments</td>
<td>46.5</td>
<td>$555,193</td>
<td>$5,558,677</td>
</tr>
<tr>
<td>Imputed rental activity for owner-occupied dwellings</td>
<td>0</td>
<td>0</td>
<td>$4,325,609</td>
</tr>
<tr>
<td>Other state and local government enterprises</td>
<td>14</td>
<td>$844,05</td>
<td>$3,607,720</td>
</tr>
<tr>
<td>Natural gas distribution</td>
<td>2.3</td>
<td>$244,208</td>
<td>$3,409,117</td>
</tr>
<tr>
<td>Wholesale trade business</td>
<td>13.8</td>
<td>$969,041</td>
<td>$2,448,590</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>16</td>
<td>$1,010,482</td>
<td>$2,179,931</td>
</tr>
<tr>
<td>Offices of physicians, dentists, and other health practitioners</td>
<td>15.8</td>
<td>$1,213,906</td>
<td>$2,076,665</td>
</tr>
<tr>
<td>Food services and drinking places</td>
<td>39.7</td>
<td>$711,032</td>
<td>$2,073,726</td>
</tr>
<tr>
<td>Animal (except poultry) slaughtering, rendering, and processing</td>
<td>3.2</td>
<td>$167,792</td>
<td>$1,474,173</td>
</tr>
</tbody>
</table>

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Table 5 Direct, Indirect and Induced Effects of Total Operating Costs without Construction Spending

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effect</td>
<td>878.9</td>
<td>$28,014,606</td>
<td>$63,200,001</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>141.7</td>
<td>$5,893,056</td>
<td>$22,406,255</td>
</tr>
<tr>
<td>Induced Effect</td>
<td>233.0</td>
<td>$8,790,623</td>
<td>$25,776,317</td>
</tr>
<tr>
<td><strong>Total Effect</strong></td>
<td><strong>1,253.5</strong></td>
<td><strong>$42,698,285</strong></td>
<td><strong>$111,382,573</strong></td>
</tr>
</tbody>
</table>

Table 6 Top 10 Industries Impacted by Total Operating Costs without Construction Spending

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private junior colleges, colleges, universities, and professional schools</td>
<td>882.1</td>
<td>$28,117,299</td>
<td>$63,431,674</td>
</tr>
<tr>
<td>Real estate establishments</td>
<td>40.9</td>
<td>$487,336</td>
<td>$4,879,283</td>
</tr>
<tr>
<td>Food services and drinking places</td>
<td>34.8</td>
<td>$624,128</td>
<td>$1,819,393</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>14.0</td>
<td>$886,978</td>
<td>$1,913,495</td>
</tr>
<tr>
<td>Offices of physicians, dentists, and other health practitioners</td>
<td>13.9</td>
<td>$1,065,539</td>
<td>$1,822,850</td>
</tr>
<tr>
<td>Other state and local government enterprises</td>
<td>12.3</td>
<td>$740,849</td>
<td>$3,166,776</td>
</tr>
<tr>
<td>Wholesale trade businesses</td>
<td>12.1</td>
<td>$850,603</td>
<td>$2,149,318</td>
</tr>
<tr>
<td>Retail Nonstores - Direct and electronic sales</td>
<td>9.9</td>
<td>$92,877</td>
<td>$324,915</td>
</tr>
<tr>
<td>Retail Stores - General merchandise</td>
<td>9.0</td>
<td>$235,094</td>
<td>$444,885</td>
</tr>
<tr>
<td>Retail Stores - Food and beverage</td>
<td>8.6</td>
<td>$256,379</td>
<td>$489,830</td>
</tr>
</tbody>
</table>

Table 7 Direct, Indirect and Induced Effects of Construction

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effect</td>
<td>83.2</td>
<td>$4,935,133</td>
<td>$11,000,000</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>17.9</td>
<td>$1,053,497</td>
<td>$2,063,863</td>
</tr>
<tr>
<td>Induced Effect</td>
<td>41.5</td>
<td>$1,563,211</td>
<td>$4,587,999</td>
</tr>
<tr>
<td><strong>Total Effect</strong></td>
<td><strong>142.6</strong></td>
<td><strong>$7,551,841</strong></td>
<td><strong>$18,211,862</strong></td>
</tr>
</tbody>
</table>
Table 8 Top 10 Industries Impacted by Employment by Construction

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of new nonresidential commercial and health care structures</td>
<td>83.2</td>
<td>$4,935,133</td>
<td>$11,000,000</td>
</tr>
<tr>
<td>Food services and drinking places</td>
<td>5.4</td>
<td>$96,000</td>
<td>$279,849</td>
</tr>
<tr>
<td>Architectural, engineering, and related services</td>
<td>5.0</td>
<td>$422,800</td>
<td>$713,941</td>
</tr>
<tr>
<td>Wholesale trade businesses</td>
<td>2.7</td>
<td>$192,848</td>
<td>$487,292</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>2.5</td>
<td>$156,589</td>
<td>$337,812</td>
</tr>
<tr>
<td>Offices of physicians, dentists, and other health practitioners</td>
<td>2.5</td>
<td>$188,503</td>
<td>$322,477</td>
</tr>
<tr>
<td>Real estate establishments</td>
<td>1.9</td>
<td>$23,236</td>
<td>$232,640</td>
</tr>
<tr>
<td>Retail Nonstores - Direct and electronic sales</td>
<td>1.9</td>
<td>$17,375</td>
<td>$60,783</td>
</tr>
<tr>
<td>Retail Stores - General merchandise</td>
<td>1.8</td>
<td>$46,882</td>
<td>$88,718</td>
</tr>
<tr>
<td>Retail Stores - Food and beverage</td>
<td>1.7</td>
<td>$49,632</td>
<td>$94,825</td>
</tr>
</tbody>
</table>

Table 9 Direct, Indirect and Induced Effects of Student Spending

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effect</td>
<td>17.3</td>
<td>$384,514</td>
<td>$1,937,551</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>3.6</td>
<td>$184,755</td>
<td>$603,883</td>
</tr>
<tr>
<td>Induced Effect</td>
<td>3.8</td>
<td>$147,612</td>
<td>$430,537</td>
</tr>
<tr>
<td>Total Effect</td>
<td>24.6</td>
<td>$716,881</td>
<td>$2,971,991</td>
</tr>
</tbody>
</table>
Table 10 Top 13 Industries Impacted by Student Spending

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food services and drinking places</td>
<td>17.0</td>
<td>$317,900</td>
<td>$932,002</td>
</tr>
<tr>
<td>Petroleum refineries</td>
<td>0.1</td>
<td>$9,898</td>
<td>$540,892</td>
</tr>
<tr>
<td>Soft drink and ice manufacturing</td>
<td>0.3</td>
<td>$32,448</td>
<td>$226,140</td>
</tr>
<tr>
<td>Chocolate and confectionery manufacturing from cacao beans</td>
<td>0.3</td>
<td>$19,651</td>
<td>$179,391</td>
</tr>
<tr>
<td>Wholesale trade businesses</td>
<td>0.5</td>
<td>$37,251</td>
<td>$87,570</td>
</tr>
<tr>
<td>Fruit and vegetable canning, pickling, and drying</td>
<td>0.2</td>
<td>$12,176</td>
<td>$84,959</td>
</tr>
<tr>
<td>Fluid milk and butter manufacturing</td>
<td>0.1</td>
<td>$5,781</td>
<td>$65,473</td>
</tr>
<tr>
<td>Imputed rental activity for owner-occupied dwellings</td>
<td>0.0</td>
<td>$0</td>
<td>$58,783</td>
</tr>
<tr>
<td>Management of companies and enterprises</td>
<td>0.2</td>
<td>$27,990</td>
<td>$53,782</td>
</tr>
<tr>
<td>Real estate establishments</td>
<td>0.4</td>
<td>$4,558</td>
<td>$46,774</td>
</tr>
</tbody>
</table>
REFERENCES


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A DETERMINISTIC SOLUTION FOR FORCE-USING BILATERAL MONOPOLISTS

Johnnie B. Linn III
Concord University

ABSTRACT

The traditional solution for a monopsony employer versus a monopoly union is indeterminate. Furthermore, cost functions for labor unions are not well defined. This paper, by introducing use of force for the bilateral monopolists, solves the cost function identification problem for the union and provides for a unique solution of the bilateral monopoly equilibrium. A profit-maximizing monopsonist hires workers and guards. The guards are used against a union, which has hired guards of its own to extract a public good, such as improvement of working conditions, from the employer. The public good arises from the employer’s investment in the production structure. A physical equivalent of the public good in terms of the output good is imputed for the purpose of calculating the union’s share of winnings. Data, using bargaining as a proxy variable for force, suggest that relative strengths of employer and union are insensitive to the numbers of negotiators and that, at equilibrium, the value of the public good to the union is likely to be about one-fourth the value of the output good to the employer.

INTRODUCTION

This paper is the third of a series exploring various scenarios under which agents simultaneously produce something of value and apply violence, theft, or fraud, or defenses to the same, to acquire, control, or defend what is produced. A unique contribution of these papers is that they allow for the existence of a group of force-using individuals, designated as outliers, who do not use force on the margin. Linn (2007) shows that purely competitive firms in the presence of outliers will sit on the right-hand sides of their average total cost curves and will exhibit upward-sloping average revenue curves because robustness confers an advantage against the outliers, but the firms’ revenue and cost curves net of outliers exhibit their conventional shapes. In Linn (2008) the analysis is expanded to include oligopolies that use force against each other and the outliers. In the current paper, the analysis is extended to bilateral monopolists where one of the force-using agents is not a firm but a labor union.

In the literature on bilateral monopoly we find three kinds of scenario that differ in the degree to which force plays a role. In the force-only scenario, there is no production; only force is generated by either agent. Hostage-taking for ransom is an example. A hostage has only one seller (the kidnapper) and only one buyer, the family or employer of the hostage (McArdle, 2012). In the production-only scenario there is no force, only production, as in the textbook example of an upstream provider of an intermediate good to a downstream user of that good, found in Henderson and Quandt (1980) and other textbooks. An intermediate scenario is what we see in the interaction of a monopsony producer facing a monopoly union. A union is the provider of labor as an intermediate good, but unlike a conventional monopoly that offers an intermediate good, a union must overcome a free-rider problem among its potential members to become an
effective monopoly. The free-rider problem can be overcome only if a union is organized and recognized, so union organization and recognition become the obvious targets of use of force by the employer. Taft and Ross (1969) state that labor violence has been most virulent in situations involving union recognition or an attempt to destroy a functioning union. Since 1933, when the National Industrial Recovery Act and its successor statutes established the right of union recognition, the level of labor violence has diminished.

Freeman (1967) identifies two “faces” that unions show in interaction with employers. One face is the union’s exercise of its monopoly power, but another face is “voice”, an effort to change working conditions affecting the workers collectively:

First, many important aspects of a business setting are “public goods”, which affect the well-being (negatively or positively) of every employee, reducing the incentive for any single person to express his preferences and invest time and money in changing conditions that benefit all. Safety conditions, lighting, heating, the speed of a production line; the layoff, work-sharing, cyclical wage adjustment, and promotion policies of the firm; a formal grievance procedure; or a pension plan obviously affect the entire work force in the same way that defense, sanitation, and fire protection affect the entire community. (p.4)

In showing “monopoly” the union provides an intermediate good, labor, to the employer. In showing “voice” the union receives an intermediate good—working conditions with a public good aspect—from the employer. An employer-union bilateral monopoly thus differs from an upstream-downstream manufacturer bilateral monopoly in that in the employer-union model, intermediate goods flow in both directions; in the upstream-downstream model they flow in only one direction. A unique contribution of this paper is that it expresses the public good as a specific investment variable. In this way something incorporeal, such as a public good, can be quantified as its physical equivalent and can be given mathematical treatment in a profit function.

THE MODEL

The public good explicitly arises from investment supplied by the employer. The union extracts this public good by use of force. The cost of manifesting this force is the cost function for the union.

The employer and union fight over control of the production process that generates sales for the employer and a public good for the union. Production and force are provided through separate technologies employing separate inputs. Little is to be gained by having an integrated force and production function, especially since here the union does not technically have a production function. A ratio rule is assumed, under which winnings are exhaustive and the share of winnings to the $i^{th}$ agent employing force $F_i$ is

$$\phi_i = \frac{F_i}{\sum_j F_j}$$

(1)

The own-force elasticity of a user’s share of winnings is

$$\frac{F_i \cdot \partial \phi_i}{\phi_i \cdot \partial F_i} = 1 - \phi_i$$

(2)
and the cross-force elasticity of winnings is

\[
\frac{F_j \partial \phi_j}{\phi_j \partial F_i} = -\phi_i, \quad i \neq j.
\]  

The production functions for the parties' output and force in elasticized form are

\[
\frac{L \partial Y}{Y \partial L} = \alpha_{11},
\]

\[
\frac{I \partial Y}{Y \partial I} = \alpha_{12},
\]

and

\[
\frac{G_i \partial F_i}{F_i \partial G_i} = \beta_i, \quad i = 1, 2.
\]

where \(L\) represents workers, \(I\) represents investment, and \(G\) represents guards.

A steady-state model is assumed. There are no strikes. In a strike scenario, the employer would bring in strikebreakers and guards, and the workers would bring in flying pickets and guards of their own. In this model, these are replaced with guards on permanent employment with either party. In conformation to a steady-state model, it is also assumed that the parties are in constant conflict in regard to the amount of the public good. Or to put it another way, a contract is in effect, the parties are in constant strife to try to change the contract terms, and equilibrium holds when there is no change in the contract terms.

**EQUILIBRIUM CONDITIONS FOR THE PARTIES**

We will emphasize the conflict of labor and employer in starkest terms by assuming that the employer's guards are hired only to use force against the union's guards, not to protect output from outsiders, so outliers or other users of force are assumed to be absent.

The profit maximization function for the employer is

\[
\pi_1 = p_1 \phi_1 (Y_1 + Y_2) - wI - w(M) L - wG_1,
\]

where \(M\) is the amount of labor in the arena, \(I\) is the amount of investment, all of which is assumed to function as a public good for workers in the production process, \(L\) and \(G_i\) are workers and guards, respectively, hired by the firm, \(Y_1\) is the quantity of output good sold by the firm, and \(Y_2\) is the quantity of the union winnings expressed as their physical equivalent in the output good, and \(p_1\) is the price of the output good sold. The argument of \(p_1\) is the employer's net winnings, and it can be designated as average net revenue.

The wages paid the various factors of production are not necessarily the same. Subscripts for the wages will not be carried in the equations because any given wage is identifiable from the factor it is associated with.

Since the employer will not be surrendering actual output to the union, the equilibrium will require that the employer's share of winnings be equal to the amount of output it ends up selling, or
\[ \phi_1(Y_1 + Y_2) = Y_1. \tag{8} \]

The value of the union's winnings is the vertical multiple of an average individual worker's demand,

\[ p_2 = nL, \tag{9} \]

where \( n \) is the average value of the public good per worker. The variables \( p_2 \) and \( n \) share the same demand elasticity. The assumption is made that the benefits of the public good are enjoyed by workers only, not guards.

In the absence of a union, the employer would invest in the public good to the degree that its contribution to worker productivity exceeded its marginal factor cost, but no further. The employer's first-order condition for its workers is

\[ \alpha_{11} \phi_1(1 - \lambda_1)p_1(Y_1 + Y_2) - w(1 + \sigma \kappa)L = 0, \tag{10} \]

where \( \lambda_1 \), or the Lerner index, is the negative inverse of the elasticity of demand for the output good produced and sold, \( \sigma \) is the proportion of employed in the arena employed as workers, and \( \kappa \) is the inverse of the elasticity of supply of labor to the arena. The quantity \( \sigma \kappa \) is the inverse of the local elasticity of supply of workers when their quantity is varied independently of the other occupations of labor.

Both the employer and the union will have monopsony power in hiring their respective sets of guards, as they are hired out of the same labor pool under the same conditions as the workers.

The employer's first-order condition for its guards is

\[ \beta_1 \phi_1(1 - \phi_1)p_1(1 - \lambda_2)(Y_1 + Y_2) - w(1 + \rho_1 \kappa)G_1 = 0, \tag{11} \]

where \( \rho_1 \) is the proportion of employed in the arena employed as the firm's guards. The demand elasticity for the output good appears in Equation (11) because the value of \( p_1 \) is defined for net winnings, which varies with \( G_1 \).

The employer's first-order condition for investment is

\[ \alpha_{12} \phi_1(1 - \lambda_2)p_1(Y_1 + Y_2) - \rho l = 0, \tag{12} \]

where it is assumed that the employer is a price taker in the market for capital.

The demand functions for the employer's inputs can be designated as their marginal net revenue products. Each of the employer's first-order conditions can be simplified in form, eliminating \( Y_2 \), by substituting in Equation (8).

The union is to maximize its net winnings

\[ \pi_2 = p_2 \phi_2(Y_1 + Y_2) - wG_2, \tag{13} \]

where \( G_2 \) is the number of guards hired by the union. The argument of \( p_2 \) is the union's net winnings.

The first-order condition for the union's guards is
\[ \beta_2 \phi_2 (1 - \phi_2) p_2 (1 - \lambda_2) (Y_1 + Y_2) - w (1 + \rho_2 \kappa) G_2 = 0, \quad (14) \]

where \( \rho_2 \) is the proportion of employed in the arena hired as the union's guards and \( \lambda_2 \) is the negative inverse of the union's elasticity of demand for the public good.

The quantities \( \rho_1 \kappa \) and \( \rho_2 \kappa \) are the inverses of the local elasticities of supply of employer's guards and union's guards respectively to the arena. In the absence of outliers, the expression \( 1 - \phi_2 \) can be replaced with \( \phi_1 \) and \( Y_2 \) can be eliminated by substituting in Equation (8).

If the union were to control the amount of investment purchased by the employer, the amount it would want purchased would be given by

\[ \alpha_{12} \phi_2 (1 - \lambda_2) p_2 (Y_1 + Y_2) - w I = 0. \quad (15) \]

This equation has the same general form as the employer's marginal net revenue product and retains the employer's coefficient of marginal physical product of investment, but evaluates it at the union's price and share of winnings. If the employer's quantity demanded for investment, given by Equation (12), and the union's quantity demanded, given by Equation (15), do not match, the employer can exploit the difference by exercising wage discrimination against workers, as illustrated in Figure 1.

**Figure 1. Wage discrimination against workers by employer.**

Point b represents the amount of investment the employer would demand in absence of wage discrimination against workers. Let point d represent the amount of investment that the union would have preferred the employer to buy. The union's marginal net revenue product curve is plotted through that point, shown reflected in the direction of the arrow.
The employer can force the equilibrium to point e by reducing the wage of workers compared to guards. By increasing investment from g to h the employer generates a deadweight loss equal to the area of triangle bce but captures the amount over cost that the workers would have been willing to pay for investment, or rectangle acef. In the limit, as point e is approached, the ratio of the employer's additional net revenue created to the amount workers' wages captured is the elasticity of the employer's marginal net revenue product.

The workers receive the benefits of an increase in investment from i to j, but lose wages acef. In the limit, the ratio of the workers' net revenues received to their lost wages is the elasticity of their marginal net revenue product curve at point e. Since the amount of wages exchanged is the same on either side, the ratio of the net revenues created for either side will be the same as the ratio of the elasticities of their marginal net revenue product curves. In turn, the net revenues for each side are proportional to their marginal net revenue products (or marginal net revenues, since each has the same marginal physical product). A relationship is thus forced between the two sides' marginal net revenues and marginal net revenue product elasticities. If the demand and product elasticity coefficients are constants, the ratio of marginal net revenues can be stated explicitly as follows:

$$\frac{p_2(1 - \lambda_2)}{p_1(1 - \lambda_1)} = \frac{\alpha_{12}(1 - \lambda_2) - 1}{\alpha_{12}(1 - \lambda_1) - 1},$$

(16)

where the left-hand side is the ratio of the marginal net revenues and the right-hand side is the ratio of the marginal net revenue product elasticities.

Since the wage discrimination by the employer generates a deadweight loss in the use of capital, the increase in labor productivity can be said to impose a tax on capital, and the company is likely to reduce its long-term capital investment. This is consistent with findings by Hirsch and Prahad (1995).

The model does not exclude the possibility that the equilibrium point could lie below the horizontal axis. In that case the workers could have a gain in productivity but exhibit a negative productivity gain on the margin. On the other hand, if the workers are especially tough, they might accept less comfortable working conditions in exchange for an increase in the wage.

The ratio of the two sides' guards, from Equations (11) and (14), is

$$\frac{w(1 + \rho_2 \kappa)G_2}{w(1 + \rho_1 \kappa)G_1} = \frac{\beta_2 p_2(1 - \lambda_2)}{\beta_1 p_1(1 - \lambda_1)}.$$  

(17)

When $G_2$ and $G_1$ are replaced with their respective $\rho$'s, the ratio of $\rho_1$ and $\rho_2$ is specified and, consequently, when a particular force technology is applied, the values of $\phi_1$ and $\phi_2$ are determined.

The compensation ratio of the employer's guards to workers is found by combining Equations (10) and (11) with the result

$$\frac{w(1 + \rho_1 \kappa)G_1}{w(1 + \sigma c)L} = \frac{\beta_1 (1 - \phi_1)}{\alpha_{11}}.$$  

(18)

When the ratio of $G_1$ to $L$ is replaced with the ratio of $\rho_1$ to $\sigma$, Equation (18) yields a quadratic equation for $\rho_1$ or $\sigma$, with only one positive root of either with respect to the other. Since $\rho_1$, $\rho_2$, and $\sigma$ are all single-valued functions of each other, and they sum to unity, all their values are determined, and the solution to the entire problem is determinate subject to a scaling factor provided by $M$.  

65
When the supply of workers is unit elastic, the solution to Equation (18) is easily calculated. Suppose that we designate the right-hand side of this equation as $\Gamma$. Since $\sigma_k$ is unity, Equation (18) reduces to

$$\rho_1 = \frac{-1 + \sqrt{1 + 8\Gamma}}{2\kappa},$$  \hspace{1cm} (19)$$

and the graphical representation of the solution is easy to draw, since the supply curve of workers is linear.

A WORKED EXAMPLE

We suppose that a small company in a remote location is a monopolist in the labor market but is a price taker in the output market. To simplify the calculations, coefficients for the various elasticities are selected so that the quantities and compensations of all factors of production are the same. All opportunities for wage discrimination have been exploited. A unit-elastic supply curve for workers is assumed.

Since the numbers of workers, company guards, and union guards are all the same, the value of $\sigma$ must be 1/3. The value of $\alpha_1$ therefore, must be 3.

From Equations (10) and (12), the value of $\alpha_{11}$ must be twice that of $\alpha_{12}$ for the quantities of labor and investment to be the same. A value of 2/3 will be selected for $\alpha_{11}$.

Since the numbers of company guards and union guards is the same, we will assume that winnings are evenly split. The values of $\beta_1$ and $\beta_2$ are assumed to be the same. From Equation (19), the value of $\Gamma$ must be unity. The value of $\beta_1$ in Equation (18) must then be 4/3.

Suppose that the individual worker's demand function for the union winnings is

$$v = v_0 Y_{2}^{-\lambda_2}.$$ \hspace{1cm} (20)$$

The value of $\lambda_2$ will be set to zero to match that for $\lambda_1$ in Equation (17). The values of $\rho_1$ and $\rho_2$ will then be the same. The value of $p_1$ is set at $100.00$. The value of $v_0$ is calibrated to generate a matching value for $p_2$. The population of the arena is set at 1,000, and the supply of labor is set so that a wage of $100.00$ would generate a quantity of 1,000 for labor supplied. The solution is shown in Figure 2.

Capita's contribution to output is one third, so its compensation is $33.33$ for each $100.00$ of output produced. If workers were to receive their marginal revenue product, their wage would be $66.67$, but the employer has monopsony power, so their wage is forced down to $33.33$. The wage of guards is also $33.33$. The workers, capital, and company guards together absorb all the company's sales.

The total amount of labor supplied is 693, divided equally among 231 workers, 231 union guards, and 231 company guards. The rectangle area is the monopsony rent extracted by the company. It matches, in this case, the amount the company pays to its guards, indicated by rectangle ghml. The compensation of union guards is rectangle gfhk. This particular worked example is extreme in that the workers spend all their wages to pay for their guards. Rectangle bgdf is the value of investment captured by workers. It is their return on the compensation of their guards. The total winnings of the union is the shape bgdhk, one third of which is physically manifested as benefits of investment flowing to workers, and the other two-thirds is physically manifested as the creation of jobs that are not worker jobs.

Figure 2. Worked example, with and without union.
The union has zero economic profit, having captured $33.33 of investment value per unit of output and paid out $33.33 per unit for its guards. However, "labor" in general has gained because new jobs have been created that would not have existed in the absence of the union. We see this by comparing the bilateral monopoly solution to the one where there is no union. We refer back to Figure 2. The quantity 550 is the number of workers that would have been hired in the absence of a union. In that case there are no company guards or union guards; the value of $\sigma$ is unity, the supply elasticity of labor is $1/3$, and the marginal factor cost for labor is four times, rather than twice, the wage; so the wage is forced down to $16.67. The compensation of capital is $33.33, leaving $50.00 per unit as economic profit for the company.

With the union, the compensation of labor has been increased and additional labor has been hired. Two new occupations for labor have been created: company guards and union guards. It might be argued that company guards should not be regarded as being beneficial to labor, but company guards are part of labor, and the company guards and union guards, together with the amount of additional investment captured by the union, constitute an unsurvivable public good extracted by labor.

The company is the big loser when the union is introduced. The company's monopsony rent diminishes because the workers' supply curve is made to be more elastic.

Both sides dissipate potential profits in paying for their guards. Both sides would benefit if guard expenses could be reduced. Since the demand for guards is elastic—as is demand for inputs generally—a way to reduce guard expenses is to have pricier guards. Another way to reduce guard expenses is to substitute free government force for them. Reduction of guard expenditures can be realized if forced negotiation is instituted.

**SO WHAT CAN UNIONS DO?**
The union can show both of its faces—monopoly and voice—by use of force. The left hand side of Equation (17) shows the ratio of union guards to company guards. The deployment of union guards varies directly with the ratio of the union’s imputed price of the output good to the employer’s price on the right hand side. This is the impact of voice. Also, the deployment of union guards is inversely correlated with the elasticity of the employer’s output demand curve on the right hand side. This is the impact of monopoly. The greater the importance of capital in the production process, the greater the value of \( p_2 \), and the greater importance of voice, and with it an increase in the productivity of labor. The greater degree of market concentration in the employer’s product, the greater importance of union monopoly, and the greater the negative impact on company profits.

FORCED NEGOTIATIONS AS CAPITALIZED VIOLENCE

Suppose that the company and union are required to negotiate but have access to government “capital” in their force functions if they abide by the government’s rules. The parties’ force functions become

\[
F_i = f(G_i, K_i), t = 1, 2, \tag{21}
\]

where \( G_i \) represents negotiators and \( K_i \) represents recourse to government force, which is applicable through the courts rather than on site. The interaction of the two sides has the appearance of “negotiation”, but in fact it is a forced outcome through the instrumentality of government-backed negotiators rather than guards acting on their own.

Negotiators do not have to bear the full load in the force functions. They are like players of Texas Hold’em, who hold only two cards each in their hands and use the community cards dealt face up on the table to complete their hands. The negotiators’ input elasticity coefficients, \( \beta_1 \) and \( \beta_2 \), do not have to be so large as those of guards acting on their own, so expenses for force are reduced in Equations (11) and (14).

The company is not better off under forced negotiations than it would be if there was no union at all, but it is better off than if it has to bear the full load of the cost of defending its winnings. Forced negotiations are in effect a subsidy by the government to the industry; since the company is the bigger loser in the unrefereed fight; it stands to gain more when negotiations are forced.

FINDING PROXY DATA FOR GUARDS

How much in public goods are generated by unions? To answer this question we refer to data for the ratios of compensations of guards and workers set out in Equations (17) and (18) and data for compensation of labor negotiators as proxies for guards.


The OES data are distributed among the various industries as designated under the North American Industrial Classification System (NAICS). Labor unions themselves are designated as an “industry” with NAICS sector number 813930 – “Labor Unions and Similar Labor
Organizations”. Table 1 shows employment for OES Subcategory 13-1079 and NAICS sector 81950 employment assigned to that category for the years 2007-2009.


<table>
<thead>
<tr>
<th>Quantity and Designator</th>
<th>Source</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time Employed in Firms with Unions ( (W) ) (00C’s)</td>
<td>BLS Current Population Survey</td>
<td>15,570</td>
<td>16,029</td>
<td>14,960</td>
</tr>
<tr>
<td>Nat’l Labor Compensation Union/Nonunion Median Wage Ratio</td>
<td>OES 00-0000</td>
<td>$40,690</td>
<td>$42,270</td>
<td>$43,460</td>
</tr>
<tr>
<td>Percent of Employed in Firms with Unions Union Average Wage Multiplier</td>
<td>BLS Current Population Survey</td>
<td>1.29</td>
<td>1.27</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>OES 13-1079</td>
<td>1.238</td>
<td>1.221</td>
<td>1.221</td>
</tr>
<tr>
<td>Human Resources, Training, and Labor Relations Specialists, All Other</td>
<td>OES 13-1079</td>
<td>211,770</td>
<td>217,440</td>
<td>219,240</td>
</tr>
<tr>
<td>Human Resources, Training, and Labor Relations Specialists, All Other, Compensation</td>
<td>OES 13-1079</td>
<td>$56,740</td>
<td>$58,230</td>
<td>$59,070</td>
</tr>
<tr>
<td>Union Negotiators ( (G_3) )</td>
<td>OES 13-1079</td>
<td>48,460</td>
<td>50,340</td>
<td>52,830</td>
</tr>
<tr>
<td></td>
<td>NAICS 813930</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OES 13-1079</td>
<td>$47,130</td>
<td>$48,010</td>
<td>$47,240</td>
</tr>
<tr>
<td></td>
<td>NAICS 813930</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employer Negotiator Compensation ( (G_3) ) (calculated)</td>
<td>OES 13-1079</td>
<td>163,310</td>
<td>167,100</td>
<td>166,410</td>
</tr>
<tr>
<td>Employer Negotiator Compensation ( (G_3) ) (calculated)</td>
<td>NAICS 813930</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inverse of Number of Employed Supply Elasticity ( (\alpha) )</td>
<td>Fiorito and Zanella (2008)</td>
<td>0.943</td>
<td>0.943</td>
<td>0.943</td>
</tr>
<tr>
<td>Marginal Physical Product of Labor ( (\alpha_i) ) (imputed)</td>
<td>St. Louis Fed</td>
<td>0.6337</td>
<td>0.6419</td>
<td>0.6390</td>
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<tr>
<td>Worker/Employed Ratio ( (\sigma) )</td>
<td>0.9869</td>
<td>0.9873</td>
<td>0.9853</td>
<td></td>
</tr>
<tr>
<td>Union Negotiator/Employed Ratio ( (\rho_x) )</td>
<td>0.0031</td>
<td>0.0031</td>
<td>0.0035</td>
<td></td>
</tr>
<tr>
<td>Employer Negotiator/Employed Ratio ( (\rho_y) )</td>
<td>0.0105</td>
<td>0.0104</td>
<td>0.0111</td>
<td></td>
</tr>
<tr>
<td>Marginal Revenue Ratio</td>
<td>0.2331</td>
<td>0.2343</td>
<td>0.2370</td>
<td></td>
</tr>
<tr>
<td>Force Input Elasticity ( (\beta) )</td>
<td>0.0084</td>
<td>0.0085</td>
<td>0.0090</td>
<td></td>
</tr>
</tbody>
</table>

The data show that labor unions employ roughly one-fourth of all individuals in Subcategory 13-1079. If all other employers of this subcategory are regarded as hostile to unions, then labor is outmanned at about a three-to-one ratio averaged over all sectors. The average salary of individuals in this category employed by unions is also lower than the category average, so,
when adjusted for salary difference, labor has about a four-to-one disadvantage in negotiating strength.

The OES data do not tell the whole story, for they comprise paid employees only. Self-employed individuals who interact with labor on behalf of employers are required to file Form LM-21, "Receipts and Disbursements Report" to the Department of Labor. Office of Labor-Management Standards (OLMS) data of the Department of Labor show that fewer than 200 individuals have filed such reports since the year 2000, so the impact of self-employed individuals on the results are likely to be small (Office of Labor Management Standards, U.S. Department of Labor, 2008).

Also to be considered in regard to negotiators for unions is that some of these are not employees of unions but workers who have taken time off from work for the purpose of negotiating and are compensated for their opportunity costs by employers. Employers who provide assistance to employees in regard to negotiations are required to file Form LM-10, "Employer Report". The OLMS appears not to have aggregated employer disbursements data for Form LM-10, but it is reasonable to infer that firms do not spend more on negotiators for the unions than for their own negotiators.

The number of LM-10 forms filed is much greater than the number of LM-21 forms filed, so the OLMS data have a stronger effect in bringing the ratio of labor negotiator costs and employer negotiator costs closer to parity.

ESTIMATION OF THE PARAMETERS

The employed in Subcategory 13-1079 will be used as the proxy for negotiators. Subcategory 13-1079 has existed as a separate subcategory since 2004, but data for this subcategory for 2004, 2005, and 2006 have been excluded from consideration because Federal sector (NAICS 999100) Subcategory 13-1079 employees appear no to have been completely reclassified into their new subcategory until 2007. The 2004 data show 540 NAICS 999100 employees in Subcategory 13-1079 with an average annual compensation of $93,530 (Bureau of Labor Statistics, 2008). By 2007, the number of NAICS 999100 employees in Subcategory 13-1079 had appeared to have settled into the normal growth trend with 21,390 employees having an average annual compensation of $73,930 (Bureau of Labor Statistics, 2008).

For $N$, total employment in arenas where a union is present, we use the number of full-time employed who are indicated as "represented" by unions in the Bureau of Labor Statistic's annual reports of union affiliation. This number represents union members and workers who report no union affiliation but whose jobs are covered by a union or an employee association contract. This value of $N$ will not pick up workers in firms where there is union organizing activity but not success in negotiating a contract.

The annual compensation of workers represented by unions is imputed from the annual compensation of workers in general (OES Category 00-0000) multiplied by the ratio of median weekly earnings of union and non-union workers, obtained from the BLS Current Population Survey, weighted for the proportion of union representation among workers, also measured in the Current Population Survey.

For the supply elasticity of labor, we want "macro" elasticity of labor to a change in the wage—a change in the number of laborers—instead of the "micro" elasticity of an individual laborer. Fiorito and Zanella (2008), using Panel Study of Income Dynamics (PSID) data, derive an estimate of 1.06 for macro labor elasticity across industries.

We will assume that the company and union have access to the same "community cards", $K$, and that $\beta$ is the same for both employer and union. An exponential force technology will be used. The value of $\phi$ is then given by
\[
\frac{1 - \phi_2}{\phi_2} = \frac{F_1}{F_2} = \frac{G_1^\beta}{G_1^\beta}
\] (22)

The value of \(\alpha_{12}\) will be represented by the ratio of employee compensation to national income (St. Louis Fed: Economic Research, 2011).

The quantity \(\beta_0\) calculated from Equation (18) is substituted into Equation (22). The value of \(\beta\) is extracted from Equation (22) by a root-finding algorithm.

The right hand side of Equation (17) gives us the ratio of the marginal revenue of the output good in its public use to the marginal revenue of the output good in its private use. In absence of specific data about the demand price elasticities, the marginal revenue ratio is our best estimate of the relative values of the public and private uses of the good.

RESULTS AND IMPLICATIONS

The last two rows of Table 1 show the parameter estimates. The value of the output good to the union good is about one-fourth of its value as a private good, as estimated by the marginal revenue ratio. The marginal revenue ratio is sensitive to the ratio of union guards to company guards and is likely to be understated because the proxy for the latter may include individuals who are not engaged in opposition to unions. Because the creation of guard jobs is minuscule compared to the magnitude of union winnings, practically all of the public good extracted by unions is realized from capital. So an upper limit to the price of the output good for the union is imposed by the portion of total output attributable to capital, a little more than one third.

The force input elasticities under forced negotiation are so small that the effective shares of the economic pie going to employer and union are almost equal. The relative standing, then, of the union to employer is not as much dependent upon the union’s negotiating strength as it is on the union’s relative evaluation of the output good.

Hirsch (2004), after expressing disappointment in the decline of unionization in the private sector since the publication of Freeman and Medoff’s (1986) book, suggests two avenues of approach in reviving union representation: conditional deregulation—in which a waiver of government mandates can be made for a company if the company and its union so agree, or change of the labor law default rule—in absence of a vote-out, the union has won the right to represent the workers. But in the end, he concludes that the likely path we will follow is akin to the status quo. The findings of the paper in hand—that the cost of negotiating is minuscule, the unions’ share of the pie is roughly one half, and the unions’ valuation of their half of the pie is compatible with what they would expect to gain from capital—might be comforting to him.
REFERENCES


THE EFFECT OF HISPANIC IMMIGRANT-OWNED BUSINESSES ON THE
HAZLETON ECONOMY

Bindu Vyas
King's College

Dalia Matos
King's College

ABSTRACT

Compared to counties across the nation, Luzerne County, Pennsylvania saw the greatest increase in its Hispanic population between 2007 and 2008. Much of the growth in Luzerne County was in the city of Hazleton. Since 2000, one quarter of new businesses in Hazleton have been Hispanic immigrant-owned businesses. This research seeks to understand the social and economic impact of Hispanic immigrant entrepreneurs in Hazleton. Since very limited research has been conducted on Hazleton’s Hispanic immigrant entrepreneurs, it was necessary to conduct primary research. Surveys of Hispanic immigrant-owned businesses revealed that although their direct economic contribution may seem small, their indirect benefits to the local economy, particularly through their socio-political impact, are significant and critical to further growth.

INTRODUCTION

Any casual observer will quickly take notice of the great number of Hispanic-owned businesses in the small city of Hazleton, Pennsylvania. These businesses make up roughly one-quarter of all new businesses that have opened since Mayor Louis Barletta took office in 2000 (Fennick, 2004). Barletta stated that what the city is seeing today is not much different from what was seen with the first wave of immigrants who started family-owned businesses. “...It’s good to see new businesses...” said Barletta. "It makes the city more vibrant (Fennick, 2004)."

This “vibrancy” is much needed considering the economic and population declines that the city has experienced since the demise of the coal industry in the 1930s and 1940s (Gilgoff, 2001). The coal industry’s demand for unskilled labor during the late 1800s and early 1900s attracted well over 100,000 immigrants into Luzerne County (Zbiek, 1994, p. 52). The immigrants’ ethnic makeup included Irish, Polish, Slovak, Italian, and Hungarian, just to name a few (Zbiek, 1994). But local prosperity collapsed along with the coal industry. During 1976 the county lost approximately 56,000 jobs (Luzerne County, 1976). The economic decline was followed by out-migration with Hazleton losing 50% of its residents (Gilgoff, 2001). Presently, the town has been able to offset the lingering effects of the exodus thanks to a new wave of immigration, primarily composed of Puerto Ricans, Mexicans, and Dominicans (Gilgoff, 2001).
Among counties across the nation with a Hispanic population greater than 10,000, Luzerne County saw the greatest increase in Hispanics from July 1, 2007 to July 1, 2008. These immigrants are attracted by the area’s low cost of living and availability of blue-collar jobs.

This revival is not just a local phenomenon. The immigrant entrepreneur has been an integral part of American society since the 1800s. In every decennial census from 1880 to 1990, immigrants were more likely than natives to be self-employed (Immigrant Entrepreneurs, 1997). Immigrant entrepreneurs have been credited with reviving inner cities and providing jobs during good and bad economic times (Miller, 2007). Yet, considering the important role immigrant entrepreneurs have played in American society, there is little understanding of their impact on the nation’s economy. What kind of jobs do they produce? What economic linkages do they create? How much wealth do they bring to the economy? These are just a few of the questions that have been posed. (Immigrant Entrepreneurs, 1997)

Through surveys of Hazleton’s Hispanic immigrant entrepreneurs and secondary data research, this paper seeks to address common concerns about negative impacts of immigrants on the local economy, encourage constructive dialog, and evaluate job creation and the revitalization potential of immigrant-owned businesses on a local level, concentrating on Hazleton’s immigrant entrepreneurs.

METHODOLOGY

Since there is very limited research that has been conducted on Hazleton’s Hispanic immigrant entrepreneurs, it was necessary to conduct primary research. The sample survey method was chosen for collecting the necessary quantitative and qualitative data. The survey consisted originally of twenty-five questions, but three were added halfway through the research. Surveying began in December of 2007 and was concluded in January of 2009.

A sampling frame of fifty-nine Hispanic immigrant-owned businesses was developed. These businesses were primarily identified through local and regional Hispanic newspapers and personally searching throughout the city. For purposes of this study, a Hispanic immigrant-owned business is defined as an original start-up (e.g. not a franchise) in which one or more of the founders are foreign born and of Latin American origin. Out of the fifty-nine immigrant-owned businesses that were identified, thirty-two (54.23%) participated in the survey. Given the political conditions at the time, the remaining 27 (45.76%) business owners did not agree to participate in the study. The introduction of a controversial ordinance meant to drive out undocumented immigrants created a sense of insecurity among immigrants to the area.

The study did have its limitations. Though it was not a random sample it was a representative sample of the Hispanic population in the county. There were certain questions, mainly those relating to revenue and supply expenses, that the respondents did not feel comfortable answering. Also, there were questions that were added midway through the research. As a result, some respondents did not have the opportunity to answer these questions, however we do not feel that this affects the validity of the survey. It was felt that additional questions regarding approximate amount of supplies, future plans for business and were important and needed to be added to get better understanding of the current and future impact.

Secondary data were also used to help support, clarify, and expand upon the findings of the primary research. Secondary data came from local and national studies and reports.
LITERATURE REVIEW

Why are immigrants more likely to be self-employed?

In every decennial census from 1880 to 1990, immigrants were more likely to be self-employed. Also, they are thirty percent more likely than natives to start their own business (Immigrant Entrepreneurs, 1997). Why is this so?

Immigrants and entrepreneurs share similar characteristics. Both are high risk-takers. They are tolerant of situations where information is unavailable or incomplete and the future is uncertain. Many immigrants leave their home country, everything they have ever known, to begin a new life in a foreign land where the environment and language is often alien to them. Having already risked so much, they are not fearful of beginning an uncertain business venture. The risks and uncertainty of beginning a new life in a foreign country is seen as similar to the obstacles faced when starting a business. (Immigrant Entrepreneurs, 1997)

Another theory developed by UCLA Sociologist Ivan Light in 1980, states that immigrants are more likely to begin a business when they face significant adversity in the mainstream economy (Immigrant Entrepreneurs, 1997). The adversities they face may include language and cultural barriers and lack of academic credentials and relevant experience (Sanders, 1996). By creating their own businesses, immigrants create for themselves opportunities that are unavailable to them in the labor market. Economists Meyer and Fairlie state that the greater the "self-employment bonus" (the gains from self-employment) for the immigrant, the more likely an immigrant is to establish their own business (Immigrant Entrepreneurs, 1997).

What principle factors enable immigrants to start their own business?

Many researchers point to social capital as a crucial resource that enables immigrants to establish their own business. Social capital is made up of norms, obligations, and values that are developed through membership in a social network (Marger, 2001, p. 440). Social networks are composed of family and the co-ethnic community (Marger, 2001, p. 440). Social capital provides immigrants with benefits such as labor, financial capital and clientele (Sanders and Nee, 1996; Marger, 2001). Social capital is based on solidarity and trust (Immigrant Entrepreneurs, 1997).

Although this theory seems reasonable, it has many critics. First, the theory ignores the fact that many differences exist among co-ethnic communities, which makes solidarity and trust hard to maintain. These factors include differences in social class, education, and diversity (e.g. different races among Asians and Latin Americans which share different cultures and values) (Sanders and Nee, 1996).

Second, social capital from a co-ethnic community is not as strong a resource as family social capital. The idea that communities band together for a common interest, "one for all and all for one," is true but on a minimal scale. For example, researcher Patricia Pessar conducted field work among Washington D.C.'s Hispanic immigrants and found that co-ethnic solidarity is not a sentiment that is widespread or even strongly desired (Immigrant Entrepreneurs, 1997). Family is a special kind of social capital. It is much easier for immigrants to draw upon the family's social capital rather than on the community for the resources needed to establish and operate a business (Sanders, 1996).
Sociologists Sanders and Nee found that family as social capital has several advantages, including low cost labor, access to financial resources, and mutual goals, obligations, and trust. Relying on family reduces operating costs and family members will work harder since they have a stake in the business. In addition, family can be trusted to handle sensitive financial transactions and under the table transactions meant to evade taxes and regulations (Sanders and Nee, 1996).

In addition, the human capital that immigrant entrepreneurs bring from their home country is often overlooked as an important resource for the establishment of a business. Many immigrants bring prior business experience as well as the education necessary to launch their own business ventures (Sanders, 1996).

What kind of contributions have immigrant businesses made to the local and national economy?

Highly skilled immigrant entrepreneurs have founded companies like Google, Yahoo!, and eBay, which have played a major role in the economy (Miller, 2007). However, most immigrant firms are usually small and employ family and co-ethnics (Immigrant Entrepreneurs, 1997). No matter the size, they help revitalize many neighborhoods, particularly inner cities, and, at some level, contribute financially to the local and national economy.

According to the New York Times, Dominicans revitalized Manhattan’s Upper West Side making Washington Heights a dynamic area of the city (Immigrant Entrepreneurs, 1997). Along with Cubans, other Hispanic immigrants helped transform Miami into an export economy, or a “gateway to Latin America” (Immigrant Entrepreneurs, 1997).

Immigrant-owned businesses generate tremendous economic activity for cities as well as the nation. In New York City, immigrants make up thirty-six percent of the city’s population but account for forty-nine percent of all those who are self-employed (Dickler, 2007). Delgado Travel, which started out with one location in New York City is now a chain of two dozen locations and generates $1 billion in annual sales (Miller, 2007). Jay Chung, a college educated Korean who immigrated in 1981, began peddling tourist items in New York City. Now his business is one of the city’s largest wholesalers of tourist items. The Golden Krust Caribbean Bakery started as a single shop in the Bronx specializing in Jamaican food products and now has 100 franchises and sells food products in forty-one states. (Bernstein, 2007) In 2000, immigrants contributed $67 billion to the nation’s business income out of $577 billion (Wadhwa, 2008).

Why do immigrant entrepreneurs concentrate their businesses in certain activities?

Harvard Sociologist Roger Waldinger’s research suggests that business activities are determined by both market conditions and barriers to entry. Certain business opportunities are a given, such as supplying co-ethnics with food products and goods from their country of origin. A co-ethnic community will create demand for certain products that are not supplied locally. This demand creates market niches for immigrant entrepreneurs. Usually, these market niches are in businesses that are easy to establish and have reasonable start up costs (e.g. restaurants, grocery stores.) Also, since many newcomers keep close ties with their home country and face cultural and language barriers, businesses such as travel agencies and multiservices will begin to develop. In short, many immigrant entrepreneurs create businesses that satisfy the special demands, needs, and wants of co-ethnics (Immigrant Entrepreneurs, 1997).

What kind of challenges do immigrant entrepreneurs face?
Some of the main challenges faced by entrepreneurs include entry into the mainstream labor market, discrimination, access to credit, and language and culture barriers.

As mentioned before, they face the challenge of entering the mainstream labor market. The human capital most immigrants bring from their home country is overlooked by U.S. firms who frequently require specific academic credentials and experience (Sanders and Nee, 1996).

Discrimination also presents an obstacle for immigrants. Prejudice may be faced during the process of establishing and operating the business. This makes immigrant entrepreneurs feel unwelcomed and unsure about their future in their city or town. A report on Hazleton’s Hispanic immigrants expressed the feelings of discrimination they felt from the area’s native residents (Ethnic Changes, 2006). This discrimination was felt to be fueled further by the area’s Illegal Immigration Relief Act which declared the city’s official language as English and fined those who rent and hire illegal aliens. At the time, Greg Skrepenak, Luzerne County Commissioner, stated that special care would have to be taken to prevent misconceptions and hostility (Ethnic Changes, 2006).

Many new and existing small businesses find it hard to gain access to debt financing, especially following the recent economic crisis. Considering that immigrant entrepreneurs make up about seventeen percent of new businesses, this can have a negative effect on the local and national economy. Jim Henderson, a regional advocate for the U.S. Small Business Administration (SBA) in Denver stated that even SBA-backed loans to small business owners declined fifty percent in November 2008 (McPherson, 2009).

Cultural and language barriers can prevent well meaning immigrant entrepreneurs from abiding by social rules and behaviors (McPherson, 2009). Language barriers can create problems for entrepreneurs when dealing with customers and suppliers and can impact business record keeping (Sanders, 1996).

HAZLETON’S IMMIGRANT ENTREPRENEURS

Country of Origin

As mentioned previously, thirty-two Hispanic immigrant-owned businesses participated in the survey (Figure 1). Participants represented the Dominican Republic, Peru, Colombia, and Mexico. The overwhelming majority of entrepreneurs, twenty-nine, or ninety-one percent, came from the Dominican Republic. Each of the remaining countries was represented by one business owner. The results from the country of origin question are a reflection of ethnic composition of Hazleton’s immigration. The majority of immigrants are from the Dominican Republic, so it makes sense that the majority of businesses owners are of Dominican origin.

Gender

One of the businesses identified themselves as co-owned. Ten female respondents identified themselves as the owner of the business. The remaining twenty-one of the businesses were male owned. (See Figure 2)

Education

Thirty entrepreneurs responded to the question of educational attainment. All of the respondents received some sort of formal education. The majority of Hazleton’s immigrant entrepreneurs were educated in their home countries. Only five (seventeen percent) of respondents
received either all or some of their final education here in the U.S. Four of those five respondents disclosed their level of education. These four all received schooling beyond high school, either from a technical school or college or university. Of the twenty-five who received schooling outside of the U.S., thirty-six percent had schooling beyond high school, fifty-six percent only had a high school diploma, and eight percent received only an elementary school education.

*Reasons for Starting the Business*

All of the entrepreneurs answered the question of what motivated them to open a business. Seventeen respondents said they believed there are more opportunities when one works for themselves. Nine stated that they wanted to gain financial independence. Two responded that they did so for family reasons. The remaining four entrepreneurs cited other reasons or a combination. Two of the four mentioned low cost of living and low business start up costs as the reasons for establishing their business in Hazleton. The other two cited a combination of reasons such as financial independence and more opportunities.

Although eighty-one percent created their business in the hopes of more opportunities and financial independence, thirty percent of the respondents across a variety of business areas mentioned that the future for commerce in Hazleton is uncertain (See Figure 3). Some comments that were made included:

- There is no future for Hispanic businesses in Hazleton – grocery store
- I thought there would be a future in Hazleton. That’s why I sold my business (in NY) – salon

*How the Entrepreneur Heard about Hazleton*

Considering the importance of social capital in influencing where immigrants settle, a question was added to the survey asking how the entrepreneur heard about Hazleton. Nine business-owners were asked. Four mainly heard about the city through family, three respondents said mainly through friends, and two from both friends and family.

*Did You Attract Others to Move to Hazleton?*

Of the nine respondents that answered this question, seven responded that, once established, they did attract others, such as friends and family, to move to the Hazleton area. One business-owner said that he believes he brought sixty to seventy people, friends and family, into the area. Only one of the respondents said that they did not attract anyone to move to Hazleton.

*Additional Sources of Income*

Fourteen entrepreneurs answered the question about additional source of income. Six operated another business either in a nearby city or out-of-state, six responded that they receive additional income from their spouse who is employed locally, and two stated that they rent out apartments or homes to others (See Figure 1).
HAZLETON'S HISPANIC IMMIGRANT-OWNED BUSINESSES

Business Type

The large Hispanic population in Hazleton (9,454 (37.3%) Census, 2010) has created many market niches for Hispanic immigrant entrepreneurs to exploit. In 2007 nearly 59 Hispanic-owned businesses operated in the city of Hazleton. The most popular type of business was the grocery store. Out of thirty-two entrepreneurs surveyed, ten owned a grocery store. Five respondents owned a multiservice, four a restaurant, and three entrepreneurs established clothing stores. Three respondents had two businesses in one. For example, one of the co-owned businesses was a grocery and clothing store. Seven respondents were scattered across different business areas and so they were all placed in the category “Other.” The category “Other” included dry cleaning, salon, transportation, and shipping and cargo service. (See Figure 4)

The results of this particular question are in line with Waldinger’s idea that entrepreneurs will primarily enter markets that are underserved and have low start up costs. In Hazleton, it is easily visible to any observer that the majority of businesses are grocery stores. Selling foodstuffs is an obvious market to enter for immigrant entrepreneurs and has a reasonably low start up cost.

Again, filling an unmet need is a big driver behind the type of business an immigrant entrepreneur will establish. An owner of a multiservice stated, “As the immigrant population grew, I saw the need for a translation service. I filled that need.”

Renting vs. Owning

Thirty-one entrepreneurs answered the question as to whether they rent or own their business location and home. Surprisingly, twenty-two of these respondents own their business location. Of these twenty-two, eighty-six percent also own their own home. Nine respondents pay rent for their businesses location. Out of these nine, sixty-seven percent own their own home. It seems that the majority of entrepreneurs, whether they rent or own their location, do own their own homes. These new homeowners pay property taxes, which fund public schools and the renters enable landlords to do the same.

Length of Operation

Length of operation for Hazleton’s Hispanic owned businesses vary greatly. For the most part, the average length of operation for a Hispanic immigrant-owned business is two and a half years. The longest business in operation was established twelve years ago. The youngest business surveyed was only two months old. (See Figure 5)

Customers

Twenty-three respondents said that the majority of their customers are Hispanic. The remaining nine entrepreneurs reported customers of different ethnic backgrounds.

Employees
All employers responded to this question. The average amount of workers that a Hazleton immigrant entrepreneur employs is two. Together, all the businesses hired a total of twenty-five workers, eight of whom were relatives. The business that hired the most employees was a combination of a salon and auto stereo systems store. He has about six employees, none of which are family.

This seems to go against Sander and Nee’s conclusion that immigrants will rely mostly on the family to operate the business rather than the co-ethnic community.

**Average Revenues per Month**

Twenty-three out of thirty-two respondents answered how much average revenue they receive per month.

- Thirteen percent of respondents reported making anywhere from $0 to under $1,000
- Twenty-two percent of entrepreneurs made from $1,000 to under $2,500
- Twenty-two percent of respondents made $2,500 to under $5,000
- Forty-three percent made $5,000 or more

**Average Supplies Expense per Month**

Thirteen entrepreneurs responded to the question of how much is spent monthly on supplies.

- Thirty-nine percent of respondents reported spending anywhere from $0 to under $1,000
- Thirty-eight percent of entrepreneurs spent from $1,000 to under $2,500
- Eight percent of respondents spent $2,500 to under $5,000
- Fifteen percent spent a total of $5,000 or more

Thirty-one responded to the question of whether they buy locally or not. An overwhelming majority of entrepreneurs, twenty-two (seventy-one percent), responded that they do buy locally. Most of these entrepreneurs buy from local office supply stores such as Staples and buy groceries and general supplies from Sam’s Club. Eleven of the twenty-two respondents that buy locally reported selling to other businesses. Six of these eleven sell to other Hispanic immigrant-owned businesses. The average business type that sells to other small businesses, are multiservices which provide tax and translation services, grocery stores which provide food products to Hispanic restaurants, and media businesses which provide publicity and advertisements to Hispanic immigrant-owned businesses.

**Loans**

Thirty-one entrepreneurs responded to the question of whether they have tried to take out a loan to establish or maintain their business. Only five have tried to seek out loans. Of these five, three were successful in receiving a loan, one was denied, and one responded that the decision is pending.

**Future Plans for the Business**

There were sixteen respondents to this question. Six had no plans. Four of these six gave reasons as to why they had no plans, including:
The business is too young so there is no future plan as of yet – restaurant
We have not seen any significant profit – restaurant

The nine respondents that had plans wanted to expand through product offerings and services or enlarging their business space. For example, one respondent involved in media desires to increase the frequency of his publications and the territories the publication covers.

**Biggest Challenge Faced in Establishing the Business**

Thirty-one entrepreneurs answered this question. Interestingly, no one mentioned the option “Language Barrier” as an obstacle. Nine respondents mentioned that they faced no obstacles when establishing their business. Six mentioned their personal economic situation as being their main obstacle. Seven cited the process, such as rules, regulations, and licensing, as being the most complicated and time consuming part of establishing their business. Nine entrepreneurs stated other obstacles that they faced when establishing their business. These obstacles included building clientele, breaking even, and gaining publicity for their business. (See Figure 6)

**Obstacles that Affect Minority-Owned Businesses**

Twenty-nine responded to this question. Sixteen (fifty-five percent) responded that their business faced no special challenges by being Hispanic immigrant-owned. Thirteen (forty-five percent) replied that they did feel that there were challenges being a Hispanic entrepreneur in Hazleton. These challenges included:

- Stereotypes (1)
- Resentment towards newcomers (1)
- Ordinance has affected sales and Hazleton residents’ attitude toward Hispanic (5)
- Lowered Sales (2)

**IMPACT ON THE CITY**

Immigrant businesses affect the city/region in many ways. These businesses generate employment in the area, increase housing values due to increased demand (including demand for rental units), and they contribute to the local and federal tax revenues. The thirty-two businesses surveyed only employ twenty-five workers, eight of which are family. This figure is small compared to other small local employers such as Van Hoekelen Greenhouses, Inc. located in Humboldt Industrial Park which has 200 workers. These businesses generate taxes for the city and buy minor supplies locally. The majority of their supplies and purchases come from big chain stores such as Sam’s Club and Staples. This means that Hazleton’s Hispanic immigrant entrepreneurs are not creating significant backward and forward linkages in the local economy.

On the other hand, the majority of the entrepreneurs surveyed own their own properties, commercial and residential. These individuals are contributing to the growing housing market and in the form of taxes. Immigrant entrepreneurs are also attracting other people into the area. A larger population will increase market niches for new and existing entrepreneurs as well as the labor pool for local and potential employers. All of the entrepreneurs that answered the question about supplementary income did indeed have an additional source of revenue. Those that do have
supplementary income, such as a working spouse or an additional business, are contributing economically or multiple fronts. For example, they are providing jobs to family members and co-
ethnics, paying more taxes, and purchasing a greater amount of supplies locally.

Although their current economic contribution may seem small, the local multiplier effect
is greater. And as the Hispanic population continues to increase, the social and political
environment will see change. Immigrant entrepreneurs will face greater demand for services and
products. This demand will increase immigrant businesses' growth, generate jobs for more co-
ethnics, and create the need for local ethnic goods suppliers. The increase in population and
immigrant-owned businesses will also generate more money for the city and attract employers and
businesses into the area.

POLICY IMPLICATIONS

In July 2006, Hazleton passed a controversial city ordinance titled the Illegal Immigrant
Relief Act. The city lost nearly one-sixth of its population in six months, ostensibly as a result of
the ordinance. This survey was conducted at the time when the law targeting undocumented
immigrants put these Hispanic owned businesses at risk. Based on this research, there are some
suggestions as to what the city can do to benefit from the growth and contributions of Hispanic
immigrant-owned businesses.

First and foremost, the city must support diversity. Survey participants were split on the
question of whether there are challenges to being a minority business owner. Recall that fifty
percent said that there were no challenges while forty-five percent said that there were. Some of
these challenges included stereotypes and resentments toward Hispanics. The city owes much of
its existence to the immigrants who worked in the local coal mines and brought so much wealth to
the city and the region. After the population declined, the city was stagnant in terms of population
and economic growth. Considering the economic benefits from an increase in population and
immigrant-owned businesses discussed so far, Hazleton should support the immigrant
entrepreneurs.

The Hazleton Area Chamber of Commerce should offer business and financial consulting
services to all small businesses. This is especially helpful for immigrant entrepreneurs. Many
respondents stated that they do not have any idea of how much of their revenue goes towards
expenses. This should concern the city because it means that many immigrant-owned businesses
may not be knowledgeable or may not be following proper record keeping practices.

Also, recall that many Hazleton immigrant entrepreneurs are searching for greater
opportunities and financial independence through self-employment. Many also wish to expand
their business. Consulting services could help small business owners reach their goals and, in
turn, their success can benefit the city in many ways. Information on small business financing
would be very beneficial, considering this was cited as a challenge by nineteen percent in
establishing their business and only five immigrant entrepreneurs have applied for a loan.

Nine out of the thirty-two participants felt that the process for establishing a business in
Hazleton was easy. It is wonderful news to hear that the process of establishing a business is not
difficult or discouraging. But there were equally as many who felt the process needed some
improvement. Improvements should be made in the rules and regulations that some felt were too
bureaucratic. In either case, regardless of the responses, a city should always strive for a smooth
process. Less regulatory barriers to establishing a business can help to attract entrepreneurs and
help businesses get started without much delay translating into greater and quicker economic
benefits to the city.
CONCLUSION

This research is limited to the extent that it studies Hispanic-owned businesses in a small town in the USA. Hazleton is a unique city because of its history and recent immigrant-related legal measures. It was feared that the city would see a large exodus of people and many Hispanic-owned businesses expected to be negatively affected by the Illegal Immigrant Act. Research suggests that these new immigrant entrepreneurs have their legal documents in order and had nothing to fear. They are resilient as they establish, operate and in some cases expand their operations in spite of governmental obstacles. Over and above this, these Hispanic businesses in Hazleton do not receive assistance from local business development agencies or banks. Only five out of thirty-two entrepreneurs applied for loans to finance their operation.

It would be useful to develop an inventory of immigrant-owned businesses in the city and the county and survey all the immigrant-owned businesses. Lastly, it would be interesting to follow-up with the businesses surveyed within the next couple of years. In this way we can see what factors contribute to the surviving immigrant-owned businesses and what, if anything, has changed and why. On June 15, 2012, President Barack Obama announced that his administration would stop deporting young illegal immigrants who match certain criteria previously proposed under the DREAM ACT (Development, Relief, and Education for Alien Minors). A future study could examine the effect it has had on the immigrant businesses in Hazleton.

This research has been informed by earlier, broader studies of immigrant-owned businesses in NEPA by Amanda Jez, Margarita Rose, and Bindu Vyas. We thank Dr. Margarita Rose and Dr. John Dilyard for their insight and comments that greatly improved this manuscript.

NOTES

1. In 2006, Republican mayor Lou Barletta as and council members passed the Illegal Immigration Relief Act. This ordinance was instituted to discourage hiring or renting to illegal immigrants. It placed an administrative fine on landlords of $1,000 per illegal immigrant rented to and a loss of permits for non-compliance.
2. According to the report, “The 10 Largest Hispanic Origin Groups: Characteristics, Rankings, Top Counties,” of the 10 largest Hispanic groups represented in the USA, the number of Puerto Ricans and Dominicans are highest in the north-east region.
REFERENCES


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FIGURE 1
Survey of Immigrant-Owned Businesses in Northeast Pennsylvania (Hazleton)

1. Type of Business or Profession: .................................................................

2. Country of Origin of Owner: .................................................................

3. Reasons for starting the business (financial reasons, to be financially independent, personal growth, better opportunity than the local work force, etc.) .................................................................

4. a. Number of Employees:
Full Time .......................... (# who are family members) ..........................
Part Time .......................... (# who are family members) ..........................
b. Are you planning on hiring any employees in the coming year? ..........................
If so, approximately how many? .................................................................

5. Average Revenues per Month: $ .......................... (or number of customers over a period of time, e.g. a week, & an estimate of revenue per customer) .................................................................

6. Do you rent or own your business location? .................................................................

7. Do you rent or own your home? .................................................................

8. Do you buy supplies in the local region? ................................................................. What types? .................................................................
If so, do you buy supplies from other immigrant-owned businesses? .................................................................

9. How much do you purchase per month locally? $ ..........................
(or physical estimate)

10. Do you sell supplies or perform service to other businesses in the area? .................................................................
If so, are any immigrant owned businesses? .................................................................

11. Who are your customers (e.g. other immigrants, neighbors, professionals, cross-section)? .................................................................

12. Have you tried to get loans for starting or expanding your business? ..........................
If yes, were you successful in getting the loan you wanted? .................................................................

13. How long has this business been in operation? ..........................
What are your future plans for the business or practice? .................................................................

14. Have you attended an educational institution, inside the United States? ..........................
If so, which institution, and what level was achieved? .................................................................

15. Did you attend an educational institution in your country of origin? ..........................
If so, which institution, and what level was achieved? .................................................................
Figure 2 Ownership by Gender

- Female 31%
- Male 66%
- Co-Owned 3%

Figure 3 Reasons for Establishing the Business

- Variety
- Cost of Living
- Family Reasons
- Financial Independence
- More Opportunities

Quantities:
- Financial Independence: 9
- More Opportunities: 17
Figure 4 Business Type

- Combination: 9%
- Clothing Store: 9%
- Other: 22%
- Grocery: 31%
- Restaurant: 13%
- Multiservice: 16%

Figure 5 Length of Operation

- 0 to under 1: 13%
- 1 to under 3: 28%
- 3 to under 5: 28%
- 5 +: 13%

Figure 6 Challenges Faced

- No Challenges: 29%
- Personal Economic Situation: 29%
- Process: 23%
- Other: 19%
THE EFFECT OF IMMIGRATION ON STATE WAGES

Jennifer M. Johnson
Indiana University of Pennsylvania

ABSTRACT

This paper empirically analyzes the effect of immigration on state-level mean wages. The data is taken from the 50 US states and Washington, DC for 2006 through 2010. The dependent variable is measured as the change in the log of mean weekly wages for each state. The key independent variable is the change in the foreign born labor force of each state. Lagged variables are included to control for the composition of local labor markets. Educational attainment, occupation, and industry groups are tested using F-tests in order to determine their inclusion in the equation. The results indicate that as the foreign born population grows, there is a statistically significant negative effect on the upward volatility of wages.

INTRODUCTION

Background

The United States has likened itself to “a melting pot” where people from all over the world immigrate to live out the “American dream.” For each of the last three years, approximately 470,000 new legal permanent residents have been admitted into the country and 625,000 immigrants filed, and were approved for, an adjustment of status (Randall and Yankay, 2011). It is estimated that between 2000 and 2009, 4,180,000 illegal immigrants resided in the United States (Hoefer et al., 2011).

As a result of the increasing number of immigrants that reside in the United States, either legally or illegally, there are raging debates over whether their presence has negative or positive effects on local, state, and national economies. Local fingers point at the immigrants for stealing “Americans’” jobs, increasing native unemployment, and driving down the price of labor. Meanwhile, newspapers report that immigration generally increases the wages of native workers with only small negative impacts on the least-skilled American workers (Montgomery, 2007).

Even academics cannot agree on the degree of impact that immigrants have on wages, as well as, the extent to which illegal immigration should be tolerated (Capelli, 2006). Immigration policymakers and companies are caught up in the middle of the debate storm. Policymakers want to please their constituents who are subject to the fear of job loss and prevailing social stereotypes and stigmas while also relying on differing and conflicting answers from researchers and academics. According to Peter Capelli (2006), a management professor at the University of Pennsylvania, illegal immigrants exert downward pressure on wages for the lower skilled jobs while legal immigrants are believed to have a high skill set that satisfies a demand within the
United States (Capelli, 2006). Others counter that labor laws in the United States are prevailingly in favor of the US citizen over a foreign national with respect to the hiring process and that although there may be some downward pressure on wages, that downward pressure is small (Capelli, 2006). Companies face the challenge of keeping up with the changing labor laws and wage laws that are produced as a result of the debates.

The conflicting opinions and a lack of completely accurate data make the topic of immigration a difficult one to address. People on one side fervently fight against immigration and argue for closing the borders with more restrictive immigration policy while those on the other side argue for the immigrants and the meaning of their presence in the nation. As a result, the United States has been effectively split over the topic.

Purpose

This paper seeks to aid in determining how immigration affects wage volatility. This will be done on a state-level so that the highly varied number of immigrants in each state can be taken into account. Because of the individual state debates about immigration within their borders, this paper will be more insightful for individual state policy rather than for universal federal policy. It also will aid in revealing whether immigration creates asymmetric shocks in wage volatility throughout the United States. It also may be useful for identifying which states would benefit from more or less wage or immigration policy.

There has been little work done at a state-level regarding immigration’s effect on wages. The existing literature focuses on Metropolitan Statistical Areas and countries. This limits the application to states because of varying levels of immigrants within each state. As a result, this paper will provide better insight into the issue, and it is also the first paper, to the author’s knowledge, to look at data for consecutive years using a panel data set. Other researchers have used only a single year, which limits the understanding of immigration’s effects over time.

Organization

This study begins with a review of the literature. It is then followed by a section discussing the model and econometric issues. Afterwards is the data section followed by the results and conclusion.

LITERATURE REVIEW

There is debate over how to measure immigration’s effects on wages with two popular approaches being at the forefront. Structural-Skill Analysis is a newer approach that utilizes the notion of workers as substitutes within their own skill level or occupation while Spatial Correlation, the more common approach, analyzes immigration’s effects through regional analysis (Card, 2001). Neither of the approaches has been able to capture the true effects of immigration on native wages due to the inability to account for every factor that affects the wages in a region, occupation, or skill-set. The literature on immigration and wages, due to the nature of the data that is used in its analysis, suffers from reporting errors, making it difficult, if not impossible, to acquire one hundred percent accurate data.

A study by Pedace (1998) uses Metropolitan Statistical Areas (MSAs) and information from the Integrated Public Use Microdata Series (IPUMS) of the US Census Bureau to develop the data sets. In order to determine the effects of immigration on wages in the MSAs, Pedace (1998) utilizes the log of mean weekly wages for native born workers depending on various human capital variables. Pedace (1998) notes that Spatial Correlation can suffer from endogeneity because it is generally believed that immigrants choose to settle into areas with initial higher
wages and higher rewards, causing a bias in the results. Pedace (1998) takes into account net migration rates and utilizes the intercensal cohort component (survival ratio) to measure it. He does so in order to correct for an issue in many studies—they do not take into account the natives’ response to downward wage pressure caused by immigration influxes by migrating out of the area (Pedace, 1998). Even with net migration taken into account, Pedace (1998) concludes that his results are consistent with those of previous studies; increasing immigration improves labor market outcomes and any negative results are small.

In another study by Hartog and Zorzlu (2002), the elasticities of wages are used to measure the effect of immigrants on wages in Norway, The United Kingdom, and the Netherlands. Hartog and Zorzlu (2002) must adapt their models to each country due to differences in labor market structures, as well as, reported and available information. Because of deficiencies in their data, Hartog and Zorzlu (2002) were forced to group immigrants by ethnicity rather than by skill-set. Their results conclude that when all three countries are compared, even though the coefficients vary in value by the ethnic group studied, immigrants have only a small negative impact on the wages of their native counterparts. However, they have a substantial effect on the wages among fellow immigrants.

Card (2001), using the 1990 Census, reexamines the effects that immigration has on local labor markets while taking into account the heterogeneity of US immigrant populations and the limitations of previous studies. Assuming that each MSA studied produces one good, Card (2001) groups together natives and immigrants within the same skill group and uses them as competitive substitute goods. Card (2001) also takes into account the potential size of the population within an MSA that could work in the given occupation using a multinomial logit model by gender and immigration status. By limiting the focus of his study to immigrants that arrived up to five years ago, Card (2001) attempts to focus only on the impact on low-skilled labor. Card (2001) concludes that immigration influxes to the studied MSAs of the 1980s had only a slight effect on laborers and low-skilled workers, decreasing wages by no more than 3%.

Camarota (1998) utilizes cross-occupational analysis in order to determine immigration’s effects on low-skilled laborers. He finds that, in 1991, the average low-skilled laborer’s wages were reduced by $23.86 a week, 7%, while average hourly wages were decreased by 2.8% (Camarota, 1998). Through his results, Camarota (1998) determines that because immigrants in higher-skilled occupations do not have downward wage effects on their native-counterparts, it is more the occupation than the skill level that creates competition between natives and immigrants. Camarota (1998) concludes that immigrants in the lower end of the labor market have a wage lowering effect for native workers.

Pischke and Velling (1997) study the impact of immigration on native German unemployment rates using an ordinary least squares analysis and data from 1985 and 1989. Pischke and Velling (1997) use a measure of the influx of foreign citizens while lagging various control variables in order to account for other aspects of the labor market. The lag is intended to control for endogeneity that may occur because of the possibility of self-selection into labor markets by immigrants. Germany is broken into 167 regional labor markets in order to create more economically telling units than individual German counties. Pischke and Velling (1997) conclude that immigration has little increasing effect on the unemployment of native Germans, in contrast to their cited literature. According to Pischke and Velling (1997), this could be because of the falling unemployment rates of the years they studied and the recession included in their period of study.

Galloway and Jozefowicz (2008) retool Pischke and Velling (1997) in order to study the immigration effect on unemployment rates in the Netherlands using data from 1995 through 2003. Their OLS analysis adds educational attainment to the equation, a variable omitted from previous literature. Galloway and Jozefowicz (2008) use a measurement for the change in the foreign population for each year and a set of control variables to account for local labor market conditions.
Galloway and Jozefowicz (2006) conclude that immigrants have a statistically significant positive effect on the upward volatility of Dutch unemployment rates.

**MODEL**

The model used in the analysis has been adapted from both literature on immigration and wages, as well as literature on immigration and unemployment rates. Pischke and Velling (1997) comment on their inability to measure the wage effects of immigration due to the nature of the German unions and a resulting lack of wage data. According to Pischke and Velling (1997), “in a standard competitive model, an increase in the supply of foreign labor reduces the wage and the employment of natives, and raises total employment” (p. 595). Their empirical model is developed from the following theoretical framework.

\[
\Delta \log w_{it} = \frac{A \Delta F_{it}}{P_{it-1}}
\]  

where \( w_{it} \) is the wage, \( A \) is a function of the supply and demand elasticities, \( F_{it} \) is the number of foreigners in the labor market, and \( P_{it} \) is the entire active population.

Previous studies, such as Altonji and Card (1991), Butcher and Card (1991), and Simon et al. (1993), have reworked the equation by adding variables to control for labor market conditions. However, Pischke and Velling (1997) and Pedace (1998) argue that the models may suffer from endogeneity because of self-selection of immigrants into areas with higher job growth. King and Sommers (2011) validate this argument in their study by concluding that certain areas are more popular destinations for unauthorized immigrants. In order to control for the potential endogeneity caused by self-selection, the control variables have been lagged in accordance with Pischke and Velling (1997) and Galloway and Jozefowicz (2008). An educational attainment group is included in the studies by Camarota (1998), Pedace (1998), Hartog and Zorlu (2002), and Galloway and Jozefowicz (2008). A group representing occupation is included in the studies by Pedace (1998), Card (2001), and Hartog and Zorlu (2002). The empirical model developed for this study was adapted from the theoretical model, as well as, the models presented by Pischke and Velling (1997), Galloway and Jozefowicz (2008), Pedace (1998), and Camarota (1998). The model is

\[
\text{CHMWAGE}_{it} = \beta_1 + \beta_2 \text{CHFBLF}_{it} + \beta_3 \text{NMR}_{it-1} + \beta_4 \text{WAPTOP}_{it-1} + \beta_5 \text{MALE}_{it-1} + \beta_6 \text{EDUC}_{it-1} + \beta_7 \text{OCCUP}_{it-1} + \epsilon_{it}
\]  

where CHMWAGE is the change in the log of mean real weekly wages, CHFBLF is the change in the foreign born labor force divided by the lagged total population of working age is, NMR is the net migration rate, WAPTOP is the ratio of the working age population to the total population, MALE is the percentage of the population that is male, EDUC is the group for education attainment, and OCCUP is the group for occupation. Utilizing the change in the labor force is done so as to compare a flow variable with another flow variable. The equation is estimated using OLS as was done by Pischke and Velling (1997) and Galloway and Jozefowicz (2008) and the random effects model is supported by the Hausman test and controls for unobserved heterogeneity.

**Econometric Issues**

The model tested homoskedastic using the White test. F-tests were run to support the inclusion of the industry, occupation, and educational attainment groups. The educational
attainment and occupation groups were supported, but industry was not. The industry group also suffered from potential multicollinearity with the education group and was not included in the model.

DATA

This study utilizes data from the United States Census Bureau’s American Community Survey (ACS) for the 50 states and Washington, DC for the period 2006 to 2010. The measurement in terms of states as a unit of observation is similar to the use of German and Dutch labor market regions by Pischke and Velling (1997) and Galloway and Jojefowicz (2008), respectively. The data set is an unbalanced panel because Alaska, Maine, Mississippi, Montana, North Dakota, South Dakota, West Virginia, and Wyoming do not have data available for 2010. The control variables are lagged in order to account for the possible endogeneity mentioned by Pedace (1998) and Pischke and Velling (1997).

Variables

The variables and their descriptions can be found in Table 1. The dependent variable is the change in the log of mean real weekly wages (CHMWAGE), as was suggested by Pischke and Velling (1997).

The key independent variable, CHFBFL, measures the change in the foreign born labor force divided by the lagged working age population aged 18 to 65. This approach was also taken by Pischke and Velling (1997) and Galloway and Jojefowicz (2008). Also included is a set of lagged control variables which consists of net migration rate (NMR), a measure of the percentage of the population that is of working age (WATOP), and the percentage of the foreign born population that is male (MALE). Net migration, a variable used in the analysis by Pedace (1998), is also included to account for people that move out of the area. The measurement of the male population was added in accordance with the studies done by Camarota (1998), Card (2001), and Hartog and Zorlu (2002). The percentage of the population that is working age was included in the studies by Galloway and Jojefowicz (2008), and Pischke and Velling (1997) and is included as a control variable.

Expected Signs

The expected signs are also presented in Table 1. The principal independent variable, CHFBFL, is expected to carry a negative coefficient. The analyses of Camarota (1997), Pedace (1998), Hartog and Zorlu (2002), and Card (2001) found that immigration has a negative effect on wages. As a result, a larger change in the foreign born labor force should result in downward pressure on the volatility of wages for the state due to the resulting increase in the supply of labor. NMR’s coefficient is expected to carry a negative value. As there is positive net migration into an area, there is an increase in the labor force. Theoretically, this should cause an increase in supply, putting more downward pressure on the upward volatility of wages. WATOP is expected to have a positive sign based on the findings of Galloway and Jojefowicz (2008). MALE has an ambiguous sign because larger male populations may mean a higher supply of labor, but because of their tendency to earn higher wages than their female counterparts, their greater presence may have an upward effect on the volatility of wages. The educational attainment group and the occupation group have ambiguous expected signs because of the difficulty in predicting some of the outside conditions that will affect each group member’s wage structure.

Descriptive Statistics
The descriptive statistics can be found in Table 2. CHFBLF has a standard deviation of 0.1123 and a mean of 0.0044. Of special note is NMR, which has a high standard deviation of 75.5099 due to a vast difference between the minimum of -409.8634 (Alaska in 2009) and the maximum of 146.665 (South Carolina in 2008).

RESULTS

Ordinary Least Squares Model

The OLS regressions appear in Table 3 as Models 1 and 2. Model 1 includes only the core variables and returned an adjusted $R^2$ of 0.0195. The coefficient on CHFBLF is negative and significant at the 10% level. This is consistent with Pedace (1998), Hartog and Zorlu (2002), Camarota (1997), and Card (2001). The theoretical model presented in Pischke and Velling (1997) demonstrates that, on average, an increase in the change of immigrants will have a dampening effect on the upward volatility of wages. According to Pischke and Velling (1997), the resulting positive sign on WAPTOP, although insignificant, may be due to increased employment growth, causing greater upward volatility in wages. NMR's negative coefficient is consistent with Pedace (1998); as net migration rises, a higher supply of labor may have negative effects on the upward volatility of wages. The resulting coefficient returned for MALE is inconsistent with literature, but this may be because more males in the labor force create more job competition, causing a negative effect on the volatility of wages.

Model 2 includes the control groups of educational attainment and occupation and has an adjusted $R^2$ of 0.11. Similar results were returned for the core variables with no changes in sign. Significance levels increased and WAPTOP becomes significant at the 10% level. NMR remained insignificant.

Random Effects Model

In order to account for unobserved heterogeneity across U.S. states, a random effects model is estimated in order to acquire efficient estimated coefficients. The inclusion of the random effects model is supported by the LaGrange Multiplier test and can be found as models 3 and 4 in Table 3. The random effects model returned results comparable to those in the OLS model with a change in the sign of only the constant between Models 2 and 4. Model 3 includes the core variables has an adjusted $R^2$ of 0.22. In this model, both CHFBLF and MALE retain significant and negative coefficients. WAPTOP and NMR remain insignificant, with WAPTOP keeping a positive sign and NMR retaining a negative sign.

When the education and occupation groups are included in Model 4, the results are robust and echo the findings presented in Model 2. The adjusted $R^2$ is calculated to be 0.3119. Comparing the two random effects models indicates that the significance of MALE increases from the 5% to the 1% level while the remaining variables remain at the same level of significance.

CONCLUSION

Using data from the United States Census Bureau's American Community Survey, this study has provided an insight into the effects on wages that immigrants have over time. The consistency of the results across models for the main independent variable demonstrates the robustness of its negative impact. According to the analysis, as the immigrant population increases, there is a dampening effect on the upward volatility of wages. This would cause downward pressure on wages, a result that is consistent with the negative effect on wages found

The results of this study can aid a state in determining where it needs to focus its policy in order to address the dampening effect on the upward volatility of wages. For some states, increased immigration-based policy, an action that is rising in popularity since Arizona’s passing of SB 1070, may be the best way to increase the upward volatility of wages. However, this may not be the case for each state.

Interpretation of the results, however, is subject to various limitations. The information available in the US Census Bureau’s database is measured using self-reporting questionnaires which are extrapolated to the entire population. As a result, the true measure of the values may be different. Due to the limitations of the data available in order to create a panel data set, the study is unable to take into account the substitutability in labor and skill sets. Measuring for this would create a more complete view on immigration’s effect on wages. This exercise would be a place to extend the research presented in this study.

(I would like to acknowledge Dr. James Jozefowicz for his aid in improving and finalizing the paper as well as Dr. Yaya Sissoko for his invaluable help in reconfirming various econometric problems)
REFERENCES


## APPENDIX

### Table 1 Variable Descriptions and Their Expected Signs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMWAGE</td>
<td>The change in the log of the mean real weekly wages</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHFBLF</td>
<td>The change in the foreign born labor force divided by the lagged working age population</td>
<td>-</td>
</tr>
<tr>
<td>WAPTOP</td>
<td>The lagged working age population divided by the lagged total population</td>
<td>+</td>
</tr>
<tr>
<td>MALE</td>
<td>The lagged percentage of the population that is male</td>
<td>?</td>
</tr>
<tr>
<td>NMR</td>
<td>The lagged net migration rate</td>
<td>-</td>
</tr>
<tr>
<td>HIGHSCH</td>
<td>The lagged percent of population with a high school degree</td>
<td>?</td>
</tr>
<tr>
<td>BACH</td>
<td>The lagged percent of the population with a bachelor's degree</td>
<td>?</td>
</tr>
<tr>
<td>GRAD</td>
<td>The lagged percent of the population with a post-graduate degree</td>
<td>?</td>
</tr>
<tr>
<td>MANPROF</td>
<td>The lagged percent of the population employed in management, professional, and related occupations</td>
<td>?</td>
</tr>
<tr>
<td>SERV</td>
<td>The lagged percent of the population employed in service occupations</td>
<td>?</td>
</tr>
<tr>
<td>FARM</td>
<td>The lagged percent of the population employed in farming, fishing, and forestry occupations</td>
<td>?</td>
</tr>
<tr>
<td>CONSTRUC</td>
<td>The lagged percent of the population employed in construction, extraction, maintenance, and repair occupations</td>
<td>?</td>
</tr>
<tr>
<td>Variable</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>--------------</td>
<td>-------</td>
<td>-----------</td>
</tr>
<tr>
<td>CHMWAGE</td>
<td>0.0024</td>
<td>0.0060</td>
</tr>
<tr>
<td>CHIGBLF</td>
<td>0.0044</td>
<td>0.1123</td>
</tr>
<tr>
<td>WAPTOP</td>
<td>0.6308</td>
<td>0.0152</td>
</tr>
<tr>
<td>MALE</td>
<td>0.5022</td>
<td>0.0323</td>
</tr>
<tr>
<td>NMR</td>
<td>-2.7434</td>
<td>75.5099</td>
</tr>
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<td>HIGHSCH</td>
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<td>0.0414</td>
</tr>
<tr>
<td>BACH</td>
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</tr>
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<td>GRAD</td>
<td>0.0998</td>
<td>0.0335</td>
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<td>MANPROF</td>
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<td>0.0056</td>
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<td>CONSTRUC</td>
<td>0.0976</td>
<td>0.0193</td>
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<tr>
<td>Variable</td>
<td>Model 1 OLS</td>
<td>Model 2 OLS</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0066</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(.271)</td>
<td>(-.204)</td>
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<tr>
<td>CHFBLF</td>
<td>-0.006*</td>
<td>-0.0067**</td>
</tr>
<tr>
<td></td>
<td>(-1.529)</td>
<td>(-1.807)</td>
</tr>
<tr>
<td>WAPTOP</td>
<td>0.0158</td>
<td>0.0531*</td>
</tr>
<tr>
<td></td>
<td>(.467)</td>
<td>(1.287)</td>
</tr>
<tr>
<td>MALE</td>
<td>-0.0283**</td>
<td>-0.056***</td>
</tr>
<tr>
<td></td>
<td>(-1.837)</td>
<td>(-2.811)</td>
</tr>
<tr>
<td>NMR</td>
<td>-0.0000045</td>
<td>-0.0000084</td>
</tr>
<tr>
<td></td>
<td>(-.647)</td>
<td>(-.220)</td>
</tr>
<tr>
<td>HIGHSCH</td>
<td>-0.0398**</td>
<td>-0.0577***</td>
</tr>
<tr>
<td></td>
<td>(-2.236)</td>
<td>(-2.87)</td>
</tr>
<tr>
<td>BACH</td>
<td>-0.0784***</td>
<td>-0.0964***</td>
</tr>
<tr>
<td></td>
<td>(-2.680)</td>
<td>(-2.854)</td>
</tr>
<tr>
<td>GRAD</td>
<td>-0.1978***</td>
<td>-0.1446***</td>
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<tr>
<td></td>
<td>(-3.811)</td>
<td>(3.55)</td>
</tr>
<tr>
<td>MANPROF</td>
<td>0.1446***</td>
<td>-0.0273</td>
</tr>
<tr>
<td></td>
<td>(3.55)</td>
<td>(-.881)</td>
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<tr>
<td>SERV</td>
<td>-0.0102</td>
<td>-0.1485*</td>
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<tr>
<td></td>
<td>(-1.086)</td>
<td>(-1.348)</td>
</tr>
<tr>
<td>FARM</td>
<td>0.0478*</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td>(1.348)</td>
<td>(.760)</td>
</tr>
<tr>
<td>CONSTRUC</td>
<td>0.0195</td>
<td>0.1107</td>
</tr>
<tr>
<td>N</td>
<td>195</td>
<td>193</td>
</tr>
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</table>

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.