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HOUSING MARKET DYNAMICS: NEW INSIGHTS FROM THE INDICATOR APPROACH

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ABSTRACT

The housing market and financial stability are inextricably linked. Indeed, insights on housing market risks can influence the financial stability of a country or region, passing critical impacts to the real economy as a whole. Therefore, the purpose of the present study is to model the oscillations of the housing market to explain and predict the boom-bust patterns in the housing cycle. We focus on the shifts in the fundamental driving forces of the housing cycle that are anticipated by a set of macro and micro foundations of housing behaviors. We explore the possibility that the waves in the housing market can be captured in information needed for policy planning, risk monitoring, and community development, as well as the delivery of affordable housing. In this context, a non-parametric indicator construction framework inspired by the National Bureau of Economic Research (NBER) of the United States was applied to develop the housing cycle indicator (HCI), with the aim of predicting the cyclical fluctuation in the housing market in the northern territory of Borneo Island. The constructed HCI correctly predicted the boom-bust patterns in the housing cycle and the average leading period was at best 9.75 months. The forward-looking attribute of the HCI suggests that it is a sound policy tool to foresee the housing market outlook in the near future.

INTRODUCTION

The real estate market in general and the housing market in particular, has long been acknowledged as a crucial source of risk to financial stability and economic growth. The importance of housing is not limited to investment opportunity but it is necessary to strengthen homeownership as well as community development. Rossi and Weber (1996) claimed that homeownership is positive for owners as they are more likely to have greater self-satisfaction and confidence. Hence, they are likely to contribute to the development of the community. Rohe and Stewart (1996) also supported homeowners being more active in civic affairs and maintaining their properties to a higher standard. These activities, in turn, are thought to lead to more stable and greater social and economic development. Therefore, encouraging more homeownership in the country is beneficial for the society.

In accordance with Wong et al. (2015), Malaysia is well off as an emerging country, making significant headway toward a globalized and liberalized world; however, its economy is unsurprisingly open to historic external influences and hence conveys immense risk and uncertainty to the domestic market. In Borneo, the real estate market has been regarded as an asset class for investment. Nevertheless, the nation does not have many appropriate hedging instruments to account for its own risk (Jin & Grissom, 2008). Therefore, housing prices have been studied from many viewpoints, such as demand, supply, financial institutions, policy makers, and related professionals.

Notwithstanding the repeating trend of boom and bust, every crisis has an exclusive countenance and something new can always be learned by precisely delving into the problems. Hence, housing market participants are highly prone to risks as real estate market as a whole usually display a cyclical nature. For that reason, an appropriate forecasting tool is required to monitor the fluctuations in the housing cycle.

Burns and Mitchell (1946) found that business cycles are fluctuations that occur in the economic activity of all nations. Practically, business cycles and housing cycles are similar concepts in that an interaction between the demand and supply causes vacancy rates and rents and housing inventories to rise and fall over and over again (Chinloy, 1996). To a degree, we can apply the identical procedures employed in the business cycle to the housing market. Numerous empirical research studies have been conducted to construct the real estate cycle in various countries using a variety of methodologies [see, for example, Borowiecki (2009); Capozza et al. (2002); Egert & Mihaljek (2007); Puah et al. (2015)]. However, the state-based housing cycle has rarely been examined even though the national housing cycle absorbs the impact of the state's development in housing activity. As a result, we deliberated a nation's need for a state-based analysis of the housing cycle to serve as a complement to the national housing analysis. In addition, the state-based housing cycle remains an important platform for state-level housing authorities to understand the state housing market and policy planning.

In keeping with the aim of building a state-level housing cycle, we took the state of Sarawak located in the northern territory of Borneo Island as a case study. The rationale was that the Sarawak housing market has been growing at an erratic pace in which the fundamental forces of demand and supply are no longer capable of predicting the changing market. Furthermore, the emergence of several giant housing development projects has bought an upsurge in cities such as Kuching, Miri, and Sibu. The housing price index (HPI) for Sarawak rose from 152.8 in 2010 to 160.1 in 2011 and eventually reached 214.6 by the end of 2014. Though housing prices have risen significantly, especially in some cities in Sarawak, the property overhang and affordable housing remain a hard-core issue for the state housing authorities. Many have questioned the sustainability of the housing price hikes despite market volatility and the approaching risk in the stock, financial, and exchange markets. Thus far, whether housing bubble is forming in the state or nation remains unknown.

Therefore, a housing cycle indicator will be an essential tool in predicting the movement of the housing cycle. The HCI will provide an early warning signal as a leading indicator which moves in advance of the actual housing market scenario of Sarawak. In addition, the existing HPI in Sarawak is merely an index compiled with a basket of housing prices that did not take into account other forces affecting housing market movements. Consequently, the HPI has limitations in portraying the housing market dynamics of Sarawak. Thus, it served as motivation for this study to explore the dynamics of the housing market in Sarawak with a different approach. Ultimately, the present study will provide a useful reference for policymakers and the general public on the movement of the housing cycle in Sarawak. More to the point, the HCI can signal approaching market movements to aid the central bank in policy making and preparing precautions for a housing market crisis.

METHODOLOGY

Predicting turning points in the housing cycle involves several major procedures. First, we selected an appropriate indicator of economic activity related to the housing sector, which is also called the reference series. As Puah et al. (2016) contended, the most commonly used measure of housing market activity is the Housing Price Index (HPI). In this case, the Sarawak HPI (SHPI) published by the Valuation and Property Services Department was evaluated for its suitability to serve as a housing cycle reference series. Based on the study conducted by Wong et al. (2013) as well as Puah et al. (2014) on the Malaysian business cycle, we evaluated the housing market of Sarawak from a growth cycle perspective. The SHPI first underwent a de-trending process to extract its cyclical component by using the Christiano-Fitzgerald (CF) filters technique proposed by Christiano and Fitzgerald (1999). After that, the reference series dealt with the turning points analysis to determine the peaks and troughs of the reference cycle. In turn, a set of adequate housing cycle indicators, also known as a component series, was identified through multiple iterations and simulation of the preliminary index.

The selected combination of the component series was utilized to construct a housing cycle indicator based on the step-wise indicator construction methodology proposed by the Conference Board (2000). The component series included lending rate, gross domestic product (GDP) of Sarawak, foreign direct investment (FDI) of Sarawak, and planned supply of residential stock in Sarawak. The lending rate serves as a good indicator for postulating housing market movement because the ease of acquiring a loan is directly proportional to the demand for housing. As the lending rate decreases, the general public and business sector will have a higher tendency to obtain mortgage loans from financial institutions. Therefore, the purchasing power for buyers will tend to increase, hence inducing a rise in housing prices due to high demand. Despite various economic activities contributing to the state's GDP, the housing sector has played a major role in the development of Sarawak. Job opportunities created by the housing sector have yielded a significant increment in the GDP of Sarawak through the multiplier effect. On the other hand, due to the inflow of FDI, the housing sector has witnessed not only the entry of many new domestic realty players but also the arrival of foreign real estate investment companies. Thus, FDI serves as an indicator with leading attributes that provides a reliable reference to gauge movement in the housing sector.

In order to establish an empirically sound Housing Cycle Indicator (HCI), we adopted the non-parametric index aggregation procedure outlined by Conference Board (2000), and the detailed step-based procedure was as follows:

(i) **Getting the month-to-month changes for each component series:** Calculation of the month-to-month changes ($m_{i,t}$), where $i = 1, \ldots, n$ for each component series ($x_{i,t}$) based on the symmetric percentage change formula below:

$$m_{i,t} = \frac{X_{i,t} - X_{i,t-1}}{X_{i,t} + X_{i,t-1}} * 200$$

If the component series is in percentage form, the simple arithmetic difference is applied.

(ii) **Computing the monthly contribution for each component series:** Computation of the monthly contribution for each component series ($c_{i,t}$) by multiplying the month-to-month changes ($m_{i,t}$) with a standardization factor (f_i). The standardization factor can be derived by inversing the standard deviation of the month-to-month changes for each component series ($m_{i,t}$).

(iii) **Adding up the symmetric changes:** Summation of the adjusted symmetric changes across the component series to obtain the total contribution across all component series for a particular month.

$$S_t = \sum_{i=1}^{n} c_{i,t}$$

(iv) **Setting the preliminary index:** By setting the initial value of the index equal to 100, derivation of the preliminary index of HCI recursively following the formula below:

$$I_2 = \frac{200 + S_2}{200 - S_2} * I_1$$

(v) **Rebasing:** Rebasing of the preliminary index of HCI into the base year 2010.

Compilation of the component series turns out to take an index form of HCI. To prevent inconsistency and series incompatibility while dating turning points, the trend of the HCI was filtered by employing the cycle extraction technique applied in constructing the reference cycle. The CF filter has been recognized as a powerful de-trending filter to extract the cyclical movement of any time series. It is widely used by macroeconomists to obtain a smooth estimate of the long-term trend component of a series. CF filters use the whole set of time series data for construction of the filtered series. The approximation of the CF filter can be computed as follows:

$$C_t = B_0 y_t + B_1 y_{t-1} + ... + B_{T-1-t} y_{T-1} + \tilde{B}_{T-t} y_T + B_1 y_{t-1} + ... + B_{t-2} y_2 + \tilde{B}_{t-1} y_1 \quad (1)$$

where $B_j = \dfrac{\sin(jb) - \sin(ja)}{\pi j}, \quad j \geq 1$

$$B_0 = \frac{b-a}{\pi}, \qquad a = \frac{2\pi}{P_u}, \qquad b = \frac{2\pi}{P_l}$$

$$\tilde{B}_k = -\frac{1}{2} B_0 - \sum_{j=1}^{k-1} B_j$$

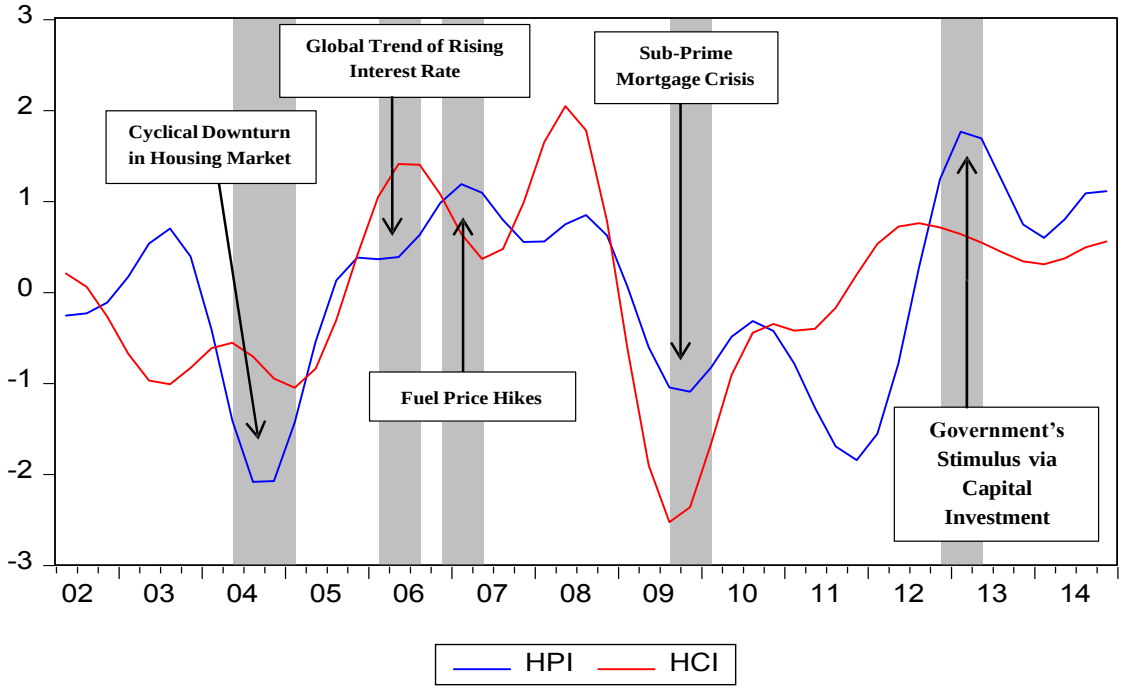
From the approximation equation above, the parameters P_u and P_l are the cut-off cycle length in months. In other words, cycles longer than P_l and shorter than P_u are conserved in the cyclical term, C_t.

EMPIRICAL FINDINGS

After implementing the procedure of the indicator approach from the Conference Board (2000), we extracted the cyclical component of HCI and the reference cycle, SHPI. Both cycles were obtained via a de-trending method known as CF filtering. Numerous combinations of possible component series were tested to obtain the HCI that best mimics the cyclical movement of the HPI, tracing each turning point in advance of the HPI. Figure 1 shows the visual representation of the optimum four component series that are unified to form the HCI.

As shown in Figure 1, the HCI always moves ahead of SHPI for a significant amount of time. Furthermore, the HCI also successfully traced down all the turning points prior to the turning points of SHPI and the level of magnitude of peaks and troughs in both cycles is fairly consistent. Evidently, the HCI has accounted for five major historical economic events.

Figure 1
HCI VERSUS HPI, 2002Q2-2014Q4



To inspect more comprehensive evidence to justify the reliability of the HCI, the cyclical processes of the component series and reference series were then subjected to the turning points detection procedure introduced by Bry-Boschan (1971). The turning points analysis strengthens the predictive ability of the constructed HCI, as tabulated in Table 1. Both the SHPI and HCI persistently dated seven important turning points, which had three peaks and four troughs within the period of 2002 to 2014. Nonetheless, all the turning points dated by the HCI were ahead of the turning points recorded by SHPI. The measure of leading signal procured by the HCI was

about three quarters on average, indicating that the constructed HCI has a long leading attribute in the Sarawak housing cycle.

Throughout the study period, HCI provided early warning of major economic incidents, namely, the cyclical downturn in the housing market of Sarawak in 2004, the global trend of rising interest rates from 2005 to 2006, fuel price hikes from 2007 to 2008, the sub-prime mortgage crisis from 2008 to 2009, and the peak turning point in 2013,which was due to more projects under the Sarawak Corridor of Renewable Energy (SCORE) commencing in 2012. This evidence is consistent with the actual picture of the Sarawak housing market. Thus, with such a profound leading characteristic and accuracy in foreseeing the dynamics of the housing market, the HCI provides an undeniably reliable measure to predict the future movements of the housing cycle in Sarawak.

Table 1
SUMMARY OF TURNING POINTS ANALYSIS

Turning Point	Reference Cycle (SHPI)	Housing Market Indicator (HCI)	Amount of Lead/Lag	Major Incidents
Trough	**2004q3**	2003q3	4	Cyclical Downturn in Housing Market
Peak	**2005q4**	2004q2	6	Global Trend of Rising Interest Rates
Trough	**2006q2**	2005q1	5	
Peak	**2007q1**	2006q2	3	Fuel Price Hikes
Trough	**2008q1**	2007q2	3	
Peak	**2008q3**	2008q2	1	Sub-Prime Mortgage Crisis
Trough	**2009q4**	2009q3	1	
Peak	**2013q1**	2012q2	3	Government's Stimulus via Capital Investment
Average			**3.25**	

CONCLUSION

In general, this study conveys noteworthy implications for housing cycle analysis in the context of Borneo Island, particularly the East Malaysian counterpart. To account for the fact that high-frequency housing-related time series are extremely limited, the present study has modeled the housing cycle in the state of Sarawak, the largest state in East Malaysia. To support the development of the HCI, quarterly observations of the macro-level foundation of the housing market are compiled to predict the cyclical movements of the housing cycle in Sarawak. The constructed HCI has been authenticated to have a remarkable leading period of 3.25 quarters or 9.75 months on average, signifying that the constructed HCI yields a long leading characteristic in the Sarawak housing market. During the analyzed period, the HCI marks the onset of housing market stress in accordance with the major economic episodes in Sarawak. Furthermore, major events that are traced by the HCI are coherent with the actual scenarios of the Sarawak housing market. Thus, by having such an outstanding leading attribute for estimating the movement of the housing cycle in Sarawak, the constructed HCI has demonstrated a strong ability to work as an early warning indicator to foresee the housing market prospects in Sarawak.

Some important inferences arise from the empirical findings of the study. Certain housing-related time series data are not up-to-date; therefore, it is not possible to construct an indicator without comprehensive and complete data sets of various variables. Additionally, the HCI is only able to act as a short-term forecasting tool to foresee fluctuations in the housing market dynamics in Sarawak. The longest predictive period of the current HCI is six quarters to 18 months. However, further improvement and exploration can be done toward out-sample forecasting in the future. Nonetheless, the constructed HCI can serve as a specific housing movement indicator in Sarawak, but it cannot be generalized for use by other states in Malaysia.

Despite this limitation, the HCI is successful in illuminating housing market fluctuations and provides early signals of movements in the housing dynamics in Sarawak. The component series that make up the constructed HCI suggests that the housing cycle in Sarawak is no longer driven by the conventional factor of demand and supply, but external forces such as foreign direct investment also come into play. In a nutshell, the present study has highlighted the potential ability of the indicator approach to predict the housing cycle dynamics for the case of Sarawak. Future research should consider building an HCI for the other states in Malaysia as well as national and regional HCIs.

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TIME BANKING AND ITS PLACE IN ECONOMIC EDUCATION

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ABSTRACT

Time banking is a non-monetary socio-economic system which has existed for more than three decades and has become an integral part of many economies throughout the world. This article seeks an answer to the question of whether information on and the theoretical background to time banking should be included in the curricula of economic subjects at universities. The article starts by briefly describing the current situation and the time banking concept, starting with the search for theoretical backing for classical economics and progressing through the founding of the theory of time banking to the anthropological point of view. In conclusion, no reason is found to deny time banking a place in economic theory and curricula as a viable economic concept.

Keywords: *Time Banking, Education, Economic Theory, Anthropology*

INTRODUCTION

When a person decides to study at university in the field of economics he/she will probably encounter different variations in the content of economic subjects, but curricula will predominantly be inspired by the mainstream point of view represented by Paul A. Samuelson (Samuelson & Nordhaus, 2005). As much as we can appreciate their educational value in relation to the current economic paradigm, they still omit much of the economic reality in terms of the notion of the complementary economy (B. Lietaer, 2001), which has developed together with mainstream economic approaches, offering solutions for many economic failures (Lietaer, Arnsperger, Goerner, & Brunnhuber, 2012). In this regard, economic education often does not address complementary economic approaches as an equal counterpart to mainstream economic education.

The people who create economic reality are not theorists - at least not directly. Rather, they are usually ordinary employees in various economic positions throughout the business sphere. Most of these people have university-level education obtained from a higher education institution in the fields of economics or management. It is very difficult for specialists working in their respective fields, educated by these institutions, to implement and use knowledge they have never gained (Valek, 2014). In previous studies, the syllabi of economic subjects at several Czech and a few foreign universities have been analysed, concluding that there is really no mention in them of non-mainstream economic systems (Valek, 2014). This raises question of why this is. Complementary economic systems are becoming increasing common nowadays and they exist and are working worldwide (CCRC).

The aim of this article is to point out that time banking, as an example of complementary economic approaches, has its place in economic education. Such approaches do not defy theory

in any way; on the contrary, they are integrated parts of the economy, ever present in the reality of human life as described by theoreticians.

In order to make the point, the rest of the paper is structured as follows. In the next section, the origins of this article are addressed, including a general explanation of the time banking concept. The most important parts of this article are the following two sections, which highlight the links between time banking and economic and other theory and go on to address its possible use in education with an extension to complementary economic systems. The conclusion discusses the place of complementary economic systems - and time banking in particular - in economic curricula.

ORIGINS

Time banking (hereinafter TB, also for "Time Bank") is one of several complementary economic systems. It is a socio-economic system in which time is used as a currency, but the economic factor - the exchange - is only a medium. One time unit of work of an individual (usually an hour) equals the same time unit of work of another. The core of TB is that it strengthens bonds within a community and overcomes various social issues. Many economic externalities are covered by the activities of TB, even though its equal approach could also be seen as an economic heresy (Cahn, 2000). In what follows, I explain why it is not. The main core values of TB are as follows: the view of individuals as all being assets; redefining work; reciprocity; social capital; respect (Boyle & Bird, 2014; Cahn & Rowe, 1998; Granger, 2013; Ozzane, 2010). These clearly illustrate the social aim of the concept. The concept, which remotely resembles barter and volunteering, was first used in Japan by Teruko Mizushima in the 1970s (Miller, 2008). It was further developed and applied as the "time dollar" by Edgar S. Cahn in the United States of America at the beginning of the 1980s. It was identified as different from barter and exempted from tax by the Internal Revenue Office in 1985 (Cahn, 2000) and as a unique socio-economic concept it was also recently described as different from volunteering or barter also by Department of Work & Pensions (DWP, 2015) in the United Kingdom.

The implementation of the TB concept is not without risk. These are primarily related to cultural, managerial, financial, societal, project management and other issues (Valek, 2013, 2016), There are many factors which can hinder the development of TB (Shih, Bellotti, Han, & Carroll, 2015), but where it works, it brings many benefits to its users, i.e. the community and society in which it is used. TB can help to solve problems with solitude, unemployment, offending and community building and it can have a positive influence on lowering healthcare costs (Boyle & Bird, 2014; Lasker & al., 2010; TimebanksUK, 2005).

Bearing in mind all the above points, the question that arises is why TB and other complementary economic systems are not taught on economic/managerial courses at universities. The next section aims to situate TB in the economic context and highlight its place in the theoretical background of economic education.

TIME BANKING AND THEORY

Classical Economics

The first link to theory, related to the values and functions of TB in society, can also be traced in the works of early economists. The very first origins lie in classical political economics and traces can even be found in David Ricardo's works, in which he looks for a currency which would have unchangeable value over time (Ricardo, 1934). Ricardo argues that there is no such currency, but we can argue that the only currency which does not change value is time itself. The revised political economics proposed by John Stuart Mill and the utilitarianism of Jeremy Bentham (Mill, 2011) bring more light and clarification. Utilitarian theory speaks of the need of an individual to satisfy pleasures and avoid pain (Mill, 2011). This might seem like a very simple dichotomy, but it is based largely on equality (Mill, Bentham, & Austin, 1962), as all people are equal in seeking to fulfil these needs; thus, a utility is defined - or a gain in an utility, to be precise. This is further developed by Mill in differentiating the utility derived from meeting primitive needs to that gained from satisfying pleasures (Mill et al., 1962) and putting it in the context of obtaining use at the equal level throughout society. In other words, individuality is important (Mill, 1881), being the driving force of society - and the economy for that matter - but the drive is based on equal and positive terms. Mill acknowledged that people have strong moral sentiments and unselfish motivations which will rightly reign in instrumental economic actions. However, these are located as "non-economic" and outside the scope of their mathematical scientific inquiry (Seyfang, 1999). Nevertheless, as this section focuses on theoretical background, the exact science of Mill's theory can now be left aside.

As for the trading concept related to TB, Mill (1990) states that there is a difference between price and value, where price is value demonstrated in money (Mill, 1900). In other words, prices do not always reflect value in general, especially the value for an individual. Prices are set by various elements, such as costs, scarcity, complexity of production, etc. and values for individuals usually have different measures. Another term outlined by Mill (1990) is "value in exchange" (Mill, 1900). This is the value which goods or services have in exchange between two parties. It can again be set in money, but when there is another, more equal currency such as time, the term seems to make even more sense. The currency of time fits the scheme much better than the usual currency of money as it reflects the actual value for each person when both sides of a trade are on completely equal terms.

In (Mill, 2011) we can find other traces related to TB, i.e. something we can call "motivation to active participation", in which the utilitarian way of viewing society seems very close to Cahn's (2000) notion of co-production (Cahn, 2000).

E. S. Cahn: the time dollar and co-production

E. S. Cahn, a civil rights lawyer, came up with the idea of TB in the 1980s. The reason was his sudden and long-term illness, due to which he felt he was moving to the edge of society as a burden or, as he wrote, a throw-away person (Cahn, 2000). At that time, he initiated the idea of time dollars (Cahn & Rowe, 1998), which worked based on the main core values mentioned

above, creating the first TBs. The movement was successful and later spread to other countries. However, the development of the concept did not stop there. The next step is called co-production.

The market economy works on the basis of profit and things that can be traded, abstracting externalities and leaving the not-for-profit part of the economy behind. Cahn (2000) argues that, for example, externalities should be the responsibility of the market economy, which should also operate outside the seller–buyer scheme. The main imperative is co-production, which is a very broad term related to social justice. In a broad sense, it entails taking responsibility at all levels of society by involving people as an active part of it, thus reintroducing care and economy in the home and neighbourhood as a part of the economy and rewarding people fairly for building communities and caring (Cahn, 2001; Cahn & Rowe, 1998). This might sound quite utopic, but only until we consider that the only thing blocking this behaviour is today's strict evaluation of everything, even the value of humans, in monetary terms. Thus, the market economy is responsible for neglecting many parts of human life and society which are a natural part of the economy, for example, care for disabled and elderly people, the creation of social capital through various arts and crafts, the environment and much more. The way forward proposed is not to replace the market economy, but to accept the non-market economy as an equal part of the economic paradigm, creating win-win economics (Cahn, 2000).

Alan Fiske´s Relational models theory

Relational models theory (RMT), proposed by the anthropologist Alan Fiske (Fiske, 1992), can also be related to the theoretical background of TB. RMT states that human relationships employ just four relational models in various combinations, no matter what the culture-specific environment (Fiske & Haslam, 2005). The models are: communal sharing (CS), authority ranking (AR), equality matching (EM) and market pricing (MP). These four models are the structures by which people construct, understand, evaluate, sanction and motivate most of their common activities (Fiske & Haslam, 2005).

- The *communal sharing* model creates the cohesion of a social group, the sense of being part of a community in which people feel they have something in common and there is a difference between "us" and outsiders.
- The *authority ranking* model assumes that there is a hierarchy, a structure which defines the roles of leaders and followers. The leader has power, but also responsibility.
- The *equality matching* model concerns equality and reciprocity, even though differences in the skills of people are acknowledged. People are equal and exchanges of knowledge, time or possessions are fair and reciprocal.
- *Market pricing* is the last model in RMT. It defines the need of people to value work or goods, setting differences, or rather proportions. The ratio could be based on monetary value, utility, efficiency, merit or anything else (Fiske & Haslam, 2005).

If we relate RMT to the TB sphere we can find a clear connection. As RMT goes to roots of society, it touches also the core values on which the TB concept is built. At the level of CS, TB focuses on building the community, making the world a better place in which to live by

working for the community and thus creating a sense of a common goal. This is actually the idea of co-production. AR is not emphasized in TB, but there are no barriers to the creation of a hierarchy, for example according to skill level, contribution to community, amount of exchanges, etc. EM is very typical of TB and is actually one of its basic aspects. Equal exchange, based on reciprocity related to the various skills and types of knowledge people can offer, can be related directly to the core values of TB. MP also fits the TB concept, but not in terms of monetary value. Exchanges are valued by the utility which they bring to people. MP utility value approach here is very similar to utilitarian theory, as mentioned above. In general, we can say that these two theories, utilitarian and RMT, share very similar common ground, which would suggest that if we go deep enough into basics of the structure of a society, at its foundations we will find the structure established by RMT. This fundamental understanding can be related to TB, but also to society as a whole. It not only demonstrates that the TB concepts fits perfectly the needs of a society in terms of a socio-economic model at its very basic level, but also that an economic system which fails to consider RMT misses an aspect important for its long-term success. Metaphorically speaking, the economic engine will not contain all the gears necessary to work sustainably as a whole.

To relate this to the previous paragraph, in a market economy AR and MP are present, as is CM in a limited way as people tend to create communities, they consider themselves part of a company, etc. But what the market economy lacks is EM, this not being systemic in terms of its place in society, which opens the door for TB and other complementary economic systems to take their rightful place by its side to fill this gap.

CONCLUSION

TB is a relatively new approach in the socio-economic environment. It has only existed for slightly more than 30 years, but it has already built its name as a viable addition to the social side of economic reality. It is designed to strengthen communities and facilitate the growth of social capital and by this means to ease the impact of negative externalities (Cahn, 2000). Earlier, this paper posed the question why it is not part of economic curricula. The answer that can be given, based on the analysis above, is that there is no such reason. The TB concept has solid backing in theory - including economic theory - and it should be an integral part of the content of economic subjects taught at universities. Together with TB, other complementary economics should also be included to broaden the perspective of students with regard to the economic reality, as this reality is starting to diverge from the original theory usually included in curricula in many respects. Not including these approaches in curricula creates an environment in which the creators of the economic reality (in general employees who work in the economic sphere, including managers, but also people in positions within municipality administration, local government and other areas) do not have the complete picture. Thus, they tend to be very sceptical when a non-mainstream idea is presented, even though it might have existed, worked and had benefits for decades. Moreover, this might be the solution for particular issue they are having, indeed the very solution they are seeking. To sum up, both students and future "operatives" of economic reality can scarcely make informed and systemic decisions if they do not possess the complete picture of economic reality (Valek, 2014).

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BRINGING ENJOY SHOPPING BY USING CREDIT CARDS: THE ANTECEDENTS OF INTERNAL BELIEFS

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ABSTRACT

This study aims to capture the hedonic motivation for the intention to use credit cards. This article investigates the effects of both perceived usefulness (PU) and perceived enjoyment (PE) on credit card usage behavior and testing the impact of external factors, including information system quality and perceived risk. We integrate the D&M information system success model into the modified technology acceptance model with hedonic motivation (perceived enjoyment) to build a research model. The final sample consists of 450 successful questionnaires. Structural Equation Modeling will be used to evaluate the conceptual model. The results indicate that internal beliefs, including PU and PE, are key determinants in the motivation to use individual credit cards.

Findings suggest that information system quality has significant and indirect effects on credit card use intention through internal beliefs. The findings, however, have limited support for the effects of perceived risks on individual internal beliefs. Practical implications are proposed.

Keyword: *Perceived usefulness, Perceived enjoyment, Perceived risk, Information system quality, Technology Acceptance Model*

INTRODUCTION

Enjoying shopping by using credit cards has emerged as a promotional message that many financial industries offer recently. For example, the Happy Go co-branded card, one of City Bank's credit cards, delivers an image of happily shopping and is now a popular credit card in Taiwan. Prior studies have focused on the utilitarian motivation that impact one's intention to use credit cards (Amin, 2007; Lee & Kwon, 2002; Abdul-Muhmin, & Umar, 2007, Khare et al., 2012). However, there are few empirical articles which capture the hedonic motivation for the intention of using credit cards. This study attempts to fill this gap.

As described in earlier studies, credit card usage could be viewed as individual technology acceptance (Sari & Rofaida, 2012). According to the revised version of the technology acceptance model (TAM) (Davis et al., 1992; Van der Heijden, 2003, 2004), perceived usefulness plays as a utilitarian motivator in technology acceptance behavior because people focus on the functional benefit (Davis et al., 1992; Van der Heijden, 2004) for credit card using requirements. In contrast with perceived usefulness, perceived enjoyment plays as a hedonic motivator because people enjoy their credit card use in the consuming processes (Van der Heijden, 2004). In addition, diverse external variables, such as user characteristics (e.g., perceived risk) (Featherman & Pavlou, 2003) and system features (e.g., information system quality) (Bhattacherjee & Sanford, 2006; Amin, 2007), are major antecedent influences on individual motivations (Davis, 1989) towards credit card usage.

For example, credit card fraud and wireless identity theft are two main negative consequences of using credit cards (Miyazaki & Fernandez, 2001). Individuals perceive that such risks will result in anxiety (Taylor, 1974) which decreases consumer internal beliefs (motivations) in their intention to use credit cards (Miyazaki & Fernandez, 2001; Salam et al., 2003). A great diversity and high quality of information may reduce such uncertainty (Taylor, 1974, Wang, 2008; Amin, 2007), increase individual motivations (Lin and Lu, 2000) and prompt credit card usage intentions (Amin, 2007). Tracing the impact of these external factors and realizing that the individual credit card using processes may be helpful for bank mangers in developing successful strategies of increasing credit card use.

This study aims to increase the understanding of individual credit card use processes, with an emphasis on three aspects: (1) the internal beliefs effects of perceived usefulness and perceived enjoyment, (2) information system quality of credit-card customer information systems, and (3) perceived risk. We integrate the D&M information system success model (Delone & McLean, 2003) into the modified technology acceptance model with hedonic motivation (perceived enjoyment) (Davis et al., 1992; Van der Hejden, 2004) to build a research model. Accordingly, we provide more explanations of factors which influence individual credit card usage.

THEORETICAL BACKGROUND AND HYPOTHESES

Motivation and TAM

The technology acceptance model (TAM) proposed by Davis (1986) is an adaptation of the theory of reasoned action (TRA, Ajzen & Fishbein, 1975) and is a model of user acceptance for information systems (Davis et al., 1989). The goal of TAM is to predict and explain computer-based technology usage behavior with an emphasis on two aspects: explaining the impact of internal beliefs on a person's attitudes, and in turn, their behavioral intentions, as well as tracing the impact of external factors on internal beliefs, attitudes, and intentions (Davis et al., 1989).According to TAM, two key internal beliefs, perceived usefulness and perceived ease of use, influence a person's attitude. Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989, p 320)." Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort (Davis, 1989, p 320)." These two internal beliefs are distinct but related constructs (Davis et al., 1989). Various external factors, such as system-specific characteristics (Van der Heijden, 2003; Davis et al., 1992), information patterns (Sussman & Siegal, 2003; Bhattacherjee & Sanford, 2006), and individual characteristics (Featherman & Pavlou, 2003; Van der Hejden et al., 2005), are fully mediated by these two beliefs.

Based on the motivation theory (Deci, 1975), researchers extended a revised version of TAM with an additional belief, called perceived enjoyment (Davis et al., 1992; Van der Heijden, 2004). They suggest that "user acceptance is determined by two fundamental types of motivation: extrinsic and intrinsic (Van der Heijden, 2004, p. 697)." Extrinsic motivation is defined as "the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions (Davis et al., 1992, p 1112)." Intrinsic motivation refers to "the performance of an

activity for no apparent reinforcement other than the process of performing the activity per se (Davis et al., 1992, p 1112)." Within this dichotomy, perceived usefulness focuses on the functional benefit (Davis et al., 1992; Van der Heijden, 2004) "external to the system-user interaction (Van der Heijden, 2004, p. 697)" for task performance requirement, and is an example of extrinsic motivation. Perceived enjoyment refers to "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated (Davis et al., 1992, p 1113)." Perceived enjoyment highlights the user experiencing fun from interaction with the system per se, and is an example of intrinsic motivation. The empirical results indicate that the effects of motivation differ in user acceptance models for utilitarian (such as work-related) and hedonic (such as the World Wide Web, leisure-related) information systems (Davis et al., 1992; Venkatesh et al., 2002; Van der Heijden, 2004).

DeLone and McLean IS Success Model

"The D&M information system success model has proven to be a useful framework to understand IS success (Petter, Delone & McLean, 2013, p. 10)" since 1992 when the original D&M model was published. In 1992, Delone and McLean reviewed the literature published during the 1981-1987 period and established the D&M IS success model for evaluating IS success. They identified six dependent variables of IS success: system quality, information quality, use, user satisfaction, individual impact and organizational impact.

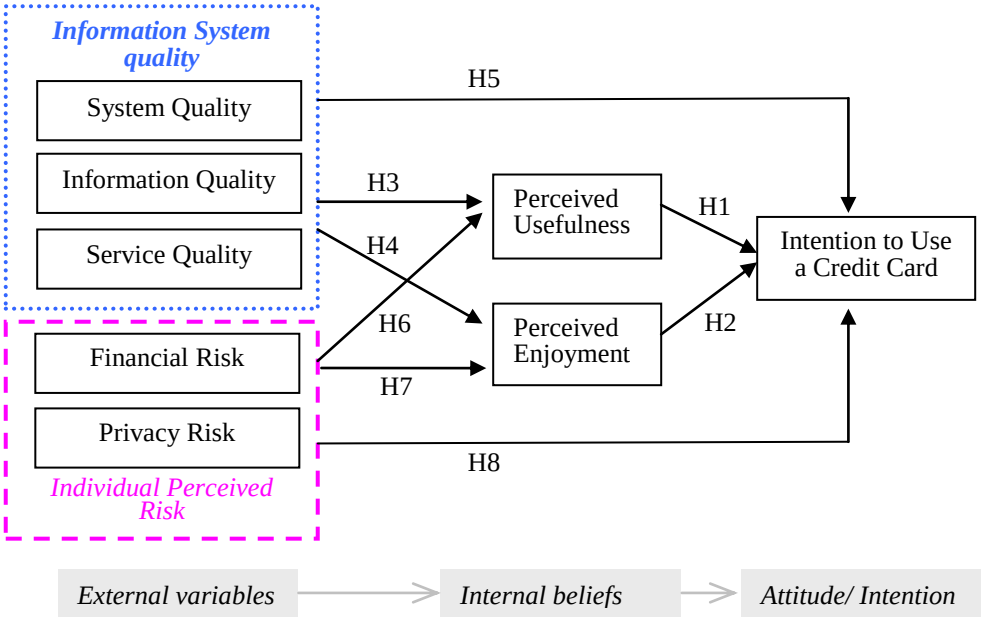
In 2003, Delone and McLean reviewed more than 100 articles related to IS success measurement since 1993 and proposed a comprehensive framework, the updated D&M IS success model, to integrate IS research findings. This study also evaluates the updated model's usefulness for measuring e-commerce system success. System quality, information quality, service quality, use/intention to use, user satisfaction and net benefits are the updated six dependent variables of IS success. The first three variables are named information system quality. They make an impact on both use/intention to use and user satisfaction, which in turn, affects net benefit (Delone & McLean, 2003). System quality is defined as "desirable characteristics of an IS (Petter, Delone & McLean, 2013, p. 11)." Information quality refers to "desirable characteristics of the system outputs (content, reports, dashboards) (Petter, Delone & McLean, 2013, p. 11)." Service quality is defined as "quality of the service or support that system users receive from the IS organization and IT support personnel in general or for a specific IS (Petter, Delone & McLean, 2013, p. 11)."

In 2013, Petter, Delone and McLean (2013) integrated over 140 studies on the determinants of IS success (during the period 1992-2007) and composed a comprehensive and integrative report as follows. (1) This research identifies 43 independent variables that influence IS success. (2) The paper organizes these success factors into five characteristics categories (classified as task, user, social project, and organizational characteristics), and investigate their effects on the specific dimensions of IS success. (3) Finally, this study reveals the research gap in the determinants of IS success to recommend for future research.

DeLone and McLean IS Success Model

The integration of the modified motivational technology acceptance model (Davis et al., 1992; Van der Hejden, 2004) with the D&M information system success model provides the theoretical basis for systematically studying the effects of internal beliefs and the influences of external factors including information system quality and perceived risk. Accordingly, we propose a research model as shown in Figure 1. We frame the hypotheses as follows.

Figure 1
RESEARCH MODEL



Internal Beliefs and Adoption Intention

The modified motivational TAM states that internal beliefs (perceived usefulness and perceived enjoyment) have significant direct effects on user intention (Davis et al. 1992; Venkatesh et al. 2002; Van der Heijden, 2004). The empirical results prove the following: strong predictors of perceived usefulness and perceived enjoyment (Moon & Kim, 2001; Van der Hejden, 2004). Hence,

H1 *The perceived usefulness has a positive effect on the intention of using credit cards.*
H2 *The perceived enjoyment has a positive effect on the intention of using credit cards.*

Information System Quality vs. Perceived Usefulness/ Perceived Enjoyment

In today's rapidly advancing technology and growing development of the Internet, banks combine information systems (Amin, 2007) to enhance credit card user service quality. For example, the credit-card customer information system allows information to be readily accessible to customers. The system provides users complete, accurate, and timely information. Credit card users could receive services or general/specific support from IT support personnel (Delone & McLean, 2003). According to the D&M IS success model, the information system quality includes system quality, information quality, and service quality. High information system quality is a key determinant in measuring information system success (Delone & McLean, 2003; Wang, 2008; Ahn et al., 2007) and increases credit card use (Amin, 2007).

Information system quality is viewed as an external factor in TAM. According to the modified motivational TAM, external factors can impact credit card usage intention through perceived usefulness and perceived enjoyment (Davis et al., 1992; Van der Heijden, 2003). Many research studies show the positive relationships between information system quality and the user's beliefs (Lin &Lu, 2000; Amin, 2007; Wang, 2008). Hence, we hypothesis:

H3a *The system quality of a customer information system has a positive effect on the perceived usefulness of credit card usage.*

H3b *The information quality of a customer information system has a positive effect on the perceived usefulness of credit card usage.*

H3c *The service quality of a customer information system has a positive effect on the perceived usefulness of credit card usage.*

H4a *The system quality of a customer information system has a positive effect on the perceived enjoyment of credit card usage.*

H4b *The information quality of a customer information system has a positive effect on the perceived enjoyment of credit card usage.*

H4c *The service quality of a customer information system has a positive effect on the perceived enjoyment of credit card usage.*

H5a *The system quality of a customer information system has a positive effect on the intention in using credit cards.*

H5b *The information quality of a customer information system has a positive effect on the intention in using credit cards.*

H5c *The service quality of a customer information system has a positive effect on the intention in using credit cards.*

The Effects of Perceived Risk

Perceived risk is one crucial aspect in consumer behavior (Bauer, 1967; Mowen and Minor, 1998) since it is a usually thought of as an alleged uncertainty about the outcome and consequences (Taylor, 1974). Bauer (1967) formally refers to perceived risk as "a combination of uncertainty plus seriousness of involved outcomes." In consumer behavior literature, Mowen and Minor (1998) define consumer perceived risk as "a consumer's perception of the overall negativity of a course of action based upon an assessment of the possible negative outcomes and the likelihood that those outcomes will occur (p. 176)." Perceived risk is "the subjective belief that there is some probability of suffering a loss in pursuit of a desired outcome (Pavlou & Gefen, 2004, p.41)." This article defines perceived risk as a credit card user's perception about

the possible uncertain negative outcomes from using credit cards (Featherman & Pavlou, 2003; Pavlou & Gefen, 2004).

Credit card fraud and wireless identity theft are two main negative consequences of using credit cards (Miyazaki & Fernandez, 2001). Therefore, this article assesses the effects of both financial risk perception and privacy risk perception on the individual intention to use credit cards. According to the modified motivational TAM, the perceived risk viewed as an external factor can impact credit card usage intention through perceived usefulness and enjoyment (Davis et al., 1992; Van der Heijden, 2003). In addition, perceived risk is considered into TAM in this study "because consumers consciously and unconsciously perceive risk when evaluating products and services for purchase and/or adoption (Featherman & Pavlou, 2003, p. 456)" in using credit cards. The probability of suffering a loss in pursuit of a desired outcome that make up perceived risk may "inhibit product evaluation (e.g. perceived usefulness) (Featherman & Pavlou, 2003, p. 456)" and spoil a user's perceived enjoyment (Van der Heijden et al., 2005).

H6a *Individual financial risk perception negatively affects the perceived usefulness of credit card usage.*
H6b *Individual privacy risk perception negatively affects the perceived usefulness of credit card usage.*
H7a *Individual financial risk perception negatively affects the perceived enjoyment of credit card usage.*
H7b *Individual privacy risk perception negatively affects the perceived enjoyment of credit card usage.*
H8a *Individual financial risk perception negatively affects the intention to use credit cards.*
H8b *Individual privacy risk perception negatively affects the intention to use credit cards.*

RESEARCH METHOD

Data Collection

This study chose respondents who hold credit cards and have experience of receiving related information from credit-card customer information systems. They also have experience in contact with online or telephone credit card customer service representatives. Data was collected using a questionnaire survey administered through interviews. This study conducted the survey at banks and supermarkets in Taiwan. The research guaranteed the subjects' anonymity. In an effort to motivate the subjects to respond, all participants received an incentive in the form of a US$4 supermarket coupon. There were 450 successful questionnaires (with an effective response rate of 93.4%). Of the respondents, 54.9% were females; 26.9% were in the 21-30 age group, 50.9% were in the 31-40, and 17.3% were in the 41-50. The majority of the sample had a university education (68.7%) and senior high school education (24%). 38.7% had annual incomes which ranged from US$15,000 - US$20,000, and 38.2% had annual incomes of US$20,000 or more. Respondent occupations were mostly in the service industry (53.6%) and manufacturing (14.4%).

Instrument Development

To evaluate the respondents' perception and behavioral intentions to use credit cards, the survey measurement instrument was based on a psychometric scale developed from the literature, as shown in Table 1. This article includes eight constructs with more than thirty items.

Measurement of all the construct items consists of a seven-point Likert scale (with the following definitions: 1= strongly disagree, 4= neither agree nor disagree, and 7= strongly agree). Related scholars and financial managers reviewed the preliminary instrument to assess its clarity. 102 respondents using the same data collection method had to respond to the instrument items. The Cronbach's α of scale assessed the reliability of the instrument. The resulting score is above the acceptable minimum score of 0.7 (Nunnally & Bernstein, 1994).

Data Analysis and Results

Data analysis involved a two-stage methodology (Anderson & Gerbing, 1988) in which the development of a measurement model was the first stage and the evaluation of a structural model was the second stage. The study used LISREL 8.5 for data analysis with confirmatory factor analysis (CFA) as the initial stage and path analysis as the latter stage.

Developing Measurement Models with CFA

CFA was used to develop the measurement model. The CFA shows acceptable fit indices (Gefen et al., 2000) with the chi-square/df ratio for this model defined as 5.12 (given 1932.08/377 = 5.12), NNFI = 0.97, CFI = 0.98, IFI = 0.98, and RMR = 0.069. The following shows the measurement model results, including information reliability and validity.

The research uses three criteria to assess convergent validity of the measurement model: the factor loading t-statistic (Anderson & Gerbing, 1988), the composite reliabilities (CR), and the average variance extracted (AVE) for each construct (Fornell & Larcker, 1981). Table 1 shows that all factor loadings are statistically significant. The CR for each construct is greater than 0.7, with values ranging from 0.84 to 0.96. The AVE for each construct is greater than 0.5, with values from 0.66 to 0.90, which demonstrates the convergent validity. The chi-square difference test (Anderson & Gerbing, 1988) assesses and demonstrates discriminant validity of the measurement model.

Table 1
CONSTRUCTS AND MEASUREMENT ITEMS

	Constructs/ Operational definitions/ Measurement items	*Factor loading*	*t-value*
Intention to use credit cards: (Mean = 5.13, Std = 1.27, CR = 0.85, AVE = 0.66) A three-item scale measuring personal intent to use credit cards was adapted from Davis (1989) and Cheng et al. (2006).			
IN1	I would use credit cards for my business transactions/payment needs.	0.86	11.07
IN2	Using credit cards for handling my business transactions/payments is something I would do.	0.73	14.09
IN3	Given the opportunity, I will use credit cards	0.84	12.09
Perceived usefulness: (Mean = 5.20, Std =1.18, CR = 0.94, AVE = 0.78) A four-item scale measuring the individual perceptions of performance and effectiveness gains from using credit cards was adapted from Davis (1989), Davis et al. (1992) and Cheng et al. (2006).			
PU1	Using the credit card would enhance my effectiveness in business transactions and payment	0.84	13.85

	Constructs/ Operational definitions/ Measurement items	*Factor loading*	*t-value*
PU2	The advantages of using credit cards will outweigh the disadvantages.	0.87	13.27
PU3	The credit card is useful.	0.92	11.15
PU4	Overall, I think that using the credit card is convenient.	0.91	11.93
Perceived enjoyment: (Mean = 4.92, Std =1.24, CR = 0.88, AVE =0.72) A three-item scale measures the extent to which fun can be derived from using credit cards was adapted from Davis (1989) and Davis et al. (1992).			
PE1	I find using credit card to be enjoyable.	0.85	11.32
PE2	The actual process of using credit cards is pleasant.	0.91	8.12
PE3	I have fun using credit cards.	0.78	13.24
System quality: (Mean = 4.70, Std =1.08, CR = 0.91, AVE =0.71) A four-item scale measuring the individual perception of desirable characteristics of the credit card customer IS quality, such as IS is easy to use and has a fast response to user requests was adapted from Petter, Delone & McLean (2013), Ahn, Ryu & Han (2007) and Lin (2007).			
	Credit-card customer information system representatives:		
STQ1	The Credit-card system allows information to be readily accessible to me.	0.82	12.91
STQ2	I find the Credit-card system easy to use.	0.86	11.82
STQ3	Has fast response to my requests.	0.85	12.32
STQ4	Can use it when I want to use it.	0.83	12.66
Information quality: (Mean = 4.54, Std =1.02, CR = 0.96, AVE =0.81) A six-item scale measuring the individual perception of desirable information from the credit card customer IS outputs, such as relevance, timeliness, completeness, and accuracy information was adapted from Petter, Delone & McLean (2013), Ahn, Ryu & Han (2007) and Lin (2007).			
	Credit-card customer information system representatives:		
IQ1	The information content meets my needs.	0.86	14.26
IQ2	Provides complete information	0.91	13.26
IQ3	Provides accurate information	0.94	11.78
IQ4	Provides timely information	0.91	13.17
IQ5	Provides relevant information	0.91	13.11
IQ6	Communicates information in an appropriate format	0.86	14.28
Service quality: (Mean = 4.61, Std =1.06, CR = 0.94, AVE =0.76) A five-item scale measures the individual perception of quality of the service or support that system users receive from the credit card customer IS organization and IT support personnel in general or for a specific IS was adapted from Petter, Delone & McLean (2013), Ahn, Ryu & Han (2007) and Lin (2007).			
	Credit-card customer information system / customer service representatives:		
SVQ1	Anticipates and responds promptly to customer needs	0.83	13.95
SVQ2	Can be depended on to provide whatever is promised	0.88	12.78
SVQ3	Instills confidence in customers, reducing their uncertainty	0.84	13.68
SVQ4	Understands the customer's specific needs	0.90	11.95
SVQ5	Provides follow-up service to customers	0.90	12.05
Perceived privacy risk: (Mean = 5.56, Std =1.25, CR = 0.90, AVE =0.75) A three-item scale measuring individual perception about potential loss of control over personal information, such as when information about you is used without your knowledge or permission was adapted from Featherman & Pavlou (2003).			
PRR1	I'll worry that Internet hackers (criminals) might abuse my private information	0.85	11.70

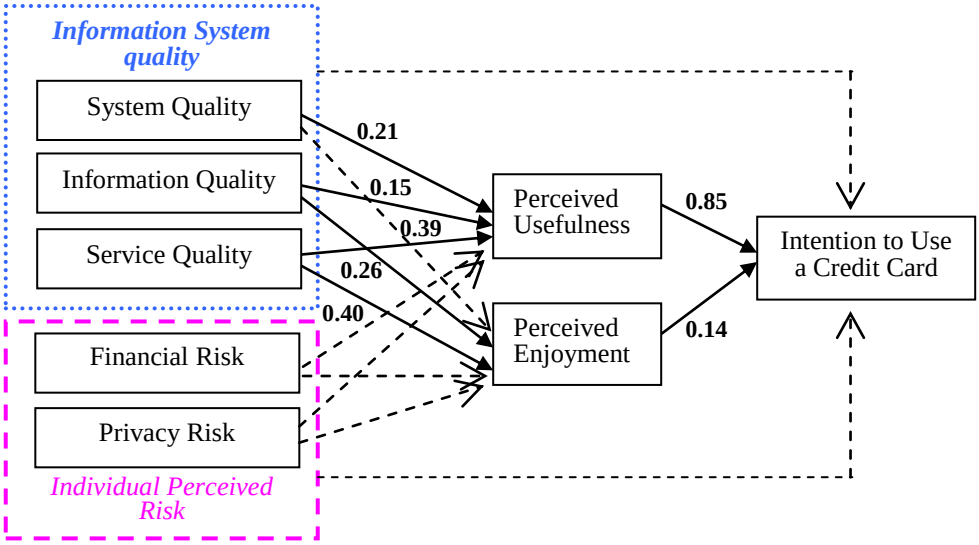
	Constructs/ Operational definitions/ Measurement items	*Factor loading*	*t-value*
PRR2	I'll worry about unauthorized use of my credit card information	0.90	9.03
PRR3	I'll worry about having my personal information (other than credit card information) become public. (Loss of privacy)	0.85	11.82
Perceived financial risk: (Mean = 5.51,, Std =1.35, CR =0.95, AVE =0.90) A two-item scale measuring individual perception about the recurring potential for financial loss due to fraud from using credit cards was adapted from Featherman & Pavlou (2003).			
FIR1	Using the credit card may subject my credit card account to potential fraud risk	0.98	2.47
FIR2	Using the credit card would lead to potentials for financial loss due to fraud	0.92	7.47

Note: Std=standard deviation, CR=composite reliability, AVE=average variance extracted,
All factor loadings were statistically significant at $p < 0.05$

Testing of the Structural Model- Path Analysis

First, goodness of fit indices for the structural model indicated that the structural model presents acceptable fit indices, with a chi-square/*df* ratio of 4.77 (given 1804.32/378 = 4.77), NNFI = 0.97, CFI = 0.97, IFI = 0.97, and the RMR = 0.060. Second, Table 2 and Figure 2 show the examination of the standardized LISREL path coefficients. Both individual perceived usefulness (PU) and perceived enjoyment (PE) have significantly positive effects on the intention to use credit cards (IN), supporting H1 and H2 (β= 0.85, $p<0.001$ and β= 0.14, $p<0.001$ respectively). All of the information system quality, including system quality (STQ), information quality (IQ) and service quality (SVQ), significantly and positively affect PU, supporting H3a – H3c (β= 0.21, $p<0.01$; β= 0.15, $p<0.01$and β= 0.39, $p<0.001$ respectively). Both IQ and SVQ have significantly positive effects on PU, supporting H4b and H4c (β= 0.26, $p<0.001$ and β= 0.40, $p<0.001$ respectively), but the STQ does not, and it does not support H4a (β= 0.04, $p>0.05$). None of the information system quality has significant effects on IN, not supporting H5a – H5c (β= 0.02, $p>0.05$; β= 0.06, $p>0.05$ and β= -0.10, $p>0.05$ respectively). The results show limited effects of perceived risk (including financial risk-FIR and privacy risk-PRR) on both PU and PE, and do not support H6a, H6b, H7a and H7b (β= -0.03, $p>0.05$; β= 0.00, $p>0.05$; β= 0.08, $p>0.05$ and β= 0.01, $p>0.05$ respectively). FIR and PRR do not have significant effects on IN, not supporting H8a and H8b (β= 0.08, $p>0.05$ and β= 0.02, $p>0.05$ respectively).

Figure 2
PATH ANALYSIS RESULTS



Note: Overall fit indices (n =450), chi-square/*df* = 4.77, NNFI=0.97, CFI=0.97, IFI=0.97, and RMR=0.060;
The dotted lines indicate non-significant relationships; the solid lines indicate that significant relationships between constructs; the values are path coefficients

Table 2
HYPOTHESIS RESULTS FOR THE STRUCTURAL MODEL

Research hypothesis	*Path coefficient*	*t-value*
H1: Perceived usefulness → Intention to use a credit card	**0.85*** **	**15.86**
H2: Perceived enjoyment → Intention to use a credit card	**0.14*** **	**3.36**
H3a: System quality → Perceived usefulness	**0.21** **	**2.87**
H3b: Information quality → Perceived usefulness	**0.15** **	**2.01**
H3c: Service quality → Perceived usefulness	**0.39*** **	**5.89**
H4a: System quality → Perceived enjoyment	0.04	0.52
H4b: Information quality → Perceived enjoyment	**0.26*** **	**3.15**
H4c: Service quality → Perceived enjoyment	**0.40*** **	**5.60**
H5a: System quality → Intention to use a credit card	0.02	0.38
H5b: Information quality → Intention to use a credit card	0.06	1.05
H5c: Service quality → Intention to use a credit card	-0.10	-1.78
H6a: Financial risk → Perceived usefulness	-0.03	-0.45
H6b: Privacy risk → Perceived usefulness	-0.00	-0.08
H7a: Financial risk → Perceived enjoyment	0.08	1.18
H7b: Privacy risk → Perceived enjoyment	0.01	0.09
H8a: Financial risk → Intention to use a credit card	0.08	1.50
H8b: Privacy risk → Intention to use a credit card	0.02	0.35

* is significant at p<0.05, ** for p < 0.01 and *** for p < 0.001

DISCUSSION

This study attempts to improve the understanding of individual credit card using processes with an emphasis on three aspects: (1) the internal beliefs effects of perceived usefulness and perceived enjoyment, (2) information system quality of credit-card customer information systems, and (3) perceived risk. This paper achieves the goal by integrating the D&M information system success model into the modified hedonic-TAM (Davis et al., 1992; Van der Hejden, 2004). The discussions are as follows.

First, the results indicate that internal beliefs, including perceived usefulness and perceived enjoyment, are key determinants in motivating individual credit card use with greater effects being observed from perceived usefulness. The results of utilitarian value echoes Lee and Kwon's (2002), Amin's (2008), and Khare et al.'s (2012) reports of consumers' use of credit cards. Superior utilitarian value may greatly increase individual intention to use credit cards. This study shows that individuals enjoy shopping by using credit cards. The results supply an empirical article which captures the hedonic motivation for intention to use credit cards. The finding has greatly encouraged hedonic value to promote credit card usage behavior.

Second, this article contributes to information system quality as an antecedent on individual motivations (beliefs) towards credit card usage. Findings suggest that information system quality has significant and indirect effects on credit card use intention through internal beliefs, including perceived usefulness and perceived enjoyment. The results show that the high quality of credit card customer information systems is a key determinant in measuring information system success (Delone & McLean, 2003; Wang, 2008; Ahn et al., 2007). The results confirm Delone and McLean's (2003) IS success model and echoes Ahn et al.'s (2007) and Wang's (2008) reports of e-commerce systems success. In today's society of rapidly advancing technology and growing development of the Internet, banks combine information technology to enhance credit card user service quality. The results imply that high quality of credit card customer information systems may be dominant strategies for motivating individual credit card use (Amin, 2007).

Third, the findings, however, have limited support for the effects of perceived risks on individual internal beliefs. This finding does not match the original assumptions of H6, H7 and H8. One possible reason is related to reliable security (Lee, 2009; Schierz et al., 2010; Meharia, 2012) from the credit card customer information system. The users' trust in the credit card security system might reduce their risk perception and alleviate the negative effects of perceived risks (Kim et al., 2008; Meharia, 2012) on individual credit card use processes.

LIMITATIONS

The survey targets are only from Taipei (Taiwan) and may limit the generalizability of the findings to other locations in Taiwan and to other countries. To test the theoretical framework's applicability in other locations/countries is an area for future research.

Recently mobile phones have provided emerging opportunities for financial industries to introduce mobile phone credit cards (Amin, 2008). An integrated model with individual internal

beliefs and diverse antecedent external variables might offer financial industries insights on consumer behavior for using a mobile phone credit card. This is also an area for future research.

CONCLUSION

This paper integrates the D&M IS success model into the modified hedonic-TAM to provide more explanations of the factors' influence on individual credit card usage. The results contribute to a finding that individuals tend to enjoy shopping by using credit cards. We further trace the antecedent external effects of information system quality and individual risk perception on individual motivations (beliefs) towards credit card usage. The practical implications for credit card marketing and management could be addressed.

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TIEBOUT FORCES, PUBLIC SCHOOL COMPETITION AND EDUCATIONAL QUALITY

Guo Li, Economist II, Fannie Mae

ABSTRACT

This paper re-evaluates the effect of US public school competition on children's educational achievement based on a large longitudinal school profile composed from the Common Core of Data (CCD at NCES). To partiallly reconcile the endogenous shift of local competi- tion measures driven by demand side sorting, I examine the changes of these measures within a local education market over a prolonged pe- riod of time and sort out the areas that are most affected by Tiebout forces and the areas least affected by these forces. I find that the marginal effect of school choices on student achievement based on a value-added specification is positive and statistically significant at 3.244 when demand side shifts are controlled using this method. The IV estimations at the second part of this paper reinforce this estimation result.

Keywords: *Tiebout Choice, Herfindahl Index, Local Educational Market, Educational Production Function.*

JEL Codes: I21, I22, I24

INTRODUCTION

Households in the US can choose the specific jurisdiction and school district by choice of residence, which is the Tiebout sorting[1] in the modern education system. Theoretical model of local educational markets[2] argue that, increasing choices among schools can improve the social efficiency of allocation of resources for two main reasons. First, students are sorted into learning envi-ronments and peers that conform to their own ability and preferences, which might facilitate learning; second, choice intensifies the competitive mechanism that rewards the most productive school, at the same time decreasing the principal-agency problem between households and school board. Therefore, schools have an incentive to increase efficiency within a more competitive market.

Policy reforms on improving choices in the local educational market has generated a substantial body of empirical literature on the productivity effect of competition. However, according to a review by Belfield and Levin (2002), the generality and scale of the effect of competition on the quality of school is still unclear. A number of previous studies (e.g., Hoxby (2000a), Belfield and Levin (2002), Hanushek and Rivkin (2003), and Bayer and McMillan (2010)) discussed the challenges in estimating the relationship of competition and academic outcome. All of them agreed that the most substantial problem is simultaneity: the question of how much more productive schools are when marginally increasing household's school choices is a question on the supply side of schooling with demand side held constant. However, only the equilibrium of demand and supply is observed. Therefore, simply linking the measure of

competition to educational outcomes in a hedonic regression function is suffered from endogeneity bias. This is mostly due to the measures of competition reflect both the initial administrative structure of school districts and the variation of school qualities within an MSA itself is endogenously determined by the location choices of families.

Therefore, an important econometric challenge is to find instrumental variables that implicitly reflect the variations in the initial supply of school districts, isolating the variations caused by the demand side shifts. In an in fluential paper by Hoxby (2000a), the author proposed geographic "streams"[3] which reflects the number of natural school district boundaries as instrument, and found large competition effects. This instrument is soon challenged by Rothstein (2007), which proves that the estimated effect is extremely sensitive to the way that the "streams" are coded, and if an alternative, more accurate measure is used, the difference between Hoxby's IV estimation and OLS is minimized.In this paper, I assess the problem of endogeneity of competition in two steps. First, I rank order all the MSAs in the US from those least likely affected by demand side Tiebout forces to those most likely affected by this force, conditional on a constant "initial" supply of local jurisdictions in 1990.[4] This is done by utilizing a nationwide panel school profile with geographic details obtained from Common Core of Data (National Center of Educational Studies) dated from 1987 to 2005; I then examine whether the estimated choice effect through both value-added and non-value-added function with time fixed effects is different for each subgroup of MSAs. I find significantly positive choice effects for the MSA group that are least affected by demand side forces. In the second step, I re-estimate the choice effects for all the MSAs using an instrument approach, which is a Herfindahl Index that is based on the share of total geographic distance of each school district to the center of MSA in year 1990. This instrumental variable measures the initial supply of school district within an education market, thus is unlikely to be correlated with the test score outcome. This step confirms the choice effect estimation obtained from the first step.

This is the first study that utilizes the longitudinal feature of the nation- wide school profile in the US to examine the changes in school competition status over time, with the initial supply of local jurisdictions held constant. My findings support the education demand literature (Black (1999), Rothstein (2006) and Bayer, Ferreira and McMillan (2007)), that the demand side component of the choice effect is quite small over time, so that a majority of these MSAs experiences small changes in school competition. Both the group-wise OLS esitmation and the IV approach support the previous findings (such as Card and Krueger (1992), Hoxby (2000a), Hoxby (2000b), and Gibbons, Machin and Silva (2008)), that increasing level of competition within a local education market significantly increases child educational outcome.

RESEARCH DESIGN

The Endogeneity Problem

The most popular measurement of school competition is based on Herfindahl Index (HI), defined as one minus the sum of squared proportions of students by districts for the MSA:

$$HI_{m,t} = 1 - H_{m,t} = 1 - \sum_{j=1}^{j} s^2{}_{j,m,t} \qquad (1)$$

where for each period t, s is the share of enrollment of school **j** in metropolitan area m. HI ranges from 0 to 1. An HI of one represents a perfectly competitive education market, and an HI of 0 represents a monopoly market. According to Hoxby (2000a), the HI measure based on student enrollment has a number of advantages over other measures of school competition (e.g.,count of schools or the share of land areas). It reflects the possibility that a student finds himself in another district if he wants to exchange place with another randomly selected student in the MSA, thus containing more information related to the student's true "choice set" of local public goods. For example, large residential areas, parks and recreations could make a district more attractive to households with school aged children, thus increasing the enrollment base for that district.

However, as mentioned in the Introduction, this HI measure is also more prone to be endogenous to parents' sorting and schools' consolidation. Consider the following stylized value-added educational production function[5]:

$$A_{i,t} = \beta_0 + \beta_1 A_{i,t-1} + \beta_2 HI_{m,t} + \beta_3 \delta_i{}_{,t} + \beta_4 \gamma_i + \beta_5 \gamma_i + \varepsilon_i{}_{,t} \qquad (2)$$

Where $A_{i,t}$ is student's achievement, affected by both his last period achievement, and other fixed and time varying individual, family and school chacteristics. Suppose a school hires more efficient administrative forces for period t, families would want to move into that district with the hope to improve $A_{i,t}$, causing $Hl_{m,t}$ to go down. Therefore, this unobservable heterogeneity component in $E_{i,t}$ is correlated with $Hl_{m,t}$, causing endogeneity bias from the demand side. From the supply side, other schools would like to consolidate with the better school, causing $Hl_{m,t}$ to go down, this has also lead to the correlation of E_{it} with Hl_{mt}.

ESTIMATION STRATEGY AND SCHOOL DISTRICT DATA

One takeaway from the discussions above is that both of the unobserved heterogeneity components in Equation 2 causes the HI index to change over time. Theoretically, if there is variation of school or district quality within a metropolitan area, then both the demand and supply forces will push the HI index to change, decreasing if families move into smaller districts and increasing if families choose to concentrate in larger school districts (or decreasing if the educational reforms create more options for schooling, and decreasing if there is consolidation of school districts). This move can be slow but steady. Importantly, if there is no observed changes in the HI index for a metropolitan area within a prolonged period of time (eighteen years here), then it is likely that the calculated HI index at a particular time period reflects the initial administrative structure of the local educational jurisdictions - almost entirely due to the natural geographic streams which offer forbidding cost to exercise demand side switching of school. This is an exogenous source of variation for the production function that this paper aims to explore.

To test this hypothesis, I examine the changes in enrollment base for all school districts in the US from year 1987 to 2005[6]. The public school profile is obtained from the Local Education Agency Survey of Common Core data files (CCD) at National Center for Education Statistics (NCES). The survey has three major components: universe survey (1986 - 2005), finance survey (1990 - 2005) and dropout survey (1991- 2005). For each local educational agency (school district), the universe survey record the name and address, county, state, type of agency and enrollment base for the district. In year 1990, there are 15512 local education agencies, 12920 of them are unified school districts that offer degree up to high school diploma. 3582 of them are standalone school districts where only partial degrees (not up to 12) are offered.

To confirm the geographic details of these school districts, I extract Geographic School District files from 1990 Census and obtain the latitude and longitude details of each district from matching with local educational agency ID. I have also obtained the Census Metropolitan Area for each district from this data source. To ensure the matching of school profiles to test score out- comes in the next step and to simplify the tracking process of these districts over the eighteen year period, I conduct the following procedures on the matched Census-CCD data: 1) I drop all specialty schools, and for the 3582 school districts that do not offer degrees up to 12, I merge nearby schools within the same county to create a "unified" school district that offers degrees up to 12; 2) Less than one percent of school districts and about fifty metropolitan areas change geographic boundaries over the years, I then use year 1990 as the base year, and match the newly created school districts and MSAs into existing school districts in the same county based on shortest great circle distance; 3) I drop the local educational agency IDs that do not appear every year and 4) I summarize each school district's enrollment base across the eighteen year span and replace the enrollment base that are over three standard deviations from the mean with the mean enrollment base for that district; 5) I also drop all school districts that is not located in the urban area to keep the homogeneity of the HI measures. There are 272 metropolitan areas with 4260 school districts in the final dataset.

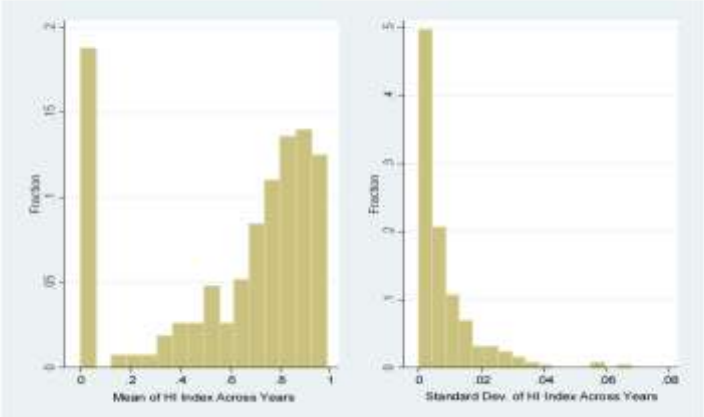
SCHOOL COMPETITIONS OVER TIME

The HI index for each metropolitan area is calculated using Equation 1. Figure 1 shows the distribution of the mean (left) and standard deviation (right) of HI index for these MSAs

across time.[7] From the histograms, it looks like that close to twenty percent of MSAs have a mean HI index of zero across the years, meaning that these areas are dominated by monopoly market. Another forty percent of these metropolitan areas have HI index value of over 0.8, which are markets with strong competitions. The right hand side figure shows the distribution of the standard deviations of these MSAs across years. One important observation from this figure is that, almost fifty percent of HI indices have a standard deviation close to zero (up to 0.004, with a mean HI value of 0.61 across the areas). This shows that there is very little or no change of HI index across the years for these areas. Another half of metropolitan areas experience change in their competition level, with standard deviations across time range from 0.011 to 0.711.

Why is there virtually no change in the competitiveness of schools for more than one hundred metropolitan areas over a eighteen year time span? There are several reasons: first, Hoxby (2000a) discussed the natural "streams" that separate school districts. Therefore, distance, traffic, and related commuting cost can incur forbidding costs for families to choose another district. The initial supply of local jurisdictions can be maintained because of this force. Second, Hanushek et al. (2004) mentioned that a lot of families may choose to move because of changes in employment opportunities or family structure, rather than schooling reasons.[8] These types of move would not affect the local HI index. This observation provides an excellent exogenous shift of supply shocks if the researcher constraint the production function estimation on these areas only, because the demand side shift is likely very small in these areas.

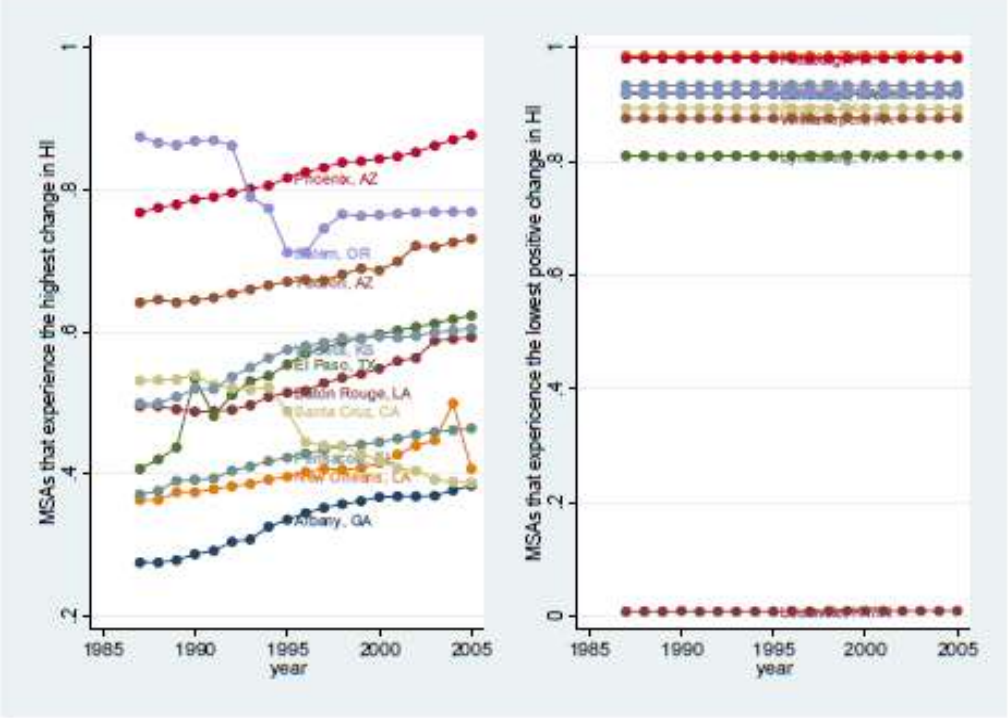
Figure 1: Distributions of HI Indices Across Years



To further examine the pattern of these changes in competition status, I graph out the top ten and bottom ten metropolitan areas that experienced any change in the HI index over the years. This is shown in Figure 2[9]. The left panel shows the ten areas that has the highest change of HI index over time. As can be seen, eight out of ten areas experienced an upward trend in HI over the

years. Possible examples include Phoenix, AZ, El Paso, TX, and Albany, GA. These are probably the results of recent educational reforms which offers more school choices to families that took places in these local markets. One can also observe downward trend for some other areas, such as Salem, OR or Santa Cruz, CA. This conforms to our demand side stories listed in Section 1, but it could also be due to school consolidations from the supply side, as discussed in Kenny and Schmidt

Figure 2: MSAs that experience highest and lowest changes in HI index over the years



(1994).

The right hand side figure shows the areas that experienced least changes in HI over time, except the thirty MSAs that have always been monopoly markets. It looks like that there are a number of competitive markets which stayed as highly competitive over time, such as Lancaster, PA, Pittsburg, PA and Nassau-Suffolk, NY. The fact that there is a consistent number of MSAs in every end of the spectrum of competition levels in this MSA group provides excellent exogenous shift in the supply side of competition, with the demand side held constant. It could also be possible that both supply and demand change simultaneously to reach a new equilibrium without changing the HI index, but I consider this highly unlikely. This is because incentives motivating demand and supply changes usually do not align with each other. For example, a slightly better school would attract families, but other schools would like to consolidate with it - that inevitably increases the monopoly power of that school.

CHOICE EFFECTS ESTIMATION

In this section, I estimate the child educational production function (Equation 2) for subgroups of MSAs that experience different levels of changes in the HI index over time, based on the assumption that areas with little or no change in HI index reflects little sorting forces from the demand side. I divide the MSAs into four subgroups according to the quartiles of the distri bution of standard deviations of HI index over time (std) shown in Figure 1. First quartile of this distribution is 0 std < 0.001418,including MSAs that are least affected by demand side Tiebout forces; second quartile is 0.001418 std < 0.004666, third quartile is 0.004666 std < 0.116985; and fourth quarter is 0.116985 std < 0.06775. Each subgroup contains 63 to 77 MSAs. I assess whether the estimated marginal contribution of the competitiveness of market is different across the subgroups of MSAs below.

Data to Estimate the Production Function

Student background and test score data for production function estimation is collected from the Child Supplement of the National Longitudinal Survey of Youth (NLSY79). Starting from year 1986, the NLSY survey conducted a biannual child supplement survey for the mothers that have taken part in the 1978 NLSY Youth survey. I collect age 5 to 18 children's information from the Child Supplement of NLSY from year 1990 to 2005. This is because women in the Youth survey were 18 to 24 years old in 1978 when the survey began, a large number of these women started to give birth around mid 1980s, and most of their children reached school age during our sample period. There are about three thousand children presented each year in our sample in the beginning of 1990s. I collect each child's age, sex, birth order, whether birth weight is less than 5.5 pounds, number of siblings, grade, and their PIAT math percentile score at the survey year.

Each child in the sample can be linked to a member (mother) in the NLSY Youth survey. I therefore collect the MSA information from the Geocode version of the NLSY Youth Survey[10]. The father and mother's demographic and work information is also collected from the NLSY Youth survey. From this database, I collect mother and father's age, education level, annual hours of work and salary income over the year that is right before the survey year. Table 1 provides summary statistics for the child test score, HI indices, student preparation and background data in the regressions, separately for each MSA group. MSA group one contains metropolitan areas that are least affected by demand side forces, thus experiencing little changes in HI index over time. The mean value of HI index for this group is 0.585 with a high standard deviation, 0.45, which shows enough observations over the spectrum of least to most competitive markets. MSA groups two and three are groups of competitive-like markets, with means at 0.82 and 0.84 and standard deviations at 0.12 and 0.14. Group four is dominated by more monopoly-like markets with a small mean value 0.246.

Current PIAT math score is the current year math percentile score, and previous PIAT math score is the math score in the last biennial survey year for the same individual. It is one of the independent variables in the value- added function estimation. Table 1 shows these two scores are similar across MSA groups. Ideally, one can track only the students that switched metropol- itan areas during the biennial survey period, because one do not need to con- trol for fixed individual and family characteristics in this case. However, from the variable "Whether moved from previous period", in Table 1, the moving rate is only ten percent, that leaves about two hundred year-individual obser

vations in each MSA group. This is not enough sample size for an unbiased regression. According to the literature, family background plays a crucial role in affecting student's academic performance.[12] Therefore, I also add a list of time invariant (1_i) student and family characteristics, such as student's age, race, and sex. Time varying family background information (6_{it}) includes child's grade level, , and birth order, number of siblings, mother and father's age, education level, annual hours of work and annual salary income. All of these variables are also summarized in Table 1 and the summary statistics show they are all consistent across the four MSA groups.

TABLE 1
SUMMARY STATISTICS FOR DATA IN THE PRODUCTION FUNCTION ESTIMATION

MSA GROUP	1	2	3	4
Individual-Year observations	1917	2432	3819	3869
HI Index	0.585	0.842	0.824	0.246
	(0.45)	(0.14)	(0.12)	(0.19)
Current PIAT Math	56.00	53.80	52.45	54.43
(Percentile)	(28.13)	(28.07)	(28.50)	(27.93)
Previous PIAT Math	57.30	55.07	54.67	52.09
(Percentile)	(27.94)	(27.68)	(28.23)	(28.27)
Whether Moved from Prev	0.12	0.11	0.10	0.10
	(0.32)	(0.31)	(0.30)	(0.29)
Mother's annual salary Income	1.719	1.686	1.603	1.457
($10,000)	(2.06)	(2.56)	(2.16)	(2.20)
Father's annual salary Income	3.151	2.777	2.820	2.693
($10,000)	(4.55)	(4.43)	(4.44)	(4.54)
Mother's annual hours of work	1.2567	1.2755	1.179	1.0996
(1,000)	(1.01)	(1.00)	(1.04)	(1.02)
Father's annual hours of work	1.332	1.1718	1.1671	1.1297
(1,000)	(1.21)	(1.19)	(1.22)	(1.20)
Mother's Age	37.4	36.7	37.2	36.9
	(4.94)	(4.95)	(5.01)	(5.06)
Father's Age	39.0	38.2	38.8	38.5
	(5.87)	(6.13)	(6.34)	(6.14)
Mother's Education Level	13.5	13.2	13.4	13.4
(years)	(2.75)	(2.20)	(2.54)	(2.48)
Father's Education Level	10.6	9.9	9.9	10.2
(years)	(6.30)	(6.18)	(6.62)	(6.36)
Child Sex	1.5	1.5	1.5	1.5
(Male=1, Female=2)	(0.50)	(0.50)	(0.50)	(0.50)
Race of Child	2.4707	2.1926	2.2694	2.1256
(Blk=1,Hisp=2,NonBlkHisp=3)	(0.75)	(0.79)	(0.75)	(0.81)
Birth Weight Less than 5.5 Pound	0.06	0.06	0.08	0.07
	(0.23)	(0.24)	(0.27)	(0.26)
Birth Order	2.06	1.98	2.06	2.02
	(1.18)	(1.06)	(1.18)	(1.12)
Child's Grade Level	4.3	4.4	4.5	4.5

	(2.39)	(2.38)	(2.43)	(2.43)
Number of Siblings	1.97	1.84	1.97	2.07
	(1.36)	(1.18)	(1.33)	(1.35)

ESTIMATION RESULTS

OLS estimation of the value-added function (Equation 2) with year fixed effects (e_t) for each MSA group is presented in Table 2. One advantage of the value-added framework is that the previous period math score controls most of the time in-variant student preparation and background characteristics, so most of these are insignificant and thus removed from the specification. Some of the time-variant characteristics, such as the age and education level of the parents, are highly correlated with the annual salary income measures, so they are also removed from the final regression. This gives a higher adjusted R-square value for the value added model than the non value-added model presented in Table 3.

The most important finding from this practice is that the coefficient estimate for the HI index measure is statistically significant for MSA group one only. The magnitude of estimated choice effect is 3.244, which means that increasing school competition level in a metropolitan area by one percentage point increases student test score outcome by 3.2 percentile point.[13] This result is important, considering that MSA group one is the group of metropolitan areas that are least affected by the demand side forces, so that the estimated choice effect is least likely suffered from endogeneity bias. For MSA group two, three, four, the estimated choice effect is small and not sta tistically significant. Note that it is hard to discuss the direction of the endogeneity bias for MSA for the other three groups, because family's preferences are heterogenous and may not follow a normal distribution, the unobserved endogeneity bias can cause the estimated effect to change on both directions. The last period math score measure is significant with a high standard deviation as shown in Table 2. Specifically, previous performance contributes 603 of changes to the current period math performance. Mother and father's annual salary income changes are also affecting child's school performance, with an effect that is positive at 0.53. Child's birth order and grade level are two other significant factors affecting the current period math score, with estimated effect of child's birth order negative at 1.941 and child's grade level negative at -1.04. Table 3 shows the results from using a non-value added approach with more controls for student preparation and family background. The estimated effect for school competition is higher at 3.597 for MSA group one, and at 10.39 for MSA group two. Other characteristics, such as the child's grade level, birth order, sex and race, whether birth weight is less than 5.5 pound is also significant factors affecting child's achievement. Family background factors such as mother and father's education level and annual hours of work also affects child's test score.

Table 2
ESTIMATION RESULTS : VALUE-ADDED FUNCTION

	MSA Group			
	(1)	(2)	(3)	(4)
VARIABLES				
HI Index	3.244***	2.946	-2.706	0.146
	[2.812]	[0.863]	[-0.758]	[0.0940]
Previous Period Math Score	0.641***	0.613***	0.649***	0.628***
	[33.03]	[33.51]	[40.51]	[37.72]
Mother's annual salary Income	0.530**	0.247	0.494***	0.399*
	[2.160]	[1.379]	[2.591]	[1.929]
Father's annual salary Income	0.530***	0.732***	0.669***	0.509***
	[4.713]	[6.309]	[6.786]	[5.233]
Child's Birth Order	-1.941***	-2.656***	-2.183***	-0.654
	[-4.250]	[-5.680]	[-5.758]	[-1.529]
Child's Grade Level	-1.046***	-0.872***	-1.077***	-1.080***
	[-4.129]	[-3.551]	[-5.110]	[-4.926]
Observations	1,693	1,917	2,432	2,289
Number of year	8	8	8	8
Adjusted R-squared	0.474	0.441	0.480	0.428

t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 3
ESTIMATION RESULTS: NON VALUE-ADDED FUNCTION MSA GROUP

	(1)	(2)	(3)	(4)
VARIABLES				
HI Index	3.597***	10.39***	1.329	-2.942**
	[3.233]	[3.198]	[0.397]	[-2.019]
Mother's annual salary Income	0.689**	-0.0109	0.727***	0.515**
	[2.200]	[-0.0489]	[2.948]	[2.119]
Father's annual salary Income	0.0576	0.510***	0.830***	0.449***
	[0.384]	[3.582]	[6.772]	[3.615]
Child's Birth Order	-2.478***	-2.468***	-2.799***	-1.113***
	[-5.143]	[-5.297]	[-7.404]	[-2.688]
Child's Grade Level	2.225***	3.939***	3.552***	3.042***
	[3.873]	[6.515]	[7.228]	[6.232]
Mother's age	0.111	0.870***	1.184***	0.421**
	[0.435]	[3.637]	[5.944]	[2.158]
Mother's education level	1.463***	2.177***	1.123***	1.223***
	[6.827]	[9.164]	[6.173]	[6.423]
Father's age	0.0237	-0.0510	-0.215**	-0.118
	[0.184]	[-0.448]	[-2.234]	[-1.085]
Father's education level Mother's	0.804***	0.693***	0.642***	0.526***
	[8.187]	[7.628]	[8.203]	[6.511]
annual hours of work Father's	-1.360**	0.421	-0.594	-0.224
	[-2.207]	[0.775]	[-1.236]	[-0.441]
annual hours of work	1.373**	0.0728	-1.414***	0.795*
	[2.502]	[0.140]	[-3.141]	[1.720]
Child's sex	-3.213***	-3.950***	-0.228	-1.690**
	[-3.377]	[-4.438]	[-0.294]	[-2.081]
Child's Race	5.626***	4.062***	8.165***	5.300***
	[7.551]	[6.658]	[14.61]	[9.801]
Birth Weight Less than 5.5 Pound	1.208	-4.875***	-3.125**	-5.427***
	[0.585]	[-2.620]	[-2.140]	[-3.482]
Child's age	-2.861***	-4.112***	-4.403***	-3.815***
	[-4.960]	[-6.845]	[-9.110]	[-7.878]
Observations	2,634	3,126	4,039	3,819
Number of year	9	9	9	9
Adjusted R-squared	0.231	0.187	0.228	0.161

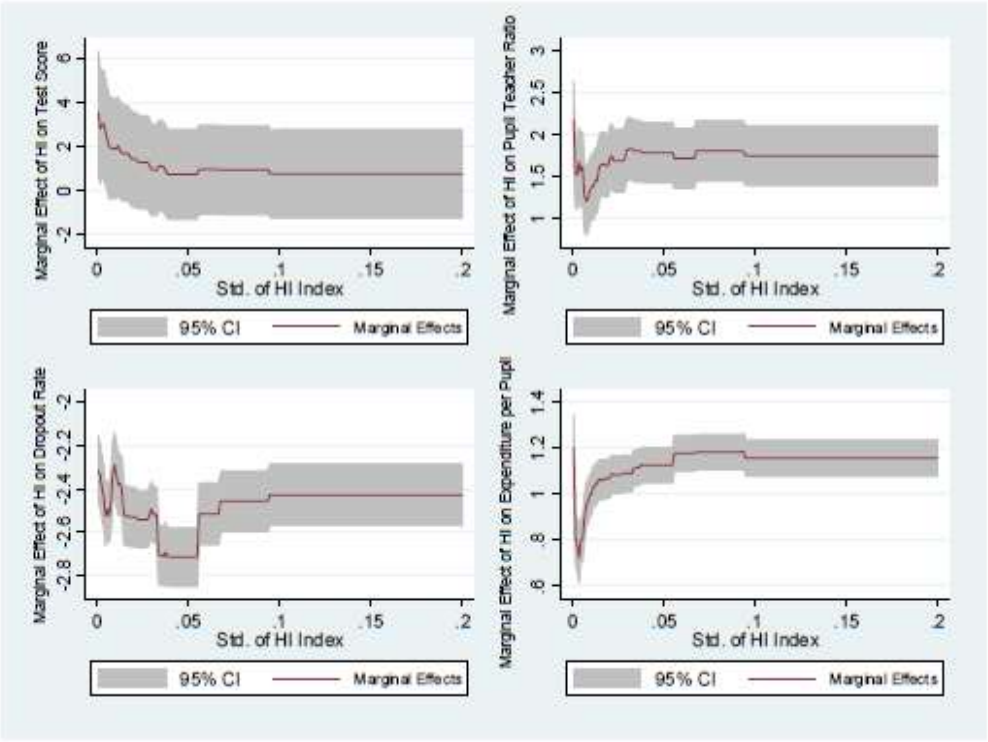
SENSITIVITY CHECK

It is necessary to examine if the estimated competition effect is sensitive to how the metropolitan areas are grouped. For example, whether the estimated effect is affected if the cutoff point for MSA groups is changed to be slightly less or more than 0.001418 in the first group of MSAs. Also, One might wonder if the group of metropolitan areas that maintain their

initial supply of local education different from other measurements of school quality, such as pupil teacher ratio, expenditure per pupil, or dropout rate. Even though several studies (such as Hoxby (2000b), and Hanushek and Rivkin (2003)) found class size and expenditures may not be the best indicators of school quality, I analyze their correlation with school competition, and the subsequent effect on test score outcome in this section.

Firstly, I graph out the marginal effect of HI index to test scores estimated using Equation 2 with respect to the value of the HI standard deviation over time. The graph is shown on the top left panel of Figure 3. The X-axis is the standard deviation of HI index over time for each MSA. The Y-axis shows the estimated marginal effect of HI index to test score using the MSAs that has a standard deviation of HI index less than or equal to the particular X-axis value in the sample. Clearly, the estimated marginal effect decreases sharply and becomes insignificant soon after the demand side effects kick in. The competition effect is significantly positive for metropolitan areas that has a standard deviation of 0.006 or less, and monotonically decreasing when the demand side effects get stronger. This trend conforms to the general intuition in the literature, that families migrate into relatively better schools, causing the HI index to decrease, even though this change in HI index may not affect the school's effectiveness at all, the estimated marginal effect of competition will go down. It is also necessary to analyze whether schools respond to changes in their own competition status over time, and how does this relationship varies when the demand side effects become stronger. Therefore, I also graph out the marginal effect of HI index to pupil teacher ratio, expenditure per pupil, and dropout rate of the local school districts based on group of MSAs that have different pattern of changes in HI index over time. This is presented in the top right panel and the bottom panels in Figure 3.

Figure 3: Marginal Competition Effects over Different State Groups Based on Standard Deviation of HI Index



From the far left side of these curves, it could be seen that for the local school districts located in MSAs that experience little to no changes of competition status over time, more competitive areas often have schools that are larger in class size (higher pupil teacher ratio), lower dropout rate, and higher expenditure per pupil. This is probably because a metropolitan area with a great number of school districts are often heavily populated big cities. When the demand side effects become stronger (moving right alongside the curve, toward bigger standard deviation of HI index over time), this variation seems to be reconciled by families' migrating behavior, or other financial planning reforms in local property tax system. Differences of class size and per pupil spending between more competitive areas and less competitive areas become smaller. It is important to notice in the graph that competitive status of a local area significantly affects school characteristics, which is true for all three school characteristics I examine here.

INSTRUMENT VARIABLE APPROACH

Discussions about the Instrument

In Hoxby (2000a), the author attempted to exclude variation that is endogenous to observed student achievement by using topographics (streams) as an instrument in production equation 2. Obtained from the US Geological Survey, the streams are used to identify natural differences in the metropolitan area's propensity to have large number of school districts. This is because travel time to school was the primary justification when local jurisdictions were set up in the nineteenth century, so that the initial supply of school districts was significantly affected by the number of larger/smaller streams in a metropolitan area, and this factor is unlikely affected by the demand side effects, because it is extremely costly to travel across a natural barrier. However, according to Rothstein (2007), this instrument could be very sensitive to how the streams are coded, and is vulnerable to different definitions. In this section, I construct and test the validity of another instrument based on Hoxby (2000a) and Gibbons et al. (2008)'s concept, i.e., a reasonable instrument in the production function should affect school production only through their effect on the supply side of competition.

The instrument I construct here is a Herfindahl Index based on the share of total distance to the metropolitan center for each school district. Specifically, Hl' is defined as

$$HI'_{m,t} = 1 - H_{m,t} = 1 - \sum_{i=1}^{J} S^2_{j,m,t} \qquad (3)$$

with S'' defined as the geographical distance of a particular school district to the geographic center of the MSA[14] divided by the sum of distances of each school district to the metropolitan center. Therefore, if a school district has been added to the MSA, then the total distance in the denominator of S' increases, so that the squared summation $\sum_{j=1}^{j} S''^2_{j,m,t}$ decreases, thus increasing the competition level of the area. This is a rough approximation of traveling cost for an arbitrary family to switch school.The advantage of this Herfindahl Index is that it roughly quantifies a random student's likelihood of finding him/herself in another school district in the metropolitan area, but is very unlikely affected by families' migration behavior. The share of total distances reflects the commuting concern of families when they evaluate the possibility of sending their child to another school district in the same area: both moving cost and commuting time increases with distance. Moreover, unlike a Herfindahl index based on enrollment share, Hl' reflects the initial supply of local jurisdictions which is likely to be sticky and un-affected by changes in short term demand (for example, migration). Therefore, Hl' is less likely to be correlated with the error term in Equation 2.

The first question about the validity of this instrument is whether it is correlated with the HI index defined in Equation 1. I plot the two HI indices, as shown in Figure 4. The two indices are highly correlated with a coefficient of 0.82. Another question is whether this instrument is effectively exogenous to production: I test the assumption that Hl' affect production outcomes

also by impacting the local area's other school characteristics, such as pupil teacher ratio, expenditure per pupil, or dropout rate. The correlation coefficient is 0.074 for pupil teacher ratio, 0.063 for expenditure per pupil, and -0.245 for dropout rate. Therefore, this informal test could lead to the conclusion that in general, HI' affect school quality through school district boundary setting, rather than other unobserved factors in the production function.

Figure 4
IV ESTIMATION: CORRELATIONS OF THE TWO HI INDICES

The general idea of the instrumental approach is to apply a two stage regression with time fixed effects for heterogeneity of unobservable across years. Note that the value added approach presented in the last section may not be appropriate in the IV estimation, because the HI index calculated based on total share of distance to the metro center may affect the last period PIAT math score, and instrumenting last period math scores by the same HI' index causes model identification problem (i.e., there are less instruments than variables instrumented). Therefore, I conduct the IV regressions using the non-value added specification presented in the last section and run the IV regressions for each group of MSAs. I have also pooled the MSA sample together to run an overall regression.

The results are presented in Table 4. The estimated effect of HI index is 4.224 and is significant at 993 confidence level for MSA group one. This effect is stronger than the 3.597 marginal estimated effect using fixed effects without instrumenting, shown in Table 2. For MSA groups two, three, and four, this effect is not significant, but positive. The overall effect pooling all four MSA groups for the instrument approach is at 2.252 and is significant at 953 confidence level. Other student preparation and family background characteristics also have significant effect on some or all of

these regressions. The results of these exogenous factors are obviously similar to that of the fixed effect results presented in Table 3.

Table 4
INSTRUMENTAL VARIABLE ESTIMATION RESULTS: COEFFICIENT ESTIMATES MSA GROUP

	(1)	(2)	(3)	(4)	Overall
VARIABLES					
HI Index	4.224***	5.152	6.536	1.154	2.252**
	[3.379]	[1.325]	[1.386]	[0.619]	[2.564]
Mother's annual salary Income	0.489	0.0431	0.689***	0.554**	0.409***
	[1.266]	[0.188]	[2.789]	[2.519]	[3.271]
Father's annual salary Income	0.222	0.548***	0.826***	0.278**	0.499***
	[1.218]	[3.759]	[6.672]	[2.469]	[7.539]
Child's Birth Order	-2.293***	-2.834***	-2.874***	-1.735***	-2.464***
	[-4.600]	[-5.758]	[-7.567]	[-4.267]	[-11.42]
Child's Grade Level	2.433***	3.560***	3.074***	4.204***	3.232***
	[4.144]	[5.561]	[6.247]	[8.495]	[11.90]
Mother's age	0.181	0.760***	1.170***	0.663***	0.722***
	[0.681]	[3.053]	[5.850]	[3.261]	[6.480]
Mother's education level	1.355***	2.102***	1.133***	1.234***	1.374***
	[6.082]	[8.352]	[6.197]	[6.633]	[13.51]
Father's age	0.0395	-0.0137	-0.199**	-0.206*	-0.128**
	[0.288]	[-0.113]	[-2.057]	[-1.924]	[-2.292]
Father's education level	0.772***	0.700***	0.638***	0.543***	0.658***
	[7.428]	[7.286]	[8.121]	[6.948]	[15.18]
Mother's annual hours of work	-1.027	0.175	-0.556	-0.322	-0.324
	[-1.538]	[0.308]	[-1.156]	[-0.660]	[-1.220]
Father's annual hours of work	1.018*	0.0829	-1.326***	0.981**	0.123
	[1.735]	[0.153]	[-2.930]	[2.206]	[0.500]
Child's sex	-3.155***	-3.964***	-1.762**	-2.420***	-2.201***
	[-3.147]	[-4.236]	[-2.261]	[-3.111]	[-5.143]
Child's Race	5.850***	3.996***	8.032***	5.562***	5.892***
	[7.555]	[6.380]	[14.31]	[10.40]	[19.88]
Birth Weight Less than 5.5 Pound	1.484	-5.542***	-2.511*	-4.790***	-3.114***
	[0.681]	[-2.815]	[-1.716]	[-3.168]	[-3.656]
Child's age	-3.107***	-3.668***	-4.013***	-4.791***	-3.840***
	[-5.243]	[-5.769]	[-8.292]	[-9.743]	[-14.24]
Observations	2,403	2,856	4,035	4,084	13,378
Number of year	9	9	9	9	9

t-statistics in brackets
*** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

This paper contributes to the literature by using the longitudinal feature of Common Core of Data to account for the endogeneity bias caused by the demand side sorting of families in estimating the choice effect of schooling. As evidenced by Hoxby (2000a) and Hanushek et al. (2004), OLS estimate of school quality effect from higher competition is usually insignificant, because of family's Tiebout sorting behavior raises a good school district's monopoly power and biases the effects of competition. This paper provides strong empirical support to this theory. The estimate choice effect is insignificant when one pool all metropolitan areas into one sample. However, once I group the metropolitan areas and separately running regressions based on these area's degree of observed Tiebout sorting, a significantly positive choice effect is found. Also, an instrumental variable approach is applied so that the endogeneity bias is partially reconciled in the pooled sample, this effect is also significant and strong. The estimated effect from improving the competition level by one index point increases the PIAT math scores by 3.244 to 3.597 percentage points, which is a strong effect.

The findings about the heterogeneity of local school market across metropolitan areas can be of particular interest to policy makers: it looks like that even with all the local policy oriented educational reforms, close to half of these metropolitan areas do not experience changes in the local competition level over a prolonged period of time.The initial supply of local education has a strong effect over time that boundaries and enrollments of these local school districts do not deviate from the initial equilibrium. Of course the changes in choices of education can be in terms of voucher or charter schools, which are beyond the scope of this paper, but most public school systems remained status quo during the last two decades. Empirical estimation in this research shows a strong positive competition effect to productivity holding students' ability, motivation and other characteristics constant, with demand side forces controlled. Therefore, this paper conforms with other research that call for more policy changes toward local educational market reform. The author declares that she has no conflict of interest.

ENDNOTES

[1] See Tiebout (1956).

[2] Epple and Romano (2003) provide a model of neighborhood system of public choice; and Hanushek, Kain and Rivkin (2004) present a model of mobility effects and divide the overall net effect of mobility on school quality into pure Tiebout, school assimilation, and disruption effects (transition costs independent of school quality).

[3] According to the US Geological Stuvery (USGS), streams include brooks, streams and rivers.

[4] The sample starts in 1987 but the boundary information for school districts is obtained from 1990 Census

[5] Several prominant papers, including Hanushek and Rivkin (2003), Hanushek et al. (2004) and Todd and Wolpin (2007) used this value-added framework.

[6] The starting year for the CCD universe survey about US public schools is 1986. Our sample ends in 2005, because the sample size for the test score outcome data I collect from NLSY becomes very slim after this year (a lot of NLSY supplement survey chidren are out of high school).

[7] i.e., I calculate the mean and standard deviations for each metropolitan area across time, and graph the distribution of these mean and standard deviations.

[8] See more discussions in Schachter (2001)

[9] There are thirty other MSAs that do not experience any changes in HI index value over the years (with a standard deviation of zero). It turns out these are all monopoly markets with only one school district in it. These areas are not included in the figure.

[10]

[11] This dataset is confidential according to the Bureau of Labor Statistics (BLS) contract number LOA2492.

As a robustness check, the author runs the same regression with families that switched metropolitan areas only. The coefficient estimate for HI index is not significant for each of the MSA group.

[12] For example, Childs and Shakeshaft (1986), Hanushek (1997) and Todd and Wolpin (2007) found that school characteristics are not significant if one controls for family background and student preparations. Liu, Mroz and Van der Klaauw (2010) found no school effect if both family input and parental employment choices and controlled together with school choices.

[13]The magnitude of this estimated effect is supported in the sensitivity check and instrumental variable regressions in the next section.

[14] Great circle distances are calculated using latitudinal and longitudinal data for the metro center and for each school district in that metropolitan area.

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AN ECONOMETRIC ASSESSMENT OF FACTORS THAT PREDICT ACADEMIC PERFORMANCE OF TERTIARY STUDENTS IN HO, GHANA

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ABSTRACT

This study seeks to access the demographic, student specific and lecturer specific characteristics that predict academic performance of tertiary students in Ho, Ghana. A descriptive, cross-sectional survey was conducted among 350 randomly selected students of Ho Polytechnic. Logistic regression analysis was used to identify the predictors of academic performance of tertiary students in Ho, Ghana. The results show that four demographic characteristics, five student specific characteristics and five lecturer specific characteristics were significant in predicting academic performance of tertiary students in Ho, Ghana. It is suggested therefore that, identifying these factors such a punctuality and regularity of both students and lecturers to class and ensuring that materials that lecturers present to students are very clear and understandable by all students, that lecturers monitor students' progress of learning through constant assignments and quizzes and that students academic affairs understand that the time students spend participating in extra curriculum activities impacts on their grades, should be the best policy option for all stakeholders who are interested in higher academic performance in tertiary schools in Ho.

***Keywords**: Academic performance, Predict, tertiary students, logistic regression*

INTRODUCTION

Education is the best legacy a nation can give to her citizens. This is because the development of any nation or community depends largely on the quality of education. Education also helps individuals to grow, develop, earn a decent living in the society and contribute positively to the welfare of the society. It is generally believed that the basis for any true development must commence with the development of human resources. Efficient human resource could also be considered a reliable tool for poverty reduction apart from its direct effect on increasing knowledge, building skills, values and attitudes and opening up people for critical thinking.

Formal or informal education continues to shape the three domains of human development. These are the cognitive, affective and the psychomotor domains. Formal education remains the vehicle for social-economic development and social mobilization in any society. Therefore, tertiary education must be of a quality that will help the individuals to acquire skills, knowledge,values and attitudes that will enable them to contribute positively to the social, economic, political and moral development of the society.

Battle and Lewis (2002) opined that higher education plays a vital role in the development of human capital, which is linked with an individual's well-being and opportunities

for better living. It could also be considered to be a reliable tool for poverty reduction apart from its direct functions of increasing knowledge, building skills, values and attitudes and opening up people for critical thinking. Education is about knowledge in basic skills, academics, technical and discipline. This is possible through the measure of performance because only what can be measured will be selected and the measuring tool is the written test or exam.

Society places great emphasis on education because it is believed to be the only avenue for national development. However, this can only be achieved if students' who are in the citadel of learning get actively involved in academic activities which will enhance their academic performance. Academic performance is defined or regarded as participants' examination grades at the end of a given duration (term, semester and programme). It could also be seen as the level of performance in a particular field of study. Higher scores indicate better academic performance (Egbule, 2004). In Ghana, most tertiary institutions measure student's performance using the grade point average (GPA). This measure tells the semester-by-semester output of the students throughout the program until final CGPA, cumulative grade point average, is determined.

Ali et al., (2009) posited that students' academic performance plays an important role in producing the best quality graduates who will become great manpower and leaders for the social development of a country. The quality of students' performance remains as a top priority for educational institutions. In spite of these, Egbule (2004) showed that students' academic performance has been declining. This could be due to the fact that they are confronted with so many school and non-school related demands and responsibilities. Many educators, trainers and researchers have long been interested in exploring variables that contribute effectively to quality performance of learners. Some researchers posited that the variables that affect quality academic achievement are inside and outside school (Crosnoe, Johnson & Elder, 2004).

Luguterah and Apaw (2013) determined the factors that influence students' academic performance in Ghanaian Polytechnics. Their findings revealed that students' academic performance is affected by a change in academic levels. Thus a given semester and age of students have a negative effect on the academic performance of the students as they tend to perform poorly with increasing number of credit hours and increased age. The researchers also indicated that students who were admitted through direct entry perform better academically compared with those who were admitted based on the matured entry requirement. According to the researchers, gender and the department of students also significantly determine the academic performance of students in the Polytechnic.

Again, researchers have identified and attributed a myriad of factors to low academic performance.These factors include: poor teaching environment (Mitzel, 1969); parents' low socioeconomic status (Sewell et al, 1980); gender bias (Gyeke-Nimako, 1983); poor parenting (Wilson & Hermstein, 1985); large sibling size (Becker & Tomes, 1985); and poor family socialisation (Friedrich, 1995).Though these factors have been found to contribute to poor performance, it is not known which of these equally predict students' academic performance in tertiary schools in the Ho Municipality. It is, therefore, imperative to assess which of the said factors will predict academic performance of tertiary students. This is the gap that this paper seeks to fill by answering the following question: What factors actually best predict the academic performance of tertiary students in the Ho Municipality? The study will enable policy makers and stakeholders in the educational sector to understand the factors that predict the academic performance of tertiary students and mitigate the effects of these factors on students' performance in the Ho Municipality in particular and Ghana in general

The remainder of the paper is organised as follows: In Section 2, we consider the review of literature and briefly discuss the data collection procedures in section 3. Section 4 explains our analytical framework and estimation procedures, after which the empirical analysis and results are discussed in section 5. In Section 6, consideration is given to the concluding remarks and recommendations.

LITERATURE REVIEW

A lot of models have been developed to explain the relationship between the teaching environment and the school performance of pupils. The classroom teaching model developed by Mitzel (1969); explicit teaching model by (Rosenshine, 1986); and the cultural relevant practice model by (Irvine, 2004; Moody, 2004; Love & Krueger, 2005) are some of the models in the literature. The classroom teaching model was to establish and expound on the variables that affect academic performance.

In 1986, Rosenshine developed an explicit instruction to enhance the teaching methods of less-effective teachers and suggested that, for a teacher's teaching to be explicit, the purpose or goals of lessons should be stated, students' memories should be refreshed with previous lessons, and new materials should be presented and explained in small steps, with students practising each step. Explicit teaching also makes it incumbent for teachers to ask students questions, check for their understanding, obtain responses from them and monitor them during lessons (Carnine, Silbert, Kame'enui, Tarver & Jungjohann, 2006).

Moody (2004); Irvine (2004) and Love and Krueger (2005) established the cultural relevant practice and admonish African-American teachers to incorporate caring attitudes and mothering skills in their teaching practices. The authors encouraged teachers to demonstrate a strong belief in students, demand for students' best, ensure balanced discipline in teaching, adopt the teaching profession as a calling and use other effective practices in teaching students.

Love and Krueger (2005) also admonish teachers to regard their position in the community as a spiritual calling and provide their students on a regular basis with opportunities to learn collectively and cooperatively. Teachers were also implore by the authors to make few assumptions about students' prior knowledge and view teaching as an art and as giving back to the community. The writers stress that teachers should ensure that knowledge is reciprocal and encourage critical thinking skills among students

In terms of Factors influencing academic performance, several researches have been carried out in diverse parts of the world to account for either high or low academic performance. For examples, Stevens, Hough and Nurss (1993) studied the effects of single parenthood on children's school attainments and vocational training in West Germany; Friedrich (1995) asserts that family socialisation is a factor that influences children's academic performance; Sewell, Hauser and Wolf (1980) in their studies suggest that children, who come from families with better education, obtain more years of schooling than children who come from families with little or no education.

The work of Peraita, Carlos, Pastor and Margarita (2000) in Spain revealed that low test scores, school attendance and high school dropout rates are common with pupils whose parents' educational background is low. Haveman and Wolfe (1994) hypothesise that parents' education is important in predicting children academic achievement. Teachman, Paasch and Caver (1997) postulate that parents' human capital is important in determining their children's education; According to Odaga and Heveveld (1995), socio-cultural expectations of girls and the priority given their future roles as mothers and wives have strong negative bearings on their formal

educational opportunities. These socio-cultural anticipations influence parents 'decisions to withdraw their daughters from school and also influence the girls' decisions to drop-out of school, which, in turn, have a negative impact on their academic performance and grade level attainment.

In sum, the literature review uncovered number of factors that influence students' academic performance. According to the literature, the dominant factors that influence academic performance have been parent specific; student specific; teacher specific and above all, socio-cultural in character. The literature review also revealed some models that have been developed to explain the relationship between the teaching environment and the school performance of pupils. Specifically, the classroom teaching model developed by Mitzel (1969); explicit teaching model by (Rosenshine, 1986); and the cultural relevant practice model by (Irvine, 2004; Moody, 2004; Love & Krueger, 2005) are some of the models in literature. We have no reason to doubt the relevance of these factors and models to this present paper.

A BRIEF DISCUSSION OF THE DATA COLLECTION PROCEDURES

This study used cross-sectional study design. The area of study was the Ho Polytechnic in Volta Region, Ghana. At Ho Polytechnic, there are five faculties- Applied Social Sciences, Applied Sciences and Technology, Business and Management Studies, Engineering, and Art and Design. Our study target population was registered students studying tertiary courses at various stages in Ho Polytechnic. The total number of registered tertiary students as of the time of the study was 4,159, which was made up of 2,676 males and 1,483 females respectively (Planning & Quality Assurance Unit Ho Polytechnic, 2015).

In order to draw inference from a sample that will accurately reflect the population, careful attention was paid to the determination of the needed sample size. In all, a total sample of 350 was drawn from the target population. Since the target respondents appear to be heterogeneous in nature or departmentalised, the selection of the 350 response units from each group was determined by using proportional representation formula, $s_i = \frac{N_i}{N} x350$, where s_i denote the number of samples to be selected from a department *i;* N_i denote the total number of students in department *i;* and *N,* the total population. The summary of the sampling results are shown in Table 1.

Table 1
STRATIFIED RANDOM SAMPLE REPRESENTATION

Department	Number of Students	Proportional representation
Statistics	11	3
Hospitality & Tourism Management	336	79
I. C. T.	8	2
Computer Science	3	1
Agro-Enterprise Development	7	2
Industrial Art	7	2
Fashion Design & Modelling	163	38
Banking &Finance	60	14

Purchasing & Supply	65	15
Accountancy	342	81
Marketing	229	54
Secretaryship	220	52
Agriculture	8	2
Civil Engineering	0	0
Building Technology	6	1
Electrical/ Electronic Engineering	12	3
Automobile Engineering	4	1
Production Engineering	2	0
Oil & Gas Engineering	0	0
Multidisciplinary Studies	0	0
Applied Modern Languages	0	0
Total	**1483**	**350**

Source: Planning & Quality Assurance Unit, Ho polytechnic

The study employed a simple random sampling technique to identify the respondents in each department. To arrive at the sample, a sampling frame provided by each course representative from a list of students was obtained. A list of random numbers was then assigned to all elements in the sampling frame. Numbers were then picked randomly from the random table designed. This process continued until the required number of respondents was achieved in all departments. The structured interview schedule was employed to collect the data because it costs less and offers the possibility of higher response rate. It is also possible to generate both qualitative and quantitative data from respondents. The data were collected to reflect the exact objectives of the study. The interview schedule had three sections.

The first section consisted of demographic characteristics (sex, age, educational level, income and marital status) of lecturers. The second section consisted of school specific attributes. The last section dealt with student's specific attributes. The structure of questions in the instruments was a combination of open-ended and close-ended questions. The survey, which spanned across four weeks, was done in December, 2015. Three hundred and fifty questionnaires were administered. All interviews were personal where the questions were read aloud to the respondents in English. The respondents were visited in their lecture halls during teaching hours. If the respondents could not answer questions because of time, they were visited later to complete the schedule.

ANALYTICAL FRAMEWORK AND ESTIMATION PROCEDURES

A binary logit model was considered for the estimation of individual student's academic performance. We assume individual student's academic performance is dichotomous, high or low. Suppose the binary variable Y= (0, 1) denotes the academic performance of the individual student. Let y=1 if and only if the individual student performs highly and y=0 if otherwise (i.e. performs lowly). The probability of high academic performance of student is expressed as

$$p_i = (y = 1 | x_i) = \frac{\exp(x_i\beta)}{1+\exp(x_i\beta)} \quad 1$$

Where $X_i\beta = \beta_1 + \beta_2 X_2 ... \beta_k X_k$

Equation (1) indicates that the probability of not having higher academic performance can be stated as:

$$1 - p_i = \frac{1}{1+\exp(x_i\beta)} \quad 2$$

We can, therefore write

$$\frac{p_i}{1-p_i} = \exp(x_i\beta) \quad 3$$

By taking the natural log of equation (3) we obtain the logistic function

$$L_i = \ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta X_i + \varepsilon_i \quad 4$$

Where ln is natural logarithms; p_i is the probability of achieving high academic performance, defined in terms of cumulative logistic probability function; $1-p_i$ is the probability of achieving low academic performance; X_i is a vector of explanatory variables; ε_i is a random disturbance term; and $[\alpha, \beta]$ are the intercept and slope parameters to be estimated.

The empirical model for estimating high academic performance is specified as:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 democh + \beta_2 stusch + \beta_3 lec\,\mathrm{sc}\,h + \beta_4 schsch + u_i \quad 5$$

Where *democh* is demographic characteristics of respondents, *stusch* is student specific characteristic, *lecsch* is lecturer specific characteristics, *schsch* is school specific characteristics and u_i is the error term. The expected signs of the coefficients are: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$.

It is easy to verify that as $x'\beta$ ranges from $-\infty$ to $+\infty$, $P(\chi)$ varies from 0 to 1 and that it relates nonlinearly to $x'\beta$.This specification, however, poses estimation problems because $P(\chi)$ is non-linear not only in the regressors but also in the parameters as could be seen from (1). This means that we cannot use the familiar Ordinary Least Square (OLS) procedure to estimate the parameters. The commonly used technique for estimating models with binary dependent variable such as logit is the Maximum Likelihood Estimation (MLE).

This technique is employed to estimate the parameters in our logistic regression models. The method of the maximum likelihood consists of estimating the unknown parameters in such a manner that the probability of observing the dependent variable is as high (maximum) as possible (Gujarati, 2006). It is possible to show that unique maximum exist for the binary logit model. Pindyck and Rubinfield (1991) argued that Maximum Likelihood Estimation yields consistent parameter estimators. Thus, the MLE would produce the most likely value to the parameters given our sample data. The odd ratios of the explanatory variables and their connections with the dependent variable were also determined after estimation of the parameters. These enabled us identify the variables that have the greatest influence on students' academic performance.

EMPIRICAL ANALYSIS AND RESULTS

This subsection looks at the summary statistics of the respondents. A total of 350 students completed the questionnaire. Table 2 summarizes the socio-demographic information of the respondents. Out of the 350 respondents 54.6% of them were male and 45.4% were females. Also 61.7% of the respondent were between the ages of 18 and 25, 33.3% of them are between 26-35 age group and 4.0% were in 36-45 age group. The analysis further revealed that about 68.9% of the respondents were never married, 27.7% of them were married whiles the rest 3.4% of them were divorced.

Table 2
DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS (N=350)

Variables	Frequency	Percentages
Gender		
Male	191	54.6
Female	159	45.4
Age		
18-25	216	61.7
26-35	120	33.3
36-45	14	4.0
Marital Status		
Never Married	241	68.9
Married	97	27.7
Divorced	12	3.4

Source: Field data (2016)

DEFINITION OF DEMOGRAPHIC CHARACTERISTICS

DC1= Age of student
DC2= Class size and composition
DC3= Lack of convenient learning environment
DC4= Low economic status of parents
DC5= Poor parental involvement
DC6= Family responsibility of students
DC7= Peer influence
DC8= Availability of school infrastructure and materials
DC9= Extra curriculum activities

Table 3
LOGISTIC REGRESSION ESTIMATES OF DEMOGRAPHIC CHARACTERISTIC PREDICTING ACADEMIC PERFORMANCE

							95.0% C.I.for EXP(B)	
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
DC1	0.022	0.129	0.028	1	0.867	1.022	0.794	1.315
DC2	0.019	0.117	0.025	1	0.873	1.019	0.810	1.281
DC3	**-0.257**	0.113	5.144	1	**0.023**	0.774	0.620	0.966
DC4	0.087	0.123	0.502	1	0.479	1.091	0.857	1.390
DC5	**-0.338**	0.130	6.805	1	**0.009**	0.713	0.553	0.919
DC6	**0.323**	0.092	12.297	1	**0.000**	1.382	1.153	1.655
DC7	-0.094	0.130	0.527	1	0.468	0.910	0.706	1.173
DC8	0.106	0.152	0.488	1	0.485	1.112	0.826	1.497
DC9	**-0.317**	0.146	4.735	1	**0.030**	0.728	0.547	0.969
Constant	1.963	0.750	6.844	1	0.009	7.121		

Source: Field data (2016)

The Wald statistics and the significance level in Table 3 show that four out of the nine independent variables namely; "*DC3= Lack of convenient learning environment", "DC6= Family responsibility of students", "DC5= poor parental involvement",* and *"DC9=Extra curriculum activities"* were significant in the prediction of academic performance in Ho, Ghana. This is because they had p-values values of less than 0.05 (sig. in Table 2).

This observation confirms assertions of Christenson and Gorney (1992) that family and environmental factors affect students' achivement. In addition, the findings are not different from Ryan (2000) that associating with friends who have positive effect towards school enhanced students' own satisfaction with school, whereas associating with friends who have negative effect towards school decreased it.

Thus the logistic function is given by the equation (2) below:

$$P(Academic\ Performance) = \frac{1}{1 + e^{-(1.963 - 0.257DC3 + 0.323DC6 - 0.094DC7 - 0.317DC9)}}$$

Furthermore, the odd ratio ($Exp(\beta)$) for the significant factors, shows the increase (or decrease if the ratio is less than one) in odds of being in one outcome category (turnover or no turnover) when the value of the predictor increases by one unit. From table 2, the odds or risk of 0.774 for *DC3 (Lack of convenient learning environment)* indicate that students who study in a convenient learning environment were 0.774 times more likely to have high academic performance as compared with those who lack convenient learning environment, ceteris paribus. The odd ratio for *DC6 (Family responsibility of students)* also indicate that, ceteris paribus, students who have and performs family responsibilities were 1.382 times more likely to have low academic performance as compared to those who do not have nor perform any family responsibility. For *DC5= poor parental involvement, the* odd ratio of 0.713 means that students whose parents do not take interest in their academic activities were 0.713 times less likely to have higher academic performance as compared with those whose parents take interest in their academic affairs, all else being equal.

Finally, the odd ratio for *DC9 (Extra curriculum activities*) means that students who participate more in extra curriculum activities were 0.728 times more likely to have low academic performance as compared with those who do not partake in any extra curriculum activities, ceteris paribus.

DEFINITION OF STUDENTS SPECIFIC CHARACTERISTICS

SSC1= Lack of adequate effort and self confidence
SSC2= Punctuality and regularity of student to lectures/class
SSC3= Study habits
SSC4= Being addicted to drinking, smoking, night clubs etc
SSC5= Long hours spend on social network like facebook and whatsapp
SSC6= Poor attitude towards courses
SSC7= Ability to attend library and do more research
SSC8= Test and Examination Anxiety
SSC9= Ability to understand course materials and curriculum

Table 4
LOGISTIC REGRESSION ESTIMATES OF STUDENT SPECIFIC CHARACTERISTICS PREDICTING ACADEMIC PERFORMANCE

							95.0% C.I.for EXP(B)	
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
SSC1	**0.328**	0.211	2.408	1	**0.002**	1.388	0.917	2.100
SSC2	**-0.914**	0.221	17.064	1	**0.000**	0.401	0.260	0.619
SSC3	0.107	0.173	0.384	1	0.535	1.113	0.793	1.564
SSC4	0.008	0.179	0.002	1	0.962	1.008	0.709	1.434
SSC5	-0.180	0.169	1.138	1	0.286	0.835	0.600	1.162
SSC6	**-0.240**	0.105	5.158	1	**0.023**	0.787	0.640	0.968
SSC7	**0.246**	0.109	5.136	1	**0.016**	1.279	1.034	1.582
SSC8	0.219	0.193	1.287	1	0.257	1.245	0.853	1.817
SSC9	0.158	0.179	0.776	1	0.378	1.171	0.824	1.665
Constant	1.340	0.847	2.502	1	0.114	3.819		

Source: Field data (2016)

The Wald statistics and the significance level in Table 4 show that four out of the nine independent variables namely; "*SSC1=Lack of adequate effort and self-confidence", "SSC2=Punctuality and regularity of student to lectures/class", "SSC6=Poor attitude towards courses",* and *"*SSC7= Ability to attend library and do more research*"* were significant in the prediction of academic performance in Ho, Ghana. This is because they had p-values values of less than 0.05 (sig. in Table 3).

This finding support Allen-Meares, Washington, & Welsh (2000) study that poor attendance such as truancy or unexcused absence from school, cutting classes, and tardiness is important in determing pupils' academic achievement. House (1997) and Hassan (2002) also complemental the results with their findings that pupils' initial attitude towards school and course is significantly related to academic performance.

Thus the logistic function is given by the equation (2):

$$P(Academic\ Performance) = \frac{1}{1 + e^{-(1.340 + 0.328SSC1 - 0.914SSC2 - 0.240SSC6 + 0.246SSC7 + 0.158SSC9)}}$$

Regarding the odd ratio ($Exp(\beta)$) for the selected student specific characteristics, *SSC1 (Lack of adequate effort and self-confidence)* indicates that students who did not put in adequate effort and lack self-confidence were 1.388 times more likely to have lower academic performance as compared with those who puts in adequate effort and have self-confidence, all else being equal. For *SSC2 (Punctuality and regularity of student to lectures/class),* the odd ratio indicates that students who are not punctual and regular to lectures were 0.401 times more likely to have low academic performance as compared with those who are punctual and regular to lectures, all else being equal. Also the odd ratio for SSC6 *(Poor attitude towards courses)* means that, all else being equal, students who develops poor attitude towards course were 0.787 time more likely to have lower academic performance as compared with those develop positive attitude towards courses.

Furthermore, for SSC7 *(Ability to attend library and do more research*), the odd ratio of 1.279 indicated that, all else being equal, students who normally attend library and do more research are 1.279 times more likely to have higher academic performance as compared with students who do not attend library and do more research. Finally, the odd ratio for *SSC9 (Ability to understand course materials and curriculum*), although not significant at 5 percent, means that, all else being equal, students who make sure they understand course materials and curriculum were 1.171 times more likely to have higher academic performance as compared with those who do not make any effort to understand course materials and curriculum, all other factors being equal.

DEFINITION OF LECTURER SPECIFIC CHARACTERISTICS

LSC1= Clarity of lecture presentation
LSC2= Lecturer's attitude towards students
LSC3= Availability of instructional aids
LSC4= Ability to hold the attention of students during lecture hours
LSC5= Encouragement of discussions and question during lecture hours
LSC6= Continuous monitoring of progress of learners through assignments and exercises
LSC7= Lecturer commitment to teaching
LSC8= Content of curriculum and methods of teaching
LSC9= Lecturer work habits

Table 5
LOGISTIC REGRESSION ESTIMATES OF LECTURER SPECIFIC CHARACTERISTICS PREDICTING ACADEMIC PERFORMANCE

							95.0% C.I.for EXP(B)	
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
LSC1	**0.482**	0.194	6.211	1	**0.013**	1.620	1.109	2.368
LSC2	-0.018	0.174	0.011	1	0.916	0.982	0.698	1.382
LSC3	0.124	0.217	0.326	1	0.568	1.132	0.739	1.733

LSC4	**0.279**	0.165	2.857	1	**0.011**	1.322	0.956	1.827
LSC5	**-0.529**	0.191	7.671	1	**0.006**	0.589	0.405	0.857
LSC6	**-0.575**	0.220	6.806	1	**0.024**	0.563	0.365	0.867
LSC7	-0.146	0.254	0.329	1	0.566	0.864	0.526	1.422
LSC8	**0.109**	0.215	0.257	1	**0.019**	1.115	0.731	1.701
LSC9	0.100	0.178	0.318	1	0.573	1.106	0.780	1.568
Constant	1.058	0.854	1.538	1	0.215	2.882		

Source: Field data (2016)

The Wald statistics and the significance level in Table 5 show that four out of the nine independent variables namely; *"LSC1= Clarity of lecture presentation","LSC4= Ability to hold the attention of students during lecture hours","LSC5= Encouragement of discussions and question during lecture hours", "LSC6= Continuous monitoring of progress of learners through assignments and exercises"* and *"LSC8= Content of curriculum and methods of teaching"* were significant in the prediction of academic performance in Ho, Ghana. This is because they had p-values values of less than 0.05 (sig. in Table 4).

This is consistent with findings of Cooper, Lindsay, Nye, & Geathouse (1998) that homework or assignments be a correlate of academic performance. They stated that homework or assignment bore a positive relation with learning outcomes when it is relevant to learning objectives.

Thus the logistic function is given by the equation (2):

$$P(Academic\ Performance) = \frac{1}{1 + e^{-(1.058 + 0.482LLC1 + 0.279LLC4 - 0.529LLC5 - 0.575LLC6 + 0.109LLC8)}}$$

Also the odd ratio of 1.620 for the significant lecturer specific characteristics *LSC1 (Clarity of lecture presentation)* means that, other things remaining the same, students whose lecturer's presentation in class are clearer were 1.620 times more likely to have higher academic performance as compared with students lecturer's presentation in class are not clear. Again, the study indicates that, other things being equal, students whose attention is held during lecture hours were 1.322 times more likely to have higher academic performance as compared with those whose attention are divided during lecture hours. This is because, the odd ratio for *LSC4 (Ability to hold the attention of students during lecture hours),* was significant at 5 percent. Following from that it was observed from the study that, other things being equal, when students are encouraged by their lecturers to have discussions and questions during lecture hours, then they will be 0.589 times more likely to have high academic performance as compared with when there is no encouragement of discussions and questions during lecture hours. The reason being that the odd ratio of 0.589 for *LSC5 (Encouragement of discussions and question during lecture hours)* was found to be significant at 5 percent from the study.

Furthermore, the odd ratio of 0.563 for *LSC6 (Continuous monitoring of progress of learners through assignments and exercises),* indicated that students were 0.563 times more likely to have high academic performance when there is a continuous monitoring of progress of learners through assignments and exercises, all other things being equal. Finally, the odd ratio of 1.115 for *LSC8 (Content of curriculum and methods of teaching*) indicates that students were

1.115 times more likely to have high academic performance when the content of curriculum and methods of teaching are favourable to students, all other factors being equal.

CONCLUSIONS AND RECOMMENDATIONS

The objective of this study was to assess the demographic, student specific and lecturer specific characteristics that predict academic performance of tertiary students in Ho, Ghana. A cross-sectional study design was used and the area of study was the Ho Polytechnic in the Volta Region of Ghana. The target population for this study was registered students studying tertiary courses at various stages in Ho Polytechnic. The total number of registered tertiary students as of the time of the study was 4,159, which was made up of 2,676 males and 1,483 females respectively (Planning & Quality Assurance Unit Ho Polytechnic, 2015). In all, a total sample of 350 was drawn from the target population, using proportional representation formula. A binary logit model was used for the estimation of individual student's academic performance.

The descriptive statistics show that 54.6% of respondents were male and 45.4% were females. From the binary logistic estimation, the results show that for the four significant demographic characteristics (*DC3=1, DC6=1, DC7=1, DC9=1)* included in the model, the estimated probability that student will have higher academic performance is 83.45% of the time. In terms of student specific characteristics (*SSC=1, SSC2=1, SSC6=1, SSC7=1, SSC9=1),* the estimated probability that student will have higher academic performance is 71.46%. Finally, the binary logistic regression results revealed that for the lecturer specific characteristics (*LSC=1, LSC4=1, LSC5=1, LSC6=1, LSC8=1),* the estimated probability that student will have higher academic performance is 69.51%.of the time.

Therefore, identifying factors such a punctuality and regularity of both students and lecturers to class and ensuring that materials that lecturers present to students are very clear and understandable by all students, that lecturers monitor students' progress of learning through constant assignments and quizzes and that students academic affairs understand that the time students spend participating in extra curriculum activities impacts on their grades, should be the best policy option for all stakeholders who are interested in higher academic performance in tertiary schools.

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EXPERIENTIAL Vs. LECTURE-BASED TEACHING: DOES THE CHOICE OF INSTRUCTIONAL METHOD MATTER?

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ABSTRACT

This paper examines the effectiveness of an activity-based teaching versus discussion-based teaching approaches on a student performance. The research, undertaken at University of Wisconsin Stout, examines the academic record of 413 students enrolled in five sections of Principles of Macroeconomics in fall 2012. We randomly select two sections to participate in the activity (treatment group) and the rest of the sections (three) serve as a control group. Course materials and assessments were consistent between the two groups. The results, as measured by in-class exercise administered to both groups, are analyzed to compare students' knowledge of concepts directly after the learning activities. We find students in the experiential groups experienced a significantly higher gain in their in-class exercise scores. Additionally, our regression results indicate that certain student's characteristics, including ACT scores, hours they spent on social media, age, employment status and use of tutoring services, can be used predict student's performance when choosing between the two teaching methodologies.

INTRODUCTION

During the past few years, we have been very much interested in understanding, designing, developing and implementing an innovative approach to teaching and conducting research projects with undergraduates through activity-based learning and classroom experiments. In an effort to enhance teaching-learning in higher institutions for students' success, many educators agree that having clear learning objectives and fair assessments are the key starting points. However, we do not often talk about and research how we can effectively evaluate our teaching methodologies for effective delivery in both face-to-face and online classroom settings. It is an established fact that, effective students' assessments emerge from clearly stated learning objectives. However, we should note that the effectiveness of our teaching approaches also matter to achieving the learning objectives. If we fail to effectively communicate information which is intended to achieve the learning objectives, we will end up with unfair assessments. In other words, an effective teaching methodology bridges the gap that exists between learning objectives and the assessments of the outcomes. In this regard, innovative approaches to teaching not only help us to enhance students' learning but also improve course assessments. There are a number of teaching methods and tools we can use for effective delivery of course materials. However, it is interesting to ask which ones are serving our best interest? Which teaching approaches help students and educators to achieve the learning objectives? And how our choices of teaching approach can affect students'

performance? Innovative teaching approaches which are tailored to achieve a specific clear learning objective would lead educators to fair assessments and a higher students' performance. In this paper we are interested to investigate whether activity-based teaching and learning approach (classroom experiment) enhance student performance compared to discussion based approach.

While teaching in a lecture-based approach may be a very popular approach in a very diverse learning environment, incorporating an activity-based learning approach may better overcome differences in commitment, motivation and retention. The traditional lecture format mainly emphasizes on giving information rather than learning and tends to reinforce performance goal orientation. Such a regime may do little to develop mastery, confidence and independent learning skills in students who need help in these respects, or to stimulate those who become disinterested. Indeed, the traditional lecture–seminar format can actually alienate such students from the learning process. We argue that the unique hands-on experience provides the potential for tremendous learning based on concrete experience. Activity based learning (ABL) or experiments stimulate students to a height that is not matched by textbook readings or lectures. Many attempts have recently been done to determine students' degree of motivation and learning outcomes associated with experiments in principles of economics classrooms. Although the research is not conclusive, experiments are generally found to be enjoyed by students more, and lead to either increased or neutral test scores as compared to the standard lecture format (Yandell, 2004; Ball et. Al, 2006; Durham et.al, 2007).

We use the term activity-based economics to designate an approach to teaching economics that includes three important components: a carefully design activity or experiment, data generation and analysis, and consistent application of the economic way of thinking and problem solving. When students are engaged in the study of economics by using economic reasoning and problem solving, they are more likely to understand the concept being taught and its importance. Moreover, students simply enjoy learning economics this way and become more interested in the subject matter.

Active-based learning methods often include the production of a document, display, graphs or other tangible results that can generate immediate feed-back and can be used to illustrate complex concepts. Students are actively engaged in the lessons. With guidance from the instructor, they become active participants in the learning process. They take part in different types of experiment, simulations, problem solving, classroom demonstrations, role-plays, and group presentations. Equally important, however, is that an activity-based learning depends on the teacher's ability to engage students and encourage them to actively participate in the activities or experiments.

In this paper, we investigate the effectiveness of the activity-based-learning compared to the lecture based discussion learning with students who enrolled in the Principles of Economics courses at the University of Wisconsin-Stout. We randomly select course sections as a treatment group and the rest of the sections serve as control group. Two instructors conduct the same experiment or activity for the treatment groups and do the traditional discussion methods for the control groups .

Both instructors use the same textbook and use the same set of questions for the assessments.

The primary research questions of the paper are the following:

(1) Does a choice of teaching methods enhance student performance?
(2) Which student specific characteristics explain student performance?
(3) Which group of people benefits the most from experiential or activity-based learning?

Most previous studies primarily focus on the impact of experiential learning on students' performances and there are mixed results regarding the effect of experiential learning on students' performance. This paper, however, contributes to the literature in two ways. First, we investigate which categories of students benefit the most from the activity based learning. Do experiments mainly benefit better students, widening existing differentials in learning? Or do experiments narrow dispersion by improving the relative performance of weaker students? Second, we also study whether experiential learning positively affects student performance immediately after the activity or later in the course.

The remainder of the paper proceeds as follows. In section 2, we provide the background and design of the experiment. The data and methodological framework are discussed in section 3. Section 4 analyzes the regression results. Finally, section 5 concludes the paper.

BACKGROUND AND DESIGN

The study was conducted in the Polytechnic University of Wisconsin Stout with an enrollment of 9247 students, approximately of 8270 whom are undergraduate students. The data used were obtained from two sources: the instructor's records of students' grades on the experiment and student responses to a semi-anonymous online survey. At the end of the experiment/activity, all sections of the course were sent an e-mail inviting them to participate in the study. The e-mail contained a link to an online survey that was constructed using Qualtrics, a Web-based tool for creating online surveys. The survey required approximately ten minutes to complete and consisted of questions about students' general demographics, employment status, educational background, and social issues. To stimulate response, numerous reminder messages were sent to students stressing the importance of the study, and the survey was left open for three weeks. The response rate for the survey was 50% Students provided informed consent on the survey and reported their student ID numbers. Those ID codes were used to link the survey results to students' grade records, after which all identifying information was deleted to preserve subject anonymity. We also used the final exam scores and TUCE IV (Test of Understanding College Economics) to assess the socio-economic impact on students' performance. TUCE IV, developed by the National Council on Economic Education, is a standardized, well documented and widely used instrument for measuring the achievement of college students in economics.

We conducted an activity-based teaching and learning in two randomly selected sections of Principles of Economics I. We selected the Production Possibilities Frontier as a topic to do the class activity with students. The activity consists of two parts: an in class component and an out of class component. Prior to the in class component, students were given a copy of the activity design.

In class the experiment was led by the professor and students were invited to participate by answering and asking questions and discussing concepts and ideas as a whole class and in small groups. Attendance was the only thing that was required of the students for this component. The out of class component, students were asked to complete an assignment that was directly related to the in class experiment. Students were also asked to provide feedback on their learning, how the experiment helped or hurt their learning, and any suggestions they had for improvement.

Production Possibility Frontier (PPF)

Opportunity cost is one of the most important concepts introduced in many introductory economics courses. Virtually all economist consider opportunity cost central to our understanding of what it means to think like an economist. However, a study by Ferraro and Tylor (2005) suggests that most students and professional economists may not really understand it. They also found out that even the top-selling college-level introductory textbook do not provide the reader with enough information to answer some basic opportunity cost questions correctly.

The Production Possibility Frontier model helps to illustrate the important concepts in economics, including scarcity, the law of increasing opportunity cost, efficiency and economic growth. We can define PPF as a curve that shows the maximum combinations of two outputs that an economy can produce in a given period of time with its available resources and technology. From my own personal experience, it is a lot easier to use a straight line PPF curve that shows a constant trade-off (slope) to illustrate the concept of opportunity cost. In most case students were able to follow the lecture quite easy. However, it is quite challenging for students to grasp the law of increasing opportunity cost in the case of bowed-out shaped PPF. In the next section, we present a simple classroom activity that would help students understand the law of increasing opportunity cost better. It could be implemented in either one or two 55 minutes class session(s).

Classroom Activity (PPF) Learning Objectives

Upon completion of this activity, students will be able to:

(1) Explain what the Production Possibilities Frontier represents,
(2) Graph a PPF using Microsoft Excel
(3) Define opportunity Cost using PPF
(4) Recognize the relationship between the slope of PPF and opportunity Cost.

Design

Assume that all students in the classroom represent citizens living in a hypothetical country called Utopia. All of them represent working adults who participate in the production of ‘football’ and ‘smile’. Moreover, each one of them is capable of producing footballs and smiles. However, since resources are scarce (in this case labor), the production of more one good is only possible by producing less of the other. In other words, there exists a trade-off.

Activity#1: Instructions

Divide the class into two large groups of equal size. One group produces 'smiles' and the other group produces 'footballs'. Distribute two different colored papers for each group. Let students draw their assigned good (smile or football) on a piece of paper which represent the level of production per unit of time.

Assumptions

(1) Everyone is able to produce one unit of good/service per hour.
(2) Each individual works one hour per week.
(3) Each producer in each group is equally efficient (produces equal amount per unit time).
(4) Each worker is a perfect substitute. In other words, every worker is equally equipped in the production of both goods. For a given unit of time, a worker can either produce a football or smile of the same amount.

Scenario #1 Perfect Substitutability of Inputs of Production (e.g. Labor)

Production Possibilities

(1) Put football in the y-axis and smile in the x-axis and let class determine the level of production if each group decides to produce their assigned product. In this scenario, half of the class produces footballs and the other half produces smiles. This is the single point on the graph.

(2) Now assume the whole class decides to produce smiles and let students determine the point on a graph that represents the level of production. Remember that if citizens of Utopia only produce smiles, then the production of football would zero.

(3) Now assume the whole class decides to produce footballs and let students determine the point on a graph that represents the level of production. Remember that if citizens of Utopia only produce footballs, then the production of smile would zero.

(4) Now let the students determine other different possible combinations of the production of smiles and footballs. Plot the data using Microsoft Excel and name the graph 'Production Possibility Frontier (PPF)'.

Scenario #2 Imperfect Substitutability of Input of

Production Assumptions

(1) Some students (4-5 students who sit either in the front or the back row of your classroom) in each group are able to produce two units of their assigned good student but one unit of the other good per hour per week. For instance, some of the students in the group who produces football are now able to produce two football per students per hour but still be able to produce one 'smile' per hour. In other words, they are more efficient or specialized in the production of football.

(2) Each individual works one hour per week.

(3) Workers are imperfect substitutes since some workers are now specialized in producing either 'football' or 'smile'

Production Possibilities

(1) Put football in the y-axis and smile in the x-axis and let the class determine the level of production if each group decides to produce their assigned product. In this scenario, half of the class produces footballs and the other half produces smiles. This is the single point on the graph.

(2) Now assume the whole class decides to produce smiles and let students determine the point on a graph that represents the level of the production. Remember that if citizens of Utopia only produce smiles, then the production of football would zero.

(3) Now assume the whole class decides to produce footballs and let students determine the point on a graph that represents the level of the production. Remember that if citizens of Utopia only produce footballs, then the production of smile would zero.

(4) Now let the students determine other different possible combinations of the production of smiles and footballs. Plot the data using Microsoft Excel and name the graph "PPF".

After the completion of the activities, students' success was assessed using multiple choice questions and applied problems that were designed to measure how well students were mastering the content of the experiment/activity. The applied questions were particularly designed to evaluate students' higher level of learning. The results from these assessments were used to measure student performance with respect to the control group and after controlling for numerous socio-economic factors which could influence student's academic performance.

METHODOLOGY

The analysis of our data was performed using ordinary least square (OLS) regression. While exploring the difference in student performance, we control for number of factors that could potentially account for the differences between the control and treatment group. To represent students' general academic aptitude, we asked the participants to self-report their ACT scores. To control for differences in students' socioeconomic status, we had them self-report their employment status, monthly income, their parents' income, and living arrangement. We also control for age and gender. In order to control for their time allocation, we asked students how much time they spent on social media in a given day. To control for financial problem to pursue their degree, students self-report whether they struggle to finance their education or not. Finally, we control for their academic background such as the number of maths course taken, economics course in high school and in college, frequency in seeking help with tutoring service. The experiment dummy takes one if students belong to the treatment group and zero otherwise (control group).

RESULTS AND DISCUSSION

Our descriptive statistics in Table 1 reveals some differences between control and treatment group. The mean comparisons of hours spent in social media indicate that students in the control group spend more time as compared to the treatment group. There is also a significance difference in the proportion of male and female in the two groups. The control group has more female students as compared to the treatment group. The mean comparison results also show that there is a significant difference in the performance (scores for the in-

class exercises) between the two groups. In general, male students did better than female students (Table 2). However, such difference is further magnified in the treatment group and it disappeared in the control group. A within group comparison reveals a different set of conclusions. Table 3 summarizes the findings. The table shows that there is less disparity in performance between male and female students in the control group as opposed to the treatment group. For example, while female students slightly outscore their male counterpart in the control group (58 percent versus 57 percent), male students decisively outperform female students in the treatment group (65 percent versus 57 percent).

Table 1
SUMMARY OF DESCRIPTIVE STATISTIC TREATMENT VERSUS CONTROL GROUPS

Variable	Control		Treatment		Difference in Means
	Mean	SD	Mean	SD	
Grade (%)	58.0714	19.2921	62.5178	18.7461	-4.44***
age	19.4642	1.5401	19.3750	1.4962	0.0892
sex	.5119	0.5028	0.3571	0.4834	0.1547**
ACT/SAT	22.3888	3.3211	22.8541	3.3197	-0.4652
Social m	4.2349	3.7460	2.5441	2.2548	1.6908**
Employment Status	0.4166	0.4959	0.5357	0.5032	-0.1190*
tutoring	0.1071	0.3111	0.0555	0.2312	0.0515
#math	1.3170	1.1317	1.9636	1.0176	-0.6465***
Economics course in high school	0.6341	0.4846	0.6545	0.4798	-0.0203

Table 2
ACT AND EXPERIMENT SCORES

Sex	Summary of ACT Score Mean	Summary of Experiment Score Mean	Time spent in Social Media
Male	22.3043	61.3116	4.3516
Female	22.9411	58.0634	2.9933
Total	22.575	59.85	

Table 3
PERFORMANCE BASED ON GENDER AND GROUP

	Control Group			
Sex	Freq.	Percent	Cum.	**Score (experiment)**
Male	41	48.81	48.81	57.5853
female	43	51.19	100	58.5348
Total	84	100.00		58.0714
	Treatment Group			
Sex	Freq.	Percent	Cum.	**Score (experiment)**
Male	36	64.29	64.29	65.5555
female	20	35.71	100	57.05
Total	56	100.00		62.5178

Table 4
VARIABLE DEFINITION

Variable	**Obs.**	**Mean**	**Std. Dev.**
Grade (out of 100)	140	59.85	19.13298
experiment (1=Treatment Group, 0=Control Group	140	0.4	0.491657
Age	140	19.4285	1.517964
Gender	140	1.55	0.49928
Employment Status (1=Employed, 0=Unemployed)	140	0.4642	0.500514
Age at first job	102	15.2941	1.957915

Table 5
EMPLOYMENT STATUS AND PERFORMANCE

Employment Status	Freq.	Percent	**Score (Experiment) Mean**
Unemployed	83	59.29	61.43
Par-time	51	36.43	58.31
Full-time	6	4.29	51
Total	140	100	

Table 6
YEARS IN COLLEGE AND PERFORMANCE

Level	Freq.	Percent	**Score (experiment) mean**	**Male**	**Female**
Freshman	67	47.86	59.35	61.56	55.8846
Sophomore	50	35.71	58.24	61.75	55
Junior	20	14.29	64.50	58	71

Senior	3	2.14	66.66	67.5	65
Total	140	100			

Students in the treatment group took more maths classes, less tutoring service, and more likely employed as compared to the control group. However, we see no significant difference in ACT score, age and number of course taken in high school between the two groups. Table 4 shows that 63 percent of the students who completed the survey affirmed taking an economics course in high school while 25 percent took a similar course in college. While math is not a prerequisite for the principles of economics course, it appears that only 20 percent of the students enrolled in the course without taking at least 1 course in mathematics. Thus, the majority of the students who enrolled in the course were equipped with a comparable academic training to be successful in an introductory level economics course. However, a closer look at the students' ACT/SAT scores reveals another story. In effect, the average ACT/SAT scores were about 22 with a maximum score of 30 and a minimum of 15. However, there is no difference in the mean ACT score between the control and the treatment groups or between male and female students. Two additional variables, namely age and the number of economics courses taking in high school, show no significant differences between the control and the experiment groups. In contrast, two variables exhibit significant difference between the treatment and control groups. In effect, the treatment group has more male students than female students, and is also the group with students who spends less time on social media per day. In general, female students spend twice more time in social media as compared to male students. Male and female senior students did better than other students (see Table 6).

While the ACT score seems to be similar across the two groups, the difference in performance is reflected in their scores from the experiment assignment. Students who participated in the activity based learning/experiment, on average, outscored students who participated in the traditional discussion based session by 4 points. To provide an insight into the possible causes of the difference in performance on the experiment assessment, we run several cross-tabulations. For example, Table 3 shows that male students outperform their female counterparts by 3 points on their score for the experiment questions. 60 percent of the students affirmed not working at the time they completed the survey, 34 percent were working part-time and 6 percent were full-time workers and full time students. Table 5 indicates that students who did not have a job perform better than those who were working either par-time or full-time job with the exception of senior students. Students who allocated more time for school purpose benefited the most out of the experience. Higher performance is achieved by either not working or spending less on the social- media.

We hypothesize that difference in students' performance could be explained by the influence of several factors, namely the amount of time the students spend on social media, students' academic aptitude, financial struggle to pay for college, willingness to seek the available tutoring help, number of maths taken, and employment status etc. To provide more insights on the effect of the aforementioned factors on student performance when comparing the traditional discussion teaching and activity-based teaching approaches, we run a regression and the results are reported in Table 9.Our results indicate that some key variable, including our variable of interest, are statistically significant with the expected sign.

We find that the experiential students have significantly larger point gains on the in-class exercises, other things equal. The remaining coefficient estimates, when statistically significant, have the expected sign. We find that our measure of aptitude, ACT score, is

significantly positively correlated with students learning, which has been highly robust finding in my research. Specifically, a one point increase in ACT score leads to a positively statistically difference in experiment score of 2.9 points, ceteris paribus. Student's employment status negatively affects students' performance. Students who at least work par-time scored less compared to those who are not currently working. The plausible explanation would be that time spent at work may reduce time available to study. Older students have larger point gains on the exercise.

We also find that students who currently being tutored enjoy a substantial gains on their scores. This strong positive reinforcement of tutoring service on students' academic performance should be encouraged and made available to students whenever possible. The upward trends in the integration of technology in higher education are driven by the fact that technology helps to engage students in the learning process and therefore improve their academic performance. It is also equally supported that technology could have a detrimental impact on student's learning if it is not properly used for educational purpose. The University of Wisconsin Stout is a laptop campus. The descriptive statistic table (Table 1) indicates the students spend an average of four hours on social media in a given day, with a standard deviation of about three and half hours. Moreover, the preliminary regression results, as presented in Table 9, indicate a statistically negative coefficient estimate for the social media variable when interacted with the experiment dummy. Students who participate in the activity may lose about 3 points for every hour they spent in the social media. Considering the self-reported amount of time they tend to spend on social media, the adverse impact on their academic performance is quite substantial. In order to control for instructor-level heterogeneity, we introduce an instructor dummy and our result shows a significant positive impact on students learning.

Table 7
FINANCIAL PROBLEM AND PERFORMANCE

Control Group		
Financial Problem	Grade	Freq.
No	58.1860	43
Yes	57.9512	41
Total	58.0714	84
Treatment Group		
Financial	Grade	
Problem	Mean	Freq.
No	65.5517	29
Yes	58.2692	26
Total	62.1090	55

Table 8
YEARS IN COLLEGE AND PERFORMANCE

Control	
Level	**Mean Score**
Freshman	57.45455
Sophomore	56.38235
Junior	63
Senior	60
Total	58.07143
Treatment	
Level	**Mean Scores**
Freshman	61.20588
Sophomore	62.1875
Junior	69
Senior	80
Total	62.51786

Table 9
REGRESSION RESULTS

Independent Variables	**Coef.**	**Std. Err.**
Experiment	17.5171**	8
Instructor dummy	6.2198***	1
Financial problem	-1.1519	4
#Maths courses	0.8231	1
Age	2.3066**	0
Employment Status	-3.8413***	0.9
Tutoring Service	11.8482*	6
Hours in Social Media	-0.3108	0
Experiment * ACT	-0.4292	0.
Experiment *Media	-3.3014**	1

ACT	2.7953***	0 .
Economics in College	2.554487	4
Economics in High	-1.6819	1
Constant	-47.554**	1
R-Square	0.32	

WHO BENEFIT FROM THE ABL (ACTIVITY BASED LEARNING?

In this section, we discuss the types of students who benefit the most from the activity based learning. Table 7 indicates that students who struggle to pay for college but belongs to the treatment group did a little bit better as compared to those in the control group. Students at each level of years of education significantly benefit from the activity based learning as compared to the control group. However, junior and senior students have a higher mean difference as compared to freshman and sophomore students. In general students who are currently being tutored score lower than students without the service. A plausible explanation is that the students are willing to seek help from their peers when they struggle, presuming that the service is made available. In the treatment group, students who are currently being tutored show a 50% improvement in their score as compared to a 5% improvement of students who are not currently being tutored. Male students in the experiential group seem to show higher improvement in their score compared to their female counterparts.

CONCLUSION

This study assesses the effects of an experiential learning exercise used in undergraduate Principles of Economics classes at the University of Wisconsin Stout and compares the results to those attained when the traditional lecture method was used in other classes. Our preliminary results lend to support the effectiveness of active-based teaching over the traditional teaching approach. The results, as measured by in-class exercise administered to both groups, were analyzed to compare student performance directly after the learning activities were concluded. Our results indicate that students in the experiential sections experience a statistically significant higher gain in their in-class exercise scores. Additionally, our regression results indicate that, certain student's characteristics, including ACT scores, age, employment status, hours they spent on social media and use of tutoring services, predict student performance when choosing between the two teaching methodologies. Experiential learning seems to improve performance of male students and relatively weaker students.

APPENDIX

Table A
SUMMARY OF THE LITERATURE REVIEW

Authors (years)	Methods	Findings on students' achievement	Other findings	Over result
Gremmen and Potters (1997) Frank (1997)	Single experiment	the experiment improves their understanding of the specific topic illustrated		Positive
Cardell et al. (1996)	Multiple experiment	no significant effect on student achievement from the four experiments		neutral
Emerson and Taylor (2004), Dickie (2006), Ball et al. (2006), and Durham et al. (2007),	Hand-run and computerized experiments	significantly higher levels of achievement (either measured by the Test of Understanding in College Economics or course work performance)	Evaluation of instructor increased, student enjoy experiment more (positive attitude)	positive
Yandell, 2004	Multiple experiments	The impact on student performance is less dramatic	improve overall student satisfaction and interest	Less dramatic (neutral?)

#miss work (1=Never, 2=Rarely 3=Sometimes, 4=Often)	65	1.3538	0.513285
Financial Problem (1=Struggle to pay for College, 0=No problem)	139	0.4820	0.501484
ACT Score	120	22.575	3.3145
Tutoring (1=Currently being tutored, 0=Otherwise)	138	0.0869	0.2827
Frist in the family to go to College (1=Yes, 0=No)	138	0.1884	0.3924
Economics Course in High school (1=Yes, 0=Otherwise)	137	0.6423	0.4810
Economics in College (1=Yes, 0=Otherwise)	137	0.2554	0.4377
#Math courses	137	1.5766	1.1293
# Hours spend in social media	134	3.5914	3.3529
Parent's marital status (1=Married, 2=Divorced, 3=Separated)	136	1.3602	0.5795
#Visit to town home (1=Every weekend,2=Every month,3=During Holiday,4=Rarely)	138	2.3550	0.7996

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FOUNDERS' APPROACH ON SUCCESSOR SELECTION: GAME THEORY ANALYSIS

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ABSTRACT

Family firms are vital in economies worldwide. However, only a small minority of these outlive their founders. The founder's lack of a proactive approach towards the succession process has been pointed out as a key contributor to that reality. This paper employs game theory to study the impact of the founder's approach on successor selection in family firms. The results obtained for a founder who adopts an activist approach and invites his preferred successor are compared to those where the founder just reacts to his children initiating the succession race. The findings provide analytical evidence of the importance of the founder being proactive to safeguard intergenerational continuity as well as increase the propensity of his/her preferred successor being appointed.

INTRODUCTION

Family firms are the oldest and most prevalent form of business in the world, representing 70 to 90 percent of the global Gross Domestic Product (GDP). Family firms worldwide range from micro and small firms to large conglomerates which dominate the global business panorama. Family firms is an area of research which has drawn rising interest given the impact and influence that such firms have on the economy worldwide. However, only 3 out of 10 family firms survive to the second generation and only 10% to 15% live on to the third (Kets de Vries, 1993). The challenge of management succession is the ultimate test that the founders of family firms face.

The founder is the first link between the family and the business dimensions of the family firm. The symbiosis which prevails of both these dimensions in the family firm justifies that founders of family firms pursue not only economic but also non-economic goals which affect their decision making process (Gómez-Mejia, Núñez-Nickel & Gutierrez, 2001; Klein & Kellermanns, 2008). The founder values the firm living on as his legacy (an important emotional benefit) but is also concerned in protecting family harmony (Friedman, 1991). The key emotional factors are firm intergenerational continuity and family harmony. The founder wants to secure the firm's executive control staying in the family but also wants to protect the family from conflict.

The founder's reluctance to move forward with the succession has been referred to as culprit of family firm's high mortality rates (Harvey & Evans, 1994). This paper contributes by deepening the use of game theory to provide analytical evidence of the importance of the founder adopting a proactive stance towards the executive succession, focusing on successor selection. We contribute to the literature, by extending the succession game modeled by Jayantilal, Palacios & Jorge (2016). In their model they include, for the first time, the non-economical

factors. They consider the emotional benefit of intergenerational continuity and the emotional costs related to conflict between family members. In their model they apply a game where the siblings simultaneously decide whether or not to pursue the successor position and then the founder makes his choice, in accordance to the firm's cultural setting. Their results highlight the importance of cultural congruence to ensure both firm continuity and family harmony.

In order to study the impact of the founder's approach on successor selection, we start by extending Jayantilal, Palacios & Jorge (2016) model to employ a sequential game where the founder, adopts an activist approach (Michael-Tsabari & Weiss, 2013), and actively moves forward with the succession by inviting his preferred successor. We then employ another sequential game where the founder is denoted as having a reactive approach, and only takes a stance after his children initiate the succession race. Our model's novelty also resides in the comparison between the outcomes in both these games, taking into consideration the children's career aspirations and, also, the father/child relationship, as these factors also play a role in terms of the chosen successor. For each case the payoffs of the games are ranked and subsequently the successor outcomes compared.

The findings demonstrate the importance of the founder assuming an activist approach to increase the propensity of his preferred child being appointed. The results collaborate that founders who are passive and simply do not assume the realms of the succession process have a greater risk of not ensuring intergenerational executive continuity of the firm.

In practical terms, we provide analytical evidence of the importance of founders' approach to successor selection and hope this works as an added impetus for family firm intergenerational sustainability.

The paper begins with an introduction to family firms and successor selection. This is then followed by the presentation of the cases studied and the comparison of the results obtained. We finalize by reflecting on the impact of the findings, and suggest future avenues of research.

FAMILY FIRMS

Family firms are said to be the beginning of any form of business activity (Wakefield, 1995). These organizations dominate the economic landscape of all the major economies. The European Commission (2009) indicates that family owned firms represent more than 65% of all organizations in the European Union and 40% to 50% of employment and are therefore considered to be "(...) *crucially important for Europe* (...)", by the President of the European Commission (Barroso, 2007). In Australia, family firms account for more than 70% of all businesses and in Latin America 65% to 90% and over 95% in the US, contributing in 40% to the American Gross National Product (GNP). In the United Kingdom family firms account for 70% of all enterprises in the private sector responsible and for more 50% of the employment. In Portugal and Spain these firms account for 70% and 75%, respectively, of the total of firms (International Family Enterprise Research Academy [IFERA], 2003). It is unquestionable that family firms play a pivotal role in the world economy not only due to their presence but, and more importantly, because of the impact they have on the macroeconomic variables. Studies, in different countries, acknowledge the vital contribution they make in terms of economic growth and employment generation (IFERA, 2003; Anderson & Reeb, 2003).

Various researchers have compared family and non-family firms to understand the differences that exist. Their findings show that family firms, in contract to non-family firms,

adopt a longer term orientation (Eddleston, Otondo & Kellermanns, 2008; Anderson & Reeb, 2003); are more conservative and risk adverse (Chrisman et al., 2010; McConaughy, Matthews, & Fialko, 2001) exhibiting greater resistance to change (Naldi et al., 2007; Zahra, 2005).

Family firms tend to be characterized by higher motivation, cohesiveness and commitment of the members comparatively to non-family members (Dunn, 1996; Donckels & Fröhlich, 1991; Lee, 2006). The strategic behaviour of family firms tends to be more inward oriented (Dunn, 1996; Fukuyama, 1995; Wong, McReynolds & Wong, 1992) and therefore exhibit reduced resource to debt (McConaughy, et al., 2001; Gallo & Vilaseca, 1996). The lower level of indebtedness reinforces the family firm's orientation towards less risk to defend from loss of control (Zellweger, Meister & Fueglistaller, 2007; Blanco-Mazagatos, Quevedo-Puente & Castrillo, 2007) preferring internal sources and avoiding external long term debt (Upton & Petty, 2000; Davidson & Dutia, 1991). Family firms are inclined to reinvest profits due to their long term orientation and risk attitude (Vallejo, 2009; Gallo & Vilaseca, 1996; McConaughy, Henderson & Mishra, 1998; Poutziouris, 2001; Donckels & Fröhlick, 1991; Gallo, Tàpies, & Cappuyns, 2004).

The employees of family firms have higher levels of identification with the values of the family firm and are more involved, also due to the higher degree of loyalty in family firms in comparison to non-family firms (Adams, Taschian, & Shore, 1996; Kets de Vries, 1993; Ward, 1988; Neubauer & Lank, 1998; Tagiuri & Davis, 1996). Family firms, as a consequence of the higher levels of trust which exist between the members, are identified with better working atmosphere and greater levels of organizational commitment (Barnett & Kellermanns, 2006; Poza, Alfred & Maheshwari, 1997; Hosmer, 1995; Ward & Aronoff, 1991; Lee, 2006).

In terms of performance, however, the findings are not homogenous. Whilst some researchers defend that family firms lead to higher performance and valuation (Sraer & Thesmar, 2007; Fahlenbrach, 2009; Villalonga & Amit, 2006) others refer that gains in agency costs are offset by costs associated with problems such as parental altruism, nepotism, adverse selection, free riding of some members and negative spill over effects of tensions and conflicts of the family to the firm (Barnett, Eddleston & Kellermanns, 2009; Dyer, 2006; Anderson & Reeb, 2003; Burkart, Panunzi & Shleifer, 2003).

Confronting family firms with non family firms sheds light on key distinctive features of family firms yet, notwithstanding the importance of family firm worldwide, there is no consensus as to their definition (Neubauer & Lank, 1998). However, it is generally accepted that the singularity of such firms arises from the co-existence and interaction of the family and the business dimensions, as symbolically represented by Tagiuri & Davis (1996). The founders of family firms are the vertex between the family and the business dimension and play a central role in both (Sundaramurthy & Kreiner, 2008; Litz, 2008).

Founders have a fundamental influence over how the organization initially defines and solves its external adaptation and internal integration problems (Schein, 2004; Harvey & Evans, 1994). The founder defines the firm's mission, choice of members and is in charge of its functioning (Dyer, 1986). In the earlier phase of the family firm, the founder has a unique and very privileged position to impose on the organization his/her values and beliefs, creating the basis of the organization's identity. The values and beliefs of the firm are rooted in the founder's education, life experience, family, and background (Arregle, Hitt, Srimon & Very, 2007). Thus, the founders have an important role in influencing the direction of the organization and its configuration (Handy, 1993). Their influence goes far beyond the earlier stages due to their long

and active roles in management (Denison, Lief, & Ward, 2004) but also resulting from the role they play in ensuring the firm's inter-generational sustainability.

Their centrality in both the family and the business explains why their decisions are driven by both economical factors (i.e. maximizing profits) but also non-economical factors (i.e. emotional factors) which are related to the family dimension (i.e. safeguarding from conflict; ensuring intergenerational continuity). As a result, their decision making process is driven to maximise the weighed sum of both economical and emotional factors (Klein & Kellermanns, 2008), by the relative importance they attribute to both the firm and family dimensions, respectively. One of the most strenuous decisions they face is the selection of their successor.

FAMILY FIRM SUCCESSION

Succession is undisputedly the most critical challenge that family firms face (Cabrera-Suárez, De Saá-Pérez & García-Almeida 2001). The succession process is described as a mutual role adjustment between the founder and the next-generation (Handler, 1990, 1992). It is a multistage and evolutionary course, characterized by the trade-off between the successor's growing involvement and the reduction of involvement of the founder culminating in the transfer of the baton, as Dyck, Mauws, Starke and Mischke (2002) put it. Mutual respect and understanding between the generations is essential for the process to run smoothly (Cater & Justis, 2009).

This process encloses various steps including the selection, preparation, integration, and finally the transfer of power to the successor. Once the successor becomes the incumbent then the cycle repeats itself. Dyck et al. (2002) draw an analogy between the succession process and a relay race with success depending on sequence, timing, the passing of the baton and communication.

Succession planning refers to the dynamic process which requires the founder to plan the firm's continuity and then implement the plan (Francis, 1993). The role and responsibilities of both the predecessor and the newly appointed CEO should be clear in the succession plan (Sharma, Chua & Chrisman, 2000). Some firms opt for succession plans which are carefully developed with contributions of accountants, bankers and other experts. Researchers have found that successful transitions can occur even if there is only an informal succession plan (Morris, Williams, Allen, & Avila, 1997).

However the numbers attest that a large majority of family firms do not outlive their founders. The founders are considered responsible for high mortality rates of family firms due to their lack of initiative in adopting a proactive approach to executive succession. Founders' lack of planning is directly linked to their resistance in leaving the top position in the family firm. The founder's inability to let go has been cited as one of the major obstacles for succession (Sharma, Chrisman, Pablo & Chua, 2001). Founders often indefinitely postpone and neglect the succession due to their strong personal sense of attachment (Bruce & Picard, 2006; Le Breton-Miller et al., 2004; Dyer, 1986). Choosing a successor and kick starting the process translates, to many founders, as the beginning of the end. Many founders view leaving the firm and death, as one and the same (Barnes & Hershon, 1989). Consequently, to reflect on succession the founder has to accept his/her mortality, which can be strenuous (Lansberg, 1988). Additionally, the succession process, and in particular, the successor selection stage can ignite rivalries leading to conflict in the family and harmful effects in the firm (Friedman, 1991), which is also one of the reasons for many founders not adopting a proactive stance regarding successor selection.

The choice of the successor is a crucial step in the executive succession process, in the family firm. Different family relationships affect the way the issue of successor selection is addressed (Dyer, 1981). Beckhard and Dyer (1983) refer that the founder can have total and complete control over the succession process or can consult and/or involve family members and professional advisors. Depending on the prevailing culture, in-laws may or may not be considered for succession (Fiegener, Brown, Prince & File, 1994). Jayantilal, Jorge & Palacios (2016) highlighted the impact of cultural alignment on successful succession transfers.

A large majority of founders want the firm to live on and prosper at the realms of their descendants. The founder's legacy and inter-generational continuity are key non-economic benefits (Chrisman, Chua, Pearson & Barnett, 2012). The choice of successor is dependent on various factors such as: availability (Sharma et al., 2000), gender (Haberman & Danes, 2007), ability (Brockhaus, 2004), culture and tradition (Ayres, 1990) to name but a few. When choosing a successor the most values attributes are his ability, commitment to the business and interpersonal skills (Motwani, Levenburg, Schwarz and Blanson, 2006). A founder, when selecting a successor, takes into consideration leadership skills (Waldman et al. 2006) and capacities in the fields of human and operational management (DeNoble, Ehrlich & Singh, 2007) allied to the power to motivate and inspire the workers (Waldman et al., 2006). In a family firm context, the founder also weighs in the successor's family orientation (Lumpkin et al. 2008), i.e. the value the successor places on family involvement in the firm. As a result, the founder's choice is influenced by the business dimension of the family firm but also by the family dimension. The founder is rational but different from non-family firm owners as he aims to maximise the sum of emotional and financial values. The trade-off will depend on the founder's predisposition to value business performance or emotional value more. This predisposition will condition how he faces the challenge of family firm inter-generational continuity.

THE ROLE OF THE FOUNDER

The founder's approach to the succession process is of fundamental importance to ensure that the firm's executive control remains in the family. A founder who adopts a proactive stance and decides to move forward with the succession, by inviting one of his children to succeed him, is denoted as having an activist approach (Michael-Tsabari & Weiss, 2013). On the contrary, a founder who doesn't take that initiative, as many times happens (Bruce & Picard, 2006), but instead reacts when his children show interest in succeeding him we denote as having a reactive approach.

These approaches should be understood in the family setting where father and children communicate and express their views and desires. In this sense, when the father invites one of his children, it results from the father's knowledge of his children's abilities, personalities, interests and desires.

In the case of the founder who is more reluctant to address the succession process, his children can inform the father of their interest in heading the family firm. The child's manifestation should be understood not as an isolated and abrupt stance but rather a step-by-step process. Progressively he/she acquires the necessary skills and competencies, through training experience and learning, to be able to head the family firm, at which point he/she can express that desire to his father. The other child can either pursue an alternative career path or express

his/her desire to also head the family firm, in which case the father will need to choose between his competing children.

To analyze the impact of the founder's role on successor selection in the family firm, we adopt to a game theoretic approach. We base our model on the game used by Jayantilal, Palacios & Jorge (2016). Our setup resorts to two sequential games, with three players: the founder (F), his elder child (E) and younger child (Y). The sequential games are of perfect and complete information where the players move in sequence and are fully aware of the strategies available to each one, and observe all the moves before making theirs. Each player knows exactly who has made what move before making a decision. These games are expressed in extensive form. The extensive form is represented by a game tree which summaries all this information.

We start by presenting a founder who adopts an activist approach with regards to the succession selection. Figure 1 represents the three players and the two staged game, when the founder adopts an activist approach and invites the elder child to succeed. In this game, the founder invites his preferred successor who can either pursue the top position in the family firm or not, and subsequently the other child decides whether to pursue the successor position. It is important to highlight that when the founder adopts a proactive approach he/she still faces the possibility that the child he invites might decline his invite and instead opt for a career outside the family firm. However, children who are more averse to going against their parents' expressed wishes will find it more difficult to decline the invitation. This can be due to cultural reasons (Dyer, 1986) or higher affective commitment (Astrachan & Jaskiewicz, 2008).

In our second game, as opposed to a founder with an activist approach, the focus is now on the impact of a founder who does not want to take the initiative but instead adopts a more reactive role to his children's efforts in pursuing the successor position. The game starts with the elder child who moves first and chooses whether or not to pursue to head the family firm. Subsequently the younger child decides if he wants to pursue and finally the founder is called to make his choice and appoint his successor. This game tree is represented in Figure 2.

We then use the rankings of the payoffs obtained from both games. The payoff of each child is the net benefit he/she obtains from the conjunction of his/her decisions with that of the other child, given the founder's preference.[i] The ranking of payoffs translates the preference for each strategic outcome for each child, being the most preferred 3 and 1 the least.

We then find the equilibrium outcomes for both the games. As a sequential game is a sequence of subgames, the idea is to find the Nash equilibrium for each subgame, which refers to the set of strategies of best response for each player where there is no incentive for any player to deviate from that strategy (self-enforcing). To reach the subgame perfect Nash equilibrium (SPNE) solution in our sequential games with perfect information, backward induction was used. This technique warrants each player to look ahead and think backwards, before making his decision. The underlining logic is that each player should figure out how each of the others will react to his move, and how he will respond to that, and so on, as a result he should anticipate the different players' reactions to his move and consider this when making his decision (Kreps, 1990). Finally, having obtained the SPNE outcomes for both games these are compared in order to contrast the role played by the founder's approach on successor selection.

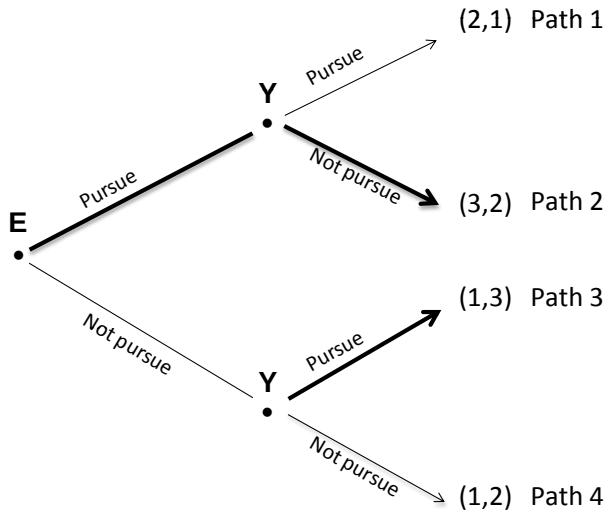
To study the impact that the founder's approach has on successor selection there are five possible cases which can be studied. In this paper we present the ones in which adopting an activist vs. reactive approach by the founder makes a difference in successor outcomes. We presume that the founder, who knows both his children well, prefers to appoint the elder child as

the successor[ii]. We consider the children's interest in developing their career outside the family firm but also whether they are subservient towards their father's expressed wishes.

Let's start by considering the case of E being subservient and averse to going against his/her father, characteristics of what Miller et al. (2003) define as a conservative succession pattern. In other words, even though he/she might have preferred to follow his/her career path outside the family firm, he/she is unwilling to do so if that means going against his/her father's expressed wishes.

Figure 1 represents the game when F adopts an activist approach and invites E to become his successor. The first node (also referred to as the root) represents the first move and refers to the elder child's decision to pursue or not the successor position. Subsequently the younger child is called to play and decides whether he wants to purse the CEO position or not. A path refers to the set of decisions that leads from the root to the terminal node (graphically the path leads from the root to the terminal node). The game has four possible outcomes, ensuing from four possible paths. Each player's ranking of payoffs from the different paths is shown at the far right end of the tree. The first number corresponds to that of E and the second to that of Y.

Figure 1
SPNE FOR ACTIVIST APPROACH



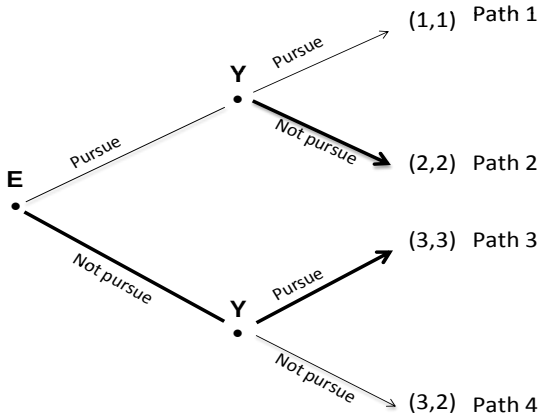
Notice that for E, given his subservient nature, and that F invites him, then E's most preferred outcome is to pursue (ranked 3) and not pursue is his least preferred (ranked 1).

To reach the SPNE backward induction is used. Starting on the upper part of the tree (when E has decided to pursue the position after having been invited by his/her father) then Y, given that he/she is rational and wants to maximize his/her wellbeing, will opt not to pursue. Now focusing on the node, where Y is called to play, given that E has decided to decline the founder's invitation, then Y prefers to pursue (path 3 vs path 4) and will be appointed successor. This is his/her best response as it is better for him in comparison to all his other options and is marked with a bolder line in the game tree in Figure 1. Continuing to employ backward induction we arrive at the root (first node). At this point it is E who needs to respond to his

father's invitation. E anticipating Y's choices will compare his outcomes from path 2 and 3 and will decide to pursue the successor position. This is his best response and is, also, marked with a bolder line in the tree in Figure 1.

As a result, the SPNE path[iii] is for E to pursue and for Y not to pursue the successor position, when the founder assumes an activist approach, and so E will be appointed successor. The equilibrium path is shown in the game tree, in Figure 1, and refers to the conjunction of the best responses of both players, marked with the bolder line, which links the root to the terminal node.

Figure 2
SPNE FOR REACTIVE APPROACH

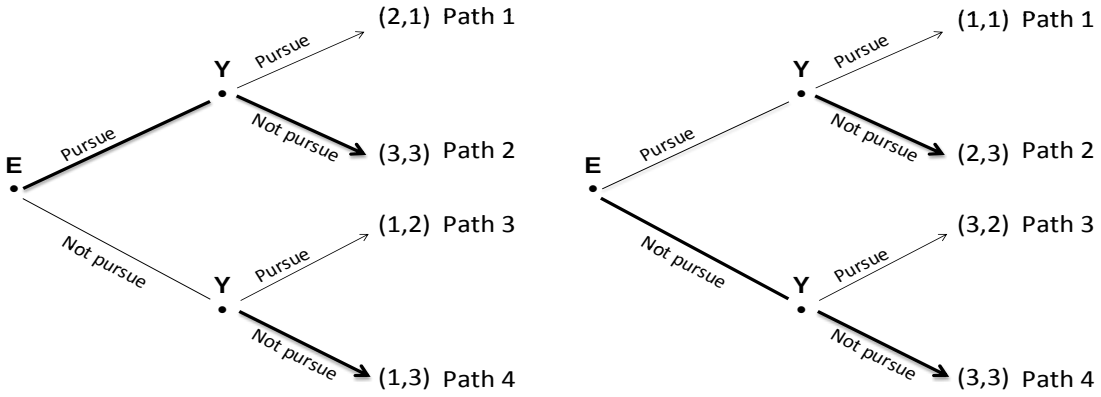


As opposed to a founder with an activist approach, the focus is now on the impact of a founder who does not want to take the initiative but instead adopts a more reactive role to his children's efforts in running for the position. The game for this succession approach is also of perfect and complete information, where the founder maintains his preference for E but doesn't proactively invite him. In this game E moves first and chooses whether or not to pursue to head the family firm. Subsequently the younger child decides if he/she wants to pursue.

To reach the SPNE again the backward induction technique is applied and the resulting equilibrium path is illustrated in Figure 2, with E not pursuing the position and Y pursuing the position, and so being appointed successor. Note that when E prefers a career outside the family firm and he/she is not conditioned he/she will opt out of the family firm.

Comparing the results it is apparent that by F inviting his preferred successor, in our case E, the founder increases the propensity of E being appointed successor. This is essentially due to the emotional costs the child faces of going against his father's expressed wishes.

Figure 3
SPNE FOR ACTIVIST AND REACTIVE APPROACH



Now we study the case where Y's career aspirations lay outside the family firm, whereas E's preferences are maintained. Figure 3 illustrates the game tree for this case, for both a founder with an activist approach (left side of Figure 3) and one with a reactive approach (right side). Notice that E's preferences, as illustrated by the rankings, remain the same as those presented before with regards to the different approaches that the founder can adopt (i.e. compare the rankings of E of the right plot of Figure 3 with Figure 1 and those of Figure 3 with Figure 2). Additionally, for a founder with a reactive type approach, the equilibrium paths for this case are also different to the one presented in Figure 2.

The SPNE outcomes, in this, case show that when the founder doesn't assume an activist approach then there is a real possibility that the firm's executive control will not stay in the family as the equilibrium path on the right side of Figure 3 illustrates. This case illustrates how the founder's approach directly contributes to high mortality rates of family firms. When the founder does nothing and waits to react to his children's actions he runs the risk of losing the opportunity to ensure that the family firm's executive power stays in the family and that his legacy lives on. This case reinforces the differences, in terms of successor selection, which results from the founder being (or not) proactive and moving forward and inviting one of his children to succeed him.

Comparing the successor outcomes resulting from the founder's approach, our findings emphasize the importance of the founder adopting an activist approach to increase the propensity of his preferred successor being appointed and ensure intergenerational firm continuity. The results highlight that if the founder doesn't actively initiate the process then there is a higher propensity that the firm's executive control will not stay in the family.

CONCLUSION

Various researchers have pointed to the founder's passivity towards planning succession as the major culprit of the tragically high mortality rates registered in family firms. By resorting

to the solid analytical foundations of game theory our results undisputedly illustrate the importance of the founder assuming an activist approach.

The founder by being more proactive places the onus on the child, making it more difficult for him to consider other career options. In other words, even when his preferred successor might desire to pursue his/her career outside the family firm, a founder who desires his preferred candidate to succeed him will be more successful if he takes a proactive stance. This is due to the emotional cost the children incur when they opt to go against their father's expressed wishes. The more averse the children are to conflict with their father, then the greater the propensity of securing intergenerational succession. In families which are more cohesive and have higher degrees of emotional attachment and/or in cultural settings where younger generations are more submissive, the founder being more proactive will be fundamental to ensure his preferred candidate is appointed successor.

Comparing the results it is evident that the propensity of the founder's preferred successor taking over the executive control of the firm is increased by the founder taking an activist approach. However, and more importantly, to ensure that the executive control of the firm remains in the family, our results stress that it is essential for the founder to be proactive. Our findings substantiate that the founder's approach towards the succession process directly contributes to the continuity of the firms' executive control remaining in the family.

For practitioners and consultants working with family firms the findings unequivocally demonstrate the importance of the founder adopting a proactive approach to successor selection. The results provide the analytical proof of the dangers that can arise jeopardizing the firm's continuity as well as harm the family's stability, and so should we hope to have contributed in providing an added motivation for founders to abandon their reluctance in addressing the issue of succession. An opportunity for future research would be to consider more complex games to include other family members and their influence on the founder's successor selection, but also extend to include non family possible successors.

ENDNOTES

[1] For more details regarding the underlining utility functions of the games see refer Jayantilal. S. (2016). *La Teoria de Juegos y la Sucesión en las Empresas Familiares.* Unpublished doctoral dissertation, Universidad de Extremadura.

[1] In the opposite case, identical conclusions may be achieved but with reference to the younger child.

[1] In this case the SPNE strategy, which refers the complete plan of action for each player for each contingency specifying what he/she will do when he/she is called to play is: Y –Not Purue if E Purse; Y – Pursue if E Not Pursue; and E: Pursue.

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ENABLING ENVIRONMENTS TO ADVANCE ECONOMICS EDUCATION: A FACTORIAL DESIGN

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ABSTRACT

The emergence of the Fourth Industrial Revolution brings challenges and provides opportunities for the education sector to accelerate the knowledge economy. This paradigm shift impacted immensely on the education sector. In today's ever-changing and increasingly competitive financial marketplace, knowledge is power. We are living in an age in which the information and communications revolution has inundated teachers with more information than ever before, even as the financial marketplace has become more complex. But simply having more information does not necessarily mean teachers have more knowledge educating learners on the basics of economics is an issue of critical importance. The purpose of this study is to use the exploratory factor analysis (EFA) to identify and interpret the underlying and common factors in respondents' responses that may influence their choice in creating powerful enabling teaching environments to advance economics education?"In today's ever-changing and increasingly competitive financial marketplace, knowledge is power. Education should be directed at reaching goals with regard to the acquisition of high quality knowledge, problem-solving skills, transfer of knowledge and skills, and self-directed learning skills. The measuring of sampling adequacy involves determining the suitability of individual variables for use in the factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO), a principle component analysis was computed on a Economics Teaching and Learning Attitude scale on the respondents' choices regarding the selection of teaching and learning principles in Economics. Four factors emerged from this research namely teaching methods; teacher teaching style; learner learning style and subject knowledge which respondents indicated as important and critical in achieving the learning outcomes for Economics teaching.

INTRODUCTION

In today's ever-changing and increasingly competitive financial marketplace, knowledge is power. We are living in an age in which the information and communications revolution has inundated teachers with more information than ever before, even as the financial marketplace has become more complex. But simply having more information does not necessarily mean teachers have more knowledge educating learners on the basics of economics is an issue of critical importance. South Africa is going through several education reforms in order to prepare more learners for challenges and success in the 21st century and beyond. The global economy has changed many of the ways we live and do business. It is critical that we equip our students, the workforce of tomorrow, with an understanding of how the economy works, and knowing how it affects everything from money management to small business to large corporations. A foundation in economic and financial literacy will inspire entrepreneurship, innovation, and prepare students to successfully adapt to a dynamic marketplace.

The purpose of this study is to use the exploratory factor analysis (EFA) to identify and interpret the underlying and common factors in respondents' responses that may influence their choice in creating powerful enabling teaching environments to advance economics education.

LITERATURE REVIEW

In the current view on learning, constructivism has a central position. Learning is seen as an active process of interpreting and constructing individual knowledge representations (Vermunt, 2003; De Corte, 2003). Learners have to process information actively and construct the knowledge through experience. Bolhuis (2003) posit that active knowledge construction in context contributes to advanced thinking and learning activities, resulting in high quality knowledge acquisition. Problem-solving skills are essential for living in a complex society. People are confronted with a variety of problems in daily life and at work. In order to effectively solve problems, three categories of skills are required (Van Merrie¨nboer & Paas, 2003; De Corte, 1990, 2003): (a) the flexible application of a well-organized domain-specific knowledge base, (b) systematic search strategies for problem analysis and transformation, and (c) metacognitive skills. Because real-life problems have a context that differs from the learning context, learners should also be able to transfer knowledge and skills they learned at school to new situations. They have to become competent in applying the knowledge in their worlds, beyond the school walls. In education, it is not a matter of reaching short-term goals, but of integrating acquired knowledge and skills with more general goals, such as understanding the surrounding reality, and adapting to changing circumstances (Dijkstra, 2001). Furthermore, people currently have at their disposal vast amounts of information, due to an increase in use of modern media, such as the Internet. In order to satisfy information needs, people have to find their way through what is available. This requires the ability to select, process, and organize information. Moreover, fast changes in work, technology, and society make it impossible to teach students everything at school, and during their youth. Individuals need to continuously update their knowledge, attitudes, and skills after graduation, however, without the support from teachers. They have to develop their professional competencies independently. An important goal of modern education is to prepare students for this lifelong process of learning. Students should acquire a self-directed way of learning: they should mainly regulate their learning processes themselves, and should be able to work without the help of others, and learn in an experiential way (Vermunt, 2003; Van Hout-Wolters, Simons, & Volet, 2000). In brief, education should be directed at reaching goals with regard to the acquisition of high quality knowledge, problem-solving skills, transfer of knowledge and skills, and self-directed learning skills. To catch these main aims of modern education, the term powerful learning environments is used, by which the current ideas about design and arrangement of learning environments are summarized. There is a significant amount of information about the characteristics of powerful teaching-learning environments (PTLEs). Several studies have been published work about designing such learning environments, and there is considerable agreement about the most important characteristics of PLEs. (De Corte 1990, 2003; Van Merrie¨nboer and Paas 2003; Vermunt 2003; Merrill 2002;). Notwithstanding, different authors have also stressed different aspects of the design, all characteristics can be brought back to the general educational aims mentioned earlier. Van Wyk (2009) is of the view that in order to stimulate active knowledge construction and the acquisition of problem solving skills, the learning environment should be problem-based, in that students are engaged in solving real-world problems. Learning tasks or

problems should be complex, realistic, and challenging in order to elicit an active and constructive learning process in students. Additionally, Merrill (2002) has described four other characteristics of PLEs that seem to be common in different current instructional theories. They can be seen as four phases of the learning process, which is directed to the acquisition of high quality knowledge and skills, problem-solving skills, and to transferability of learning outcomes. First, prior knowledge and experiences of the student must be activated, in order to build new knowledge on pre-existing knowledge. Second, new skills or knowledge must be demonstrated to the student through modelling. Third, the student should have the opportunity to apply their new knowledge and skills. Fourth, the newly acquired skills and knowledge must be integrated into real-world activities of the student. These features described by Merrill (2002) fit well with the ideas behind cognitive apprenticeship.

Conceptualized Economics Education

Economics education is a field within the teaching and learning of subject at school and university level that focuses on two main themes: 1) the current state of, and efforts to improve the economics curriculum, learner support materials and pedagogy used to teach economics at all educational levels; and 2) research into the effectiveness of alternative instructional techniques in economics, the level of economic literacy of various groups, and factors that influence the level of economic literacy (Brown, 2009). Economics education is distinct from economics of education, which focuses on the economics of the institution of education. Van Wyk (2009) argues that economic education focuses on the scholarship of teaching and learning economics as a subject. It encompasses the content to be taught (what-subject content knowledge), different teaching methods (how-pedagogical content knowledge), designing of applicable assessment practices (why-purpose of using assessment tools/strategies), and information of general interest to teachers of economics in primary, secondary to undergraduate studies. Moreover, Santomero (2003) indicates that the purpose of economic education is to create future responsible citizens, effective decision-makers and voters for change. The author further posits that economic education is a very crucial subject that many of our nation's schools tend to overlook. I am of the opinion that the importance of economic education goes far beyond the goal of improving an understanding of the basic principles of supply and demand and the workings of the economy. Economics education can be taught by generating new knowledge with the help of exposing learners to powerful and real-life learning environments and experiences to enhance critical thinking. Many learners develop perceptions of their economic world at an early age, which, as they progress through the educational process, develop into attitudes and opinions about the subject of economics. Intended or not, teachers influence the direction of attitude development. In reference to the latter, we must equipped our learners with effective money management skills and provide an understanding of how our ever-changing, fast-paced global economy works to avoid future global economic crisis.

The Importance of Economics Education

Walstad and Rebeck (2001) concurred and argues that economic knowledge is vital important for economic growth and development. Concluding from their findings, further emphasized that despite the gains; knowledge of economics by secondary school learners is relatively weak, suggesting that work remains in raising public literacy in a subject that is of central importance for citizens in many aspects of their lives. On the other hand, my view is that

the importance of economics education goes far beyond the goal of improving an understanding of the basic principles of supply and demand and the workings of our economy.

I believe learners develop perceptions of their economic world at an early age, which, as they progress through the educational process, develop into attitudes and opinions about the subject of economics. Walstad (1997) argue that teachers intended or not, influence the direction of attitude and development of learners understanding of the subject. On the other hand, Van Wyk (2012) content that teachers need to explore ways to teach learners which may contributing to improve attitudes toward the subject. By teaching basic economic concepts and applying them to classroom discussions of economic issues and institutions, teachers are not indoctrinating learners, but providing a knowledge foundation for more informed learner opinions and decision making on vital issues. The more economics concepts learners know, the more they like and value the subject and the more information they have about economic issues. Learners who do not get the opportunity to learn economics and increase their economic understanding will probably never take much interest in the subject or in their economic world. Beautement, King, Pilbeam, and Reynolds (2005) said that economics education is extremely important because it is vital to the future health of our nation's economy. The authors asked the following vital questions: Why is economic education needed? Why can we not rely on the truths of economics being recognized by the intelligent public without deliberate, organized effort at public enlightenment? Economic understanding does not call for sophisticated technical prowess. It does, however, require appreciation for a way of looking at human actions and of social interaction, which many at first find rather strange and unfamiliar (Manuel, 2006; Santomero, 2003). Economic understanding requires one to see the "objects" with which economic activity is concerned the money, the natural resources, the capital equipment, the flows of half-finished goods, the fully produced goods ready for delivery to the consumer from a subtly different perspective from that to which the layperson has been accustomed. In summation, economics is about choice and the impact of our choices on each other. It relates to every aspect of our lives, from the decisions we make as individuals or families to the structures created by governments and firms. Emanating from literature review, this study seeks to answer the following research questions: "*What are the underlying and common factors in respondents' responses that may influence their choice in creating powerful enabling teaching environments to advance economics education?"*

METHODOLOGY

The researcher undertook an empirical investigation by employing a quantitative method of research. An exploratory factor analysis (EFA) was constructed because of its resistance to common threats to internal validity (Mouton, 2001; Gray, 2004). The measuring of sampling adequacy involves determining the suitability of individual variables for use in the factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) (Berghaus, 2005). Secondly, a principle component analysis (PCA) was performed using Social Science Package Software (SSPS) statistical package analysis on a *Economics Teaching and Learning Attitude scale* questionnaire on the respondents' choices regarding the selection of teaching and learning principles in Economics (Cohen, Manion & Morrison, 2003, Leedy & Ormod, 2001). Only Economics teachers were purposefully selected to participate in the research study in the Free State Department of Education (FSDoE), South Africa. Teachers from Motheo, Xhariep, Fezile Dabi, Lejweleputswa and Thabo Mofutsanyane education districts of FSDoE participated in the study. One hundred and eight (n=108) teachers participated in this research study. This

represents 47.2% of the Economics teacher population (n=229 schools that offers Economics as school subject) within the five districts of the FSDoE.

A structured thirty-item *Teaching and Learning Attitude scale (TLA)* devised was designed on the basis of an extensive study of the relevant literature, and was distributed to 200 Economics teachers in Free State secondary schools and 47.2% (n=108) completed questionnaires were returned. The questionnaire was based on a 5-point Likert scale (aimed at determining the factor structure of the responses relating to teaching principles of Economics teachers in Free State secondary schools (Starborn, 2006). To ensure that the one hundred and eight Economics teachers were representative of the Free State, the researcher drew a random sample of respondents. Given that we were concerned primary with developing a concise, holistic questionnaire that might be use in complementary ways with powerful learning environment (PLE) measurements. We sought to develop an initial set of questionnaire items that adequately reflected key characteristics of teaching and learning context (TLC), learner involvement (LI) and competency levels (CL). Exploratory factor analysis (EFA) was selected because it does not impose a specific pattern on the data in an a priori manner. Instead, it provides an opportunity to identify a factor's inclusion substantially. EFA was warranted in this study as no previous research has examined the factor structure of teaching and learning principles in Economics education at school level in FSDoE in South Africa. The EFA was conducted to identify and interpret the underlying and common factors of respondents' reasons that influence the selection of teaching principles in the Economics. Gorsuch (1997) mentioned that EFA explains the variation in the observed variables in terms of underlying latent factors. The first step required to perform a factor analysis is to determine whether it is actually necessary to perform a factor analysis on the data. This is done by testing the adequacy with which the data can be sampled. The measuring of sampling adequacy involves determining the suitability of individual variables for use in the factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) (Berghaus, 2005). Secondly, a principle component analysis (PCA) was performed using SSPS statistical package analysis on 30 variables on the respondents' choices regarding the selection of teaching and learning principles in Economics (Cohen, Manion & Morrison, 2003, Leedy & Ormod, 2001).

RESULTS

Measurement of Sampling Adequacy

The suitability of the KMO for individual variables for use in the factor analysis which is aimed at measuring the sampling adequacy of 30 items in the questionnaire. A KMO-value which is greater than 0.5, indicates that the variable is significant at that level. The KMO-values relating to the importance of teaching principles for Economics that were included in the factor analysis which are presented in Table 1 (this KMO value scale was used: 0.90 to 1.00 = marvellous or 0.80 to 0.89 = meritorious or 0.70 to 0.79 = middling or 0.60 to 0.69 = mediocre or 0.50 to 0.59 = miserable and 0.000 to .0.49 = don't factor).

Table 1
KAISER-MEYER-OLKIN MEASUREMENT OF SAMPLING ADEQUACY
(N=108)

	Statements	Kaiser-Meyer-Olkin-values
1	When a learner does better in Economics, it is often because the teacher exerted extra effort.	0.87**
2	I am continually finding better ways to teach Economics.	0.98**
3	Even when I try very hard, I think I do not teach Economics as well as I teach other subjects.	0.41
4	When the Economics marks of learners improve, it is often due to their teacher having found a more effective teaching approach or method.	0.89**
5	I know the different methods to effectively teach Economics concepts.	0.86**
6	I can interpret Economic data and calculations easily.	0.83**
7	If learners are underachieving in Economics, it is most likely due to ineffective teaching of Economics.	0.27
8	I generally teach Economics less effectively compared to other subjects.	0.47
9	Graphs are a useful tool to explain Economics concepts to learners.	0.84**
10	The low Economics marks of some learners cannot be blamed on their teachers.	0.94**
11	The inadequacy of a learner's Economics background can be overcome by good teaching.	0.40
12	Learners who are weak in Mathematics generally do not do well in Economics.	0.93**
13	When a low-achieving learner progresses in Economics, it is usually due to extra attention given by the teacher.	0.43
14	I understand Economics concepts well enough to teach grade 12 NCAPS assessment standards effectively.	0.42
15	Increased effort in Economics teaching produces little change in some learner's achievement.	0.37
16	The teacher is generally responsible for the achievement of learners in Economics.	0.96**
17	Learners' achievement in Economics is directly related to their teacher's effectiveness in teaching Economics.	0.87**
18	Learners' achievement in Economics is influenced more by their own motivation to succeed than by their teacher's ability.	0.44
19	I find it difficult to explain to learners why different Economics theorists offer different solutions to economic problems.	0.41
20	I am usually able to answer learners' Economics questions.	0.69**
21	I can effectively teach the different mathematics calculations used in Economics.	0.90**
22	Effectiveness in Economics teaching has little influence on the achievement of learners with low motivation.	0.34
23	I find it difficult to explain to learners the various graphs in Economics.	0.61**
24	Given a choice, I would not invite the Head of Department or Principal to evaluate my Economics teaching.	0.48
25	When a learner has difficulty understanding an Economics concept, I find it hard to help the learner understand it better.	0.89**
26	When teaching Economics, I usually welcome learners' questions.	.091**

27	I do not know what to do to get learners interested in Economics.	0.48
28	Even teachers with good Economics teaching abilities cannot help some learners to learn Economics.	0.69**
29	Learners can understand Economics better if they are good in Mathematics.	0.68**
30	Learners find Economics boring compared to other subjects.	0.79**

***KMO > 0.5 of a factor analysis is significant*

Based on the data obtained in table 2, it is clear that eighteen of the variables scored a KMO-value that is well over 0.5 with the lowest being 0.68 = middling, the Learners can understand Economics better if they are good in Mathematics. The KMO-value scores of variables, I am continually finding better ways to teach Economics (0.98 = marvellous); The teacher is generally responsible for the achievement of learners in Economics (0.96 = marvellous); the low Economics marks of some learners cannot be blamed on their teachers (0.94 = marvellous); learners who are weak in Mathematics generally do not do well in Economics (0.93 = marvellous); when teaching Economics, I usually welcome learners' questions (0.91 = marvellous); and I can effectively teach the different mathematics calculations used in Economics (0.90 marvellous) was well over the 0.5 level and this indicates that the data qualify as marvellous and highly significant when measuring the importance of teaching and learning principles for Economics. In conclusion, the KMO sampling adequacy measurement of the nine variables is marvellous to meritorious (ranging from 0.90 to 0.98) and the factor analysis is thus appropriate for this study.

TEACHERS' CHOICES REGARDING TEACHING PRINCIPLES IN TEACHING ECONOMICS: PRINCIPAL COMPONENT ANALYSIS (PCA)

As a statistical technique, a PCA was conducted to determine the number of factors that should be included in the factor analysis (Cohen, Manion & Morrison, 2003). Research showed that PCA is used abundantly in all forms of analysis - from neuroscience to computer graphics - because it is a simple, non-parametric method of extracting relevant information from confusing data sets. With minimal additional effort PCA provides a roadmap for the reduction of a complex data set to a lower dimension to reveal the sometimes hidden, simplified structure that often underlies it (Shlens, 2005). The Eigen-value criteria were used to determine the number of factors that have to be specified in the factor analysis. Using the Eigen-value criteria, an Eigen-value of 1 was used as the cut off value. Based on the data obtained, five principle components had Eigen-values greater than 1 and explained 62.36 percent of the variance in all the respondents' choices regarding didactic principles in teaching Economics.

Table 2
PRINCIPAL-COMPONENT ANALYSIS OF TEACHING ECONOMICS (N=108)

Statements	Factor 1 TMS	Factor 2 TTS	Factor 3 LLS	Factor 4 SKS
When a learner does better in Economics, it is often because the teacher exerted extra effort.	**0.81****	0.37	0.34	0.44
I am continually finding better ways to teach Economics.	**0.89****	**0.73****	0.47	0.46
Even when I try very hard, I think I do not teach Economics as well as I teach other subjects.	0.21	**0.81****	0.45	0.49
When the Economics marks of learners improve, it is often due to their teacher having found a more effective teaching approach or method.	**0.83****	0.48	0.41	0.34
I know the different methods to effectively teach Economics concepts.	**0.84****	0.30	0.23	0.48
I can interpret Economic data and calculations easily.	0.34	**0.98****	0.38	0.22
If learners are underachieving in Economics, it is most likely due to ineffective teaching of Economics.	0.30	**0.82****	0.27	0.33
I generally teach Economics less effectively compared to other subjects.	**0.93****	0.32	0.41	0.39
Graphs are a useful tool to explain Economics concepts to learners.	0.44	0.33	0.21	**0.87****
The low Economics marks of some learners cannot be blamed on their teachers.	0.32	0.43	**0.78****	0.45
The inadequacy of a learner's Economics background can be overcome by good teaching.	0.38	**0.76****	0.23	**0.78****
Learners who are weak in Mathematics generally do **not** do well in Economics.	0.38	0.26	**0.88****	**0.78****
When a low-achieving learner progresses in Economics, it is usually due to extra attention given by the teacher.	0.22	**0.69****	**0.84****	0.40
I understand Economics concepts well enough to teach grade 12 NCAPS assessment standards effectively.	0.39	**0.83****	0.32	0.28
Increased effort in Economics teaching produces little change in some learner's achievement.	**0.70****	0.22	0.33	**0.91****
The teacher is generally responsible for the achievement of learners in Economics.	0.24	**0.92****	**0.67****	0.12
Learners' achievement in Economics is directly related to their teacher's effectiveness in teaching Economics.	0.42	**0.94****	0.42	0.46
Learners' achievement in Economics is influenced more by their own motivation to succeed than by their teacher's ability.	0.21	**0.87****	**0.83****	0.38
I find it difficult to explain to learners why different Economics theorists offer different solutions to economic problems.	0.43	**0.93****	0.34	0.13
I am usually able to answer learners' Economics questions.	0.34	0.23	0.41	**0.89****
I can effectively teach the different mathematics calculations used in Economics.	0.43	**0.87****	0.37	0.41
Effectiveness in Economics teaching has little influence on the achievement of learners with low motivation.	0.34	0.49	**0.86****	0.19

I find it difficult to explain to learners the various graphs in Economics.	0.45	**0.91****	0.39	0.27
Given a choice, I would not invite the Head of Department or Principal to evaluate my Economics teaching.	0.34	**0.72****	0.23	0.18
When a learner has difficulty understanding an Economics concept, I find it hard to help the learner understand it better.	0.47	0.15	**0.92****	0.28
When teaching Economics, I usually welcome learners' questions.	**0.75****	0.21	0.33	0.32
I do not know what to do to get learners interested in Economics.	0.45	**0.82****	0.33	0.44
Even teachers with good Economics teaching abilities cannot help some learners to learn Economics.	0.23	0.23	**0.94****	0.12
Learners can understand Economics better if they are good in Mathematics.	0.48	0.30	**0.74****	0.33
Learners find Economics boring compared to other subjects.	0.27	0.22	**0.72****	0.27

***KMO > 0.5 of a factor analysis is significant*
Factors: Teaching methods and strategies (TMS); Teacher Teaching style (TTS); Learner Learning style (LLS); Subject Knowledge and skills (SKS)

Based on data obtained in table 2, four factors met the KMO retention of Eigen-values greater than 1.00. The first factor is identified as Teaching methods and strategies (TMS) which accounted for 68,5% of the variance. This first factor included seven variables and accounted for 69% of the variance in the model (Eigen-value = 9.44). This second factor included fifteen variables in the area of Teacher Teaching style (TTS) for Economics and accounted for 6% of the variance in the model (Eigen-value = 2.41). The third factor also included ten variance and accounted for 35% of the variance (Eigen-value = 3.45). It was clustered as Learner Learning style (LLS). The final factor consisted of five variables and counted as 22% of the variance (Eigen-value = 6.35), and was clustered as Subject Knowledge and Skills (SKS). The item I am continually finding better ways to teach Economics appeared to be factorially complex as it loaded on both factors, Teaching methods and strategies (TMS) (r = 0.89) and Teacher Teaching styles (r = 0.73). However it was maintained on the Teaching methods and strategies (TMS) factor because of a similar retention of the variable in the data set. Another two items, Increased effort in Economics teaching produces little change in some learner's achievement and The teacher is generally responsible for the achievement of learners in Economics appeared also to be factorially complex as they loaded on both Teaching methods (r = 0.70) and Subject Knowledge and Skills (r = 0.91). However the items were maintained on the Subject Knowledge and Skills factor. The alpha coefficients for all four factors, Teaching methods and strategies (0.93); Teacher Teaching style (0.98) Learner Learning style (0.94) Subject Knowledge and Skills (0.91) were found to be acceptable respectively.

DESCRIPTIVE DATA ANALYSIS: MEAN SCORES OF ECONOMICS TEACHING AND LEARNING FACTORS

The mean and the standard deviation for the 30 items are shown in Table 3. Item 16, "The teacher is generally responsible for the achievement of learners in Economics". Item 3,

"Even when I try very hard, I think I do not teach Economics as well as I teach other subjects" and item 12, "Learners who are weak in Mathematics generally do **not** do well in Economics" are the three items with the lowest score. The highest mean score is associated with Item 6, "I can interpret Economic data and calculations easily". The result implies that teachers have a rather positive perception on the usefulness of economics education in their future professional teaching career. Teachers were able to relate the teaching and application of economics in their field of study even though some of them were not from the Economics and Management faculty but more from the Education faculty. Nevertheless, their main concern was their little or no knowledge regarding economics before taking up the subject, a lot have to be learnt and economics being a difficult subject.

Table 3
SUMMARY DESCRIPTIVE OF MEAN SCORES OF ECONOMIC TEACHERS (N=108)

	Statement	Mean*	SD	% Max**
1	When a learner does better in Economics, it is often because the teacher exerted extra effort.	3.43	1.39	68.6
2	I am continually finding better ways to teach Economics.	4.81	1.23	90.2
3	Even when I try very hard, I think I do not teach Economics as well as I teach other subjects.	2.35	0.89	47.0
4	When the Economics marks of learners improve, it is often due to their teacher having found a more effective teaching approach or method.	4.18	1.52	83.6
5	I know the different methods to effectively teach Economics concepts.	4.29	1.10	85.8
6	I can interpret Economic data and calculations easily.	4.90	1.39	98.0
7	If learners are underachieving in Economics, it is most likely due to ineffective teaching of Economics.	3.43	1,25	68.6
8	I generally teach Economics less effectively compared to other subjects.	4.07	1.22	81.4
9	Graphs are a useful tool to explain Economics concepts to learners.	3.91	1.17	78.2
10	The low Economics marks of some learners cannot be blamed on their teachers.	3.68	1.28	73.6
11	The inadequacy of a learner's Economics background can be overcome by good teaching.	4.58	1.31	91.6
12	Learners who are weak in Mathematics generally do **not** do well in Economics.	2.12	1.17	62.4
13	When a low-achieving learner progresses in Economics, it is usually due to extra attention given by the teacher.	4.13	1.22	82.5
14	I understand Economics concepts well enough to teach grade 12 NCAPS assessment standards effectively.	4.88	1.09	96.2
15	Increased effort in Economics teaching produces little change in some learner's achievement.	4.78	1.49	95.6
16	The teacher is generally responsible for the achievement of learners in Economics.	2.28	1.20	65.6
17	Learners' achievement in Economics is directly related to their teacher's effectiveness in teaching Economics.	3.34	1.2 6	46.8

18	Learners' achievement in Economics is influenced more by their own motivation to succeed than by their teacher's ability.	4.61	1.07	92.2
19	I find it difficult to explain to learners why different Economics theorists offer different solutions to economic problems.	4.19	.89	83.8
20	I am usually able to answer learners' Economics questions.	3.95	1.55	79.0
21	I can effectively teach the different mathematics calculations used in Economics.	3.43	1.19	68.6
22	Effectiveness in Economics teaching has little influence on the achievement of learners with low motivation.	3.39	1.04	67.8
23	I find it difficult to explain to learners the various graphs in Economics.	4.12	1.39	82.4
24	Given a choice, I would not invite the Head of Department or Principal to evaluate my Economics teaching.	2.12	1.50	42.4
25	When a learner has difficulty understanding an Economics concept, I find it hard to help the learner understand it better.	2.38	1.47	47.6
26	When teaching Economics, I usually welcome learners' questions.	4.58	1.33	91.6
27	I do not know what to do to get learners interested in Economics.	4.12	1.12	82.4
28	Even teachers with good Economics teaching abilities cannot help some learners to learn Economics.	3.98	1.28	79.6
29	Learners can understand Economics better if they are good in Mathematics.	4.77	1.17	95.4
30	Learners find Economics boring compared to other subjects.	2.11	1.00	52.4

- ✓ Mean*: 5 = Strongly agree 4 = Agree 3 = Uncertain 2 = Disagree 1 = Strongly disagree
- ✓ % Max** = percentage of maximum scores for each *TLEQ* item calculated by dividing item mean score by the maximum score for the *TLEQ* item (e.g. 2.62/5=51.2% or 94/5=78.4%).

Usable data from one hundred and eight questionnaires yielded means scores raging from 4.9 to 2.1 on a 5-point Likert scale. Table 3 shows the mean, standard deviation and percentage of maximum scores for each TLA items (98.0% maximum score).

In the next table 4, we are presenting and interpreting the use of Kaiser-Meyer-Olkin (KMO) as statistical technique to rotate a factor matrix and do a reliability analysis of data.

Table 4 **KAISER-MEYER-OLKIN (KMO): ROTATED FACTOR MATRIX & RELIABILITY ANALYSIS**	F1	F2	F3	F4
Factor 1: ***Teaching methods and strategies*** (Cronbach 's alpha = 0.901)				
1. When a learner does better in Economics, it is often because the teacher exerted extra effort.	0.785			
2. I am continually finding better ways to teach Economics.	0.731			
4. When the Economics marks of learners improve, it is often due to their teacher having found a more effective teaching approach or method.	0.710			
5. I know the different methods to effectively teach Economics concepts.	0.591			
11. The inadequacy of a learner's Economics background can be overcome by good teaching.	0.589	0.521		
16. The teacher is generally responsible for the achievement of learners in Economics.	0.532		0.433	
21. I can effectively teach the different mathematics calculations used in Economics.	0.512			
25. When a learner has difficulty understanding an Economics concept, I find it hard to help the learner understand it better.	0.496			
	0.451			
	0.431			

Factor 2 : *Teacher Teaching style* (Cronbach 's alpha = 0.881) 3. Even when I try very hard, I think I do not teach Economics as well as I teach other subjects. 6. I can interpret Economic data and calculations easily. 8. I generally teach Economics less effectively compared to other subjects. 13. When a low-achieving learner progresses in Economics, it is usually due to extra attention given by the teacher. 17. Learners' achievement in Economics is directly related to their teacher's effectiveness in teaching Economics. 24. Given a choice, I would not invite the Head of Department or Principal to evaluate my Economics teaching. 27. I do not know what to do to get learners interested in Economics.		0.701 0.631 0.576 0.530 0.491 0.482 0.422 0.341		
Factor 3: *Learner Learning style* (Cronbach 's alpha = 0.875) 7. If learners are underachieving in Economics, it is most likely due to ineffective teaching of Economics. 10. The low Economics marks of some learners cannot be blamed on their teachers. 15. Increased effort in Economics teaching produces little change in some learner's achievement. 18. Learners' achievement in Economics is influenced more by their own motivation to succeed than by their teacher's ability. 22. Effectiveness in Economics teaching has little influence on the achievement of learners with low motivation. 28. Even teachers with good Economics teaching abilities cannot help some learners to learn Economics.			0.779 0.633 0.552 0.512 0.487 0.475 0.455 0.400	

Factor 4: ***Subject knowledge and skills*** (Cronbach 's alpha = 0.886)				
9. Graphs are a useful tool to explain Economics concepts to learners.				0.725
14. I understand Economics concepts well enough to teach grade 12 NCAPS				0.569
19. I find it difficult to explain to learners why different Economics theorists offer different solutions to economic problems.				0.552
20. I am usually able to answer learners' Economics questions.				0.488
23. I find it difficult to explain to learners the various graphs in Economics.				0.469
26. When teaching Economics, I usually welcome learners' questions.				0.422
29. Learners can understand Economics better if they are good in Mathematics.				0.349
30. Learners find Economics boring compared to other subjects.				0.321

- ✓ * Cronbach 's alpha = *0.7*

Data in table 4, a reliability analysis was carried out on the four extracted factors. Reliability which describes the internal consistency of a set of items was measured by Cronbach's Alpha and item-total correlations. In general, reliabilities less than .60 are considered to be poor, those in the 0.70 range, acceptable, and those over 0.80 good to excellent (Cohen, Manion & Morrison, 2003). The measure of sampling adequacy, Kaiser-Meyer-Olkin (KMO), was 0.846 which is greater than the recommended minimum of 0.50 by Kaiser (1974). KMO values between 0.80 and 0.90 are considered to be good (Hutcheson and Sofroniou, 1999). The correlation matrix is not an identity matrix since the Bartlett's Test of Sphericity is statistically significant (Chi-Square = 3126.777, df =325, p< 0.000). These tests imply that factor analysis was appropriate. All the values are well above the bare minimum level of 0.5. Factors were extracted using the principal axis factoring method. An orthogonal rotation using Varimax with Kaiser Normalization was applied on the initial factors since there is no theoretical basis that the factors were correlated. The fit of the model is considered good since the Reproduced Correlations indicated that only 55 (16%) residuals were greater than 0.05. The Anderson-Rubin method was applied to calculate factor scores so that no multicollinearity exists (that is, the factors were uncorrelated with each other). Six interpretable factors were obtained from the analysis using Kaiser's criterion of retaining factors with eigenvalues greater than one. Looking at the point of inflexion of the scree plot, a graph of each eigenvalue (Y-axis) against the factor it is related with (X-axis) as proposed by Al-Qaisi (2010), it indicates that the data may have four underlying factors. The rotated factor matrix which is a matrix of the factor loadings for each variable onto each factor is shown in Table 4. Loadings of less than 0.40 are not shown in the rotated factor matrix since they do not represent substantive values (Holve-Sabel and Gustaffsson, 2005). The four interpretable factors accounted for 35.9%, 6.04%, 4.69% and 3.62% of the variance in the data for a total of 50.25% (before rotation) and 15.09%, 13.84%, 12.84% and 8.49% respectively (after rotation). Factor 1 is labeled '*Teaching methods and strategies'* with loadings varied from 0.785 to 0.431. It includes items from the highest to lowest scores such as "When a learner does

better in Economics, it is often because the teacher exerted extra effort (0.785) to " When a learner has difficulty understanding an Economics concept, I find it hard to help the learner understand it better (0.431). This factor which has the highest percentage of explained variance implies that teachers regard knowledge of effective teaching methods and strategies as essential in their teaching practice and everyday life in lesson presentations. Factor 2 is labeled '*Teacher Teaching style* with loadings from 0.701 to 0.341. It includes items such as "Even when I try very hard, I think I do not teach Economics as well as I teach other subjects (0.701)" to "I do not know what to do to get learners interested in Economics" (0.342). Factor 3 is labeled '*Learner Learning style* required in economics subject' with factor loadings ranging from 0.779 to 0.400. Among the items from the highest to lowest scores are "If learners are underachieving in Economics, it is most likely due to ineffective teaching of Economics."(0.779) to "Even teachers with good Economics teaching abilities cannot help some learners to learn Economics "(0.400). Factor 4 is labeled '*Subject knowledge and skills* with factor loadings from 0.725 to 0.321. Items included are "Graphs are a useful tool to explain

Economics concepts to learners "(0.725) to "Learners find Economics boring compared to other subjects "(0.321). There were two items of factor 1 loaded on Factor 2 and 3 which are. "I know the different methods to effectively teach Economics concepts" (F 2=0.521) and "The inadequacy of a learner's Economics background can be overcome by good teaching" (F 3=433). Item 28 is dropped from the list due to low factor loading.

Table 5
MEANS AND STANDARD DEVIATIONS OF THE TLAQ

	Mean Scores	Std Deviation
Teaching methods and strategies	4.428	0.541
Teacher Teaching style	4.327	0.629
Learner Learning style	4.093	0.718
Subject knowledge and skills	4.134	0.845

(A higher score of the mean indicates a more positive attitude)

Referring to Table 5, teachers tend to agree or showed positively of teaching methods and strategies (given the mean of Factor 1 = 4.428 which is better to 3 (neutral) on the 5-point Likert scale). The same observation goes to teaching style where teachers tend to agree on the perception that they must possessed subject knowledge and skills required in terms of teaching practical skills. Nevertheless, teachers tend to agree that teaching methods and strategies are somewhat important and but agree that they used their teaching style to accommodate learners learning styles. These results revealed that economics teachers were positive towards economics education who participated in this study. Independent sample t-test was performed on the mean score for each of the four factors to compare the attitudes towards economics education between gender. Table 6 shows the comparison between male and female economics teachers.

Table 6
COMPARISON OF MALE AND FEMALE ECONOMICS TEACHERS

Four factors exacted	Mean (Male)	Mean (Female)	t-value	p-value
Teaching methods and strategies	4.122	4.412	-0.355	0.782
Teacher Teaching style	4.216	3.365	-0.124	0.823
Learner Learning style	4.673	4.503	0.112	0.881
Subject knowledge and skills	4.264	4.534	-0.744	0.349

p-value = 0.05

Since the p-value for each of the four factors is greater than 0.05, there is no evidence that there is a difference in the perception of male and female economics teachers on the four dimensions of perceptions towards economics education. Male teachers performed better in teacher teaching style and learner learning style (mean = 4.673 and 4.216) than female teachers. In comparison to a study conducted by Holve-Sabel and Gustaffsson (2005) observed that their factor score analysis indicated that males enjoy economics relatively more than females, but were not significantly different from females regarding perceived difficulty or attitude toward usefulness of economics. Therefore, findings from this survey are inconsistent with similar studies with respect to enjoyment of learning economics between male and female students (Al-Qaisi, 2010; Holve-Sabel & Gustaffsson , 2005).

DISCUSSION OF FINDINGS

The findings of this study showed that four important factors emerged from the factor analysis regarding the underlying and common factors of respondents' responses that influence their choice of teaching and learning principles in the Economics classroom in Free State secondary schools. *Teacher Teaching style* (Cronbach 's alpha = 0.901) was the most important factor to emerge from the data. This factor, according to Economics teachers, is an important component in their teaching and learning practices because learners are important in the didactical situation. Further research studies on EFA were used in a variety of applications, which included the development of an instrument for school evaluation (Al-Qaisi, 2010; Lovett, Zeiss, & Heinemann, 2002). Another study assessed the motivation of Puerto Rican high school principals (Morris, 2001) which support the conclusions flowing from this particular study. In last five years surveys were conducted yielded over 1700 studies that used some form of EFA (van Wyk, 2012; Al-Qaisi, 2010; Parsian and TDunning, 2009; Costello & Osborne, 2005; Majors & Sedlack, 2001). Considering the application of EFA in the above mentioned research studies, it is clear that for the purposes of this study, the focus on teachers' choices regarding the selection of didactic principles in teaching Economics in Free State secondary schools was substantiated and applicable to the performance of factor analysis. *Teaching methods and strategies* (Cronbach 's alpha = 0.881) was the second most important factor that emerged from the data. Respondents reported that, by and large they believed that in their experience, the teaching methods factor remains an important tool for learner progression, motivation,

integration, relevance and creditability of their teaching in the field of Economics education. This factor comprised of seven variables and counted as 62% of the variance (Eigen-value = 6.35). The effectiveness and success of learning can only be determined through effective, active, democratic and participative ways. In a doctoral study undertaken by Kurian (2005) on the management strategies required to improve the academic performance of previously disadvantaged secondary schools in the grade 12 examination, the researcher also used an empirical investigation statistical tool, a factor analysis technique. The research focus however on the roles and responsibilities of school management teams (SMT) pertaining to the support given to teachers in grade 12. *Learner Learning style* (Cronbach 's alpha = 0.875) was the third factor to emerge from the data. This factor had ten items and accounted for 5% of the variance (Eigen-value = 1.45). Pertaining to the Economics teacher this means that the subject matter should be viewed and presented in such a way that the greater portion thereof, and the implications of the subsections for the greater whole, can be realised. The analytical skills of learners must be developed by means of problem setting, where learners must think of creative solutions to relieving aspects such as scarcity. *Subject knowledge and skills* (Cronbach 's alpha = 0.786) was the fourth and last factor to emerge from the data, on which five items were loaded. This factor was indicated as one of the important didactic principles for teaching Economics and accounted for 13% of the variance (Eigen-value = 2.41). Subject knowledge is also very important for the purposes of effective teaching. This demands careful planning, organising and monitoring of the teacher's teaching activities. At the start of the academic year, the objectives (and the eventual learning outcomes) pursued within the NCS policy for Economics teaching (i.e. the course outcomes, e.g. for grade 12) should be made available to the learner. Furthermore, learners should be provided with the NCS Economics subject framework, including learning objectives and a full timetable. Factors which influence teachers' choice of teaching and learning context in teaching Economics emerged from the factor analysis. Moreover, Padhy, Emo, Djira and Deokar (2015) conducted a study analyzing factors influencing teaching as a career choice using structural equation modeling extracting several factors that suported their career choices. These four factors are critical and of vital importance to the Economics teacher. They must create a teaching-learning situation in which learners will be able to master critical and developmental outcomes (i.e. high levels of knowledge, skills and positive attitudes in the domain). Within the National Curriculum and Assessment Policy Statements (NCAPS) curriculum, but specifically in the context of Economics education, it is of critical importance that learners learn how to obtain relevant information and transform such information into knowledge, skills and values.

CONCLUSION

The results of this study are encouraging and suggest that the EFA is a valid and reliable measure of teachers' choices regarding determing the underlying and common factors that influence their choice of teaching and learning principles in the Economics classroom in Free State secondary schools. The actual data survey items and results were useful as meaningful forms of data analysis for this study. The findings of the study revealed the application of an EFA of the underlying and common factors of respondents' responses that may influence their choice of teaching and learinng principles in the Economics classroom. In conclusion, the application of KMO sampling-adequacy measurement of the nine variables range from "meritorious to marvellous" and the exploratory factor analysis is appropriate for this study. In

summation, the common factors that emerged from this research were Teaching methods; Teacher Teaching style; Learner Learning style and Subject Knowledge which respondents indicated as important and critical in achieving the learning outcomes for Economics teaching. The findings of the present study indicate the positive effects of this study on economics teachers' attitudes toward their own teaching practice, as well as towards the subject were achieved. However, it is difficult to demonstrate a generalisable effect on teacher attitudes from a short period of training, such as that reported in this research study. In addition, attitudes are both abstract and subjective, and it is therefore difficult to measure changes in attitude over a short time. One must view the present study cautiously because of *four* limitations. The first limitation concerns the *sample size* which involved a small number of teachers (n=108) who participated in this study. Because of the restricted range of participants, in future research studies, the researcher should include a more diverse and representative sample of teachers and learners. The second limitation is the *time factor*. This study was conducted only on a fourteen day workshop. A longer investigation period will maybe yield different results. The third limitation is *economics teacher lack of subject knowledge and pedagogical knowledge*. This was a serious concern for some teachers because of limited or lack of knowledge regarding pre-course economics content and different teaching strategies. This impeded a lot on how to learn the subject and how to implement applicable teaching strategies to enhance their praxis. Future investigations intend to pursue reporting involving exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) in order to examine the relationships between teaching styles and learning styles variables and specific outcomes for Economics teaching. The following strategies are recommended to advance economics education in South Africa into the 21st century and beyond by coordinate in-service teacher workshops; plan and develop lesson writing workshops for teachers in relation to the CAPS (grades 7-12); and ongoing conducting research to strengthening economics education.

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USING AN ATTITUDE TOWARD ECONOMICS EDUCATION SCALE TO EXPLORE TEACHERS' ATTITUDES TOWARD THE SUBJECT IN FREE STATE SECONDARY SCHOOLS

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ABSTRACT

Economics teachers in the Further Education and Training (FET) phase currently find themselves in a transitional phase between the traditional teaching approach and the National Curriculum and Assessment Policy Statement (CAPS) based on a problem-based learning approach. The purpose of this paper is to measure teachers' perception of economics education by using an exploratory factor analysis in a South African context. It makes use of an exploratory, descriptive, contextual research design, implementing the quantitative research method. A closed structured forty-five item questionnaire, the Attitude Toward Economics Education (ATEE scale) was constructed to survey teachers' perceptions (n=319) of the economics subject in relation to some demographic information. Factor analysis was applied to the 45-item ATEE questionnaire and six factors extracted as the latent variables for forty five items, with one item dropped due to low factor loadings. Reliability analysis shows that the internal consistency of factors was between acceptable (α = 0.786) and excellent (α = 0.881). The six underlying factors were related to the following themes: value of economic education; difficulty of economics as a subject; knowledge and skills for the enhancement of economic literacy; enjoyment of economics; academic application; and facilitation during workshop sessions. The instrument can therefore be used for further research to determine the effects of other variables - including learning styles, teaching styles, retention, assessment and absenteeism - that may have direct effects on the performance of economics teachers in South African schools.

INTRODUCTION

From an educational economist point of view, knowledge is power. This suggests that economic education is, or should be, important to (future) citizens' ability to participate in society, and in that sense, to manage their everyday life. However, we note that an education in economics is about much more than improving the general understanding of the basic principles of supply and demand and the workings of the national and global economies. A basic knowledge of economics will also help consumers, business, trade unions and voters to make informed decisions on "bread and butter" issues relating to their own activities in the economy. Economics involves the study of how people make choices with scare resources. Giving learners access to an understanding of how markets work will help them to make efficient choices in managing their own scarce resources, such as time and money. Along the way, they also learn about decision and choice-making processes that can be applied to other aspects of their lives. A literature review on the subject reveals that there is widespread agreement that it is vital to highlight the importance of a sound economic education system for growth and development from a global and a local-national perspective. A number of research studies have been conducted on economics students'

attitudes regarding economic education internationally, but so far as could be ascertained, no studies have been conducted on South African student economics teachers' values as these relate to economics education. Recent studies have focused on entrepreneurship at schools (North 2002), cooperative learning as a teaching strategy for economic education (van Wyk 2007) and the impact of student team achievement divisions (STAD) as cooperative learning technique in economic literacy (van Wyk 2010).

LITERATURE REVIEW

In 2009, Pravin Gordhan, the South African finance minister told the country that the global economic crisis of 2008 had seriously affected the economy, along with many others around the world. The ex-finance minister said that "The global crisis continues to weigh heavily on economies around the world," he said. He further indicated that the South African "budget deficits have soared to unprecedented heights as tax revenue has fallen sharply and employment is falling in almost every country" (p.12). However, the global downturn has been worse than expected and South Africa is now in recession, the first in over 17 years. Gordhan (2009) said that there are indications that the South African economy might have reached the bottom of this sharp downturn, but the road to recovery will be slow and gradual" (p.2). Gordhan also suggested that a contributing factor to the country's crisis was a general lack of financial and economic literacy. It would appear that not enough had been done in the areas of financial education and economic literacy in South Africa in the twenty-odd years since the advent of democracy. Despite this, Gordhan added that he believed that the country could overcome the challenge. In 2013, Ebrahim Patel, minister of economic development painted a glooming picture of the South African economy: "The full impact on South Africa was reflected in the economic data from May," he said. "Economic growth slowed down dramatically and the manufacturing sector shrank by 20%. Job losses in one area affected other sectors and credit became more difficult to obtain. The current account (Balance of Payments) deficit pressures continued. There were 179 000 job losses in the first three months and another 267 000 jobs were lost in the second three months of the year. There was a decline in Gross Domestic Product… and in manufacturing but there were major contractions in other sectors such as mining" (Patel, 2013:4). Moreover, North (2002) agreed with the sentiments of two ministers that the South African economy was a cause for concern because the poor were likely to suffer most. The country's citizens were already confronted by problems such as crime, corruption, mismanagement and unemployment. In a newspaper article, the unemployment problem in South Africa was a cause of anxiety not only for the government and other role players in the private sector because of the impact it would have on the younger generation. This author has suggested that more than eight million people would be unemployed in South Africa by 2010 (*Mail & Guardian, 2010*). Furthermore, Van Schoor (2000) paints a gloomy picture of the state of economics education in South Africa. South African schools, he says, "are brilliant at educating children for the 1950s". To remedy this situation, an approach would be to increase efforts on the part of private-public initiatives in South African schools to provide young people with a thorough grounding in the basic elements of economics. An example of an effective private-public initiative is the Banking Association of South Africa (BASA) and the South African Savings Institute (SASI) "*Teach Children to Save Initiative*" pilot project. The project was launched on 25 July 2009 in an effort to improve financial awareness among the country's young people. The programme was derived from a similar project launched in the USA in 1997 and

sponsored by the American Bankers Association Education Foundation (ABAEF). According to the BASA, the purpose of the pilot project was to lay the groundwork for an ongoing annual event that would highlight the important role that bankers and financial sector professionals could play in educating the country's young people in basic economic ideas, and in particular on the importance of starting to save earlier in their lives. Currently, the national education department, expanded the "*Teach Children to Save Initiative*" project targeting students in grades four to seven at primary school. The initiative aims to promote financial literacy, foster a culture of saving, promote volunteerism, create awareness about the value of money and the importance of savings and assist students to appreciate that being able to choose empowers them. Further vigorous effects by private-public initiatives aimed at improving mathematics literacy and economic and entrepreneurial knowledge as pathways to empowerment are to be encouraged. The National Curriculum and Assessment Policy Statement (NCAPS) policy states that the purpose of economics as a subject is to equip learners with the knowledge, skills, values and attitudes that will enable them to participate in, contribute to, adapt to and survive in a complex economic society. That is, grounding in economics will enable them to demonstrate a critical awareness of the benefits of responsible and sensitive resource utilization (DoE 2003; van Wyk 2007). Economics studies the activities of production, consumption and exchange viewed from macroeconomic and micro-economic perspectives. These activities are informed by individual and societal preferences. In an historical context, they focus successively on the primary, secondary and tertiary sectors. Contemporary priorities include the issues of poverty, redistribution of income and wealth, growth and development, globalisation, respect for the environment and human rights (DoE 2003). A study was conducted (van Wyk 2007) and it revealed that Economic education is more taken as an elective by students in grades 10 to 12. The study also indicates that the current teaching strategies implemented by economic teachers are outdated and do not pertain to the ways in which learners best comprehend to economics content (van Wyk 2007). To ensure that the outcomes of economics teaching are achieved, teachers of the subject are required to consider different teaching strategies and methods. A large variety of teaching strategies, methods and techniques are available, which can be utilised to immense benefit in the teaching and learning situation (Anderson, Benjamin and Fuss 1995; Shen and Shen 1993) but this study focuses on teachers' perceptions of economics teaching in South African high schools.

PROBLEM STATEMENT

Economics teachers in the Further Education and Training (FET) phase currently find themselves in a transition between a traditional teaching approach and the prolem-based learning approach outlined in the National Curriculum and Assessment Policy Statement (CAPS). It appears from interviews during study that economics teachers in the Free State department of basic education are not ready for this change of approach, because they have not been adequately trained in the NCAPS principles in economics and are therefore still following the teacher-centred approach as they were previously trained to do. (van Wyk 2007). Furthermore, South Africa requires well-trained graduates in the economic and management sciences, because knowledge and skills in these areas are prerequisites for economic growth and sustainable development. One of the current problems with Economics education in South Africa involves the strategies that teachers use to teach the subject. The majority of teachers are stuck on outdated traditional methods that were in practice for years. The 'chalk and talk' method, a

traditional method of education in which the teacher addresses the students and uses the blackboard or a "power point presentation" to provide examples or illustrations to learners, are mostly commonly used. Research studies have highlighted the ineffectiveness of the lecture, text book and direct instruction methods (van Wyk 2007). These methods results in students experiencing economics classes as boring. If teachers used more effective methods in teaching economics, their students would be able to better comprehend the information and would thereby be empowered to be effective citizens. The purpose of this study is to investigate Economics teachers' attitudes toward economics education. To achieve this, an instrument was designed to measure subject teachers' perceptions of economics education, using an exploratory factor analysis and reliability analysis. This statistical method identifies group of variables called factors or latent variables that can measure the underlying dimensions of attitudes on a particular subject, in this case Economics education.

RESEARCH METHODOLOGY

Research paradigm and design: This paper used a post-positivist research paradigm. An exploratory, descriptive, contextual research design was designed to collect data for the purpose of this study. It implements the quantitative research method through the use of a closed structured forty-five item questionnaire. The rationale for using the Attitude Toward Economics Education scale (ATEE scale) because it proved to be an effective instrument for measuring and investigating changes in economic attitudes and values of student teachers at the Free State department of basic education (see table 2 for reliability scores). A number of matters require some discussion before a factor analysis can be conducted. The first concerns methodological issues, in particular the number of variables to be included in the instrument for the study and the size of the sample to be used. At least four measured variables for each common factor were expected to emerge from the data analysis (Fabrigar, Wegener, MacCallum and Strahan 1999). Further, there is considerable debate in the literature as to what constitutes an adequate sample size. Gorsuch (1983) suggests a case ratio of 1:5 with a total sample size of at least 100. Sample for the study: The sample size of this study was one hundred and nineteen economics teachers who teach the subject in grades 10 to 12 (n=319). MacCallum, Widaman, Zhang and Hong (1999) argue that a sample size of 100 can produce an accurate estimate of population parameters if the communalities of the measured variables are high and if four variables represent each common factor. Another methodological issue concerns the choice of an exploratory or confirmatory factor analysis. An exploratory approach is aimed at determining which constructs underlie the variables in the questionnaire, and if so, how many. It is used when there is insufficient evidence available to predict a set of constructs in advance. Finally we note that Hastings, Horne and Mitchell (2004) say that an exploratory factor analysis is more familiar to researchers, and is consequently more easily understood. Data collection and analysis; The Attitude Toward Economics Education (ATEE scale) was constructed on the basis of preliminary readings of previous studies. It took the form of a 45-item questionnaire, the purpose of which was to collect data on teachers' perceptions of economics as a teaching subject in school, as well as some demographic information. Items that were a combination of positive and negative statements were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). During data entry into the statistical software, negative statements were reversed into positive statements. A higher score for each item would therefore imply a more positive attitude to economics as a teaching subject in schools. The Statistical Package for Social

Sciences (SPSS), Version 18.0 was used to run the factor and reliability analysis, as well as the statistics. Ethical considerations: Consent was obtained from the Free State Department of Basic Education, school principals and FET economics teachers before the study was begun. An official FSDBE letter explaining the purpose of the study was attached to the questionnaire. The letter also highlighted the confidentiality of any results deriving from each teacher's participation. Each participant signed a consent letter.Rationale for using the exploratory factor analysis (EFA) technique.The purpose of using EFA was to identify and interpret underlying and common factors in respondents' responses to questions concerning their perceptions of economics as a teaching subject. Gorsuch (1997) says that EFA helps to explain variations in the observed variables in terms of underlying latent factors. The first step is to perform a factor analysis is to determine whether it is actually necessary to perform a factor analysis on the data. This is done by testing the adequacy with which the data can be sampled. The measuring of sampling adequacy involves determining the suitability of individual variables for use in the factor analysis and was evaluated using the Kaiser-Meyer-Olkin coefficients of sampling adequacy (KMO) (Kaiser, 1974; Berghau, 2005; Cohen, Manion and Morrison 2009, Leedy and Ormod 2001).

RESULTS

Biographical data revealed that three hundred and nineteen (n=319) teachers of economics who teach the subject in grades 10 to 12 were purposively selected as the stratified sample for the research. Some 65% of the sample were black teachers while 35% were white. Some 61.0% of the teachers were female (n=180) and 39.0% male (n=139).

Measuring Sampling Adequacy

A KMO-value which is greater than 0.5, indicates that the variable is significant at that level. The KMO-values relating to the importance of teaching principles for Economics that were included in the factor analysis which are presented in Table 1 (this KMO value scale was used: 0.90 to 1.00 = marvellous or 0.80 to 0.89 = meritorious or 0.70 to 0.79 = middling or 0.60 to 0.69 = mediocre or 0.50 to 0.59 = miserable and 0.000 to .0.49 = don't factor). Factor analysis was applied to a 45-item ATEE-scale. The Kaiser-Meyer-Olkin (KMO) coefficients of sampling adequacy indicate that factor analysis is appropriate for ATEE-scale data. According to Kaiser (1974), a KMO coefficient of .70 or higher is adequate for the application of factor analysis, and a coefficient of .80 or larger is good to excellent. The measure of sampling adequacy using Kaiser-Meyer-Olkin (KMO) was 0.846, which is greater than the recommended minimum of 0.50. KMO values between 0.80 and 0.90 are considered to be good to excellent (Hutcheson and Sofroniou 1999). The correlation matrix is not an identity matrix since the Bartlett's Test of Sphericity is statistically significant (Chi-Square = 3126.777, df =325, p< 0.000). These tests imply that factor analysis was appropriate. The measure of sampling adequacy for individual variables from the Anti-Image Correlation ranged from 0.692 for item 9 to 0.915 for item 12. All the values are well above the bare minimum level of 0.5. Factors were extracted using the principal axis factoring method. An orthogonal rotation using Varimax with Kaiser Normalisation was applied to the initial factors, since there is no theoretical basis that the factors were correlated. The fit of the model is considered good since the reproduced correlations indicate that only 55 (16%) residuals are greater than 0.05. The Anderson-Rubin method was applied to calculate factor scores so that no multi-colinearity exists (that is, the factors were

uncorrelated with each other). Seven interpretable factors were obtained from the analysis using Kaiser's criterion of retaining factors with eigenvalues greater than one.

Table 1
ROTATED FACTOR MATRIX & RELIABILITY ANALYSIS OF THE ATEE-SCALE

Primary Factors	F1	F2	F3	F4	F5	F6
Factor 1: *Value of economics* as subject (α = 0.871)						
21. Knowledge of Economics will help me get suitable job in the future	0.785					
25. Economics will be very useful in my everyday life	0.731					
23. Economics will be utilized in my professional teaching career	0.710					
24. Economics will be very useful in my future career	0.591					
22. Economics subject is relevant to me	0.589					
3. The graphs help me to understand better	0.532					
26. I will be using economics throughout my life	0.486					
10. I like economics since it is an easy subject	0.469					
Factor 2 : *Difficulty of economics subject* (α = 0.861)						
15. I adore economics as a subject						
17. I had basic knowledge of economics prior to taking this subject		0.691				
8. I understand economic formulas		0.631				
9. Most students will find economic subjects easy		0.576				
1. Economic subjects are not difficult		0.530				
5. Easy to understand economic concepts & theory		0.491				
2. There are not many graphs to be learnt		0.482				
		0.476				
Factor 3: *Knowledge and skills required* (α = 0.855)						
6. Level of English used is appropriate			0.779			
19. I am good with the English/Afrikaans language			0.633			
7. I will surely apply economic concepts in my praxis			0.552			
12. I am capable of understanding this subject			0.512			
13. I can pass economics even though there were many cases of failure			0.487			
18. I have a strong mathematical background			0.475			
27. Economics makes me think about contemporary issues			0.465			
Factor 4: *Enjoyment of learning economics* (α = 0.736)						
16. I do not feel nervous or frustrated during tests or exams.				0.725		
14. I feel comfortable with economics subject				0.569		
11. Economic subjects are very interesting and enjoyable				0.482		
4. There are not many topics to be learnt				0.468		
28. I enjoy reading articles on economic topics				0.460		
Factor 5: *Academic Application of subject* (α = 0.816)						
29. I usually prepare before coming to tutorials					0.775	
30. I generally do the set reading before tutorials					0.741	
31. I usually set out to thoroughly understand most topics					0.719	
32. I really enjoy the theoretical content of economics					0.591	
33. I get a lot of satisfaction from studying economics					0.589	

Factor 6: *Facilitation during workshops sessions* (α = 0.755)						
34. Facilitator was good at explaining things						0.799
35. Facilitator made it clear where the CAPS subject is going						0.761
36. Facilitator gave me helpful feedback on my progress						0.610
37. Facilitator tried hard to make the subject interesting						0.591
41. It was easy to know what was expected of me						0.569

The rotated factor matrix, a matrix of the factor loadings for each variable onto each factor, is shown in Table 2. Loadings of less than 0.399 are not shown in the rotated factor matrix since they do not represent substantive values (Steven, 1992). The four interpretable factors accounted for 35.9%, 6.04%, 4.69% and 3.62% of the variance in the data for a total of 50.25% (before rotation) and 15.09%, 13.84%, 12.84% and 8.49% respectively (after rotation). Factor 1 is labelled "Value of economics as a subject" with loadings from 0.469 to 0.785. It includes items such as "Knowledge of economy will help me get suitable job in the future (0.711)", "Economics will be very useful in my everyday life (0.705)" and "Economics will be utilized in my professional teaching career (0.656). This factor, which has the highest percentage of explained variance, implies that non-business students regard knowledge of economics as essential in their future career and everyday life even though they were majoring in a range of subjects, including wood technology or office management. Factor 2 is labelled "Difficulty of economics as a subject" with loadings from 0.476 to 0.691. It includes items such as "I adore economics as a subject. (0.693)", "I understand economic formulas (0.557)" and "Most students will find economic subjects easy (0.530)". Factor 3 is labelled "Knowledge and skills required in economics subject" with factor loadings ranging from 0.465 to 0.779. Among the items included are "Level of English used is appropriate (0.767), "I am good with the English language (0.609)" and "Level of Mathematics used is appropriate (0.569). Factor 4 is labelled "Enjoyment of learning economics" with factor loadings from 0.460 to 0.725. Items included are "I do not feel nervous or frustrated during tests or exams (0.725)", "I feel comfortable with economics subject (0.569)" and "Economic subjects are very interesting and enjoyable (0.468)". There were four items loaded on two factors. "The graphs help me to understand better" and "I like economics since it is an easy subject" were loaded on both Factor 1 and 3. "Easy to understand economic concepts & theory" and "I will surely apply economic concepts in my praxis" were loaded on both Factor 2 and 3. Item 20 is dropped from the list due to low factor loading. Factor 5 is labelled "Academic application" with factor loadings 0.775 to .0.589. Items included "29. I usually prepare before coming to tutorials", "30 I generally do the set reading before tutorials", "31. I usually set out to thoroughly understand most topics", "32. I really enjoy the theoretical content of economics", "33. I get a lot of satisfaction from studying economics". Factor 6 is labelled as "Facilitation during workshops sessions" with factor loadings 0.799 to 0.569. Items included are "Facilitator was good at explaining things (0.799)"; and "It was easy to know what was expected of me (0.569). A reliability analysis was carried out on the six extracted factors based on the data presented in table 2. Reliability, which describes the internal consistency of a set of items, was measured by Cronbach's Alpha and item-total correlations. In general, reliabilities of less than .60 are considered to be poor, those in the 0.70 range are acceptable, and those over 0.80 are good (Sekaran 2003; Cohen, Manion and Morrison 2009). The reliability analysis results are shown in Table 2.

Table 2
MEANS AND STANDARD DEVIATIONS OF THE FACTORS OF ATEE-SCALE

Four factors exacted	Mean Scores	Std Deviation
Value of economics as a subject	4.558	0.641
Difficulty of economics as a subject	2.587	0.729
Knowledge and skills required	4.333	0.788
Enjoyment of learning economics	4.234	0.895
Academic application of the subject	3.561	0.667
Facilitation during workshops sessions	4.110	0.778

(A higher score of the mean indicates a more positive attitude)

Referring to Table 2, the students sampled tended to agree or were positive regarding the value of economics to their future career and everyday life (given the mean of Factor 1 = 4.558 which is better to 3 (neutral) on the 5-point Likert scale). The same observation applies to knowledge and skills; here students tended to agree on the perception that they must possess the economics knowledge and skills required in order to be able to teach them.
Nevertheless, the teachers sampled tend to agree that economics subjects can be somewhat difficult especially for those students who did have a sufficient knowledge in economics content, but many agreed that they enjoyed teaching the subject. These results indicate that teachers sampled were positive about economics as a teaching subject. An independent sample t-test was performed on the mean score for each of the seven factors to compare the attitudes of male and female students, and those who had passed or failed the subject. Independent sample t-test was performed on the mean score for each of the four factors to compare the attitudes towards economics education between gender. Table 3 shows the comparison between male and female economics teachers.

Table 3
COMPARISON OF MALE AND FEMALE ECONOMICS TEACHERS

Six factors exacted	Mean (Male)	Mean (Female)	t-value	p-value
Value of economics as a subject	4.122	4.412	-0.355	0.022
Difficulty of economics as a subject	4.216	3.365	-0.124	0.023
Knowledge and skills required	4.673	4.503	0.112	0.081
Enjoyment of learning economics	4.264	4.534	-0.744	0.349
Academic application of the subject	4.112	3.771	0.211	0.766

Facilitation during workshops sessions	3.891	4.221	0.311	0.045

Since the p-value for four of the six factors is greater than 0.05, there is evidence that there is a difference in the perception of male and female economics teachers toward economics education. Male teachers show a better attitude toward Economics with regard to the *Difficulty of economics as a subject* and Knowledge *and skills required* (mean = 4.216 and 4.216) than female teachers. On the other hand, female teachers are more positive regarding the *Value of economics as a subject*, *Enjoyment of learning economics* and *Facilitation during workshops sessions* (mean = 4.412; 4.503 and 4.221) toward the subject than male teachers.

DISCUSSION OF FINDINGS

Factor analysis was applied to the 45-items ATEE questionnaire. Six factors were extracted as the latent variables for forty five items with one item dropped due to low factor loadings. Reliability analysis shows that the internal consistency of the six factors was excellent ($\alpha = 0.881$) as acceptable for the study. The six underlying factors are related to a number of themes: the value of economic education, the difficulty of the economics, the knowledge and skills necessary for the enhancement of economic literacy, the enjoyment of economics, academic application, and facilitation during workshops sessions. Factor 1 represents students' perception of the value of economics education (that is, their degree of satisfaction in learning the subject) and it usefulness to them. Factor 2 represents the sampled students' perception of the difficulty of the subject matter. Factor 3, knowledge and skills, represents the sampled students' perception of the basic knowledge and skills required to excel in economics education. Factor 4, enjoyment represents the sampled students' perception of the extent to which they enjoyed learning economics. Factor 5 refers to the level of preparation and application of academic knowledge in class. Factor 6 represents performance, and indicates the extent to which the sampled student teachers worked together to achieve specific outcomes for the Training of Teachers project. The EFA was selected because it does not impose a specific pattern on the collected data in an a priori manner and provides an opportunity to substantially identify a factor's inclusion. The internal consistencies of the constructs for each underlying variable were found to be good, as indicated by the Cronbach's Alpha value, which ranged from excellence to acceptable. The findings of the study indicate that sampled teachers attitudes toward the subject covered by the four underlying variables. There was a significant difference in the attitudes of students who performed well and those who did not (van Wyk 2013). Student teachers who performed well in the subject had a more positive attitude than those who did not, with reference to all four underlying variables. In a study by Phipps and Clark (1993) on Attitudes toward Economics with first year students, indicated that males enjoy economics relatively more than females, but males did not significantly differ from females as regards the perceived difficulty or usefulness of economics. The findings of this survey are therefore inconsistent with those of the Phipps and Clark (1993) study. Moreover, Yu, Lam and Lo (2005) conducted a study on gender differences in comprehension of Economics, found that female students enjoyed involvement in learning economics more than male teachers at high schools. Similar studies were conducted by Chizmar, McCarney, Halisky and Racich (1985) at ten primary schools and van Wyk (2013) at University of South Africa on economics achievement and basic skills development on the transfer of cognitive and social skills among Post Graduate Certificate of Education (PGCE)

student teachers. The finding of latter study indicates that learning economics content can improve a student's ability in social studies skills. EFA was warranted for the purposes of this study; no previous research had examined the factor structure to measure teachers' perceptions of economics education by using exploratory factor analysis and reliability analysis. The purpose of using EFA was to identify and interpret underlying and common factors in respondents' responses to questions concerning their perceptions of economics as a teaching subject.

CONCLUSIONS

The results of this study are encouraging and suggest that the EFA is a valid and reliable measure of teachers' attitude toward economics as a subject in Free State secondary schools. This study confirms earlier work by Phipps and Clark (1993) and van Wyk (2012) on attitudes toward economics with first year university students. This study revealed that the six underlying factors are related to a number of themes namely the value of economic education, the difficulty of the economics, the knowledge and skills necessary for the enhancement of economic literacy, the enjoyment of economics, academic application, and facilitation during workshops sessions. These factors clearly impact teachers' perception of economics education in the Free State Department of Basic Education. Furthermore, an exploratory factor analysis was computed and six factors were extracted from the data. Additionally, the reliability analysis shows that the internal consistency of the seven factors was excellent ($\alpha = 0.881$) as acceptable for the study. The Kaiser-Meyer-Olkin (KMO) coefficients of sampling adequacy indicate that factor analysis is appropriate for ATEE-scale. Finally, there were differences between male and female teachers toward economics education in this study. It can be concluded that the ATEE scale is highly reliable for the purpose of conducting this research. Further analysis should be undertaken to determine the factors that contribute to subject difficulty. These include topics that require a lot of calculations, or assignments that require academic writing skills and a general knowledge of national and global economics issues. The 45-item ATEE scale was validated and the instrument can be used for further research to determine the effects of other variables (such as race), learning styles, teaching styles, retention, assessment and absenteeism, all of which may have a direct effect on the performance of teachers of economics subjects in South African schools. However, it is difficult to demonstrate a generalisable effect on teacher attitudes from a small sample and short period of training, such as that reported in this research study. It would be interesting to assess the effects of the cognitive and social skills development involved in learning the subject, especially as regards calculations, communication, data interpretation and the presentation of academic writing, while more attention needs to be paid to weak students. Other strategies may include exposing students to the application of economics in the real world, such as role playing and simulated economics games. The specific objective is to make student teachers aware of the usefulness of the subject they are studying. Real world data, simulated economics games, economic cartoons, economic quizzes and case studies should be integrated in the teaching content.

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LUCAS ISLAND MODEL: A "CASE STUDY" FOR IMPROVING STUDENTS' SKILL IN INTERPRETING MACROECONOMIC MODELS

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ABSTRACT

This paper develops a teaching apparatus of Lucas's 1972 model aimed at improving students' ability to interpret the underlying structure of modern macroeconomics models. In this respect, the Lucas island model represents the perfect "case study" since it falls into the narrow range of mile stone "modern" macroeconomic models. Our teaching apparatus adds to the Lucas island model three distinctive features. First, it replaces the overlapping generation structure with the producer-shopper distinction within the household; second, it presents the classical perfect information case as the benchmark of the analysis and, finally, introduces a money market into the model.

INTRODUCTION

The failure of mainstream researchers to predict the 2007-2008 economic crisis has prompted a group of economists to require some deep changes within the economic profession in several directions. For instance, Colander (2009, 2010) proposes three main changes. First, he requires that macroeconomic models with significant policy relevance should include warning labels directed to non-scientific users of the model. Second, he asks for a wider range of peers in the funding peer review process so as to encourage more creative research on a much wider range of models. Finally, he recognizes that most economists and policymakers have scarce ability to choose an appropriate model, or relate a model to policy, with obvious bad implications for the implementation of economic policy especially when facing deep economic crises. In order to overcome this shortcoming, Colander (2010) maintains that a growing number of researchers should be trained in interpreting models rather than developing them.

Following this last proposal, in this paper we use Lucas's 1972 model as a kind of theoretical "case study" in order to improve students' ability to interpret modern macroeconomics models. While this model is commonly regarded as a mile stone in modern macroeconomics and still widely taught, in the literature there is also a growing emphasis on its limitations as an account of business cycles (see *e.g.*, Zarnowitz 1992, Romer 2005). For this reason, we believe it is now time to address Lucass model in a more critical manner also at the classroom level.

One way to do this is to go beyond both most textbooks' simplified presentations and naive classroom "parables" which paradoxically do not take account of the most distinctive methodological feature of the modern macroeconomic theory, *i.e.*, the complete microfoundation of agents' behaviour functions. Ever since Lucas's original articles many important contributions have sought to remedy this flaw (see e.g., Azariadis 1981, Bénassy 1999, Bull and Friedman 1983), but turn out difficult to teach. Indeed a gap still exists between these relatively advanced contributions and classroom presentations.

This aim of this paper is to fill this gap by developing a teaching apparatus of Lucas's original model aimed at improving undergraduates understanding of the underlying structures of mainstream macroeconomic models.

Our teaching apparatus presents three distinctive features. First, it shows how the imperfect information problem arises by assuming from the start that the household consists of two individuals, a "producer" and a "shopper" in a two-island context. As noted for example by Romer (2005), this assumption represents an alternative way with respect to Lucas's original overlapping generation structure to account for imperfect information since it makes possible the lack of communication between the two individuals and thus the confusion between relative and absolute prices changes needed for deriving the positively sloped aggregate supply. Second, in order to capture the close contiguity of Lucas's model with the traditional classical pre-Keynesian approach and, consequently, appreciate its most significant contribution to economic theory, our apparatus starts by focusing on the working of Lucass model in the absence of imperfect information so to define a starting benchmark of the analysis. Third, instead of a shortcut approach to modeling aggregate demand such as Romer's, we add a money market. While it is true, as Romer says in his textbook, that there is little point in modeling aggregate demand more fully in view of the key focus of Lucas's approach on aggregate supply, yet we believe that this novelty adds pedagogical value to the presentation as it allows students to think in terms of a more familiar aggregate demand and supply structure.

The paper is organized as follows. Section 2 presents the basic model and analyzes the role of money in the perfect information context. Section 3 introduces imperfect information and derives the Lucas model.

THE LUCAS ISLAND MODEL WITH PERFECT INFORMATION

The Features Of The Economy

The economy is geographically bipartite in two islands, in which there are $L+L$ identical households that live one period (hereafter, we will label them as *household* 1 and *household* 2, respectively). Two different perishable goods, produced in island 1 and island 2 respectively, exist together with money, which is the only available medium of exchange issued by the public sector. Each island works in a decentralized way and has a *local* goods market as well as a *local* money market. Thus, by considering both islands, two aggregate markets (for goods and money) are obtained. The geographic bipartition allows

each household of a given island to go to the other one for buying goods. Finally, two shocks hit the economy: a real, idiosyncratic, local shock (households migrate from one island to the other), and a nominal aggregate shock (a change in the money supply) affecting both islands uniformly. Each household is made up of two individuals: the *producer* who utilizes its labor endowment to produce consumption goods that he/she sells to receive revenue and the *shopper* that spends this revenue to buy consumption goods.

The Goods Market

In the economy there are $L+L$ nomadic households that on *average* bipartite between the two islands. Because of nomadism, the economy is hit by a local demographic idiosyncratic shock continuously: in each period households 1 can increase or decrease depending on inward or outward flows. Therefore, at period t, the number of households 1 is equal to:

$$L_1 = (1+\lambda)L$$

where $-1 < \lambda < 1$ is the rate of change of households 1 at period t: if $\lambda > 0$ ($\lambda < 0$) a positive (negative) migratory flow towards island 1 occurs. Given the economic bipartition, the demographic shock implies that the number of households 2 is equal to:

$$L_2 = (1-\lambda)L$$

where $L_1 + L_2 = L + L$. Taking logarithms of the previous expressions *i.e.*, $l_1 = \log L_1$, $l_2 = \log L_2$ and $l_1 + l_2 = \log L_1 + \log L_2$ and recalling that $\log(1+\lambda) \simeq \lambda$ it follows that

$$\begin{cases} l_1 = l + \lambda \\ l_2 = l - \lambda \\ l_1 + l_2 = 2l \end{cases} \tag{1}$$

By assumption, λ is a stochastic variable that follows a normal distribution with mean 0 and variance σ_λ^2:

$$\lambda \sim N(0, \sigma_\lambda^2)$$

The variance is a parameter that measures the intensity of the local shock and captures the "fundamentals" of the economy: it is higher when the local shock is stronger and the migratory flows between islands are greater.

The representative household 1 at period t has to make three decisions on (obviously, the same demonstration applies to the representative household 2 because of household homogeneity):

1. its labor supply and, as a consequence, output supply;
2. its demand for goods;
3. its demand for money.

First, the household produces goods that are sold on the local market to households. Goods that are produced and consumed directly by households 1 do not flow

into the local market. They can be considered like a minimum subsistence consumption level that allows households to carry on the production activity and, therefore, do not enter their utility function. In carrying on the production process, the household uses the following production function:

$$X_1 = A N_1 \tag{2}$$

where X_1 is the level of output, A is the constant labor productivity level (average and marginal) and finally N_1 is the household's labor supply. Second, once having chosen its labor supply and the level of output, the household sells the goods at the current price in order to get the revenue it needs to buy goods on island 2. The household's preferences on goods and labor are represented by the following utility function:

$$U_1(C_{1,2}, N_1) = C_{1,2} - \frac{1}{2} N_1^2 \tag{3}$$

where $C_{1,2}$ is the household's consumption of the goods produced by households 2; N_1 is the number of labor units (e.g., hours) employed by the household to produce goods. Utility depends positively on consumption and negatively on the amount worked: the marginal utility of consumption is constant whereas the marginal disutility of labor is increasing. The household's choice has to satisfy the following budget constraint:

$$P_1 A N_1 \equiv P_2 C_{1,2} \tag{4}$$

that is, the household's revenue must be equal to its demand for goods produced and sold in island 2. The rational household, therefore, has to solve the following utility maximization problem:

$$\begin{aligned} \max_{\text{respect to } C_{1,2},\, N_1} \quad & U_1 = C_{1,2} - \frac{1}{2} N_1^2 \\ \text{subject to} \quad & P_2^{\mathrm{E}} C_{1,2} = P_1 A N_1 \end{aligned}$$

In order to solve the utility maximization problem, the household has to form expectations on the price of good 2, P_2^{E}. In this section, we assume that such expectations are perfect because the household has perfect information about this price. In particular, we assume that, thanks to the use of technological devices, such as cellular phones, the *representative shopper* 1 is able to transmit immediately to the producer of his/her household the current price of good 2. Thus it follows that:

$$P_2^{\mathrm{E}} = P_2 \tag{5}$$

The household derives his *labor supply function* from the above utility maximization solution:

$$N_1 = A \left(\frac{P_1}{P_2} \right)$$

By taking logarithms this reduces to

$$n_1 = \overline{n} + (p_1 - p_2) \tag{6}$$

where $\overline{n} = a = \log A$, $p_1 = \log P_1$ e $p_2 = \log P_2$. Two remarks on equation (6) are in order.

1. First, since the household is both a producer and a consumer, equation (6) is a *sui*

generis labor supply function because a proper labor market does not actually exist in the economy.

2. Second, the labor supply is an increasing function of the relative price of good 1 in terms of good 2 . Since there are two relative prices (*i.e.*, the relative price of good 1 in terms of good 2 and the relative price of good 2 in terms of good 1), hereafter we refer only to the first one. Furthermore, because of the double nature of the household, the relative price of goods is equivalent to *real wage* on island 1: an increase of p_1, given p_2, implies an increase in the household 's revenue and, in turn, an increase in its labor supply.

By substituting the production function (in logarithm terms *i.e.*, $x_1 = a + n_1$) in equation (6) we obtain the household's *supply function*:

$$x_1 = \bar{x} + (p_1 - p_2) \tag{7}$$

where $\bar{x} = 2a$. Equation (7) shows that supply is an increasing function of the relative price. By substituting (7) in the budget constraint (in logarithm terms *i.e.*, $c_{1,2} + p_2 = p_1 + x_1$) we obtain the household's *demand function of good* 2:

$$c_{1,2} = \bar{x} + 2(p_1 - p_2) \tag{8}$$

which shows that demand depends positively on the relative price. By repeating the same procedure with respect to household 2, we obtain its supply and demand functions:

$$x_2 = \bar{x} - (p_1 - p_2) \tag{9}$$

$$c_{2,1} = \bar{x} - 2(p_1 - p_2) \tag{10}$$

which depend negatively on the relative price.

The Equilibrium in the Local Good Market

The equilibrium in the local good market of island 1 requires L_1 households supply to be equal to L_2 households demand, *i.e.*, $L_1 X_1 = L_2 C_{2,1}$ (in real terms). Taking logarithms of the latter expression:

$$(l + \lambda) + \bar{x} + (p_1 - p_2) = (l - \lambda) + \bar{x} - 2(p_1 - p_2)$$

Rearranging the equilibrium equation and setting $a_1 = (2/3) < 1$, we obtain the equilibrium value of the relative price:

$$p_1 - p_2 = -a_1 \lambda \tag{11}$$

that follows a normal distribution with mean 0 and variance σ_λ^2 *i.e.*:

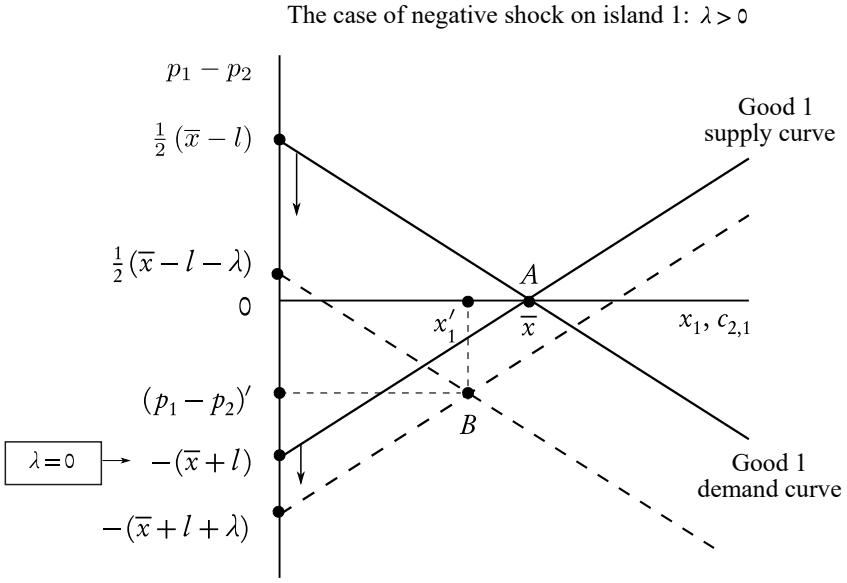
$$(p_1 - p_2) \sim N(0, a_1^2 \sigma_\lambda^2) \tag{12}$$

By substituting (11) into the (7) we obtain the equilibrium value of output:

$$x_1 = \bar{x} - a_1 \lambda \tag{13}$$

that follows a normal distribution with mean $\bar{x}$ and variance $a_1^2 \sigma_\lambda^2$ *i.e.*, $x_1 \sim N\ (0,\ a_1^2 \sigma_\lambda^2)$. Equations (11) and (13) show that the equilibrium value of the relative price and output depends on the real local shock. Fig. 1 shows that if the local real shock is absent *i.e.*,

Figure 1 The equilibrium in the local goods market on island 1. The equilibrium values of output and the relative price depends on the real local shock.



$\lambda = 0$, the relative price is equal to zero: the demand and supply curves intersect at point A. If we assume that $\lambda > 0$, a real negative shock hits island 1. Because of the increase in households 1 the supply curve shifts to the right, while the demand curve shifts to the left due to the fall in households 2. The new equilibrium is thus reached at point B where the relative price is negative and output is less than $\overline{x}$.

By replicating the procedure with respect to island 2, we obtain the equilibrium values of both the relative price of good 2 in terms of good 1 and the supply of good 2:

$$p_2 - p_1 = a_1 \lambda \tag{14}$$

$$x_2 = \overline{x} + a_1 \lambda \tag{15}$$

Because of its idiosyncratic nature, a negative real local shock on island 1 generates a positive shock on island 2. Therefore, it brings about an increase in both the relative price of good 2 in terms of good 1 and in the supply of good 2.

The Equilibrium in the Aggregate Good Market

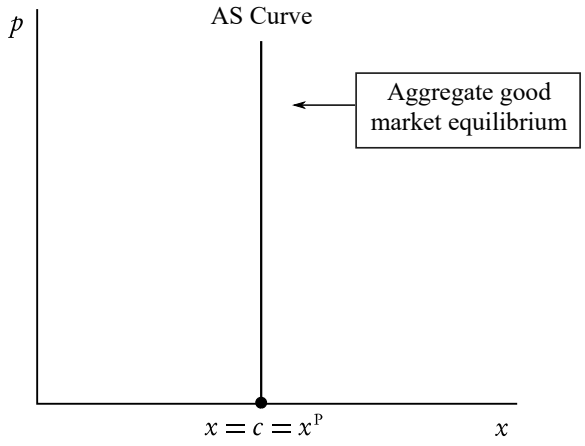
Equilibrium in the goods market occurs when aggregate demand and aggregate supply in real terms are equal.

The *aggregate supply* is equal to $(LX + LX) = (L_1X_1 + L_2X_2)$ where $X = (X_1 + X_2)/2$ is the supply per household on average. Taking logarithms one obtains $2l + 2x = l_1 + l_2 + x_1 + x_2$. Given (1), (13) and (15), the supply per-household is equal to:

$$x = x^{\mathrm{P}} \tag{1.a}$$

where $x^{\mathrm{P}} = (2\overline{x})/2 = \overline{x}$. The supply per household on average is equal to permanent output,

Figure 2 The equilibrium in the aggregate goods market. The equilibrium value of output does not depend on the price level and the real local shock.



x^{P} that, in turn, is equal to the arithmetic average of the permanent supply per household on the two islands. Therefore, the supply is independent of the price level p as well as the real local shock. The hypothesis of local idiosyncratic shocks implies that output variations on two island cancel each other out.

The *aggregate demand* is equal to $(LC + LC) = (L_1C_{1,2} + L_2C_{2,1})$ where $C = (C_1 + C_2)/2$ is the average of demand per household. Taking logarithms, given (8) and (10), it follows:

$$c = x^{\mathrm{P}} \tag{2.a}$$

the average of demand per household is equal to permanent output per household and is independent of both the relative price and the real local shock.

Combining the previous equations, we can then represent equilibrium in the goods market as follows: $L_1X_1 + L_2X_2 = L_1C_{1,2} + L_2C_{2,1}$. Taking logarithms and given (1.a) and (2.a) it is straightforward to get:

$$x = c \tag{3.a}$$

Equation (3.a) is always satisfied regardless of the price level and local shocks. Therefore, *Say's law* holds: aggregate supply generates aggregate demand in such a way that a general glut is ruled out.

Fig. 2 shows the *AS* curve which is the graphical representation of the equilibrium equation of the goods market and is given by the combinations of output and the price level that ensure the equality between aggregate demand and supply. Because both demand and supply functions are independent of the price level, the two respective curves are perpendicular at x-axes at point $x = x^{\mathrm{P}}$; furthermore, because of Say's law, the two curves overlap.

The Money Market

Money is the only medium of exchange. Hence, the nominal demand for money per household (of island 1 and 2 respectively) is equal to nominal consumption and, in turn, to nominal revenue: $M_1^{\mathrm{D}} = P_2C_{1,2} = P_1X_1$ and $M_2^{\mathrm{D}} = P_1C_{2,1} = P_2X_2$.

The aggregate demand for money, therefore, is $L_1M_1^{\mathrm{D}} + L_2M_2^{\mathrm{D}} = L_1P_1X_1 + L_2P_2X_2$, Taking logarithms, this becomes

$$m_1^{\mathrm{D}} + m_2^{\mathrm{D}} = p_1 + p_2 + x_1 + x_2 \tag{4.a}$$

The *aggregate supply* is $LM + LM$ where M is the nominal money supply per household that splits up evenly between the two islands so that the nominal money supply in a given island is equal to LM. The supply per household is made up of two components: the predictable one, $\overline{M}$, and the unpredictable one, Z, so that $M = Z\overline{M}$ where $Z > 0$. The variable Z represents the *nominal shock* that hits both islands uniformly: if $Z > 1$ ($Z < 1$) the public sector implements an expansionary (restrictive) monetary policy through the unpredictable component. By assumption Z is a stochastic variable that follows a log-normal distribution with mean 0 and variance σ_z^2

$$z \sim N\left(0, \sigma_z^2\right)$$

The variance σ_z^2 measures the intensity of the aggregate nominal shock; it is a *monetary policy parameter* rather than a structural one: it is higher when the nominal aggregate shock is stronger and the economy more perturbed. Taking logarithms, the aggregate nominal money supply thus becomes

$$m = z + \overline{m} \tag{5.a}$$

Given the output level, the equilibrium in the two local money markets are respectively $LM = L_1 M_1^{\mathrm{D}} = L_1 P_1 X_1$ and $LM = L_2 M_2^{\mathrm{D}} = P_2 X$ where, implicitly, it is assumed that money velocity is constant and equal to 1. In logarithms terms, monetary equilibrium on island 1 can be described as follows:

$$l_1 + p_1 + x_1 = l + z + \overline{m}$$

Solving for p_1 we obtain the equilibrium value of the absolute price of good 1 :

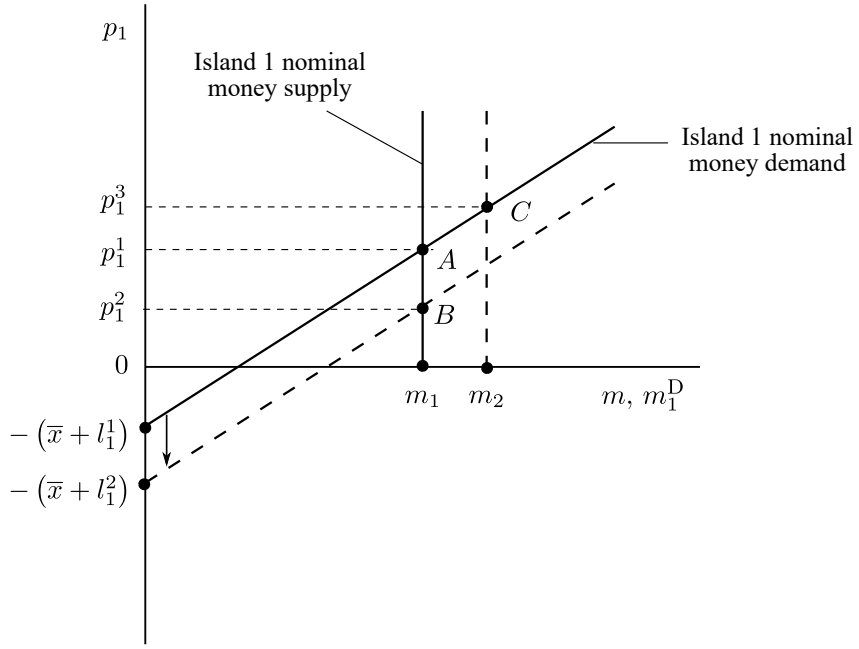
$$p_1 = \overline{m} - x_1 - (\lambda - z) \tag{16}$$

Replicating the procedure with respect to island 2 we obtain

$$p_2 = \overline{m} - x_2 + (\lambda + z) \tag{17}$$

Fig. 3 represents the graphical solution of the equilibrium in the money market in island 1. Given an arbitrary value of x_1 and given l_1^1, it is clear that the nominal demand for money per household $m_1^{\mathrm{D}} = \left(l_1^1 + x_1\right) + p_1$ is an increasing function of p_1; while the exogenous nominal money supply $m_1 = l + z_1 + \overline{m}_1$ is perpendicular to the x-axes. Therefore, for m_1 and the given output value, the equilibrium is reached at point $A = (m_1, p_1^1)$. Furthermore, fig. 3 shows how a local shock greater than the initial one (*i.e.*, $l_1^2 > l_1^1$) produces, *ceteris paribus*, a reduction in the equilibrium value of the absolute price of good 1 (point $B = (m_1, p_1^2)$) and, how an increase in the nominal money supply from m_1 to m_2 – either in the predictable or unpredictable component – given l_1^1, produces, on the contrary, an increase in the equilibrium values of p_1 (point $C = (m_2, p_1^3)$).

Figure 3 The partial equilibrium in the money market of island 1.



Let us now assume that the general price level is measured by a geometric average of the absolute price of the two goods $P = (P_1P_2)^{1/2}$. Taking logarithms, it follows that $p = (p_1 + p_2)/2$. The equilibrium in the money market requires the equality between aggregate demand and supply $L_1P_1X_1 + L_2P_2X_2 = LZ\overline{M} + LZ\overline{M}$. Taking logarithms, we first obtain $(p_1 + p_2) + (x_1 + x_2) = 2\overline{m}^{\mathrm{S}} + 2z$ and, subsequently, after expressing the equilibrium equation in average terms per household and recalling that $x = (x_1 + x_2)/2$ e $p = (p_1 + p_2)/2$, we finally obtain

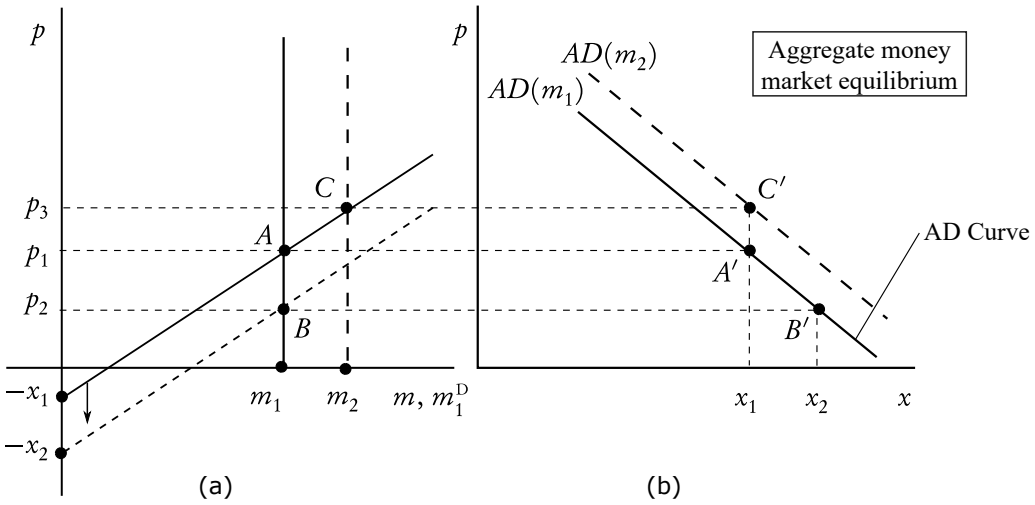
$$p + x = \overline{m} + z \tag{6.a}$$

Equation (6.a) shows that, once output is known, the money market determines the equilibrium value of the general price level p. On the other hand, the (6.a) can be seen as an equation in two variables *i.e.*, the price level and output, whose combinations realize market equilibrium.

In fig. 4 we derive graphically the *AD* curve which represents the equilibrium on the money market and is given by the combinations of output and price level that ensure the equality between aggregate supply and demand for money.

Equation (6.a) shows the decreasing relationship between output and the price level ensuring money market equilibrium. In graph (a) we represent the money market equilibrium at point A, where the demand curve (drawn for an arbitrary value of output, x_1) intersects the supply curve $m_1 = (m_1, p_1)$. In graph (b) we draw a price level/output combination that establishes, at point A', an equilibrium in the money market, in the plane (x, p). In graph (a) we see that a *ceteris paribus* increase in output from x_1 to x_2 generates a rightward shift of the money demand curve and a lower price level, which is needed to

Figure 4 The graphical derivation of the *AD* curve.



re-establish equilibrium in the goods market. The negative slope of the *AD* curve emerges from graph (b) where point B' shows the new price level/output combination that establishes money market equilibrium (x_2, p_2).

General Macroeconomic Equilibrium with Perfect Information

The economy considered in this paper is described by the system of six equation (1.a)-(6.a) in six unknown variables. The reduced form of the model is given by two equations in two unknown variables that is p and x:

$$\begin{cases} x = x^{\mathrm{P}} & (1.\mathrm{b}) \\ p + x = \overline{m} + z & (2.\mathrm{b}) \end{cases}$$

Based on this, we are able to define the general equilibrium with perfect information as a set of values (x, p) that satisfies the equation system (1.b)-(2.b), given the monetary policy parameters $\overline{m}$ and z, and the local shock λ.

The solution of the model is straightforward: the goods market determines equilibrium output, x^{P}, whereas the money market determines the equilibrium price level, p. Indeed, by substituting (1.b) into the (2.b) and by putting $\overline{p} = (\overline{m} - x^{\mathrm{P}})$ we finally obtain

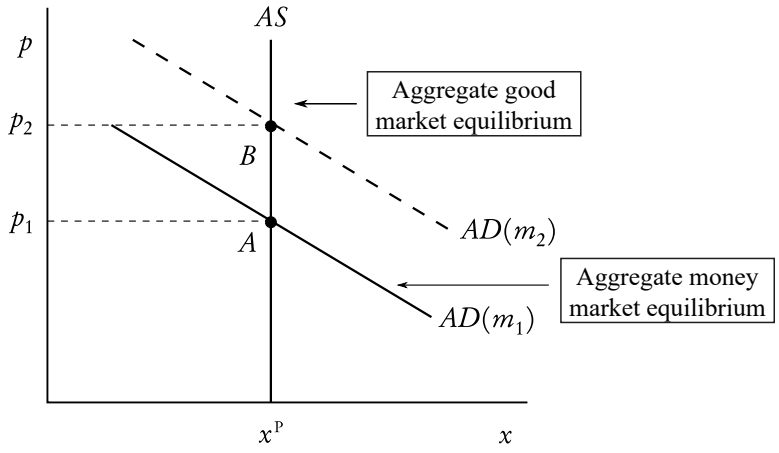
$$p = \left(\overline{m} - x^{\mathrm{P}}\right) + z = \overline{p} + z \tag{18}$$

The general price level turns out to be a stochastic variable that follows a normal distribution with mean $\overline{p}$ and variance σ_z^2

$$p \sim N(\overline{p}, \sigma_z^2) \tag{19}$$

On the other hand, recalling that $x_1 = x_2 = x^{\mathrm{P}}$, from (16) and (17) it follows that the

Figure 5 Macroeconomic general equilibrium in the Lucas Island model with perfect information: the neutrality of money in the predictable component.



equilibrium values of the prices of the two goods are respectively

$$p_1 = \overline{p} - (\lambda - z) \tag{20}$$

$$p_2 = \overline{p} + (\lambda + z) \tag{21}$$

Such prices, then, are stochastic variables that follow a normal distribution with mean $\overline{p} = (\overline{m} - x^{\mathrm{P}})$ and variance $\sigma_z^2 + \sigma_\lambda^2$.

$$p_j \sim N(\overline{p}, \sigma_z^2 + \sigma_\lambda^2) \text{ where } j = 1,2 \tag{22}$$

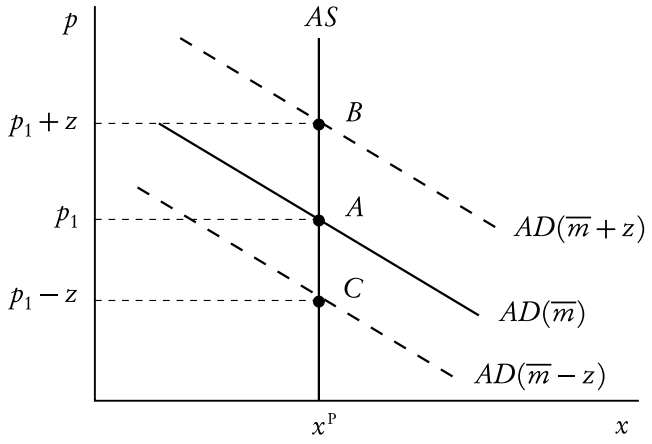
From (18) it follows the neutrality of money proposition, according to which, in the perfect information case, monetary policy is completely ineffective, both in the predictable and the unpredictable component, since it produces only nominal effects a change in absolute prices.

Fig. 5 represents the general macroeconomic equilibrium and shows the effects of a monetary policy implemented by a change in the predictable component only. First, given $m = m_1$, the equilibrium is reached at point $A = (x^{\mathrm{P}}, p_1)$ where the *AS* and *AD* curves intersect. Second, an increase in the money supply from $\overline{m}_1$ to $\overline{m}_2$ shifts the *AD* curve to the right and produces a permanent increase in the price level from p_1 to p_2. The new equilibrium at point $B = (x^{\mathrm{P}}, p_2)$ shows the neutrality of the predictable component of money. Fig. 6 shows instead that even the unpredictable component of money is neutral. Given $m = \overline{m}$, an expansionary monetary policy implemented by rising the unpredictable component to $z > 0$ determines a temporary increase in the price level from p_1 to $p_1 + z$.

To summarize, the Lucas Island model with perfect information generates the following basic conclusions of the standard classical benchmark.

1. Dichotomy *i.e.*, the equilibrium value of the real variables (*i.e.*, real consumption, output and the relative price) are determined by the real side of the economy (*i.e.*, the labor and goods markets) whereas the equilibrium values of the nominal

Figure 6 The neutrality of the unpredictable component of money.



variables are determined by the nominal side of the economy (*i.e.*, the monetary market represented by the *AD* equation).

2. Money is neutral.
3. Say's law *i.e.*, supply creates its own demand.
4. The occurrence of shocks is not sufficient to explain output fluctuations: it merely produces price level oscillations.

THE LUCAS ISLAND MODEL WITH IMPERFECT INFORMATION AND RATIONAL EXPECTATIONS

Imperfect Information and Rational Expectations

In the previous section, the existence of a simple technological device allows households to get perfect information about the key relative price, despite the geographical distance between the two islands. In this section, we present instead a simple version of the original Lucas Island model where this simple device does not exist and an information imperfection thus arises. In particular, the *shopper* of island 1 is unable to transmit immediately to the producer of his/her household the price of good 2. In consequence, to choose its labor and output supply, the household 1 needs to form expectations about such a price. The solution of the expected utility maximization problem under uncertainty can be simplified by assuming that the household adopts the *certainty equivalence principle*. This means proceeding in two steps:

1. first, the household forms its expectation p_2^E and, subsequently, assumes that this expectation is fulfilled for certain;

2. second, given the certain expectation, the household solves its utility maximization problem in the same way as in the previous section.

This means that, given the certainty equivalence behavior and the expectation on p_2, the household maximizes $U_1 = C_{1,2} - \frac{1}{2}N_1^2$ subject to the budget constraint $P_2^{\mathrm{E}} C_{1,2} = P_1 X_1$. Taking logarithms, we first obtain the household's labor supply:

$$n_1 = \overline{n} + (p_1 - p_2^{\mathrm{E}}) \tag{23}$$

and then its output supply of good 1

$$x_1 = \overline{x} + (p_1 - p_2^{\mathrm{E}}) \tag{24}$$

To complete the picture, like Lucas we assume that the household forms rational expectations on p_2.

The Information Transmission Structure

In order to form rational expectations, households have to gather information on both the structural relations of the economy and the values of current variables. In the model considered here, households have both a general information about the overall economy and a local information about the markets where they sell their goods. These two kinds of information differ both in terms of completeness and the timing of information acquisition. On the one hand, the general information $I_t^{\mathrm{G}}(j)$ at disposal of household $j = 1,2$ is complete but delayed. On the other, the local information $I_t^{\mathrm{L}}(j)$ at disposal of household $j = 1,2$ is incomplete but immediate

At time t, the household 1 has past general information on the economy, that is relatively at period $t-1$, I_{t-1}^{G}. In particular, as already noted, it knows the structural relations, the parameters of the model and the first moments of the probability distributions of the relative price, the price level, and absolute prices of the two goods:

1. *The relative price:*

$$p_2 - p_1 = a_1\lambda \qquad p_2 - p_1 \sim N\left(0, a_2^2\sigma_\lambda^2\right) \tag{25}$$

2. *The price level:*

$$p = \overline{p} + z \qquad p \sim N\left(\overline{p}, \sigma_z^2\right) \tag{26}$$

3. *Absolute prices of the two goods:*

$$p_1 = \overline{p} - (\lambda - z) \qquad p_1 \sim N\left(\overline{p}, \sigma_\lambda^2 + \sigma_z^2\right) \tag{27}$$

$$p_2 = \overline{p} + (\lambda + z) \qquad p_2 \sim N\left(\overline{p}, \sigma_\lambda^2 + \sigma_z^2\right) \tag{28}$$

where $\lambda \sim N\left(0, \sigma_\lambda^2\right)$ e $z \sim N\left(0, \sigma_z^2\right)$.

In conclusion, the set of general information is given by

$$I_{t-1}^{\mathrm{G}} = \left\{\overline{p}, \sigma_z^2, \sigma_\lambda^2, (25), (26), (27), (28)\right\} \tag{29}$$

As for local information, at time t the household knows the equilibrium value of p_1 but does not know p_2, so that it has to form a rational expectation on this price to make its decisions. However, the household can cumulate its current information about p_1 with the information

available on the probability distribution of the absolute price. Indeed from (27), given p_1, the household realizes that:

$$\lambda - z = \overline{p} - p_1 \tag{30}$$

As a consequence, the local information $I_t{}^{\mathrm{L}}(1)$ at disposal of the household is given by the current price of good 1 and the algebraic sum of real and nominal shocks

$$I_t^{\mathrm{L}}(1) = \{p_1, \lambda - z\} \tag{31}$$

Summing up these two information sets, the household is able to define the set of overall information, $I_t^{\mathrm{C}}(1)$ which is at its disposal at time t:

$$I_t^{\mathrm{C}}(1) = \left\{p_1; \lambda - z, \overline{p}, \sigma_z^2, \sigma_\lambda^2, (25), (26), (27), (28)\right\} \tag{32}$$

Signal Extraction from Current Information

However, this is not the end of the story. To form a rational expectation on p_2, the household has to take another step: exploit all available information efficiently.

One possibility is to use the *general information set* and form the rational expectation on p_2 conditional on I_{t-1}^{G} so as to obtain

$$p_2^{\mathrm{E}}(I_{t-1}^{\mathrm{G}}) = E(p_1 \mid I_{t-1}^{\mathrm{G}}) = \overline{p} \tag{33}$$

By using solely past information, the household regards the deviation of p_1 from $\overline{p}$ (*i.e.*, $(\lambda - z)$) as due to the real shock only and thus as signaling a relative price change which leads it to modify its output supply. One obvious limitation of this approach is that the household does not exploit the information available at time t, which includes the sum of the real and nominal shocks. However, once the household considers this information, the issue of how it manages to decompose this sum of shocks in order to single out the relative price change and form rational expectations more efficiently *i.e.*, the signal extraction problem, cannot be avoided. In principle, if the household were able to exploit the value of λ exactly by using the (25), it might determine the current relative price with certainty. In two extreme cases, the signal coming from $\lambda - z$ can be easily decoded:

1. *the real local shock is absent*: $\sigma_\lambda^2 = 0$. In this case, the household knows for sure that the deviation of absolute prices from their respective mean is due to the nominal shock only, so that the relative price does not change;
2. *the nominal aggregate shock is absent*: $\sigma_z^2 = 0$. In this case, the household knows instead that the deviation of p_1 from $\overline{p}$ is totally due to the real local shock: the occurrence of $\lambda - z$ thus signals a relative price change.

Clearly, the signal extraction problem becomes significant when both shocks are present, that is when both variances differ from 0. The solution calls for five steps.

1. First, the household calculates the expected value of p_2 through the (25) conditional on the overall information set. Since the household knows p_1 (so that $E(p_1 \mid I_t^{\mathrm{C}}) = p_1$) and assigns to the real local shock at least a fraction of the observed sum of shocks, we have

$$p_2^{\mathrm{E}}(I_t^{\mathrm{C}}) = p_1 + a_1 E(\lambda \mid I_t^{\mathrm{C}}) \tag{34}$$

2. Second, the household estimates the expected value of the real local shock *i.e.*, $E(\lambda \mid I_t^{\mathrm{C}})$ quite naively, that is by regarding it simply as a fraction β of $(\lambda - z)$ plus an error term, ε, following a normal distribution with mean 0:

$$\lambda = \beta(\lambda - z) + \varepsilon \tag{35}$$

In this case, the signal extraction factor (*i.e.*, the coefficient β) is equal to the ratio between the real local shock and the observed shock plus the random error term $\varepsilon_1 = \varepsilon/(\lambda - z))$

$$\beta = \frac{\lambda}{\lambda - z} + \varepsilon_1$$

3. Third, the household calculates the expected value of the real shock conditional on overall information by using the (35).Since $\lambda - z$ is a constant, it obtains:

$$E\left(\lambda \mid I_t^{\mathrm{C}}\right) = \beta E\left(\lambda - z\right) = \beta\left(\lambda - z\right) \tag{36}$$

4. Fourth, the household computes the value of β by using the least square method, which minimizes the sum of squared errors *i.e.*, $\varepsilon^2 = [\lambda - \beta(\lambda - z)]^2$

$$\varepsilon^2 = [(1-\beta)\lambda + \beta z)]^2 = \left[(1-\beta)^2\lambda^2 + \beta^2 z^2 + 2(1-\beta)\beta z\lambda\right]$$

By solving the following minimization problem

$$\min_{\text{with respect to } \beta} \quad E\left(\varepsilon^2\right) = E\left[(1-\beta)^2\lambda^2 + \beta^2 z^2 + 2(1-\beta)\,\beta\,z\,\lambda\right]$$

and therefore differentiating with respect to β, it gets

$$\frac{d}{d\beta} E\varepsilon^2 = E\left[-2(1-\beta)\lambda^2 + 2\beta z^2 + 2\beta z\lambda + 4\beta z\lambda\right] = 0$$

By assuming $\mathrm{cov}(z, \lambda) = 0$ and solving for β, it finally obtains

$$\beta = \frac{\sigma_\lambda^2}{\sigma_z^2 + \sigma_\lambda^2} \tag{37}$$

5. Fifth, the household calculates the rational expectation of p_2 conditional on the overall information set. First of all, from the (36), given the (27), it obtains:

$$E(\lambda \mid I_t^{\mathrm{C}}) = \beta(\lambda - z) = \beta\left(\overline{p} - p_1\right) \tag{38}$$

By setting $\beta_1 = a_1\beta = [(2/3)/\beta] < 1$ and substituting the (38) into the (34) it gets

$$\begin{aligned}
p_2^{\mathrm{E}}(I_t^{\mathrm{C}}) &= p_1 + a_1 E(\lambda \mid I_t^{\mathrm{C}}) \\
p_2^{\mathrm{E}}(I_t^{\mathrm{C}}) &= p_1 + a_1\beta\left(\overline{p} - p_1\right) \\
p_2^{\mathrm{E}}(I_t^{\mathrm{C}}) &= (1-\beta_1)p_1 - \beta_1 E(p_1 \mid I_{t-1}^{\mathrm{G}}) \\
p_2^{\mathrm{E}}(I_t^{\mathrm{C}}) &= (1-\beta_1)p_1 + \beta_1\overline{p}
\end{aligned} \tag{39}$$

The rational expectation of p_2 at time t conditional on the overall information set at time t is equal to the weighted arithmetic average of the absolute price of good 1 (*the current information*) and the mean of the probability distribution of the general price level *i.e.*, $\overline{p}$ (*the past information*) where the weights depend on β. Three cases can be distinguished:

1. $\sigma_z^2 \approx 0 \Rightarrow \beta \approx 1 \Rightarrow \beta_1 \approx a_1 \Rightarrow p_2^{\mathrm{A}} \approx p_1 + a_1(\overline{p} - p_1) = p_1 + a_1\left(\lambda - z\right)$. In this case, β indicates that only a real local shock occurs.

2. $\sigma_\lambda^2 \approx 0 \;\Rightarrow\; \beta \approx 0 \;\Rightarrow \beta_1 \approx 0 \Rightarrow p_2^{\mathrm{E}} \approx p_1$. In this case instead only a nominal shock occurs.
3. $\sigma_\lambda^2 \neq 0 \; \sigma_z^2 \neq 0 \Rightarrow 0 < \beta < 0 \Rightarrow 0 < \beta_1 < 0 \Rightarrow p_2^{\mathrm{E}} - p_1 = \beta_1 (\overline{p} - p_1)$. In this case, both shocks occur. In consequence, the relative price changes by a fraction of the difference between the price of good 1 and the mean of the probability distribution of the general price level.

The Local and Aggregate Supply Functions

The Local Supply Functions

From (24), given (39) it follows:

$$\begin{aligned} x_1 &= x^{\mathrm{P}} + \left[p_1 - p_2^{\mathrm{E}}(I_t^{\mathrm{C}})\right] \qquad (40)\\ x_1 &= x^{\mathrm{P}} + [p_1 - (1-\beta_1)p_1 - \beta_1 \overline{p}] \\ x_1 &= x^{\mathrm{P}} + \beta_1 \left[p_1 - p_2^{\mathrm{E}}(I_{t-1}^{\mathrm{G}})\right] \qquad (41)\\ x_1 &= x^{\mathrm{P}} + \beta_1 (p_1 - \overline{p}) \\ x_1 &= x^{\mathrm{P}} + \beta_1 (z - \lambda) \qquad (42) \end{aligned}$$

The local supply function permits three interpretations. Equation (40) shows that the deviation of the supply of good 1 from its potential level depends on the expected relative price conditional on the overall information set. Equation (41) indicates that this deviation is equal to a fraction of the difference between the price of good 1 and the mean of the probability distribution of the price level. Finally, equation (42) shows that the supply of good 1 can be seen as the sum of a constant and a cyclical component, equal to a fraction of the shocks that hit the economy. The good 1 supply function (42) can be rearranged as follows $(p_1 - \overline{p}) = -x^{\mathrm{P}}/\beta_1 + x_1/\beta_1$. As for the slope of the curve, which depends upon β, one can distinguish three cases:

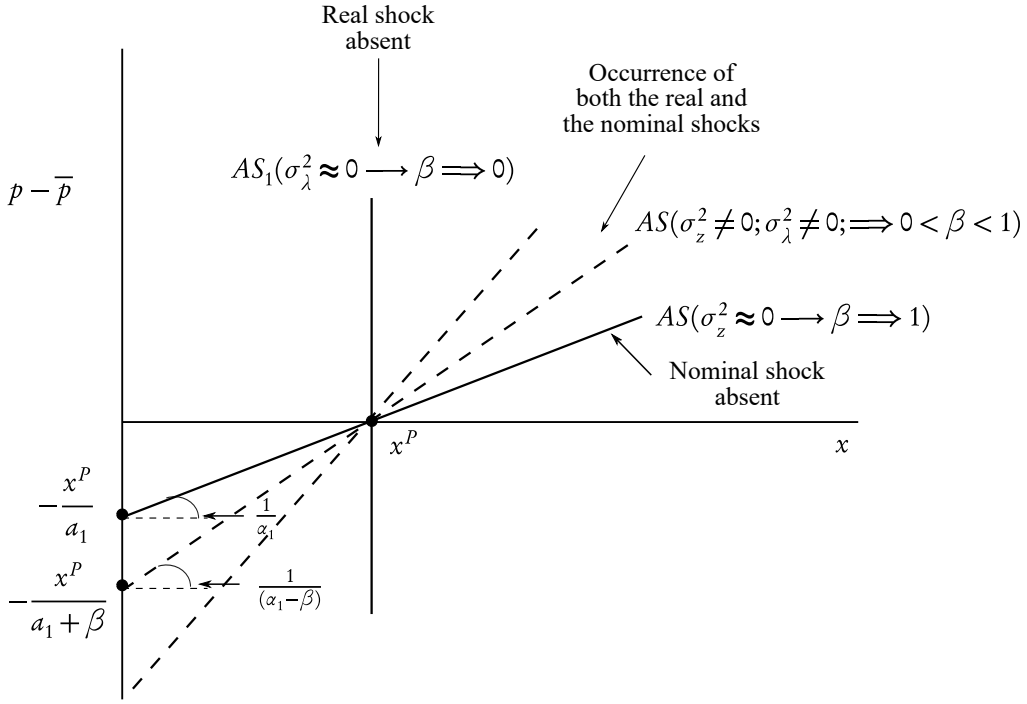
1. if $\sigma_z^2 \approx 0 \Longrightarrow \beta \approx 1 \Longrightarrow \beta_1 \approx a_1$. The household holds that only the real local shock occurs so that he regards the change in price 2 as a relative price change.
2. if $\sigma_\lambda^2 \approx 0 \Longrightarrow \beta \approx 0 \Longrightarrow \beta_1 \approx 0$. The household considers instead that the change in the price of good 2 is entirely due to the occurrence of a nominal shock. In this case, the model corresponds to the classical benchmark of the previous section.
3. if $\sigma_\lambda^2 \neq 0$ and $\sigma_z^2 \neq 0 \Longrightarrow 0 < \beta < 1 \Longrightarrow 0 < \beta_1 < 1$. In this intermediate case, both shocks occur so that the household assigns a fraction of the observed shock to the real shock.

The Aggregate Good Supply: the Lucas Supply Function

The aggregate supply of goods can be obtained by summing up the two local supplies: $2x = x_1 + x_2 = (x^{\mathrm{P}} + x^{\mathrm{P}}) + \beta_1(p_1 + p_2 - 2\overline{p})$. Diving both sides of the equation by 2, we finally obtain the aggregate supply equation:

$$\begin{aligned} x &= x^{\mathrm{P}} + \beta_1 (p - \overline{p}) \\ x &= x^{\mathrm{P}} + \beta_1 z \end{aligned} \qquad (43)$$

Figure 7 The aggregate good supply curve with imperfect information.



According to the Lucas supply function, the deviation of current supply from its permanent level depends on the unpredictable change in the general price level, which is equal to a fraction of the nominal aggregate shock. The Lucas function is also known as the "surprise" aggregate supply curve precisely because an unpredictable nominal shock takes agents by surprise and leads them to change their output with respect to its natural level. Equation (43) shows that the aggregate function, like its local counterpart, is formed by a constant and a cyclical component depending on the unpredictable nominal shock. In Fig. 7 we draw the aggregate supply curve (43), which is rearranged as follows $(p-\overline{p}) = -x^{\mathrm{P}}/(a_1\beta) + [1/(a_1\beta)]x$. While the same conclusions obtained for the local supply case also apply to the Lucas function, three further remarks are in order.

A first remark is that while in the local goods market output oscillations may be due to both types of shock, at the aggregate level instead such oscillations depend exclusively on the aggregate nominal shock. This result, however, is not general since it depends crucially on the assumption of an idiosyncratic real shock, according to which the latter hits the two islands in an opposite way so that the net aggregate effect is nil. If local shocks hit both islands uniformly, then the supply function would incorporate an additional random variable so that aggregate output would depend on the unpredictable real shock as well.

A second remark is that imperfect information is not a sufficient condition for the occurrence of output fluctuations. Indeed, if the real shock were absent, an aggregate nominal shock would not bring about output oscillations. It can generate this effect only if it is combined with a real shock. It is because both shocks occur that agents get confused

and tend, through the signal extraction process, to form rational expectation on the relative price incorporating a random forecast error.

In the end, the slope of the aggregate supply function depends on both structural and policy parameters. Hence, the so-called Lucas critique follows: econometric models based on the assumption of structural parameters invariant to policy changes lead to biased conclusions on the effects of macroeconomic policies.

General Equilibrium with Imperfect Information

The economy with imperfect information is described by a system of 7 equations (one of these, say equation (2.a), is redundant and can be removed) in 6 unknown variables x, c, m, m^{D}, p e p^{A}:

$$x = x^{\mathrm{P}} + \beta_1 \, (p - p^{\mathrm{E}}) \tag{1.a}$$

$$c = x \tag{2.a}$$

$$c = x \tag{3.a}$$

$$m^{\mathrm{D}} = x + p \tag{4.a}$$

$$m = \overline{m} + z \tag{5.a}$$

$$m^{\mathrm{D}} = m \tag{6.a}$$

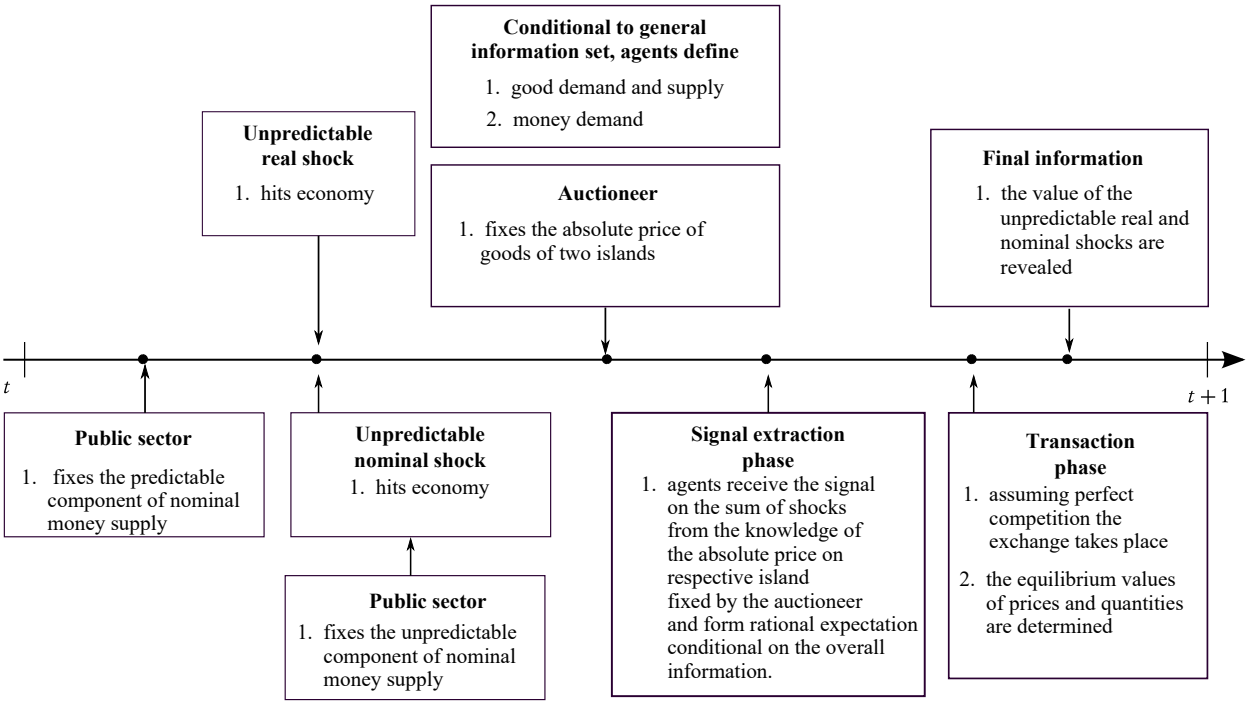
$$p^{\mathrm{E}} = E(p \mid I_t^{\mathrm{C}}) \tag{7.a}$$

The first three equations represent the goods market: (1.a) is the supply function; (2.a) is the demand function that, given the validity of Say's law, is equal to supply and (3.a) is the market equilibrium condition. The successive three equations represent the money market: (4.a) is nominal demand that is equal to nominal labor income; (5.a) is the nominal supply, while (6.a) is the market equilibrium condition. In the end, (7.a) describes agents' rational expectations on the price level.

Let us make a digression on the timing of events and agents' choices in a given period t that is represented in Fig. 8.

1. First, at the beginning of period t the public sector reveals the predictable component of the nominal money supply; subsequently, a real local shock (*i.e.*, nomadism) and a nominal aggregate shock (*i.e.*, a change in the unpredictable component of money supply) occur.
2. Second, given the past general information set, households form rational expectations and define their demand and supply for goods and money demand.
3. Third, the auctioneer fixes absolute prices on both islands.
4. Fourth, households observe the absolute price on their respective islands and extract the signal from current information about relative price changes.

Figure 8 The timing of events and agents' choices.



5. Fifth, transactions occur in perfect markets and equilibrium prices and quantities are determined.
6. Sixth, agents know the size of the relevant shocks and update the probability distributions of the key random variables needed to form rational expectations.

Let us return to the solution of the model. From the above equation system, we can derive the reduced form of the model:

$$x = x^{\mathrm{P}} + \beta_1 (p - p^{\mathrm{E}}) \tag{4.b}$$

$$x = \overline{m} - p + z \tag{5.b}$$

$$p^{\mathrm{E}} = E(p \mid I_t^{\mathrm{C}}) \tag{6.b}$$

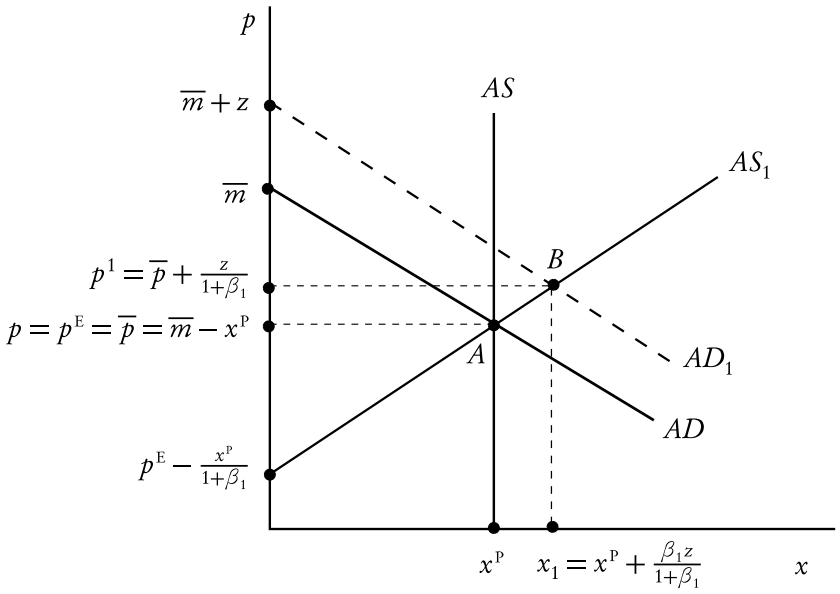
This shows that, given the monetary policy parameters $\overline{m}$ and z, and the local shock λ, the general equilibrium with imperfect information is a set of values (x, p, p^{E}) that satisfies the equation system (4.b)-(6.b).

The solution of the model proceeds in two steps.

1. *Calculation of the rational expectation of p_t.* Taking the expected value of (4.b) and of (5.b) given (6.b), and recalling the reiterative property of rational expectations, we obtain respectively

$$E(x) = x^{\mathrm{P}} + \beta_1 (p^{\mathrm{E}} - p^{\mathrm{E}})$$
$$E(x) = \overline{m} - p^{\mathrm{E}}$$

Figure 9 General equilibrium with imperfect information: the invariance proposition.



Since the right-hand side of the expressions are equal we get:

$$p^E = \overline{p} = \overline{m} - x^P \tag{44}$$

The rational expectation of p is equal to the mean of the probability distribution of the price level conditional on the general information set of period t that, in turn, is equal to the difference between the predictable component of the money supply and permanent output.

2. *Calculation of equilibrium values of prices and quantities.* Making equal (4.b) e la (5.b), given (44), we obtain

$$\overline{m} - p + z = x^P + \beta_1 (p - \overline{p})$$

Solving the previous expression with respect to p, we first obtain the equilibrium price level:

$$p = \overline{p} + \frac{1}{(1+\beta_1)} z \tag{45}$$

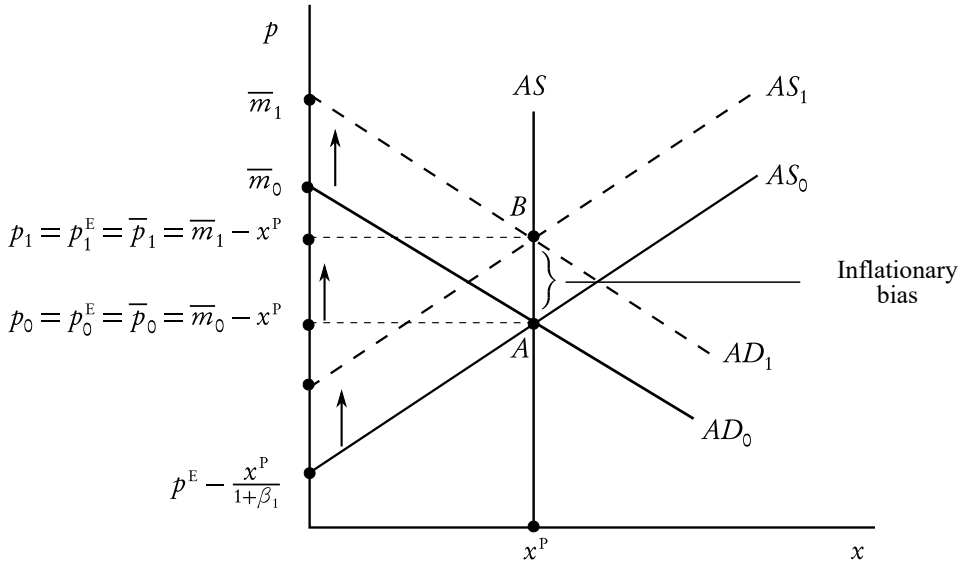
By substituting (45) into (4.b) we finally obtain equilibrium output:

$$x = x^P + \frac{\beta_1}{(1+\beta_1)} z \tag{46}$$

From (46) the invariance proposition follows: current output oscillates erratically around permanent output.

The Effects of Predictable and Unpredictable Monetary Policies

Figure 10 The effects of a permanent expansionary predictable monetary policy. A permanent increase in the predictable component of the money supply produces an inflationary bias.



Equations (46) and (45) show that the unpredictable component of monetary policy generates real effects: it changes current output. In Fig. 9 we draw the graphical solution of the reduced model in the plane (x, p) and analyze the effects of an expansionary monetary policy implemented through a change in the unpredictable component. With respect to initial equilibrium at point A, this change shifts the *AD* to the right, whereas the *AS* curve stays put (since its position depends solely on the predictable component of the money supply $\overline{m}$ *via* $p^{\mathrm{E}} = \overline{p}$). Households do not fully predict this change and erroneously regard it at least partly as a real local shock and thus change their output supply. The new point of equilibrium is reached at $B = (x_1, p_1)$ where $x_1 > x^{\mathrm{P}}$ e $p > p_1$.

If the public sector instead carries out a permanent change in the predictable component of the money supply, as Fig. 10 shows, only an inflationary bias occurs. Starting from the equilibrium point $A = (x^{\mathrm{P}}, p_0)$, this change produces two effects. First, it leads households (who fully observe this change) to update their rational expectation of p from p_0^{E} to $p_1^{\mathrm{A}} = \overline{m}_1 - x^{\mathrm{P}}$: the *AS* shifts upwards. Second, it generates a disequilibrium in the money market that, in turn, given the constant level of output, implies a price level rise: the *AD* curve shifts upwards. In consequence, the new equilibrium point is reached at $B = (x^{\mathrm{P}}, p_1)$ where output remains constant at the initial level and a permanent increase in the price level occurs.

CONCLUSIONS

Two main conclusions seem to follow from the analysis developed in this paper, seeking to provide a teaching apparatus – based on the Lucas island model– capable of

helping students taking an intermediate-level macroeconomics course to interpret the structure of mainstream models.

The first is that the replacement of Lucas's original overlapping generation structure with the producer-shopper distinction holds at least two distinctive distinctive pedagogic advantages over other presentations which are currently available in the literature. First, it both makes Lucas's model more realistic and increases students' intuitive understanding of its limitations. In particular, it shows the existence of a kind of inconsistency in the information structure implied by this model. On the one hand, by making the rational expectations assumption, Lucas's model implies a very high degree of information efficiency, a feature which is made much more plausible by the existence of advanced technology such as computers. On the other, however, the model actually implies technological backwardness: the simple geographic distance between islands turns out to be sufficient to generate the lack of communication between the producer and the shopper which is responsible for agents' confusion between relative and absolute prices. As the perfect information case discussed in this paper shows, this naturalistic hurdle can be overcome by the existence of technological devices such as cellular phones which enable shoppers to communicate the prices on island 2 to producers on island 1.

The second conclusion is that the introduction of a money market in Lucas's island model adds further pedagogical value to the presentation as it allows students to think in terms of a more familiar aggregate demand and supply structure. In particular, by allowing a comparison between the Lucas model with a benchmark model (identical to Lucas's model except for the imperfect information assumption), the apparatus makes clear that Lucas's explanation of output fluctuations reduces simply to individuals misperception of unpredictable real shocks that arise because of their imperfect information concerning the state of the economy.

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THE PUZZLE CHALLENGE: A CLASSROOM DEMONSTRATION OF PRODUCTIVITY GAINS THROUGH SPECIALIZATION

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ABSTRACT

The puzzle challenge is a simple, fun classroom activity designed to demonstrate in a hands-on way how specialization increases productivity. Working in teams of one, two, or three, students race to complete identical 100-piece puzzles for small cash prizes. Students will observe that team completion times are proportionally much faster than individuals' times, indicating that teams are more productive on a time per-worker basis. In discussing this results, students will realize that teams spontaneously and intuitively implemented specialization in their puzzle building process, which is the source of the higher per-worker productivity.

INTRODUCTION

"The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is any where directed, or applied, seem to have been the effects of the division of labour." (Smith 1828 [1776], 15)

Economists have long recognized the fundamental importance of specialization and the division of labor in promoting productivity gains that generate economic growth. The puzzle challenge is a fun, hands-on way for students to experience and observe these productivity gains in the classroom. The puzzle challenge allows students to think intuitively about how specialization increases per-worker productivity, and it establishes a clear-cut empirical basis for assessing the magnitude of these productivity gains.

The puzzle challenge is designed as an "experiential learning" exercise that allows students to develop economic intuition through hands-on experience. Educational psychology literature has established a strong rationale for such experiential methods of instruction, indicating their superior effectiveness for students with different learning styles (Kolb 1984).

Many economists have made effective use of classroom games and activities. Spencer and Van Eynde state "The most consistent finding of those who have become involved with experiential learning as a form of instruction is that it is intrinsically motivating, more involving, and almost always more enjoyable for participants than are most other forms of instruction." (1986, 292) Hawtrey (2007, 144) notes that such activities "improved student motivation and better retention of knowledge" when implemented along with standard forms of instruction. Salemi (2002, 721) argues that experiential methods are "effective but seldom used." Dolan and Stevens (2006), Grawe (2007), and Park (2010) have also successfully utilized these "active learning" methods.

With a growing number of published classroom activities and a growing list of economists who endorse their use, one would suspect a trend of increasing classroom use of experiential learning tools. Lamentably this is not the case. According to a survey conducted by Watts and Becker, undergraduate economics instructors made use of classroom activities

"relatively infrequently" (2008, 203). Watts and Becker summarize their report by stating "the teaching method of choice in undergraduate economics courses at least among instructors has remained chalk and talk" (2008, 285).

With the goal of supplementing chalk and talk with more hands-on techniques, I present the puzzle challenge for classroom use. In one class period, this simple competition can be used as an effective lesson to get students thinking about the productivity gains arising from specialization and the division of labor.

SETUP

Materials Required:

Identical 100 piece puzzles (one for every two students)
6 or 7 $1 bills for cash prizes
Timer (stopwatch or smartphone/ web app)

Working individually or in teams, students will race to complete 100-piece puzzles for cash prizes. The activity demonstrates that team productivity, measured in completion time, is proportionately higher than individuals'. For the activity you need identical 100 piece puzzles. It's important to supply the students with identical puzzles in order to eliminate variation in puzzle difficulty from skewing the results. I learned this from experience—when I first did this activity several years ago, I gave students different puzzles, but I soon realized that certain puzzles were much more difficult to complete. 100 piece puzzles are just right for one hour classes and can be found at hobby or craft stores for very low prices. You will be dividing the class into teams of one, two, and three, each team working one puzzle, and you will need roughly one puzzle per two students. Cash prizes give students motivation and incentive to try their hardest to complete the puzzles as quickly as possible. I give a $3 prize for first place (shortest completion time), $2 for second place, and $1 for third place. Because teams of two or three will typically take all three prizes, a consolation prize of $1 may be offered to the fastest soloist, to maintain solos' motivation after they see that the two and three student groups will most likely be taking the main prizes.

PROCEDURE

Begin by grouping students into equal numbers of one, two, and three student teams. I facilitate this process by arriving early and pre-arranging chairs around the tables; for instance if I have 20 students in a class, I'll have three tables with just one chair, three tables with two chairs, three tables with three chairs-sufficient for 18 students, and for the remaining two students can either be added as another team of two or two more solo teams. Next, announce the puzzle challenge. I'll say something along these lines. "Today we're doing a puzzle challenge. Each team will receive an identical 100 piece puzzle. When I say go, I'll start a timer, and the table that finishes first will receive a $3 first prize; second place will receive $2, and third place $1."

When starting the activity don't tell students what it's about-you want to induce a spontaneous emergence of the phenomenon of specialization, and then have students reflect on this during the post-activity discussion. I won't announce the optional consolation prize until I

realize that I need it; it could be the case that a solo will finish first, and in that case the consolation prize is unneeded. In the more typical case that teams of two and three finish first, second, and third, I'll bring in the consolation prize to keep the soloists motivated. When distributing the puzzles, make sure that all tables have their puzzles before any team is allowed to begin. Finally, start the timer and say "go." You'll keep a running timer; when each team completes its puzzle, just look at the timer and note the completion time, don't stop the timer. Round completion times to the nearest minute and record them on the board. Stop the activity when the third place team finishes and be sure that all remaining teams cease work on their puzzles. Have teams that have not completed their puzzles count the number of pieces they assembled in order to estimate completion times (instructions provided below). Be sure to hand out the cash prizes before doing any calculations or discussing the results.

RESULTS

Once you've run the challenge, recorded the times of the winners and handed out the prizes, it's time to put the puzzles aside and discuss what just happened. Students will observe that teams on average not only finish faster, but *proportionately* faster than individuals. In other words, a two person team will take less than half the time required by an individual to complete the puzzle. What this means is that teams are more efficient than individuals on a time-per-worker basis. We'll do some simple math to prove this, so that students will understand that it's not just a matter of getting more work done with specialization, but getting work done more efficiently. A screen capture of the actual results obtained from a recent implementation of the activity is presented in Figure 1 and will be discussed in the following section.[1]

Figure 1
PUZZLE CHALLENGE ACTUAL RESULTS, JANUARY 2016

	A	B	C	D	E	F	G	H	I
1	Team Size	Times (minutes, rounded)				Average Time	Total Worker Time (Avg. * team size)	Fraction of Solo Time (TWT/ solo avg)	Time Savings (Difference / solo avg)
2	*1*	207	93	56	83	110	110	100%	0%
3	*2*	17	34	38		30	59	54%	-46%
4	*3*	21	31	37		30	89	81%	-19%

The first step in tabulating the results is to enter completion times (rounded to the nearest minute) into the spreadsheet. In the example results shown in Figure 1, a duo team finished in 17 minutes, earning them 1st prize of $3; a trio team finished in 21 minutes for 2nd prize of $2, and another trio finished in 31 minutes for the 3rd prize of $1. A one dollar consolation prize went to the soloist who was closest to completion when the activity ended at the 31 minute mark (estimated completion time of 56 minutes). To estimate completion times for teams who are not able to complete in given time, record the non-completed teams' counts of how many pieces they assembled-for 100 piece puzzles this number constitutes the completion percentage.[2] Assuming

each team progresses toward puzzle completion at a linear rate, completion time may then be estimated by solving for *x* in the following equation:

$$\frac{\begin{matrix} completion \\ percentage \end{matrix}}{\begin{matrix} 3rd\ place\ time \\ (activity\ stop\ time) \end{matrix}} = \frac{100\%}{x\ minutes}$$

For instance, a solo completed 15% of the puzzle in 31 minutes (the 3rd place time/ activity stop time), which works out to:

$$\frac{15\%}{31\ min} = \frac{100\%}{x\ min}$$

By cross-multiplying, we find that *x* equals approximately 207 minutes.[3] Work out the estimated completion times for all non-placing teams before moving on to discuss the results.

Once all times-actual or estimated-for all teams are entered (cells B2:E4 in Figure 1), the spreadsheet will automatically calculate all relevant results. First among these is the average completion time[4] for each team size (column F in Figure 1). Average completion times clearly indicate, as we might expect, that teams are faster than solos-i.e. teams of workers accomplish more than an individual worker in a given time period. The point of this activity is not to belabor this obvious fact, but to demonstrate that specialization leads not just to greater output, but greater *per-worker productivity*. In other words, we're not just getting more work done, but we're getting more work from each person. To establish this efficiency gain, we calculate the *total worker time* taken, on average, for each team size to complete the puzzle. The column "total worker time" (column G) in the spreadsheet does exactly this, multiplying the average time for each team size by the number of workers in that team size. Thus in the example case we can see that, while solos needed on average 110 minutes of *total* work time to complete the task, duos required an average of just 60 minutes of *total* work time-nearly double the per-worker productivity. The final two columns of the spreadsheet express the productivity gains in two distinct yet complementary ways. The column "Fraction of Solo Time" (column H) expresses the average time for each team size as a percentage of the average solo time. The column "Time Savings" (column I) divides the difference in average solo vs. team times by the solo time, indicating how much less total worker time teams required as compared to soloists. Thus in the example we can see that duos used on average just 54% of the total work time that solos required. Put another way, teams of two completed the task using 46% less total worker time.

DISCUSSION

The results presented in the spreadsheet thus establish that not only are teams more productive, but proportionately more productive than individuals in terms of total worker time. In other words teams are more *efficient*-they accomplish the same output with less input. Now we want to discuss how and why that occurred-in other words, what did teams do differently than individuals? This is literally the question to ask the students and, while the answer should be obvious, it is worth noting and stating explicitly in order to ensure students recognize this basic,

fundamental tenet of economics: how productivity gains arise from specialization and the division of labor.

Discussion is brief and should begin by simply addressing the winning team(s) and ask them to describe how they constructed the puzzle. In the recent implementation for which actual results data is presented above, a student on the winning team answered this question by stating, "[We] started with the outside first, separating all the outside [from] the inside pieces; and then while they worked on the outside, I started working on putting together the inside pieces." Common responses should take this form, i.e. students should indicate that teams implemented some kind of specialization when working on the puzzle, specialization that was of course impossible for solos. Once students themselves have recognized and described the specialized process of team puzzle-building, it is important to ask how this came about. I'll ask the students how they came upon the idea of specializing. Did they need to be prompted or encouraged to specialize, or did it occur naturally and without much (if any) conscious thought on their part? Because no other instruction was given at the beginning of the activity other than the announcement of the prizes, any specialization that emerges[5] will be *ipso facto* spontaneous.

In other words, we can surmise that specialization occurs naturally when a team of workers is striving to complete a task for a monetary reward. This last point is important because it makes the result of seemingly frivolous puzzle building generalizable to the market economy. Real-world production processes can be likened to "puzzles" in which entrepreneurs put together discrete pieces of land, labor and capital to produce goods for consumers' benefit. The greatest rewards (profits) accrue to those who are most productive, and a large part of that productivity stems, as we have just observed, from effectively instituting specialization.

CONCLUSION

The puzzle challenge teaches a fundamental lesson of economics in a fun, memorable, and empirically powerful manner: specialization increases productivity. Having experienced the power of specialization for themselves in a spontaneous fashion, students should be ready to delve deeper into the economics of specialization and trade, to learn how individuals and entire countries can gain through the application of specialization based on comparative advantage. I am pleased to share this activity with my colleagues in the economics teaching profession, and I encourage its use, especially in the introductory and principles classroom, to get students involved in and excited about one of the most important lessons in all of economics.

ENDNOTES

1 A blank version of the Excel workbook used to record and calculate results is available via email by request from the author: tylerwatts53@gmail.com

2 A team that has mostly completed the puzzle may of course find it easier to count the non-assembled pieces and subtract this number from 100 to establish their completion percentage.

3 As a shortcut, you may simply divide the decimal of the team's completion percentage into the activity stop time: ————

4 Average time is taken for each team size to "smooth out" any distortion in completion times affected by the possible presence of extremely good or bad puzzle builders in the class

5 Specialization and the associated productivity gains will assuredly occur, especially in larger classes. I've run the activity with as few as four students two solos and one duo and achieved satisfactory results, with the duo team requiring 22% less total worker time than the average of the solos.

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EFFICIENCY OF MUNICIPAL SCHOOLS IN RIO DE JANEIRO: EVIDENCE FROM TWO-STAGE DEA

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ABSTRACT

This paper analyzes the efficiency of 465 elementary schools run by the city of Rio de Janeiro by means of a two-stage data envelopment analysis, according to the model proposed by Simar and Wilson (2007). The first stage of this study analyzes school efficiency; in the second stage, from a bootstrapped truncated regression, the variables that have a significant impact on efficiency are identified. This paper, in addition to suggestions for public policy in education, finds that higher student socioeconomic level does not correlate with higher efficiency. However, longer school days, student discipline-related problems, and the lack of solidarity programs or community clean-up programs correlate with lower efficiency.

Keywords: *school; two-stage DEA; Brazil; learning efficiency*
JEL: A20; B23; C24; C67; H52

INTRODUCTION

According to the United Nations (UN), education is a fundamental human right and essential for the exercise of all other human rights (UNESCO, 2014); but, despite this, the resources applied in education compete with those applied to other sectors, such as infrastructure development and health, among others.

According to the OECD (2014) report, in 2011, per-student expenditure in Brazil was 2,985 USD, compared with an average of 8,952 USD in OECD countries - this despite Brazil spending 6.1% of GDP on education, i.e., one percentage point more than the average of 5.6% of other countries. This difference is even more apparent when assessing spending as a percentage of public spending, which in Brazil is 19%, compared to 13% in OECD countries. This situation is explained by the liability posed by the country's low level of socioeconomic development and low per-capita income compared with OECD countries. However, the above-average spending is testament to the government's intention to change this picture.

On average, between 2000 and 2013, Brazil invested 5.1% of GDP on education; moreover, the trend has been upward, increasing to 6.2% in 2013. Of this percentage, about 30% equivalent to 1.7% of GDP is earmarked for elementary education (INEP, 2015), i.e., the cycle studied this paper.

In 2011, the municipality of Rio de Janeiro spent 1.840 billion USD on education, of which 85.6% was earmarked for Primary School (FNDE, 2011).

Considering the high amounts spent, the need for good management of resources is essential to avoid waste and foster efficiency in a country where the state is charged with providing free education.

Each year, the Sistema de Avaliação do Ensino Básico (Basic Education Evaluation System) (SAEB) conducts a census; and, every two years, students graduating from each stage of basic education are tested (the Prova Brasil) in order to assess the quality of education (BRASIL, 2014). In view of the numbers above and focusing on elementary schools run by the city of Rio de Janeiro, this work proposes, firstly, to assess the efficiency of these schools using Data Envelopment Analysis.

The inputs were the number of rooms, number of computers, number of employees, and number of teachers. Outputs comprised the average score obtained in the Prova Brasil, average pass rate, and the number of students served by the school (enrollment).

In a second step, using a bootstrapped truncated regression based on the methodology proposed by Simar and Wilson (2007), it was sought to identify the environmental variables that have a significant impact on efficiency. The intention is to highlight aspects that influence school performance in terms of efficiency and indicate improvements that can be made by public policies and managers.

After this introduction, a literature review is presented where aspects related to school effectiveness in the Brazilian scenario are addressed. Following is the presentation of the methodology used, divided into the presentation of the method itself and then with respect to obtaining and filtering the data. The results are interpreted and discussed, followed by the conclusions of the study.

REVIEW OF THE LITERATURE

The Education Development Plan explains that Brazil seeks to provide education that is equitable and of good quality (BRASIL, 2008). Thus, education in Brazil is organized into four areas: basic education, higher education, vocational education, and literacy. This work focuses on Basic Education, which, in turn, is divided into elementary school (1st - 5th grade); middle school (6th - 9th grade); and high school, (10th - 12th grade).

In Brazil, it is the sole purview of the federal government to pass laws on guidelines and rules for national education. The rules state that the municipalities are to prioritize primary and early childhood education and that the states and the Federal District shall prioritize primary and secondary education. Moreover, the federal government, the states, the Federal District and the municipalities shall work together to organize their education systems. All levels of education are open to private enterprise, subject to compliance with the general rules of national education and authorization and evaluation of quality by the Government (BRASIL, 1988).

This work specifically addresses elementary school education. Therefore, in addition to census and SAEB data, information from the Basic Education Development Index (IDEB) was obtained which evaluates quality based on two indicators: average pass rate and student performance in the Prova Brasil (BRASIL, 2008).

International Context

Several authors have used DEA to study efficiency in higher education. Ahn, Charnes, and Cooper (1988) use the traditional model (CCR) to compare the efficiency of public and private universities in the United States, while Breu and Raab (1994) evaluate the efficiency of the 25 highest ranked education institutions in the USA. Abbott and Doucouliagos (2003) investigated the technical efficiency and scale of Australian universities and found their level to be excellent. Flegg et al. (2004), using the Malmquist index, examined the technical efficiency of

45 British universities in the period 1980 to 1993. In their study of public Portuguese universities, Afonso and Santos (2005) presented a literature review, including a tabulation of studies carried out in higher education. Johnes (2006) looks at the academic year 2000/2001 to study English universities using DEA, output-oriented, VRS, with bootstrapping procedures, applying the method proposed by Pastor, Ruiz and Sirvent (2002) to reduce the number of significant variables in the model. Kuah and Wong (2011) presented a DEA model consisting of 16 inputs and outputs to measure the efficiency of universities based on their teaching and research activities.

Secondary schools are studied by Diamond and Medewitz (1990), Portela and Camanho (2007), Agasisti (2013), Agasisti and Zoido (2015) and Brennan, Haelermans, and Ruggiero (2014).

Diamond and Medewitz (1990) studied the technical efficiency of development programs (Developmental Economic Education Program - DEEP) in high schools in the USA. Portela and Camanho (2007) evaluated 22 Portuguese secondary schools (12 public and 10 private) and found no significant differences between them. In this study, two perspectives of evaluation were considered: (i) the perspective of society, whereby schools are seen as a resource to improve the characteristics of the students in terms of academic and socio-economic skills and (ii) the perspective of student performance.

Agasisti (2013) analyzed the efficiency of Italian secondary schools from data from the Programme for International Student Assessment for 2006 (PISA, 2006) using DEA with bootstrapping procedures and, in a second stage, investigated the factors affecting efficiency using a Tobit regression. In subsequent work using the PISA 2012 data, Agasisti and Zoido (2015) studied the efficiency of 8,600 secondary schools in 30 countries, applying the method proposed by Simar and Wilson (2007).

Miningou and Vierstraete (2013) used DEA to assess the efficiency of primary education in the 45 provinces of Burkina Faso. The results revealed that resources are not used optimally for the provision of basic education in the provinces. To explain inefficiency scores, the method of Simar and Wilson (2007) was used, which enabled a causal relationship to be discerned whereby the living situation of households explained the efficiency of primary education.

Burney et al. (2013) studied schools in Kuwait in two periods, 1999 and 2004, and in four levels of schooling: kindergarten, primary, intermediate and secondary. They used technical efficiency followed by regression to explain the causes.

Wanke, Blackburn, and Barros (2016) used two-stage network DEA to study primary and secondary Australian schools and concluded that (i) investments in teacher skills generate positive results on learning outcomes and (ii) the most relevant aspects that explain the levels of efficiency and contextual variables affect primary and secondary schools differently.

Regarding the application of DEA to evaluate student efficiency, Thanassoulis (1999) conducted a study that shows a method to define references for the academic assessment of students, decomposing the responsibility for education into responsibility shared between the student and the school. Thanassoulis and Silva Portela (2002) also separated school responsibility and student responsibly in a study of 6700 students in 122 British schools.

Silva Portela and Thanassoulis (2001) investigated the performance of high school students in British schools. The authors use DEA to study how school type influences student transformation. They conclude that student quality influences school efficiency and note that one can determine precisely the school's impact on the student, the effectiveness of the school, and student effort, comparing them with their peers.

Brazilian Context

Within the Brazilian context, Sant'Anna (2012) analyzed the efficiency of elementary education provided by the Municipal Public Education of the State of Rio de Janeiro. To frame the problem, Sant'Anna used conceptual maps and, among other findings, noted that municipalities with a low investment in education and below average results in education quality tests were more efficient due to the input/output trade-off. Thus, there is a long path ahead for public and school management to achieve good levels of efficiency.

Diniz (2012) measured the efficiency of spending allocation in education and sought to identify empirical relationships to validate the thesis that conditional transfers of resources in primary education are unfavorable to efficiency. Diniz, using the DSBM (Dinamic Slacks Based Model), looked at the period 2004 to 2009 in relation to 3,013 Brazilian municipalities. This phase was developed in two stages. In the first, he used the inputs controlled by the manager (cost per student) and the Basic Education Development Index (IDEB) as a product of education. In the second, he performed a GEE (Generalized Estimating Equation) regression, using as explanatory variables of efficiency the conditional transfers of primary education, such as Fundo de Manutenção e Desenvolvimento da Educação Básica (Fund for Maintenance and Development of Basic Education) (FUNDEB) and Fundo Nacional de Desenvolvimento da Educação (National Fund for Education Development) (FNDE). The results revealed that the conditional intergovernmental funds transfers allocated to education adversely affect the efficiency of public spending on primary education.

Spending on education in the southwestern municipalities of Paraná was studied by Bohrer, Comunelo, and Godarth (2014); their results were similar to those of Diniz (2012), insofar as the highest spending on education did not reflect in greater efficiency.

Considering the school as the unit of analysis, Reinaldo (2002) evaluated the relative technical efficiency of public schools in Fortaleza and suggested actions for improvement. Almeida and Almeida Filho (2013) evaluated the technical efficiency of the management of basic education in federal public schools in Brazil, while Nascimento, Costa, and Olher (2015), using the city as a reference unit, studied the efficiency of public funds use in education in an assessment of 142 municipalities in the Zona da Mata Mineira.

Delgado (2007) studied the effectiveness of the various levels of public schools in Minas Gerais in a two-stage DEA model. In addition to obtaining various efficiency indices by region for schools in Minas Gerais, Tobit regressions were performed where the influences of variables on the degree of efficiency of schools are raised. Important findings included the observation that (i) numbers of computers correlate with increased efficiency and (ii) other technological resources and higher levels of teacher education do not contribute to improved efficiency.

Rosano-Pena, Albuquerque and Marcio (2012) evaluated the efficiency of public spending on education in the municipalities of Goiás, from 2005 to 2009, by comparing results obtained using the DEA model with results obtained using the inverted frontier method.

METHOD

Two-stage DEA

Farrell (1957) developed the seminal concept of technical efficiency that paved the way for Charnes, Cooper, and Rhodes (1978), who introduced data envelopment analysis (DEA), a method based on linear programming where each observation (decision making unit), DMU_k (j =

1, ...,n) uses *r inputs* x_{ik} *(i = 1,..., r)* to produce s *outputs* y_{jk} *(j = 1,...., s).* The initial model came to be known by the initials of the founders' names, CCR, or CRS (constant returns to scale).

Among its many characteristics, note that (i) this method does not require the inputs and outputs to be converted into monetary or standard units and the efficiency ratios can be obtained from real data, without the need for transformations; (ii) outliers do not represent deviations from the average behavior, but possible benchmarks to be studied; and (iii) unlike parametric approaches, the method optimizes each individual observation in order to determine a linear frontier of parts (Estellita Lins & Meza, 2000). Moreover, according to Thanassoulis (1993), the results from a set of hypothetical data suggest that the efficiency measured by the data envelopment analysis is more accurate than that used in regression analyses.

The CRS models assume that any variation in input levels will generate variations in outputs. When input-oriented, efficiency is achieved by decreasing inputs while maintaining outputs (Estellita Lins & Meza 2000); conversely, when output-oriented, efficiency is achieved by controlling outputs while keeping inputs fixed.

Therefore, the ability of the DMU to control inputs or the results will be an important tool for selecting the model to be used (Agasisti, 2013). In this article, it is assumed that a public education institution will (i) seek optimal results, (ii) service the maximum number of students, and (iii) increase the quality of services offered. Therefore an output-oriented model was used.

Banker, Charnes, and Cooper (1984) continued to develop the method, culminating in the variable returns to scale (VRS) method also known by the initials of the authors (BCC) which reflects management efficiency (Estellita Lins & Meza 2000).

The input-oriented CRS and VRS frontier models are shown in Table 1.

Table 1
INPUT-ORIENTED DEA MODELS

Frontier type	Envelope model
CRS or CCR	$\text{Min: } \theta$ $\text{St: } \theta x_{i0} - \sum_{k=1}^{n} x_{ik}\,\lambda_k \geq 0,\ i = 1, \dots, r$ $-y_{j0} + \sum_{k=1}^{n} y_{jk}\,\lambda_k \geq 0, \quad j = 1, \dots, s$ $\lambda_k \geq 0\ \forall k$
VRS or BCC	Add: $\sum_{k=1}^{n} \lambda_k = 1$

The value of CCR efficiency is called *technical efficiency*, while VRS efficiency is called *pure technical efficiency* or management efficiency. The scale efficiency models are used to assess the impact of the size of the production scale on productivity and are calculated by the relationship between efficiencies CCR and VRS, $SE = \Theta_{CCR} / \Theta_{VRS}$ (Cooper, Seiford, & Tone, 2006; Zhu, 2014). When the values of VRS and CRS efficiencies coincide, the scale efficiency is equal to 1 and the DMU is operating at optimal scale (Bogetoft & Otto, 2010).

The summation λ identifies whether a DMU is present (i) in the region Increasing Return to Scale (IRS), where the scale of the DMU is operating below the DMU scale level of technical efficiency; or (ii) the region Decreasing Return to Scale (DRS), where DMU scale is greater than

the technical efficiency level. In case $\sum_i^k \lambda_i = 1$, the DMU is at the CRS frontier; if $\sum_i^k \lambda_i < 1$, the DMU is in the region IRS; and, if $\sum_i^k \lambda_i > 1$, the DMU will be in the region DRS.

The Tobit regression (Tobin, 1958) in the second stage is a common practice in DEA studies in education (Agasisti, 2013; Barbosa, Fernandes, & Pires, 2014; Chakraborty & Blackburn, 2013). The Tobit regression works on the premise that the dependent variable has efficiency indices ranging between 0 and 1 and tests a vector of independent variables (x_i) in relation to a dependent variable vector (y_i) predefined in one interval. That is, considering $y_v = 1$, y_i takes the value y_i^* *if* $y_i^* < y_v$ *; and* y_i^* takes the value y_v *(1) if* $y_i^* > y_v$.

However, studies were able to show that Tobit analysis is inappropriate for this type of study and presented other possible approaches, including suggesting that ordinary least squares regression (OLS), subject to the heteroscedasticity restrictions of residuals, among others, is the most appropriate approach for producing consistent and valid estimators (McDonald, 2009; Hoff, 2007).

Simar and Wilson (2007, 2011) presented and discussed bootstrap methods in a truncated regression, making it a consistent estimator, without being subject to the restrictions required for OLS regression.

This study uses the two-stage DEA approach with bootstrap truncated regression (Simar & Wilson, 2007) developed by Jaak Simm, Galina Besstremyannaya in the RStudio rDEA package, and applied by Besstremyannaya (2011, 2013), Barros et al. (2011), Blank and Valdmanis (2010), Coco and Lagravinese (2014), Miningou and Vierstraete (2013) and Agasisti and Zoido (2015).

The second stage of analysis used a regression in which the VRS efficiency scores calculated in the first phase are the dependent variable and the relevant questions (obtained as explained above) are the independent variables.

Data

The data discussed are from the year 2011 and were obtained from various databases of the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP).

Initially, we selected 813 first-stage primary schools in the municipality of Rio de Janeiro. Of these, only the first-stage primary schools that had complete data with respect to the decision variables, or 465 schools, were kept. For the second phase of the study, just 427 remained due to the data deficiency of contextual variables. Note that of these 465 schools, 389 also offer kindergarten, prior to elementary.

According to Estellita Lins and Meza (2000), Decision Making Units (DMU) should be homogeneous and have autonomy in decision making. Despite these differences in the stages of education that the schools provide, we consider the schools as homogeneous in the sense that they are all (i) operating under a single administrative guidance (the city of Rio de Janeiro), (ii) urban, and (iii) located in the same municipality, despite the known socioeconomic differences found within the districts and/or regions the school serves.

The SAEB provides, as a biennial census, the administration of Portuguese and math tests for fifth graders (last year of elementary school) in schools that have a class of more than 20 students. The test score ranges from 0 to 500 and the results are standardized on a 0-to-10 scale.

The school census which is held annually, is used by SAEB and surveys schools, students, teachers and principals. The data pertaining to facilities and resources (school surveys) were used for extraction of the decision variables as well as certain contextual variables. The responses of the direct managers of the DMUs evaluated (survey of principals), as well as certain

characteristics of these managers, were considered relevant to explaining the results for school efficiency.

The student questionnaires are translated in terms of socio-economic level and failure rates. And student test results in Portuguese and mathematics, the school average (performance index) of which combined with the failure rates constitutes the model output (grade-level standards).

Choice of Variables

Some authors have indicated difficulties in obtaining data and defining variables to evaluate school efficiency (Worthington, 2001; Agasisti, 2013). Similar to Miningou and Vierstraete (2013), who evaluated school system efficiency in Burkina Faso, using as outputs the quality and quantity of education offered, in this study the outputs will be the average pass rate in 1st through 5th grades and the average standardized score in the Prova Brasil taken by 5th graders. With these variables, we seek to evaluate the quality of teaching and the time the student remains in the elementary school system to achieve the quality standard, as assessed by the Prova Brasil. That is, considering the study's objective to measure school efficiency in terms of investments of state resources, the higher the score in the Prova Brasil, and the shorter length of the school day (the higher the pass rate), the greater the efficiency of the school.

The third output, also used by Miningou and Vierstraete (2013), is *the number of students served by the school*. This variable indicates the influence of the school in its regional microenvironment, being representative of the "quantity of education offered." As such, the more students the school educates, the better for the state. Because certain schools in the study also offer pre-school (i.e., prior to elementary education), pre-school enrollment is also included in calculations.

As inputs, we used as a reference the approach of Miningou and Vierstraete (2013), developed by Correa (1963) and Burkhead, Fox, and Holland (1967), who used two main assets: human resources and physical assets. As a proxy for human resources assets, the number of employees and teachers are used as variables; and as a proxy for physical assets, the number of computers and classrooms are used. Other authors have used similar approaches (Burney et al., 2013; Delgado, 2007).

Number of teachers employed. Indicates the efficiency of teacher deployment in the education of the students. Preschool enrollment is calculated similarly to the way teachers allocated to the school are calculated.

Number of school staff. This variable is used to survey the amount of human resources (except teachers) the school uses develop their students. Thus, the lower the use of these resources, the better their deployment.

Number of computers. As in the previous variable, this variable aims to relate the available resources and considers the total number of computers, regardless of use. In addition, there are studies indicating that computer technology instructions have a direct impact on the performance of students (Silva, Milkman, & Badasyan, 2014; Austin, & Totaro, 2011).

Number of classrooms. A reference to indicate the efficiency with which the school uses its facilities.

Statistics and the correlation of decision variables are shown in Table 2; it can be seen that all are highly correlated, with the exception of the number of computers. The number of classrooms is of note for being strongly correlated with the number of teachers, number of staff, and number of students. All of these are indirectly related to school size. The variable *number of*

computers, in turn, has low correlation with all other variables. The variables that indicate the pass rate and standardized score relate negatively with all the others, indicating that, in most cases, the larger the school, the lower its pass rates and scores on the Prova Brasil.

Table 2
DESCRIPTIVE STATISTICS AND CORRELATION OF DECISION VARIABLES

		Num. rooms	Num. staff	Num. computers	Teachers	Average pass rate	Score in the Prova Brasil	Students served by the school
Inputs	Num. rooms	1						
	Num. staff	0.65	1					
	Num. computers	0.15	0.17	1				
	Teachers	0.81	0.49	0.20	1			
Outputs	Average pass rate	-0.40	-0.27	-0.06	-0.28	1		
	Score in the Prova Brasil	-0.34	-0.21	-0.01	-0.25	0.36	1	
	Students served by the school	0.64	0.39	0.14	0.82	-0.16	-0.24	1
	Average	11.91	19.68	13.93	20.36	91.83	6.09	494.99
	CVs	0.50	0.56	0.56	0.40	0.05	0.09	0.45
	DP	5.97	11.06	7.73	8.24	4.66	0.58	221.91

The choice of context variables that could effectively be relevant to explain school efficiency was carried on the basis of an analysis in which 66 questions related to the school and 212 questions answered by the principles were investigated. Variables were selected that, in some way, can generate a broad impact on school performance, insofar as they represent (i) the local socioeconomic level where the school is located, (ii) the technologies or infrastructure used in support of teaching, (iii) characteristics of the principals, (iv) student behavior (discipline), and (v) characteristics of management, such as community participation in academic life. Table 3 and 3a provides some statistics and frequencies of the variables.

There are several articles analyzing the various impacts of contextual variables on the performance of students and consequently, the efficiency of schools. (Austin, & Totaro, 2011; Ross, & McGee, 2012; Gius, 2012; Silva, Milkman, & Badasyan, 2014).

Table 3
DESCRIPTIVE STATISTICS AND FREQUENCIES OF CONTEXT VARIABLES

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Socioeconomic status of the students of the school (NSE)	4.38	5.13	5.35	5.347	5.56	6.53
Average length of school day (minutes)	205	270	270	296.7	270	540
% of enrollment in pre-school	0	0.1249	0.1842	0.1678	0.2299	0.558
Average enrollment per class – MedMatricTurmaFund1FaseReg	18.8	27.11	29	28.67	30.69	35.05
Q36 Dropout reduction program	Yes, program being applied	Yes, program not implemented	No program, although problem exists		No. Problem not apparent	
	52.1% (A)	1.4% (B)	7.3% (C)		39.3% (D)	
Q020 - School principal hours	Up to 20 hours per week	Up to 30 hours per week	Up to 40 hours per week		More than 40 hours per week	
	0% (A)	0.4% (B)	56.6% (C)		56.6% (D)	

Q16 Principal exercises other activity	Yes, in education	Yes, outside the field of education	No
	11.60% (A)	2.10% (B)	86.30% (C)

Table 3a - Cont.
DESCRIPTIVE STATISTICS AND FREQUENCIES OF CONTEXT VARIABLES

	No (A)	Yes, without gravity (B)	Yes, with gravity (C)
Q58 Lack of educational support staff	82.20%	12.80%	5.00%
Q61 High rate of teacher absence	91.50%	7.40%	1.10%
Q62 High rate of student absence	78.60%	17.40%	4.00%
Q64 Student disciplinary problems	45.00%	49.80%	5.20%

	No	Yes
Teachers' room	7.1% (A)	92.9% (B)
Computer lab	7.7% (A)	92.3% (B)
Science lab	97.2% (A)	2.8% (B)
Playground	30.8% (A)	69.2% (B)
Indoor sports court	58.9% (A)	41.1% (B)
Open air sports court	50.5%(A)	49.5% (B)
Q120 Solidarity campaign held by the school	47.3% (B)	52.7% (A)
Q123 community school cleanup	94.3% (B)	5.7% (A)

DISCUSSION

Of the 465 schools initially studied, 30 achieved technical efficiency (CRS), 65 were effective (VRS), 30 had scale efficiency (SE), 430 were classified as DRS, and 5 were classified as IRS.

The histogram of corrected scale efficiency is shown in Figure 1, where it can be seen that only 13.7% of schools (63) are more than 90% efficient, thus indicating improvement is possible for some 86.3% of schools.

Figure 1
HISTOGRAM OF EFFICIENCY, SCALE CORRECTED

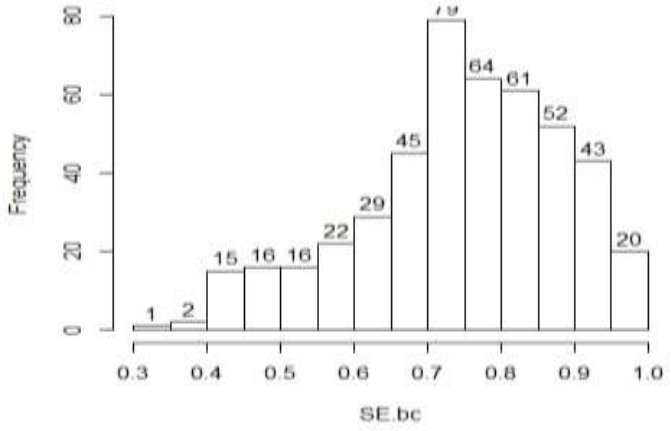


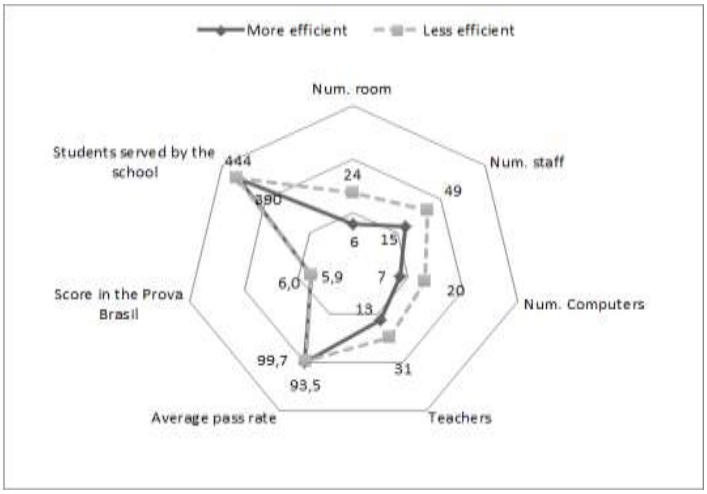
Table 4 shows the statistics for the 1st quartile, the sample, and the last quartile, for scale efficiency corrected by bootstrap. Note that all input variables in the most efficient quartile are, on average, lower than the sample as a whole. The opposite occurs with the least efficient quartile (1st Q). Regarding the output variables, one can see that the number of students served contradicts "the bigger the better" rule, thus demonstrating that schools that serve fewer students tend to be more efficient, and pointing to an interesting aspect to be explored in future research.

Table 4
SCALE EFFICIENCY CORRECTED BY BOOTSTRAPPING, BY QUARTILE

			Input				Output		
		SE.bc	Num. rooms	Num. staff	Num. Computers	Teachers	Average pass rate	Score in the Prova Brasil	Students served by the school
1st Q	Average	0.55	18.09	29.77	17.41	27.55	90.01	5.92	**558.44**
	SD	0.09	5.63	13.71	10.87	8.57	5.17	0.59	222.72
	CoefVar	0.16	0.31	0.46	0.62	0.31	0.06	0.10	0.40
Sample	Average	0.75	11.91	19.68	13.93	20.36	91.83	6.09	**494.99**
	SD	0.14	5.97	11.06	7.73	8.24	4.66	0.58	221.91
	CoefVar	0.19	0.50	0.56	0.56	0.40	0.05	0.09	0.45
3rd Q	Average	0.91	7.18	13.49	11.54	13.32	92.74	6.22	**363.44**
	SD	0.04	2.69	5.67	5.79	3.84	4.62	0.59	149.41
	CoefVar	0.04	0.37	0.42	0.50	0.29	0.05	0.09	0.41

Figure 2 shows the values of the decision variables of the DMUs with the highest and the lowest efficiency of scale: it appears they are quite representative of their quartiles. Except for *exam pass rate* the most efficient DMU has below-average decision variables; moreover, the least efficient DMU (an IRS DMU) has, except for *standardized score* and *enrollment* (both output) above average variables. It is important to note that well-performing schools in terms of the Prova Brasil are among the least efficient due to existence of superior resources vis-à-vis their counterparts, an observation that corroborates the results of Bohrer, Comunelo, and Godarth (2014), Diniz (2012) and Sant'Ana (2012). Hence it appears that 86 of the 214 schools (40.2%) that have below-average efficiency (SE.bc < 0.75) have above-average scores on the Prova Brasil (NotaPadr > 6.09). With *exam pass rate*, a similar situation presents, with 97 of the 214 schools (45.3%) garnering an above-average rate. These indicators portray a situation in which, despite achieving good results in evaluations, these schools use more resources than others; and this suggests that it is not the amount of material or human resources that are a barrier to increasing school efficiency in the city of Rio de Janeiro.

Figure 2
MORE AND LESS EFFICIENT DMUS



From the contextual variables initially surveyed, the model was fit using a backward stepwise regression. Several variables were eliminated from the model, of particular note *socioeconomic level* (NSE), which, despite (i) having a positive correlation with the *exam pass rate* and score on the Prova Brasil, of 0.21 and 0.27 respectively and (ii) several papers and data proving this relationship (Alves and Soares, 2013; BRASIL, 2013), the regression model did not fit the data. This fact points to the difference of treatment between school performance and school efficiency, as treated in this article.

Table 5
TWO-STAGE BOOTSTRAPPED WITH TRUNCATED REGRESSION

	beta_hat_hat	sd_beta	t_value	pr_t	
(Intercept)	0.919	0.020	46.847	0.000	***
Average length of school day	0.164	0.022	7.297	0.000	***
Teachers' room	0.019	0.012	1.648	0.050	**
Science lab	0.043	0.016	2.723	0.003	***
% of enrollment in pre-school	0.060	0.031	1.905	0.028	**
Q061B - High rate of teacher absence – Yes, without gravity	0.019	0.011	1.603	0.055	*
Q061C - High rate of teacher absence – Yes, with gravity	0.025	0.028	0.860	0.195	
Q062B - High rate of student absence – Yes, without gravity	0.018	0.007	2.437	0.007	***
Q062C High rate of student absence – Yes, with gravity	0.054	0.012	4.251	0.000	***
Q064B - Student disciplinary problems - Yes, without gravity	0.024	0.006	3.812	0.000	***
Q064C - Student disciplinary problems - Yes, with gravity	0.037	0.014	2.655	0.004	***
Q120B - Solidarity campaign held by the school - NO	0.026	0.006	4.261	0.000	***
sigma_hat_hat	0.050	0.002	25.874	0.000	***
***, **, *: statistical significance at 1%, 5% and 10%, respectively					

The bootstrap was performed using output-oriented VRS, the results of which are greater than 1, i.e., the inverse of efficiency. For this reason, when a positive coefficient is observed, it would be negative were efficiency between 0 and 1 considered. For example, Table 5 shows the variables that remained in the fitted model with statistical significance and the coefficient β of the variable positive Duracao_Turma_1_5Ano (Duration, Class 1, 5th Grade) is positive indicating that the longer the school day, the lower the efficiency. Figure 3A until 3S shows the graphs of the variables of efficiency vs. contextual variables.

Figure 3a

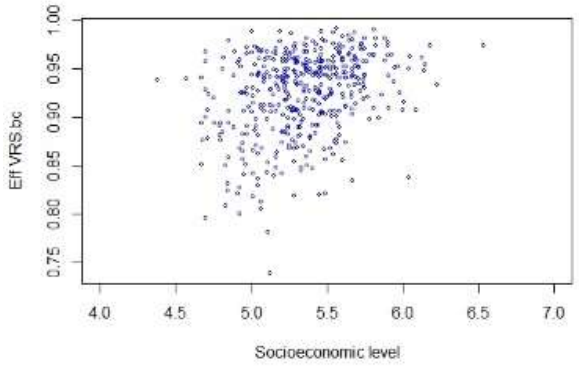


Figure 3b

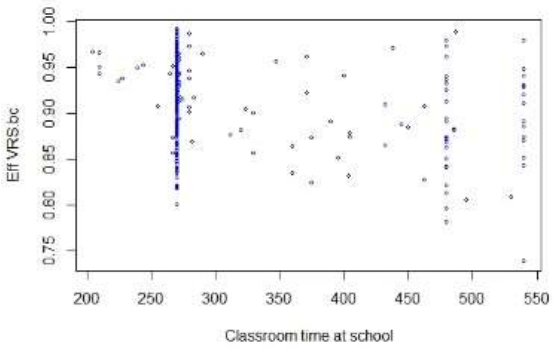


Figure 3c

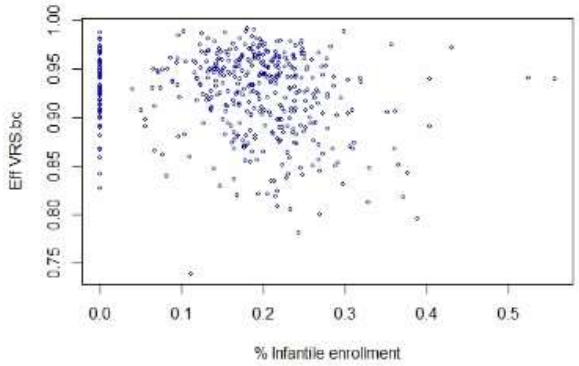


Figure 3d

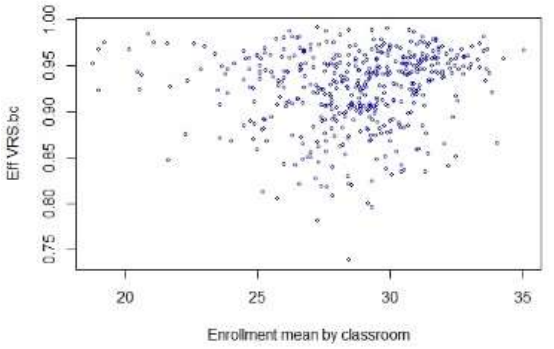


Figure 3e

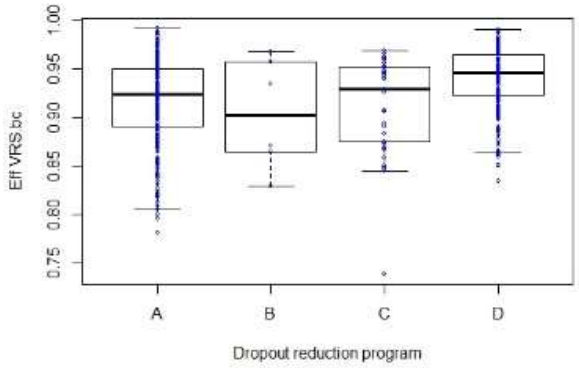


Figure 3f

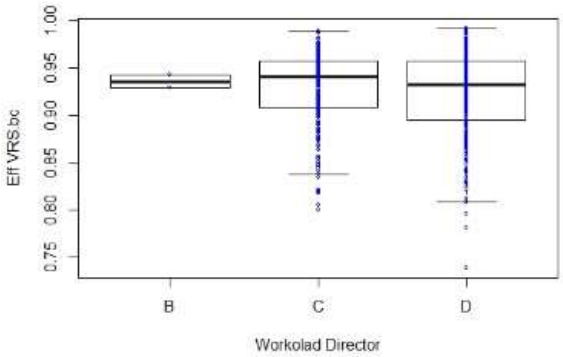


Figure 3g

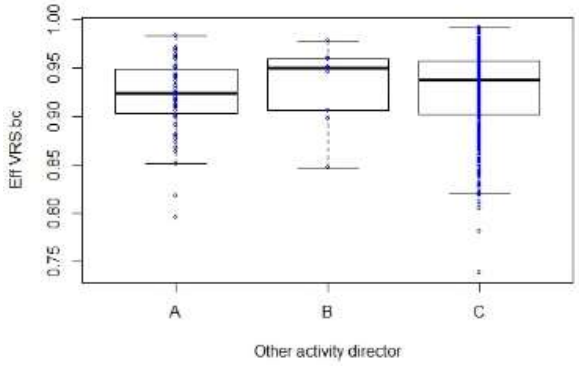


Figure 3h

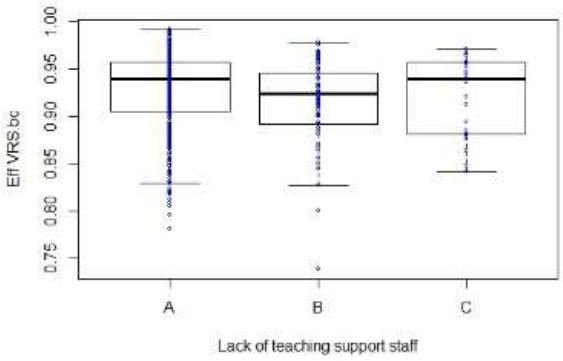


Figure 3i

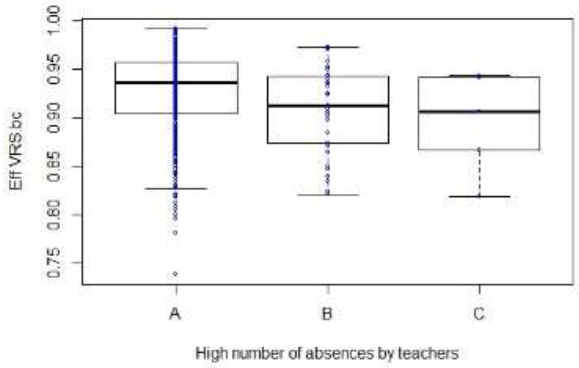


Figure 3j

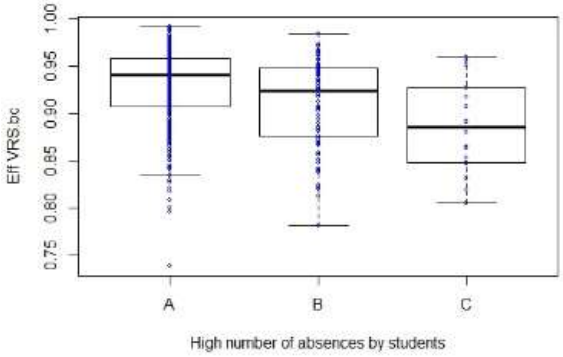


Figure 3k

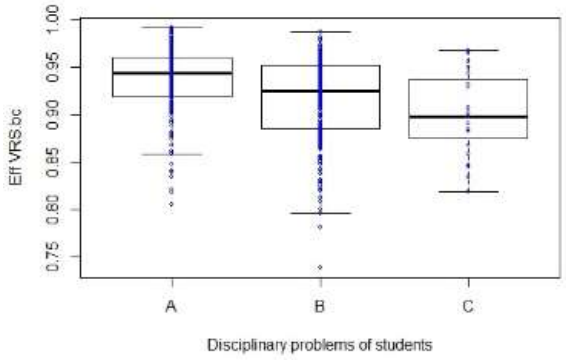


Figure 3l

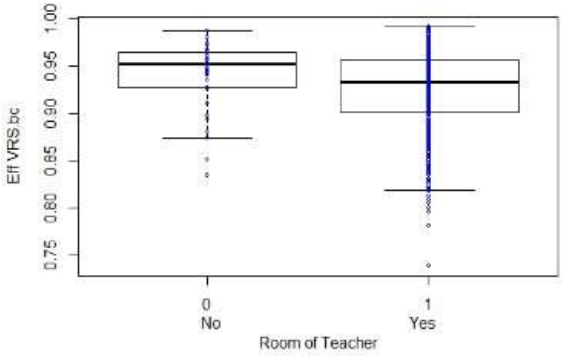


Figure 3m

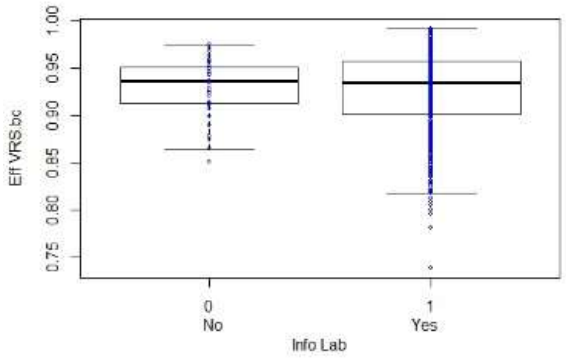


Figure 3n

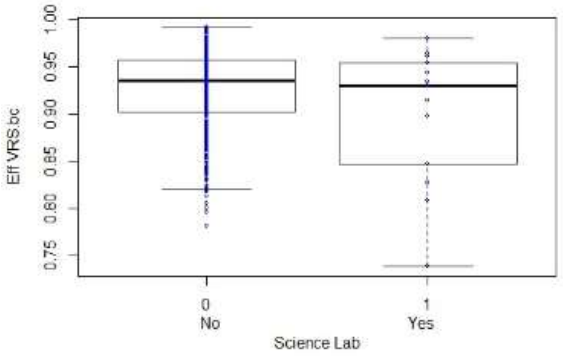


Figure 3o

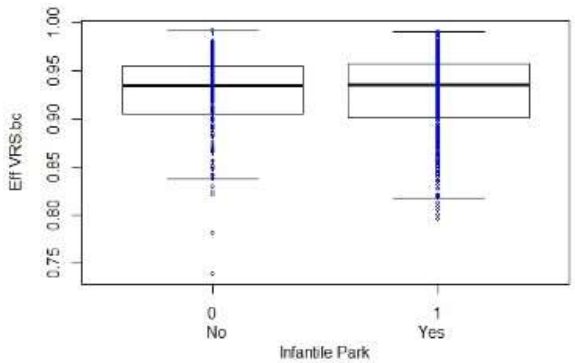


Figure 3p

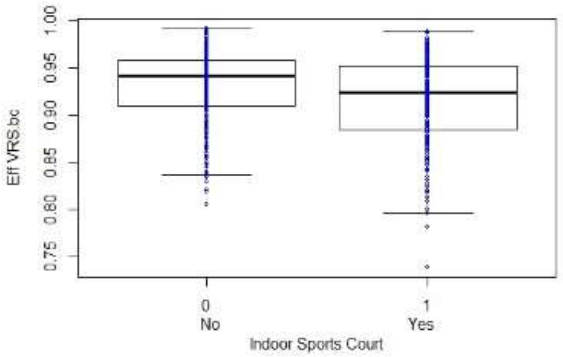


Figure 3q

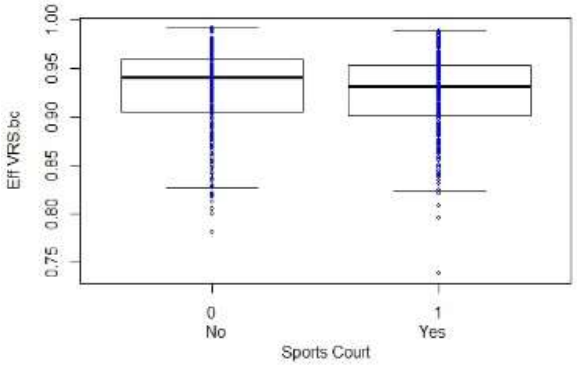


Figure 3r

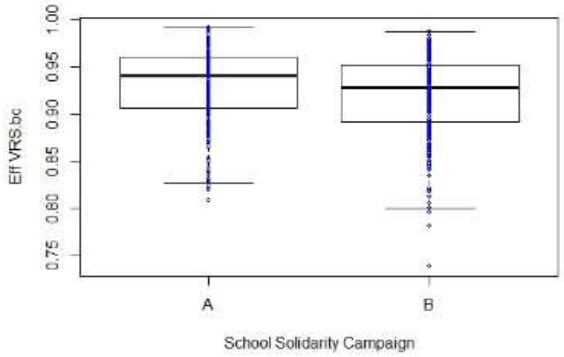
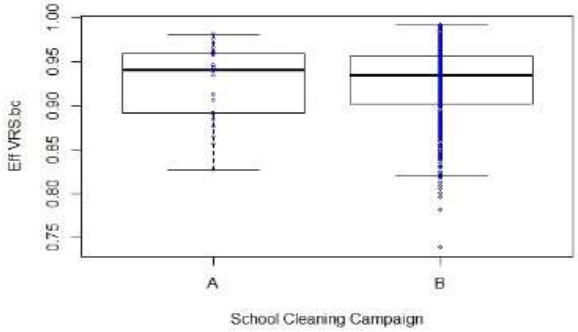


Figure 3s



When the regression was performed, the records of the schools with incomplete data were eliminated, thus reducing the initial number of 465 schools to 427. The contextual variables were standardized to between 0 and 1, by Min-Max methods, in order to facilitate the analysis.

As explained above, the length of the child's school day, represented by the average length of the class school day, contributes to reduced efficiency, counter to the natural intuition that the longer the school day, the higher the student proficiency in qualitative assessments (Prova Brasil) and the lower the rate of do-over exams. This variable has a high correlation with the input variables, number of classrooms and number of staff (0.52 and 0.45, respectively), and a negative correlation with *standardized score* and *pass rate* (-0.15 and -0.29, respectively). This variable also has the greatest relevance to the model, with a β index of 0.166, i.e., three times greater than the second greatest index in terms of explanatory power.

A school class having a longer school day may entail more (i) human and material resources for their management and (ii) higher liability in terms of inputs than contributing to improved results, including as seen in the correlation with the *standardized score* and *exam pass rate*. The possibility of the state keeping the child in school more hours per day is a service of great social value and should be utilized to improve education, which either (i) is not happening or (ii) other benefits that a longer school day affords are not being appraised.

The existence of the teachers' room and science lab are also inversely related to administrative efficiency. These two variables are important resources in the structure of a school, and this negative relationship may indicate that their use is not an effective contribution to (i) increasing the quality of education, as measured by the average score on the Prova Brasil or (ii) decreasing the Prova Brasil failure-rate. Also not to be overlooked is the need for increased

human resources to operate and maintain such facilities. The correlation of this variable with the decision variables is weak and has no significant data.

From this analysis, one can formulate several questions, for example, is the science lab serving to inculcate the knowledge required for the Prova Brasil? Should the Prova Brasil address scientific knowledge in a specific way? Is the cost to implement tracking consistent with the goals of public administration? And what about the teachers' room? Why did it contribute to decreased efficiency? Simply because it is a facility that requires resources or contributes to scattering the teacher's attention away from the class, rather than being a space for teachers to share knowledge? Can activities be created in these rooms to turn this situation around?

Moving to the next point of analysis, the percentage of student enrollment in preschool also contributed to decreased efficiency. The schools with the lowest percentage of students enrolled in preschool tend to be more efficient than those with the highest. This may indicate that sharing resources at different levels can disperse attention as well as material and human resources. However, social and economic aspects can often make it impossible to separate the different phases of education.

The high rate of absenteeism of teachers (Q061) and students (Q062), considered by management to be not serious ('B') or serious ('C'), contribute to reducing school efficiency; the same applies to student discipline problems (Q064).

The non-occurrence of solidarity campaigns held by the school contributes to decreased efficiency and can be an indicator of a lack of involvement on the part of family and other portions of society in the construction of child education.

CONCLUSION

Evaluating school efficiency is a powerful tool for managers to more effectively and efficiently administer state resources. Small improvements in the management process will mean savings for public coffers, especially in a country like Brazil, which still suffers from a costly social liability that needs rescuing.

In evaluating the scale efficiency, it was found that only 30 schools - some 6.5% of the schools surveyed - have achieved scale efficiency. Considering scale efficiency corrected by the bootstrap, about 86.3% of the schools need improvement to reach the level of 90% efficiency.

In the analysis of statistics of quartiles of corrected scale efficiency, it was found that schools that serve fewer students tend to be more efficient.

Applying the algorithm proposed by Simar and Wilson (2007) enabled a regression with consistent estimators. In relation to the variables that did not fit the model, *socioeconomic level* is worth noting: despite being positively associated with increased school performance, *socioeconomic level* did not contribute in a similar manner to increased efficiency. This reinforces the need for differentiation between efficiency and school performance levels.

The regression showed interesting results, particularly in relation to a longer school day contributing in a representative way to decreased efficiency. The presence of a teachers' room and science lab had a similar impact. These aspects, counter-intuitively, require further investigation in order to obtain a more consistent understanding; however, the immediate need for improved use of the available time and resources must be addressed.

Schools with a high percentage of children enrolled in preschool also correlated with decreased efficiency. Vis-à-vis the social problems that cause schools to operate with several educational cycles concurrently, schools providing elementary school alone were more efficient

than those also offering pre-school services. Future studies may also contribute to a better understanding of this phenomenon and investigate better ways to develop public policy.

As expected, frequent absences of teachers and students and disciplinary problems with students correlated with decreased efficiency. In turn, efficiency increases with the rate of solidarity campaigns run by the schools, indicating the importance of the parental and community involvement in child development.

School efficiency varies greatly in the environment studied and it appears that the improvement of management techniques paying attention to the proper use of available resources combined with an accurate assessment of the size of the schools and their organization in terms of educational cycles are aspects relevant to developing public policies.

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PICTURES AND CASES: DEVELOPMENT OF CASE-BASED TEACHING COURSEWARE TO IMPROVE STUDENT UNDERSTANDING OF STATISTICS

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ABSTRACT

Cohorts of students in economics and business classes often find the theory and fundamentals of statistics difficult to grasp. This paper outlines how a student-centred case-based teaching approach for inferential statistics, combined with educational technology, can make a significant contribution to teaching statistics in a traditional University undergraduate lecture-oriented statistics course. The author explores the advantages of using pictorial icons within a problem learning environment. Also provided is empirical evidence supporting some success using this approach. Findings suggest that students' fundamental understanding of concepts improve, the overall course failure rate reduces, and student engagement with the teaching material increases.

INTRODUCTION

It is widely accepted that statistics students have negative perceptions of statistics as well as difficulties in mastering fundamental concepts (Cochran 2005, Kotz 2010, Prabhakar 2008). Garfield and Ben-Zvi (2007) argue that statistics education is emerging as a discipline in its own right, with a proliferation of research studies appearing into the teaching and learning of statistics and probability. Today's introductory statistics course is actually a family of courses taught across many disciplines and departments; with students having different backgrounds and goals (Aliaga, et al. 2012:10).

Literature related to teaching and learning statistic pedagogical methods, instructional formats, and technological tools, finds that students are often faced with general mathematical problem solving issues. Further, they have problems understanding concepts specific to statistics such as an incomplete understanding of control variables inferring causality from correlation, or confusing probability with typicality (Murtonen and Lehtinen 2003).

Technology is also increasingly playing a larger role in the education of students of statistics (Ben-Zvi 2000, Chance et al. 2007); however, the authors stress the importance of choosing an appropriate technology tool that enhances student collaboration and student-instructor interactions instead of a poor technology that causes students to spend more time learning to use the software than applying it. A further constraint to successfully learning statistics arises from a failure to provide learning experiences in problem solving (Norman, Henk, and Schmidt 2000). These issues may be compounded as some commentators suggest that many teachers may have limited statistical content knowledge as well as little, if no, exposure to any specific pedagogy related to the teaching of statistics (Froelich, Leinmann and Thompson 2011, Sorto 2011). This further reduces students' statistical literacy development with many quickly falling behind resulting in a disliking for statistics.

To counter this with an aim to have students gain a more meaningful and valuable experience in their learning, the author developed a case-based teaching method that includes a

set of illustrations as visual cues, called Pictorial Icons (PI), that assist in the delivery of abstract mathematical concepts to students in an engaging, easily understood manner. Cases are an active learning paradigm of guided inquiry embedded in problem-based instruction (Problem Based Learning) where learners are presented with a problem scenario (or case) from which to imagine and research potential outcomes and conclusions (Andrews, Hull & Donahue 2009). The case-based method was chosen as research studies have indicated that case studies facilitate and promote Active Learning, help problem solving, and encourage the development of higher order critical thinking skills through the interpretation of information and the creation of ideas (Boston University, undated; Kaddoura, 2011; Nair, et al. 2013; Popil, 2011). The benefits of the case experience are derived from the interaction between the problem, task and setting (Bruner, 2004). Similar applications are found with Marriott, Davies and Gibson (2009) who review how teachers of statistics have gradually proposed changing the way statistics is taught to make it more relevant by drawing on real problems in real contexts. The chosen approach is also in line with the call for using authentic, real world problem contexts for the teaching of statistics, as recommended in the Guidelines for Assessment and Instruction in Statistics Education (GAISE, 2005), which state that statistics educators, specifically, should foster active learning in the classroom through techniques such as group problem solving, hands-on activities and discussion.

After experimenting and trialling this teaching method for three years with positive verbal and written student feedback, as well as improved learning outcomes, the author wanted to test the pedagogical effectiveness of this case-based approach for teaching statistics. It was hoped that integrating the approach with a multimedia web-based software package that delivers statistics materials as problem-based learning scenarios would increase students' engagement, develop effective problem solving skills as well as accelerate the practical transfer of relevant course-specific knowledge involving the normal distribution, sampling distributions, confidence intervals and hypothesis testing.

This paper presents empirical findings from research into integrating technology into a statistics course. It also investigates the impact and effectives of the techniques used in the authors' student-centred case-based teaching methods in an undergraduate statistics course. In addition, this paper explores the benefits available to educators and students of incorporating this teaching technique with online interactive eLearning software. The results suggest that a combination of Pictorial Icons, embedded within eLearning scenarios, can enhance both student motivation and student problem solving abilities. Some reflections are offered on the implications of adopting case-based learning as a method of teaching inferential statistics.

CAN CASES AND PICTURES HELP STUDENTS TO UNDERSTAND STATISTICS FUNDAMENTALS?

In 2005 the GAISE College Report asserted that introductory statistics has been taught almost the same way for 30 years, and that most students don't learn what they need to know in modern society (Aliaga, et al. 2012). As early as 1990 Dallal argued that statistics students are frustrated by their courses, finish with no useful skills, and are turned off the subject for life. In our own experiences at teaching university level introductory statistics we often encounter students who experience preconceived ideas that statistics is something to be feared as they struggle to understand key concepts. A challenge of large university courses is the diversity that comes with heterogeneous student populations possessing different cultural backgrounds, mathematical literacy, styles, expectations and background knowledge or skills required to fully

understand the material. The result is that students find statistics concepts hard to grasp and hard to work out how to apply them to the real world.

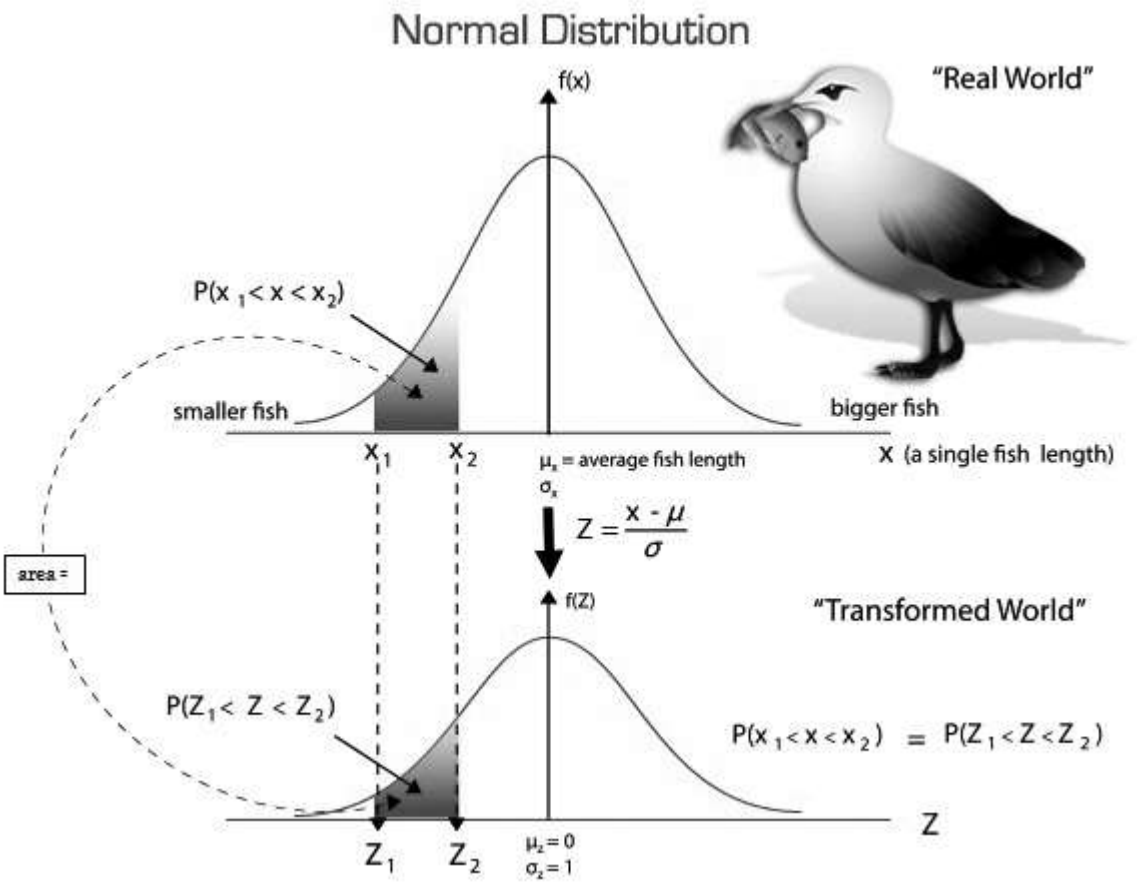
The research reported in this paper aims to partly address how to help students grasp difficult statistical concepts and apply them to real world problems. There is a plethora of empirical evidence that Active Learning 'learning by doing' is vital for understanding. For example, Rodenbaugh, Lujan and DiCarlo (2012) argue that active learning enhances student performance on examinations and improves student retention of course content. Similarly, Lee (2007) reported success when using chocolate chip cookies in class for demonstrating many statistical concepts. After many years lecturing and tutoring large, first year undergraduate statistics courses, typically with 750 enrolments, the author developed a teaching method that uses a series of linked real-world based cases to illustrate statistical concepts. In doing so, a set of illustrations, Pictorial Icons, evolved to accompany the cases used to help students clarify abstract mathematical concepts. This helped to engage students, as the case and illustrations could be easily understood and related to real-life experiences. By using linked scenarios and simple cases, key concepts such as the normal distribution and the sampling distribution of the mean are able to be explained in an engaging manner. This approach enables students to compile a cognitive image and make mental linkages to enable difficult concepts to be understood and readily recalled, as described by Trafimow (2011) who demonstrates a technique proving statistical theorems that can be explained quickly with pictures where students grasp the concepts and better understanding of the theorem with pictorial presentations.

COURSEWARE CREATING NON-TRADITIONAL CASE-BASED TEACHING METHODS

Four case studies of a mock fish farm called 'Silver Lining Fish Farm' have been developed introducing inferential statistics topics; the normal distribution, sampling distributions, confidence intervals, and hypothesis testing. The case studies are developed as courseware, or 'scenarios' in the Scenario Based Learning Interactive (SBLi) eLearning software. Simply put, a scenario is a learning environment focused on a specific problem or realm of enquiry. The software was chosen, as it is an easy-to-use multidisciplinary eLearning tool with its pedagogical origins in problem-based learning (PBL) and situational learning theory (University of Queensland 2011). Each subsequent scenario builds on the theoretical concepts and learning from the previous scenario. This approach enables students to practice relevant concepts on a particular topic before confidently proceeding to the next scenario that builds upon the knowledge from the previous scenario. Theoretical concepts are represented using pictures, which are the key to the scenarios. The aim is to help alleviate the discouraging cumulative effects students can experience if they fall behind. Multiple choice quizzes and short answer questions are applied during the scenarios to evaluate and review student performance, and to provide instant feedback thus reinforcing learning outcomes. In solving the various fish farm problems presented in all four scenarios, students are ultimately required to reach a final conclusion based on work covered. Whilst progressing through the scenarios, there are items students should collect such as data sets and tables. Ultimately, as students work through all four scenarios, they need to continually reflect on the question, 'Would I buy the Silver Lining Fish Farm?' using data collected and analysed for such things as fish sales, farm expenses, profitability etc. Through the gathering of information and using statistical analysis techniques in a real-world context, students are ultimately required to advise their client whether or not to purchase this fish farm as a viable business proposition.

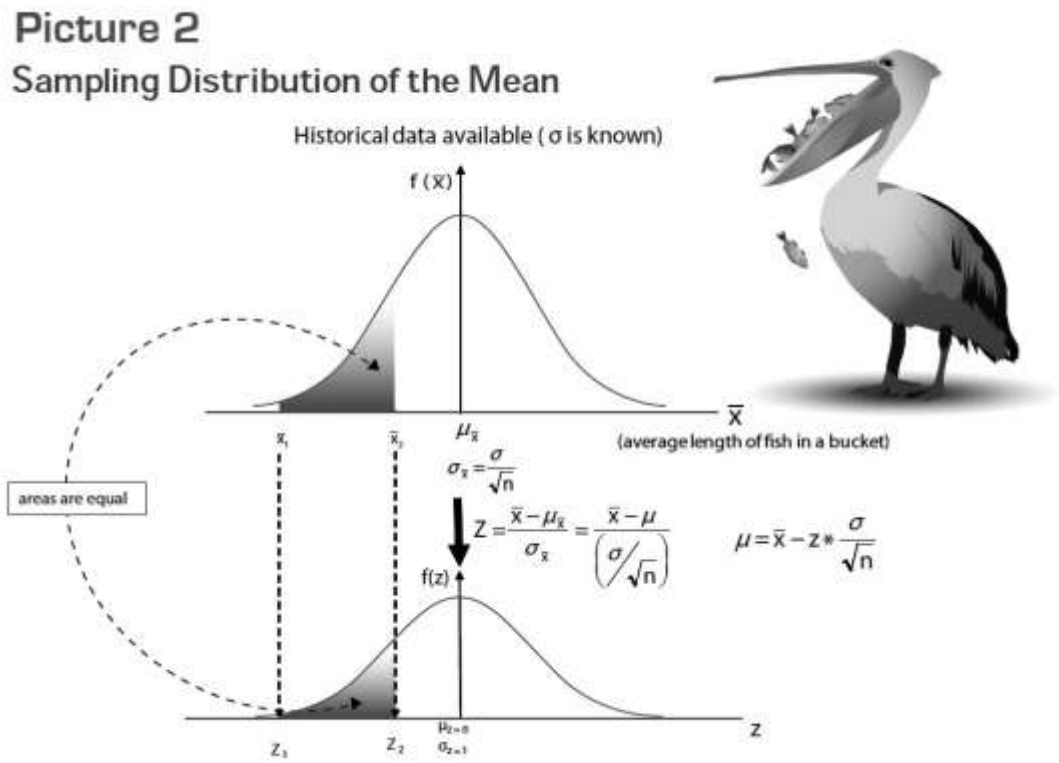
Concepts such as the normal distribution and the sampling distribution of the mean have been explained using simple characters such as a seagull and pelican catching fish from a large pond. These characters and cases capture the essence of the mathematical relationships in the bird-fish domain, and this helps invoke their analogous meanings in the statistical domain. For example, the length of a single fish (the variable), that could be caught by a seagull diving into the fish farm pond, is explained as being normally distributed within the population of all fish in the pond. Fish in the pond form the population of interest. It can be easily understood by students that some individual fish lengths are smaller than the mean length fish at the centre of the distribution, many fish lengths will be located near the mean, and some fish lengths will be larger than the mean. A seagull is used to represent the act of catching a single fish and, as such, becomes the Pictorial Icon that is associated with the normal distribution where the variable refers to a single item (a fish length). Equations relating to the transformation of the 'real world' variable of fish lengths to a 'transformed' Z variable can then be captured diagrammatically. This helps consolidate a fundamental concept needed to build up an understanding of inferential statistics. Thus the concepts involved with the normal distribution is captured in the seagull analogy i.e. a picture of a seagull with a single fish in its beak, see Figure 1.

Figure 1
THE SEAGULL PICTORIAL ICON LINKED TO THE NORMAL DISTRIBUTION



Having understood the normal distribution, the sampling distribution of the sample mean is then introduced. This is a very conceptual topic that students struggle to understand. Developing a conceptual understanding of statistics has been widely discussed in the literature (Trafimow 2011, Vargas-Vargas et al. 2010). In an attempt to create an analogy to explain the sampling distribution of the sample mean, a pelican catching several fish in its bill at a time is introduced. It is then possible to explain that when the pelican catches a bill full of fish, this can represent a sample. This sample average length of fish that the pelican has caught could be calculated. If the pelican catches the same number of fish each time (same sample size), many times over, the theoretical sampling distribution of the sample mean can then be built up and explained to students in simple terms. Once again a visual analogy is created and the pelican image is used to relate to sample means where the population standard deviation is known. The sampling distribution of the sample mean concept and pelican are shown in Figure 2.

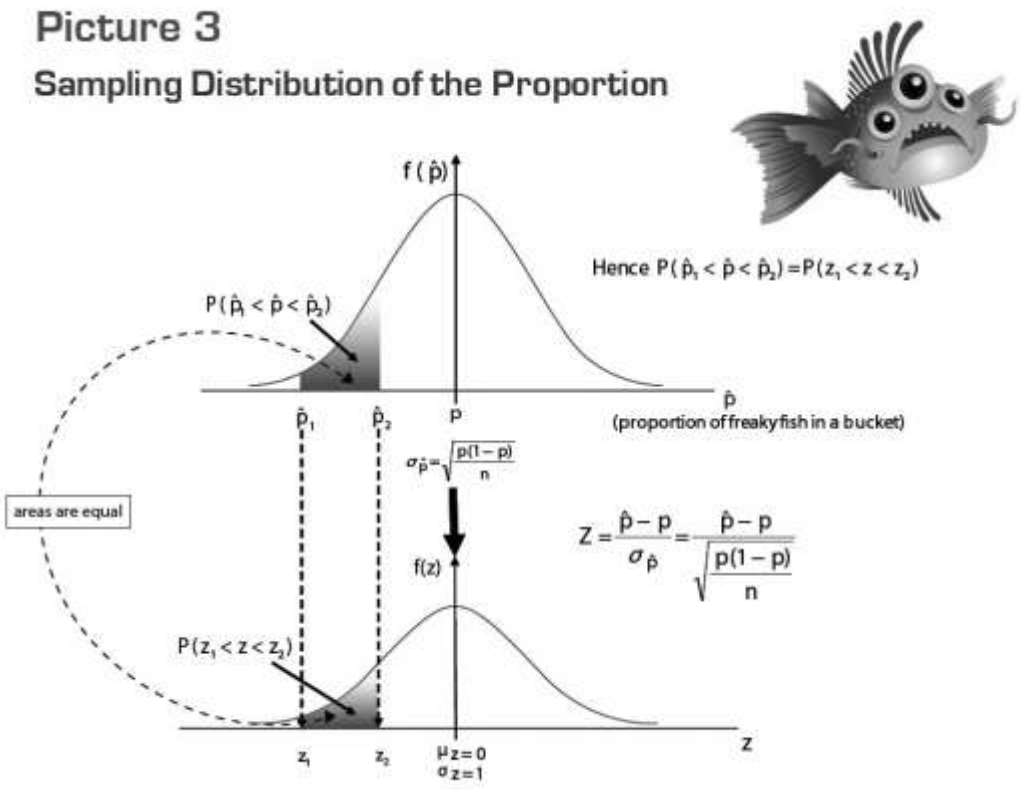
Figure 2
THE PELICAN PICTORIAL ICON, RELATED TO THE SAMPLING DISTRIBUTION OF THE MEAN.



Another fish farming analogy is used to convey the concept of the theoretical sampling distribution of the sample proportion. Here, it is assumed the fish on the farm are contaminated with a pesticide from an industry nearby. As a consequence, some of the fish become deformed and have three eyes (or some other related strange characteristic). This then enables a description of gathering random samples (in buckets) so as to work out the sample proportion of freaky fish (in the bucket). In a similar way to the sampling distribution of the mean, it can then be explained how the theoretical sampling distribution of the sample proportion can be found. In

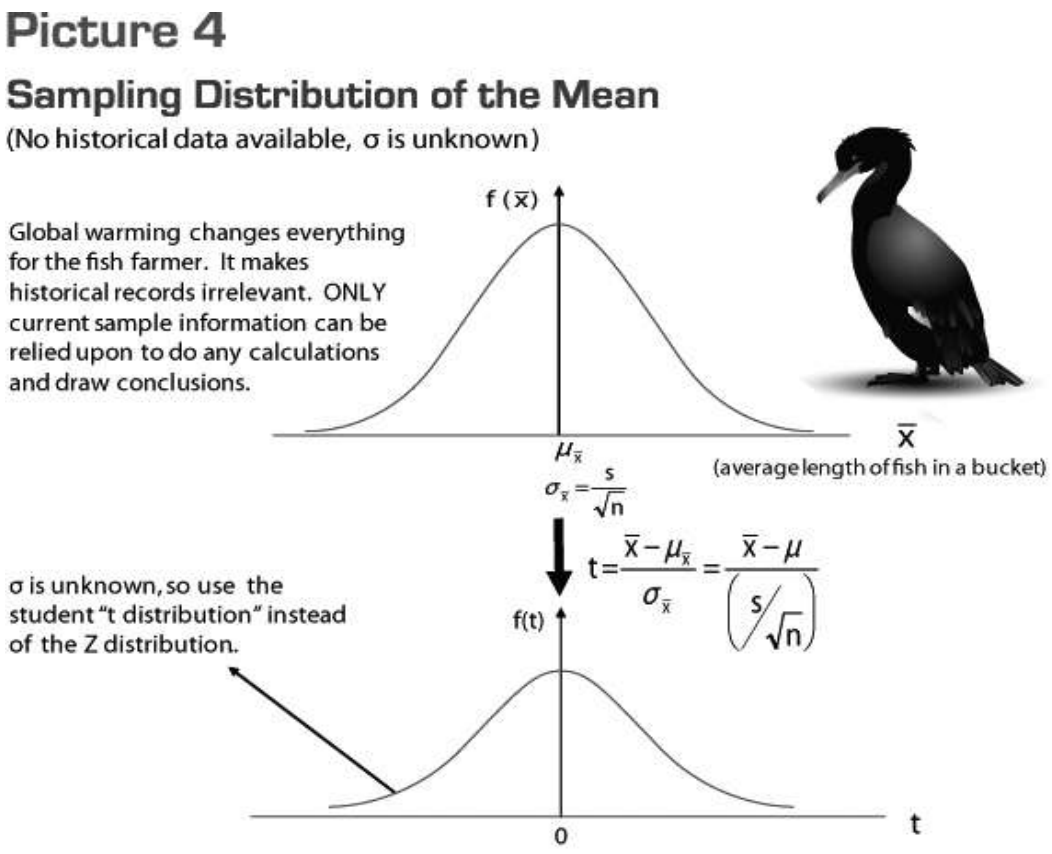
doing so, students can see the similarities between the two theoretical sampling distributions and begin to appreciate the linkages to particular problem types. The visual analogy with the freaky fish and sampling distribution of the sample proportion is seen in Figure 3.

Figure 3
THE FREAKY FISH PICTORIAL ICON, RELATED TO THE SAMPLING DISTRIBUTION OF THE SAMPLE PROPORTION.



To distinguish between the sampling distribution of the sample mean when the population standard deviation is known (σ) and when it is unknown, a new Pictorial Icon is introduced. The image of a 'shag' or cormorant is used to create a link as to when to use the t-distribution (as opposed to the Z-distribution and the Pelican when σ is known). In inferential statistics, it is highlighted how characteristics of the population, such as σ, are usually not known. In the fish farming analogies, it is possible to illustrate that new conditions can occur on the farm. For example, an increase in water temperature can change the growing characteristics of fish resulting in differences to previously collected historical data. This would mean that using such things as σ from previous observation is likely to result in incorrect inferences being made under the new conditions. Hence it is explained how the t-distribution becomes important. The Pictorial Icon of the shag and use of the t-distribution transformation is shown in Figure 4.

Figure 4
THE HERON PICTORIAL ICON, RELATED TO THE SAMPLING DISTRIBUTION OF THE MEAN.



Therefore, environmental impacts on farming activities and using Pictorial Icons to make connections with theoretical concepts and real problems to solve, linkages involving statistical concepts are able to be explained in a meaningful way to students. The Pictorial Icons and the cases have been designed to improve students' understanding and application of inferential statistics techniques, increasing student awareness in applying statistical concepts in real-world situations (i.e. not just text book learning), and an improved student ability to observe, analyse and interpret quantitative information. The method of linking the Pictorial Icons to theoretical concepts enables students to build effective mental models, the theory is easier to understand because it is being taught in terms of useful everyday events that students already understand.

APPLICATION IN UNIVERSITY COURSES

The four scenarios are taught each semester to law, engineering, arts, economics, social science, tourism and hospitality, and business students who have enrolled in a University introductory undergraduate statistics course ECON1310 (Quantitative Economic and Business Analysis A); which is an introductory course that covers basic statistical concepts and techniques such as descriptive statistics, probability concepts, theoretical distributions, inferential statistics (confidence intervals & hypothesis testing) as applied in business and economics.The course

helps students develop an ability to apply inferential statistics techniques to independently solve practical problems and to then explain the solutions using everyday language. This course is widely regarded as challenging by many students partly because the work is totally cumulative meaning that it is exceptionally difficult to catch up if a student gets behind. Success in the subject depends on students keeping up-to-date with the subject matter. Student assessment consists of a one-hour mid-semester exam with multiple-choice, short answer, and a problem solving format (25%); five quizzes each worth 4 percent covering topics from lectures and tutorials (20%), and a two-hour final examination which examines work from the start of lecture five (i.e. normal distribution) onwards through to the last lecture, again consisting of multiple-choice, short answer, and a problem solving format (55%).

Enrolled students have a wide range of mathematical abilities that need to be catered for in order for them to grasp key statistics concepts. Access to the scenarios is provided via the University's Blackboard website. The scenarios are designed to support and enhance the lectures and clarify concepts with a focus on using real-world situations. It is intended, at a later date and upon further refinement, to incorporate the scenarios into the course as an assessable item. The scenarios were introduced to undergraduate students in semester one, 2010. Initial feedback from both students and staff members exposed to the scenarios has been positive with many students having accessed the scenarios during their course.

METHODOLOGY

Research Design

A study was designed to test how much conceptual understanding could be gained from working through online scenarios with the theory available when needed. Students from all thirty-six tutorial groups (those with and without the Pictorial Icon (PI) teaching) were asked to volunteer to work through the eLearning scenarios in semester 1, 2010. At the beginning of the semester students are required to select a tutorial slot from the options provided on the University's Blackboard system. Students self-assigned themselves to a tutorial group based on their timetable availability and what time/day was most suited to them. Students are, however, required to remain in their tutorial slot for the duration of the semester once making their selection. Tutorial procedures are strict. Students are not allowed to change groups without a request in writing and receiving approval from the Course Administrator. Thus, tutorial groups maintained some stability and students were classified into one of four groups, shown in Table 1 below, which indicates the expected outcome for each group in the design.

Tutorials gave practical experience in data analysis and allowed students to further synthesise and revise the challenging concepts faced in this course. A mixture of teaching approaches was applied to the tutorial groups, as indicated in table 1. The selection of what approach to apply per group was made by the Course Administrator. Some tutorials followed the same case-based technique used in lectures and implemented in the eLearning software. The cases were further illustrated by the pictorial icons used to help students develop mental concept maps in recalling the details of different topics and establish mental connections between the picture and the theory.

Additionally, two focus groups were run at the end of the course, using a set of topics that enabled students to discuss their impressions regarding both the Pictorial Icon (PI) analogies and the eLearning scenarios. The author led the focus groups; during the final tutorials students were informed of the study intention and asked to volunteer. Those that volunteered to participate

joined the focus group at an agreed time, were given instructions and asked to sign a statement of voluntary participation (refer to appendix).

Objectives

Our research objective was to assess the learning impact of the constructivist case-based teaching approach that uses pictures to form linkages to appropriate theory and how this practice, embedded in technology, can improve statistical literacy. We expected that students participating in tutorials using the bird-fish analogies only (PI instruction; No SBLi) would do better at understanding theoretical concepts than a control group. We then expected that students using the SBLi software (SBLi only; No PI instruction) would do better on application questions than the control group and the PI only group. Finally, we expected that students who participated in tutorials using the bird-fish PI's as well as using the SBLi scenarios (the full treatment group) should do better on both theoretical and application questions.

Any learning advantage of the PI groups over the control group would indicate the importance of effective guided instruction for successful problem solving. Furthermore, if the SBLi groups showed further advantage over the PI instruction alone, this would suggest that some amount of additional understanding is created by applying learned concepts to real world scenarios. It would also give some empirical support for constructivist approaches to teaching statistical theory. If no extra advantage is found, it could be concluded that effective instruction alone is sufficient for learning complex statistical theory.

Research Question

The following research question developing from the above stated objectives has guided the study:

Can case based teaching exemplifying real-world situations embedded in educational technology help students' theoretical understanding and improve their problem solving and statistical literacy?

Pre/Post Test Instrument

To answer the research question each group in the design was given a pre-test and a post-test list of statements relating to a real world problem regarding the purchase of a small take-away suburban fish and chip shop business. A series of business orientated questions requiring an understanding of statistical concepts were presented to the students in the form of a questionnaire. Students were required to select from a set six statements only three they believed to be most correct. The choices presented were all applied type statements relating to a fish and chip shop business. The students then needed to select from a second set six statements only three statements that they believed to be most correct. The choices presented in this second set of statements were all applied type statements relating to the fish and chip shop business, designed to stress conceptual understanding, rather than mere knowledge of procedures. Students were scored on the number of correct options that they chose. With each set of statements a total of three correct responses could be made by the student. This same survey set of questions was given to the students to do once again near the end of the course after attending the lectures and tutorials. This allowed a theoretical and an application score out of three to be obtained both

before and after students had taken the course (please refer to the appendix for a copy of the pre-post-test and instructions to students).

RESULTS

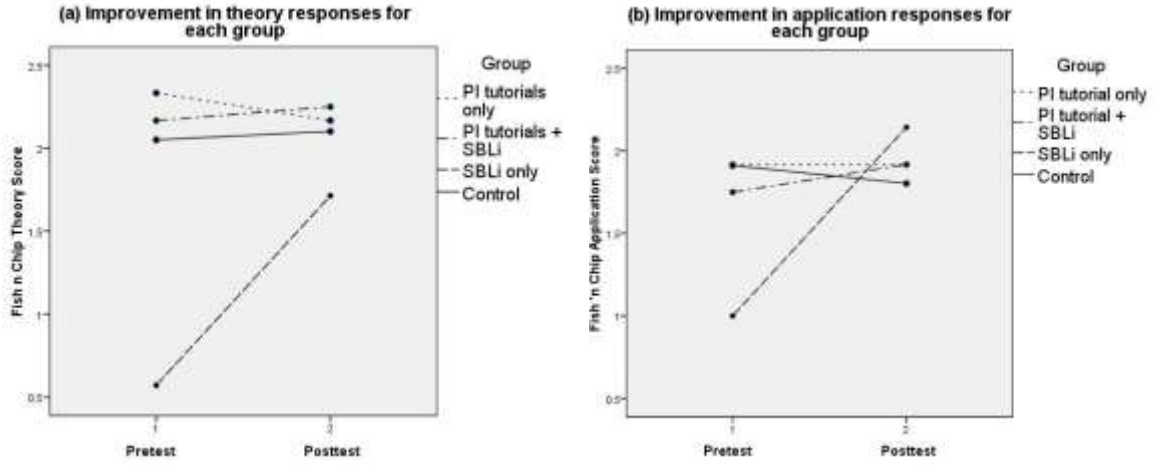
Table 2 shows the average exam marks for each group in the study at the end of semester 1, 2010. Since students were self-allocated to tutorials and to eLearning scenarios, the numbers in each cell of the design are not evenly distributed. Participation in the survey was optional; the difficulty was getting students to participate due to their busy study schedule. However, since the numbers were enough for a preliminary investigation, we proceeded with the analysis.

Table 2 reveals that there were some surprising results. As expected, the control group had the lowest mean (53) for exam marks. Furthermore, the students who were taught using the PIs had a mean (57) that was four points higher than the control group, and students who used the SBLi software as well as being taught using the PI's had a mean (59) that was six points higher than the control. However, students who used the SBLi software only and did not attend any of the PI classes had a mean (70) that was 17 points higher than the control, and higher than every other group in the study.

Possible effects of the experimental groups were analysed using ANOVA's. The results revealed that there was a significant difference somewhere amongst the four groups ($F3= 2.28$; $p = .04$). However, post-hoc tests showed that these effects were only due to the significant differences between the SBLi and the control groups. That is, the students who used the SBLi performed significantly better in the exams than any other groups. While the students in the PI groups (i.e. that took the author`s tutorials) had higher means than the control group, the sample sizes are too small to allow any differences between this group and any others to be significant.

Given that the SBLi only group was very small, it could just be that the significant result for the exam was a random anomaly. Or, it could be that these were just the brightest or most motivated students, who used all materials available (i.e. the SBLi scenarios) to study for the exam. In order to investigate this result more closely, we then inspected the pre-test versus post-test patterns for each of these groups on both the theoretical and applied concepts.

Figure 5
PRE-TEST VERSUS POST-TEST SCORES FOR EACH EXPERIMENTAL GROUP (A) FOR THE THEORETICAL QUESTIONS AND (B) FOR THE APPLIED QUESTIONS.



The number of correct statements that students gave on the pre-test versus post-test fish farm problems were compared using two-way ANOVAs, for both the theoretical questions and the applied questions. While there was only a small variance from which to detect any differences, the results, graphed in Figure 5, showed that there were improvements from the pre-test to the post-test for some of the groups. For the theoretical questions, there was a significant interaction between test occasion and experimental group (F3= 2.88; p=.04). Post-hoc tests showed that the significant effects were due to the SBLi group producing a large pre-test to post-test improvement while neither the PI tutorials alone nor the PI tutorials plus SBLi showed any significant improvements across the test occasions. This may have been because these groups already had high scores so that there was little room for improvement from the pre-test. Furthermore, the SBLi only group, while starting much lower than the other groups, still ended up with a post-test mean lower than all other groups for the theoretical statements. All other groups showed no significant changes from the pre-test to the post-test for these statements.

The results showed that for the applied questions, the interaction between test occasion and experimental group was also significant (F3= 4.35; p=.005). Furthermore, while starting out at a much lower score, the SBLi only group greatly improved on the applied questions, to the extent that this group ended up with a post-test mean comparable to the other three groups when comparing the scores on the applied statements. All other groups showed no significant changes from the pre-test to the post-test for these statements.

The significant improvements for the SBLi group could have been because the SBLi group started with very low scores on the pre-tests for both theory and application questions. If so, that result is interesting, because the analysis of the exam marks in Table 2 showed that these same students obtained the best exam marks by far. We originally interpreted this exam result by suggesting, previously, that the SBLi only students could have just been the brighter students. However, the fish and chip shop pre-test survey data in Figure 5 shows that initially, these students had the least knowledge! By combining the results of the fish farm tests with the exam results, we are lead to conclude that the higher exam marks of the SBLi group was not a result of these students having a higher-level of intellect. Rather, the SBLi experience gave these students

an advantage in the exam. It also gave these same students a significant improvement in their applications aspects, as well as an improvement (but not an advantage) on the theoretical aspects, of a real world problem. Together these results suggest that the SBLi experience probably helped with the applied aspects of the exam (i.e., problem solving).

An analysis of examination results over recent years provides some evidence to support the positive outcomes attributed to this teaching approach. The results for the introductory statistics course from 2005 to 2011 are summarised in Table 3.

In semester 1, 2010, all students were asked to complete a survey in the first week of the course with only 410 completing a follow up second survey in the last week of the course. There were 832 students enrolled in the course at the time (since semester 1, 2010, SBLi and the Pictorial Icon teaching approach was not used in semester 2, 2010, but was used again in semester 1, 2011).

STUDENT REACTION AND PRELIMINARY RESULTS

"*A great course. I found it interesting but I understand why some students might find stats very dull. Regardless, it [the course] teaches you a lot about how businesses gather information and make decisions in the real world*" Jessica, ECON1310 student semester 1 2014.

As this comment above demonstrates, student reaction to the eLearning activities and the course has been typically positive. On the day of demonstrating the use of the software scenarios in lectures, there is typically a noticeable increase in the level of attentiveness, enthusiasm and participation. On official University student evaluations for the course completed by students, there are now regular written comments indicating how the SBLi scenarios and case-based teaching approach are highlights of this undergraduate statistics course. On exam questions that relate to the normal distribution, sampling distributions, confidence intervals, and hypothesis testing, student understanding has been seen to clearly improve through both verbal communications with them as well as observing improved exam outcomes.

Overall user feedback from the eLearning scenarios has been positive; with many students indicating they believed using the software had helped greatly in their understanding of concepts. Student comments regarding the course can generally be summarised as: eLearning provides opportunities to revise course materials, pictures provide clarity of core concepts, and interactivity provides stimulation and interest in materials. Student comments suggested that the eLearning scenarios also helped with understanding the concepts. The students said that they liked the scenario problems with the screen-casts included, because it helped them to revise e.g. "You can use the scenario lesson to go over it again after the tutorial, when you need it and Tutorials go a million miles an hour. The scenario doesn't have the same questions as the tutorials, but it has the same theory that you need for the tutorials (which gets skipped over in the tutorials)." It also helped them to focus on the elements of the theory that were the most important; e.g. "it focuses on what's important…lectures and the textbook give too much detail." Students liked that the materials were presented visually and verbally; e.g., "Visual or verbal learner, it's all there and I like that it is in text as well. I am not a visual person, I need words." The class also had a large percentage of students with English as a second language, who made comments like "the screen-casts help me to understand because I can hear Carl as well as see what he is talking about."

From the author led focus group discussions involving eight students some light was shed on what advantages for student learning may have been provided by the eLearning tool. Students found the interactive experience motivating; e.g. "*You don't have to come to uni. I hate*

reading a book, I don't mind sitting on the net, it's [the SBLi scenario] not monotonous. It's interesting. It relieves the study condition of sitting there," and "I only did stats because I have to; however, this way, you learn it."

The focus group participants gave very specific comments regarding the effectiveness of the visual analogies; e.g. "*The pictures linking up with the theory gives me more clarity… I picture what he [the lecturer] is saying; e.g. when he says 'sampling distribution' I think of a bird with a bucket in its mouth, which makes me think further of the Z-formulae, and further still, that it needs a sample size, a mean, X-bar and a standard deviation and everyone has experienced fish in a pond and in a bucket, so everyone can relate to those and I don't even say proportion any more, I say freaky fish."* These types of comments suggest that the bird-fish analogies were effective teaching tools that aided understanding, and that the Pictorial Icons were being used to remind students of the entire analogy. Even though the data did not show the advantage of these analogies for the PI groups over the control group, these comments suggested that the bird-fish analogies were well understood and appreciated by some of the students.

This is also reflected in the much improved passing rates in the final exam in semester 1, 2010 (86 percent) and semester 1, 2011 (89 percent) compared to previous years where no changes to the course material delivery or exam style format occurred. The examination procedure and questions in both semesters 1, 2010 and 2011, were very similar to the previous ten years of the course. This involved a 90-minute mid semester exam and two-hour final exam. Both exams consisted of multiple choice questions and short answer calculation style questions. Indeed, previous lecturers in the course wrote the majority of the exam questions for semester 1, 2010. This was to help eliminate any bias in comparing exam result outcomes with previous years by ensuring the author did not set an "easy exam."

Students' historical pass rates increased from approximately the mid 70 percent area in 2005, to 86 percent pass rate in semester 1, 2010 when SBLi was first introduced (refer table 3). Feedback provided by students in the semester1, 2010 course was generally very positive after exposure to both the case-based method of teaching and the SBLi scenarios. Student feedback indicates a general increase in interest for the subject. Below is some of the received written feedback provided from students who trialled the resources:

"SBLi had helped me to gain insight and the steps required to solve real-world problems."

"When I did use it (SBLi), it was just as easy to work through tutorial questions and realise where I went wrong, rather than just seeing the wrong answer."

"It's more interactive, I think. It's easy to tune out during Lectopia."

"Even though I didn't get far into it, it is definitely interesting to learn the practical applications of what we are studying not just the theory."

When asked what was the most useful thing learned from the course, one student made the following insightful, if not humorous, response concerning the practical application of what she learned;

"SBLi helped me to acquire vocational skills and understand the approach to solving real-world problems. Like the standard normal curve, and how many human measurements conform to the probabilities it contains. As a girl who likes tall men, I would use it to judge whether a current boyfriend is worth sticking with, based on the probability of finding a taller one."

DISCUSSION

This paper has described an approach that teaches undergraduate statistics through presenting material using simple cases and examples illustrated with pictures to put difficult concepts into context. In addition, it has outlined the benefits of presenting the material using scenarios and eLearning software. This was the first time the eLearning software (SBLi) had been used in this way in order to teach inferential statistics concepts.

The findings from this preliminary investigation into the benefits this teaching approach brings are positive. This has been assessed primarily from focus group discussions, written evaluations from users, as well as verbal feedback from many students. An initial focus group in 2009 found that from a limited amount of responses from users that there was a significant improvement in students understanding of important inferential statistical concepts. However, while this was only a pilot study it did provide a sense that further investigation into the effectiveness of the teaching approach warranted further investigation.

Stewart, Brown, and Weatherstone (2009) observe that an illustrated narrative, or story, is often the manifestation of the problem-based scenario paradigm in an eLearning context. They argue that the use of interactive problem-based scenarios in educational contexts has been founded on the premise that students learn better by active engagement (i.e. doing things). Michael and Modell (2003) observe that learning is an active process, while Martí et al. (2006) state that Problem-Based Learning (PBL) is an educational strategy to improve student's learning capability that, in recent years, has had a progressive acceptance in undergraduate studies.

The active learning paradigm of PBL seemed applicable for application in a statistics educational context, as it is aimed at evoking student motivated, improving student ability to observe, analyse and interpret quantitative information, and developed a sound understanding of the underlying concepts. In addition, scenario-based learning is also recognised as active learning with the efficacy of scenario-based learning in health science education being especially well documented for example (Hoffman et al. 2006, McLoughlin, Burns, and Darvill 2015, Poulton et al. 2014). What is not so well documented is the efficacy of scenario-based learning in statistics education.

Considering that PBL activities make problems relevant and have been shown to increase student engagement, the question arose as to whether a case-based approach combining PBL would help student cognitive engagement and subsequent understanding of statistical concepts. It has been demonstrated across various disciplines that the efficacy of the PBL format over more traditional methods is thought to offer significant advantages in the acquisition of knowledge and underlying educational theory, motivation enhancement, as well as promoting self-directed learning (Kiernan et al. 2008, Gallagher and Gallagher 2013

Klegeris and Hurren 2011). Evidence from other disciplines suggests there are indeed likely benefits for students from implementing a PBL approach to teaching inferential statistics.

The author wished to address the pedagogical effectiveness of combining web-delivered problem-based learning scenarios with the picture illustrated case-based teaching method developed. The software was chosen in part because Scenario Based eLearning places an emphasis on internalised learning where learners are able to assess situations and react appropriately; creating more realistic and fluid dynamic learning experiences (Kindley 2002), because the authoring tool does not require any programming knowledge and is adaptable to specific contexts, plus students' involvement with materials is active and goal based. In addition, building an electronic student tool appeared to be the next logical step in augmenting this novel teaching approach in a flexible, cost effective, interactive manner. The software has also been

previously demonstrated as highly motivational for students and enables independent problem solving abilities to be developed using real-world simulations (Blackburn 2011, Gossman et al. 2007, Stewart 2007).

Combining eLearning software with a non-traditional case-based teaching method is an original approach to using technology in order for statistics students to recognise problem types and learn how to solve them. A series of fully interactive eLearning scenarios were developed to enable students to make choices and interact with an environment where they are presented with real-world technical issues. The fish farm analogies previously used by the author in teaching inferential statistics theory where incorporated into the eLearning scenarios. The scenarios apply multimedia materials to capture student interest and engage students in the learning process by building linkages between mathematical formulae and real-world applications.

The software has been developed as a cognitive tool for the design of problem based simulations in an eLearning environment that will facilitate problem solving, critical thinking and higher-order learning. It takes advantage of the educational benefits of problem based learning and combines it with the flexibility and engagement of interactive multimedia providing students with a more realistic and fluid educational experience. Students become engaged in the process of critical thinking and problem diagnosis, involving iterative cycles of enquiry, reflection, and hypothesis generation.

RESEARCH CONCLUSIONS

The research presented in this paper shows that eLearning scenarios designed to emphasise conceptual understanding rather than mere knowledge of procedures may significantly benefit students who struggle to develop problem solving skills. Specifically, eLearning software allows guided instruction to be incorporated with just-in-time learning principles.

Given the small sample sizes in some of the cells in this study, it is unwise to draw any hard and fast conclusions from the data. The study presented here is currently being repeated with more students in each cell of the design. In addition, the repeated study also provides more statement options for students to select from in the fish farm pre-test and post-test problems. Students are now required to select the best five options from a list of ten specific questions. This is an improvement over the first survey study as it allows for more variance in the data. Furthermore, a full test of the relative importance of effective instruction and of experience alone could be performed. This would involve comparing the eLearning scenarios described in this paper (that use embedded screen-casts and analogy based teaching), with a new series of eLearning scenarios relying on students experiencing spread sheets and graphical tools only (without any embedded explanations).

The use of effective visual analogies embedded in technology is a cognitive teaching tool that appears to promote positive benefits when teaching difficult concepts in introductory statistics. Although a full and independent evaluation of PBL for education in large undergraduate statistics classes is yet to be undertaken, this paper argues that PBL, combined with a case-based teaching approach and Pictorial Icons embedded in educational technology can make a significant contribution to professional training in inferential statistics on the basis that it stimulates student motivation and promotes deep learning on a number of levels. Further rigorous experimental design and research is needed to investigate whether PBL intervention in a traditional curriculum is more effective than an exclusively didactic statistics programme.

However, it is important to recognise the potential benefits student-centred PBL has in relation to the life-long learning of future statisticians.

Table 1
EXPECTED OUTCOMES FOR THE FOUR GROUPS.

1.	Pictorial Icon (PI) instruction	No Pictorial Icon (PI) instruction
SBLi	Full treatment (Better on both)	SBLI only (Better on Applications)
No SBLi	Pictorial Icon only (Better on Concepts)	Control

Table 2
VALUES SHOWN ARE: AVERAGE EXAM MARK; STANDARD DEVIATION; AND SAMPLE SIZE RESPECTIVELY.

	Pictorial Icon (PI) instruction (the author's tutorials)	No Pictorial Icon (PI) instruction (other tutors)
SBLi	59; 17; 14	70; 12; 8
No SBLi	57; 17; 38	53; 18; 350

Table 3
PASS RATES FOR UNIVERSITY COURSE ECON1310 QUANTITATIVE ECONOMIC AND BUSINESS ANALYSIS (TOTAL NUMBER OF ENROLLED STUDENTS INDICATED IN BRACKETS)

Year	Semester 1	Semester 2
2005	70% (745)	60% (365)
2006	77% (761)	62% (396)
2007	76% (766)	67% (456)
2008	79% (880)	77% (481)
2009	79% (697)	78% (421)
2010	86% (832)	76% (400)
2011	89% (762)	-

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APPENDIX

School of Economics
ECON1310
Semester 2, 2009

Dear Student, **1ST ROUND**

The following exercise is part of a research project. In this exercise, specific teaching techniques are being examined to measure their effectiveness in helping students learn statistical concepts. In particular, our aim is to assess the impact of scenario based learning. To evaluate this teaching method, we need to look at your current understanding of statistics and your ability to apply statistical knowledge. Later in the semester, we will redo this same exercise after your participation in ECON1310.

To enable proper analysis of the data, we are asking you to supply your **8-digit student number** with your answers in this exercise. UQ ethical standards specify that the lecturer will not see any of the information or answers you supply. Infact, an outside researcher will be collecting the data and analysing it. This will be strictly followed. Thus, your answers in this exercise will be c**onfidential** at all times and are not part of the assessment for this course. Please be assured once the information is analysed, the master file will have your student identification totally removed. At no time will any individual student be able to be distinguished. Furthermore, your participation in this exercise is completely voluntary and you are free to withdraw at any time. If you consent to participating, and for the researcher to use your information as outlined, please sign below.

I have read the explanation above. I understand my participation in this exercise is voluntary and that my privacy will be protected. I agree to provide my student number to assist with data collection and analysis.

Signed _____ date: _____

Thank you for your participation.

8 digit Student Number: _ _ _ _ _ _ _ _
ECON1310: Fish 'n Chip Shop Scenario Purchase Decision Survey

The scenario you are presented with below involves collecting data for the purchase of a local Fish ‘n Chip shop. If you answer the scenario questions to the best of your ability, it will be used as benchmark for your current grasp of statistical concepts.

Scenario

A friend of yours has asked for help in deciding if they should purchase a Fish ‘n Chip shop that is for sale. The current owner has told your friend that, on average, the shop serves 500 customers each week, and makes a monthly pre-tax profit of $10 000. Your friend needs your knowledge of statistics to help decide if the shop has the characteristics the owner claims.

Some features of a fish ‘n chip shop business can be assessed using statistics. The variable your friend has asked you to focus on is the shop’s **average daily sales** (as you need to make a purchase decision after one month). You have no access to official records of all daily sales for this particular shop, so the owner’s claims cannot be directly verified.

By collecting data on daily sales for this shop over a one-month period, you could (**tick** all those you believe are **true**):

- ☐ 1. Calculate the average sales for all fish ‘n chip shops in the local area.
- ☐ 2. Create a sample of daily sales.
- ☐ 3. Calculate the population mean of daily sales.
- ☐ 4. Estimate the population proportion spending more than $20 on each visit.
- ☐ 5. Calculate average monthly sales for one year.
- ☐ 6. Calculate the sample mean and standard deviation of daily sales.

Now you need to go out and collect data for the fish ‘n chip shop purchase decision. **Tick** the **three (3) most important** tasks below that you would perform so as to **collect data** and then be able use so as to make an informed purchase decision.

- ☐ 1. Visit the shop, on random nights during the month, and count the customers.
- ☐ 2. Visit the shop, observe and record what customers buy.
- ☐ 3. Visit other local fish ‘n chip shops in the area recording what is bought.
- ☐ 4. Visit the shop on random nights, then buy and taste the food.
- ☐ 5. Collect sales data from another fish ‘n chip shop to compare with your sample.
- ☐ 6. Ask customers how much they spent.

ANALYSIS OF THE INTERRELATEDNESS OF THE MENA REGION

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ABSTRACT

Any level of foreign market penetration involves a risk to a certain extent. Several factors play a role in determining the level and extent of this risk of doing business in a foreign country. Among others, these factors include a country's economic development, political system and its stability, legal system, sociocultural differences, and geographic location. Different tools are available to investors to minimize risks and their liability of foreignness.

This paper focuses on diversification options utilizing the analysis of comovement of gross domestic product between eight countries in the Middle East and North Africa, also known as the MENA region. Stemming from economic indicators, the cointegration test of comovement of gross domestic product between Bahrain, Egypt, Iran, Jordan, Morocco, Oman, Saudi Arabia, and Tunisia are used to analyze which factors, if any, influence countries interrelatedness of their economic output and to conclude whether comovement can be determined.

INTRODUCTION

Economic integration and harmonization of free trade among countries has been an ongoing process slowly evolving into more regional interconnectedness. Perhaps the concept of one open market throughout the world is quite optimistic at this stage of development; however, closer ties between countries located in the same regions of the world have progressed significantly in the past century and continue to evolve. (Husain, 2014)

Saturated markets in the Western world and Asia are stimulating investors in search of new opportunities and turning to emerging economies, such as the Middle East and North African Region (MENA) for new investments. (Smith, 2010) Based on World Bank's World Development Indicators of growth of output based on average annual percentage of the countries' gross domestic product, MENA's GDP growth was 0.9%, Sub-Saharan Africa's 3.2%, and South Asia's 1.4%. At the same time Europe and Central Asia's remained at 1.6% and North America's declined by 1.9%. (World Bank, 2014)

One determining factor in foreign market penetration is the diversification of risks by utilizing foreign direct investment in different regions, which can reduce costs associated with the liability of foreignness of a parent company. The existence of comovement of real output between countries located within the same geographic region can influence the interest of a potential foreign market entrant. The current paper investigates the comovement of GDP, or lack thereof, between countries in the MENA region. If there is comovement of GDP, economic, cultural, political, geographical, and legal aspects of these countries may influence this comovement. This may provide a better understanding of the cause and effect relationship that may exist and provide benefits in terms of diversification. Furthermore, risks associated with

foreign investments could be significantly lowered in a country with a stable regulatory environment where the rules and regulations of doing business are clearly stated, cannot be easily changed, and obligations resulting from contract agreements and international business transactions are enforceable. (Mehrabani, Basirat, & Abdollahi, 2016)

The current study analyzes eight countries in the MENA region, more particularly three located in North Africa: Egypt, Morocco, and Tunisia, and five in the Middle East: Bahrain, Iran, Jordan, Oman, and Saudi Arabia. First, the countries' economic, political, cultural, and legal similarities and differences will be discussed. Then the comovement of GDP between each country will be analyzed.

Bahrain in 2006 was the first country in the Persian Gulf region to have signed a Free Trade Agreement with the United States, thus embarking the region on a long journey towards economic integration. Bahrain's economy is largely dependent on oil, which has led to a significant budget deficit in 2016 due to the low oil prices. The country mainly exports petroleum and petroleum products, aluminium, and textiles, while it imports crude oil, machinery, and chemicals. Saudi Arabia is its main trade partner. (Central Intelligence Agency, 2016).

Bahrain's neighboring country across the Persian Gulf, Iran, with 80% of exports comprised of petroleum and petroleum products, is significantly dependent on the one commodity. Despite its mixed-economy, state owned enterprises are the ruling standard in forms of business ventures. The 2012 economic sanctions attempting to steer Iran into a different political direction have been reduced after Iran agreed to the Joint Comprehensive Plan of Action (JCPOA) signed by the United Nation's Security Council's five permanent members and Germany in 2015. Iran's promise to curtail its nuclear program promises more economic growth due to free trade in the future. However, in order to achieve this goal and to get closer to the level of economic development of the other countries in the region, Iran must undertake various political and legal reforms to enhance the predictability of doing business. International economic cooperation, transparency in legal regulations will decrease the cost of doing business in the country and perhaps stimulate foreign investment. (Mehrabani, Basirat, & Abdollahi, 2016)

The southeastern neighbor of Saudi Arabia and the United Arab Emirates, Oman has direct access to the Arabian Sea and the Gulf of Oman. Its main trade partners are China, The United Araba Emirates, South Korea, Saudi Arabia, and Pakistan. An economic downturn in 2015-2016 caused by low oil prices affected the country, since its most important export commodity is crude oil. Oman lacks significant foreign direct investment.

Bordering Israel, Syria, Iraq, and Saudi Arabia, Jordan differs from the above discussed countries by the lack of oil, water, and natural resources, thus relying mainly on foreign aid. It imports crude oil, refined petroleum products, machinery and equipment, and iron. Export commodities include textiles, fertilizers, potash, phosphates, vegetables, and pharmaceuticals. The United Sates, Saudi Arabia, and Iraq are its main export partners. The International Monetary Fund approved a three-year $723 million extended arrangement in 2016 under the Extended Fund Facility agreement to help with Jordan's Syrian refugee influx and economic reform.

The country with the largest area on the Arabian Peninsula is Saudi Arabia. Along with Iran, Saudi Arabia is among the founding members of the Organization of the Petroleum Exporting Countries (OPEC). (Member Countries, 2016) In 2016 plans have been announced to list the shares of ARAMCO, a state owned oil enterprise, in an attempt to increase revenue and possible foreign investment.

Moving onto the African continent, Egypt is located between the Mediterranean Sea and Red Sea. An uncertain political situation largely impacts Egypt's economy, due to lack of foreign direct investment; however, its 2015 GDP reached the highest level in the country's history. Although crude oil and petroleum products are among the export commodities of Egypt, it is to a lesser extent when compared to previously discussed Middle-Eastern countries.

Political unrests and recent terrorist attacks define the recent developments in Tunisia. The country's main export commodities include textiles and agricultural products. One of its main sources of revenue tourism has significantly declined after the 2015 terrorist attacks on tourists. Terrorist attacks have also negatively impacted foreign direct investment. (Richter & Steiner, 2008) France, Italy, and Germany, and Spain are among Tunisia's most important trading partners.

Morocco followed suit with Bahrain in becoming a free trade partner with the United States in 2006. With its close proximity to Europe, Morocco is separated from Spain only by the Strait of Gibraltar, making Spain its main trading partner. (Central Intelligence Agency, 2016).

DATA AND METHODOLOGY

The data is annual real GDP data for Bahrain, Egypt, Iran, Jordan, Morocco, Oman, Saudi Arabia and Tunisia. The source of data is International Financial Statistic (IFS) through the International Monetary Fund (IMF) at the website http://www.imf.org/en/Data. The time span of data is 1982 through 2010 (determined by availability of data across countries).

The existence of a long term relationship among output data will be tested using Johansen (1988) and Johansen and Juselius (1990) methodology for cointegration. The existence of a cointegrating relation would imply a common business cycle since series that are cointegrated can be expressed with a causal ordering in at least one direction. The use of cointegration tests is relatively common in the literature and the reader is referred to Johansen (1988) and Johansen and Juselius (1990) for a complete discussion.

EMPIRICAL RESULTS

Prior to cointegration testing, the order of integration needs to be ascertained. The orders of integration of the individual series is determined using the Augmented Dick-Fuller test (Fuller, 1976; Dickey and Fuller, 1981). The unit root tests are provided in Table 1. The null hypothesis is that a unit root exists. For all countries, the level of each country's output measure was found to contain a unit root; that is, each variable was found to be nonstationary in their levels and stationary in their first differences. We then proceeded to test for cointegration among these nonstationary variables.

Table 1 UNIT ROOT TESTS		
	Augmented Dickey Fuller	
	Level	1st Difference
Bahrain	-0.20	-4.36**
Egypt	-1.07	-3.70**
Iran	-1.45	-3.29*
Jordan	-0.42	-3.76**
Morocco	-0.18	-10.17**
Oman	-0.20	-3.24*
Saudi Arabia	-0.43	-4.72**
Tunisia	-0.13	-6.23**
Notes: * denotes statistical significance at 10% and ** denotes statistical significance at 5%.		

To investigate the comovement among the nonstationary variables in their levels, the cointegration test is applied on a pairwise basis. The lags lengths to be used in the bivariate cointegration models were determined by the Akaike criteria. The null hypothesis for the maximum eigenvalue statistic is that there are r cointegrating vectors and the alternative hypothesis is that there are at least r+1 cointegrating vectors. The null hypothesis for the trace statistic is that there are r or fewer cointegrating vectos and the alternatives hypothesis is that there are at least r+1 cointegrating vectors. The results of these bivariate cointegration tests are reported in Table 2.

Eleven of the twenty-eight country pairings were found to be cointegrated; that is, they were found to contain at least one cointegrating vector. These eleven pairing could be interpreted as sharing a common business cycle as cointegration shows Granger causality in at least one direction. The majority of the pairings showed no cointegration or the results were inconclusive.

The eleven country pairings for which cointegration was concluded to exist are the following: Bahrain and Iran; Bahrain and Morocco; Bahrain and Oman; Egypt and Iran; Iran and Jordan; Iran and Morocco; Iran and Tunisia; Morocco and Oman; Morocco and Saudi Arabia; Morocco and Tunisia; and Oman and Saudi Arabia.

The country pairings that showed no evidence of a cointegrating relationship included the following: Bahrain and Jordan; Bahrain and Saudi Arabia; Bahrain and Tunisia; Egypt and Morocco; Egypt and Oman; Egypt and Tunisia; Iran and Saudi Arabia; Jordon and Oman; Jordan and Tunisia; and Saudi Arabia and Tunisia. The pairings of Bahrain and Egypt; Egypt and Jordan; Egypt and Saudi Arabia; Iran and Oman; Jordan and Morocco; Jordan and Saudi Arabia; and Oman and Tunisia exhibited evidence that was inconclusive regarding the existence of comovement of their GDP.

Based on GDP comovement analysis, Tunisia is projected as the country with the lowest level of comovement when compared to the rest of the countries since Tunisia only has comovement with Morocco. It was determined that it does not have comovement with Bahrain, Egypt, or Saudi Arabia, and comovement was indeterminant with Iran, Jordan, and Oman. On the other hand, Morocco showed the most evidence of comovement between the MENA countries considered. Morocco projected comovement with Bahrain, Iran, Oman, Saudi Arabia, Tunisia, and its comovement was indeterminant with Jordan.

Table 2
COINTEGRATION TEST RESULTS

	Trace Statistic		Maximum Eigenvalue		
Country Pairings	r=0	r=1	r=0	r=1	# of vectors
Bahrain and Egypt	16.18*	7.49*	8.69	7.49*	inconclusive
Bahrain and Iran	19.94*	4.71*	15.23*	4.71*	1
Bahrain and Jordan	5.86	0.43	5.43	0.43	0
Bahrain and Morocco	31.40*	4.72*	26.68*	4.72*	1
Bahrain and Oman	22.96*	8.21*	14.75*	8.21*	1
Bahrain and Saudi Arabia	8.12	0.61	7.51	0.61	0
Bahrain and Tunisia	9.20	2.72	6.48	2.72	0
Egypt and Iran	22.70*	7.44*	15.26*	7.44*	1
Egypt and Jordan	17.18*	7.56*	9.63	7.56*	inconclusive
Egypt and Morocco	15.08	5.33	9.75	5.33	0
Egypt and Oman	11.29	5.11	6.18	5.11	0
Egypt and Saudi Arabia	18.55*	5.67*	12.88	5.67*	inconclusive
Egypt and Tunisia	12.21	2.95	9.26	2.95	0
Iran and Jordan	20.35*	5.66*	14.68*	5.66*	1
Iran and Morocco	27.77*	12.46*	15.31*	12.46*	1
Iran and Oman	15.50*	4.51*	10.99	4.51*	inconclusive
Iran and Saudi Arabia	7.18	1.98	5.19	1.98	0
Iran and Tunisia	22.10*	3.05	19.05*	3.05	1
Jordan and Morocco	20.28*	6.14*	14.14	6.14*	inconclusive
Jordan and Oman	10.30	4.66*	5.65	4.66*	0
Jordan and Saudi Arabia	16.48*	4.28*	12.20	4.28*	inconclusive
Jordan and Tunisia	10.71	1.37	9.33	1.37	0
Morocco and Oman	23.79*	4.27*	19.52*	4.27*	1
Morocco and Saudi Arabia	24.32*	2.38	21.93*	2.38	1
Morocco and Tunisia	20.62*	2.27	18.35*	2.27	1
Oman and Saudi Arabia	25.79*	7.22*	18.57*	7.22*	1
Oman and Tunisia	18.37*	5.36*	13.01	5.36*	inconclusive
Saudi Arabia and Tunisia	8.40	0.24	8.16	0.24	0

ANALYSIS OF RESULTS AND THEIR IMPLICATIONS

Table 3 provides information from the IMF regarding the level and ranking of GDP in each of the countries considered in the study.

Table 3
COUNTRY GDP (IN BILLIONS, US DOLLARS)

Saudi Arabia	618.274
Iran	386.120
Egypt	330.78
Morocco	108.096
Oman	51.679
Tunisia	43.989
Jordan	39.795
Bahrain	30.079

(IMF, 2016)

The World Bank's World Development Indicator of Growth of Output (comparing the average annual percentage growth of Gross Domestic Product of countries between 1990-2000 and between 2000-2014) indicates that among the countries of analysis, Iran's average annual percentage growth declined the most by 1.5% and Saudi Arabia's increased by 3.7% (World Bank, 2014) Iran and Saudi Arabia do not have comovement based on our analysis.

Several other factors may explain why comovement may or may not exist among countries within the same geographic region. The legal environment of business, political, social, cultural, and geographical aspects are among the attributes that may have an impact. The political and economic stability of a country as well as a region will have implications as to risk factors associated with doing business.

National legal regulations are often indicative of ease or difficulty of doing business for foreign market entrants as well. The World Bank's annual report on Doing Business ranks 189 countries based on various steps utilized to begin economic operations in a particular country. These include taxation laws, trade barriers, enforceability of contracts, availability of credit and electricity, hardship or ease of obtaining a construction permit, bankruptcy laws, and overall regulation of starting a business. Based on these criteria, countries of interest were ranked as provided in Table 4 (World Bank, 2016):

Table 4
DOING BUSINESS 2016 RANKING

65.	Bahrain
70.	Oman
74.	Tunisia
75.	Morocco
82.	Saudi Arabia
113.	Jordan
118.	Iran
131.	Egypt

Furthermore, the legal environment of these countries also constitutes a determining factor in the level of possible barriers to entry. Traces of all three legal traditions - civil, law, common law, and theocratic law are present in every country present on our list, with Islamic law predominantly ruling over legal doctrine. Civil and common law adaptations in the legal systems are closely tied with former historical ties within the Age of Exploration (Smithsonian Institution, 2011). Thus Egypt, Morocco, and Tunisia's legal systems encompass traces of civil law, whereas Oman, Bahrain, Jordan use common law besides Islamic law. Iran and Saudi Arabia almost exclusively utilize Islamic Law; although Saudi Arabia's legal system does contain elements of Egyptian, French, and customary law. (Central Intelligence Agency, 2016) The utilization of various legal traditions does not appear to have an impact on the determination of comovement between countries. For example, Iran and Saudi Arabia, with the predominance of Islamic law do not indicate comovement. However, countries with a combination of civil and common legal traditions indicate comovement in many variations. Bahrain, Jordan, and Oman with common law traditions indicate comovement with either strongly Islamic law based Iran or Saudi Arabia. Furthermore, Iran and Saudi Arabia also project comovement with civil- and Islamic law based Egypt, Morocco, and Tunisia. (Central Intelligence Agency, 2016)

In regards to regional economic integration, every country relevant to this analysis is member of the Arab League, except Iran. The Arab League is the major regional organization of economic and political cooperation. It was established in 1945 and its founding members include Egypt, Saudi Arabia, and Jordan. Bahrain, Morocco, Oman, and Tunisia are also members. Similar to other regional organizations of economic and political cooperation, in Article II of the Charter of the Arab League, the Arab League spells out as its main goal to be the "strengthening of the relations between the member-states, the coordination of their policies in order to achieve co-operation between them and to safeguard their independence and sovereignty; and a general concern with the affairs and interest of the Arab countries." This includes cooperation in economic and financial affairs, regulation of commercial transaction, customs enforcement, and currency exchange. (Arab League, 2014) Shared business cycles phenomena could be anticipated by this formalized cooperation agreement; however, our results do not provide strong evidence for this.

A recent setback in economic integration by international trade occurred when the Doha Round of negotiations under the oversight of the World Trade Organization were suspended in 2006. Negotiations eventually resumed but reached agreements did not deliver as expected. The latest development is the Nairobi Package which contains agreements on agriculture. Although slow in progress and perhaps undetermined in final outcomes, negotiations are periodically ongoing. Since all countries listed in our study are members of the World Trade Organization, they're also part of the Ministerial Conferences, the decision-making body of this organization. (WTO, 2015)

The political environment and its instability can pose a significant risk for foreign investors and therefore impact economic comovement between countries. The most common political system among the countries of interest is a variation of theocratic totalitarianism when an individual or group governs based on religious principles. More specifically, Bahrain's form of government is constitutional monarchy, Oman and Saudi Arabia are absolute monarchies, Egypt is a presidential republic whereas Tunisia is a parliamentary republic, Morocco and Jordan are parliamentary constitutional monarchies, and Iran is a theocratic republic. (Central Intelligence Agency, 2016) The presence of different ethnicities and nationalities living in the same country is deemed as an indicator of possible social unrest, which then in return may pose a higher risk of performing economic activities in a particular country. (Shimray, 2001) The similarities among the listed countries are that they are all predominantly Muslim. However, there are three different traces of this religion present: mostly Sunni, secondly Shia, and finally, Ibadhi Muslims in Oman. The greatest ethnic diversity can mostly be observed in Iran, where Persian, Azeri, Kurd, Leir, Baloch, Arab, Turkmen, and Turkic tribes of population coexist in one country. (Central Intelligence Agency, 2016) This factor does not appear to have an influence on comovement of GDP in the current study. As an example, the predominantly Shia Muslim Iran has indicators of comovement with the almost exclusively Sunni Muslim population of Tunisia. Also, 70% Shia Muslim Bahran has comovement with predominantly Sunni Muslim Morocco.

The cultural aspect of economic and political integration of countries is often overlooked. Cultural integration is very often a by-product of economic integration through foreign aid and free trade. Based on Islamic traditions, however, religion plays a major role in everyday life of society making it a significant part of Islamic culture but it is also utilized in business. These

countries reject the idea that their religious practices can be changed because they are deemed perfect. This socio-political view creates a barrier of reluctance for further integration into a world highly dominated by Western practices and cultures. Since all countries embrace Islam, occurrence of comovement is not supported based on religious views. (Levine, 2005)

CONCLUSION

Out of twenty-eight bivariate country pairings of the MENA region considered in this study, only eleven show statistical indication of comovement of their real output. Of these eleven pairings indicating comovement, nine of them included either Iran or Morocco. However, analyzing economic, political and cultural aspects of these selected MENA countries, we do not find a consistent pattern or explanation of why some country pairings exhibit comovement and others do not. Investors could utilize the finding as a consideration in diversification in that they could potentially benefit from investing in a mix of countries that do not exhibit comovement. However, as the study does not provide strong or consistent evidence that can be readily explained, additional future analysis would be beneficial.

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COST-EFFECTIVENESS ANALYSIS: EXTENDING DENTAL CARE COVERAGE TO MEDICARE BENEFICIARIES

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ABSTRACT

With the healthcare debate in this country centering on increasing access, reducing cost, and improving population health, reform efforts should utilize cost effectiveness analysis to weed out wasteful practices in medicine by assessing the added improvement in health outcomes relative to their cost. However, many of the recent changes in preventive care coverage under the Medicare program neglect to consider this analysis. For example, the annual physical, demonstrated to be cost ineffective for this age group, is covered. Whereas, preventive and restorative dental services, recognized to reduce incidents of other medical issues that subsequently result in significant cost savings, are not covered under Medicare. This paper discusses how cost-effectiveness analysis can be utilized to inform ongoing and future policy discussions lending support to the inclusion of preventive dental coverage to Medicare. Preventive dental coverage would pay for itself through the reduction of expensive nonpreventative dental care and the early identification of and better management of chronic illness.

Keywords: *Cost-effectiveness analysis, dental coverage, Medicare*

INTRODUCTION

In 2014, U.S. healthcare spending reached $3.0 trillion with projected increases to 20 percent of the GDP by the year 2020 (Centers for Medicare & Medicaid Services, 2015). With Medicare accounting for 20 percent of the total current healthcare expenditure and nearly ten thousand Americans attaining Medicare eligibility daily, the Congressional Budget Office sounded the alarm that 60 percent of the growth in healthcare spending over the next several decades will be attributable to the aging population (Congressional Budget Office, 2014). Furthermore, health policy researchers report that waste on activities that produce little if any value account for as much as one third of health care expenditures. The continual escalation of healthcare spending combined with the aging population and waste of scarce resources poses a serious threat to the sustainability of the nation's healthcare.

The government responded to both the cost and waste challenges through the enactment of the Patient Protection and Affordable Care Act (ACA). This reform is a major attempt at

increasing access to healthcare services and expending preventive health programs primarily for the non-Medicare eligible population. The ACA also includes provisions to address gaps in Medicare prevention and prescription drug benefits, to test new Medicare payment and healthcare delivery models, and to control waste, fraud, and abuse in the Medicare system. Since the enactment of Medicare in 1965, numerous amendments, including the ACA, attempted to expand benefits and/or control costs. Despite the many payment, quality, and delivery system reforms throughout the years and the important role Medicare plays in providing health and economic security for beneficiaries, policy makers have never formally considered cost-effectiveness analysis (CEA) to address these challenges (Gold, Shoshanna & Siegelberg, 2007; Neumann, Rosen, & Weinstein, 2005; Pearson & Bach, 2010).

CEA informs health care decision making by assessing the gains in health relative to the costs of different health interventions. The goal is to identify ways to redirect scarce resources to achieve greater value. Despite the clear link between oral health and systemic health, Medicare has never covered preventive and restorative dental services; Essential care for older adults who face greater age-related oral health risks due to physiological changes, underlying chronic diseases, and increasing use of medications. Therefore, this paper contends that CEA should be utilized to inform ongoing and future policy discussions related to coverage decisions, cost control costs, and allocation of resources, specifically as it relates to dental coverage under Medicare to reduce health costs and improve the long-term health for older Americans.

THE IMPORTANCE OF ORAL HEALTH

In 2000, the U.S. Surgeon General issued a landmark report entitled "Oral Health in America: A Report of the Surgeon General," which alerted the American public to the relationship between oral health and systemic health. The report highlights that poor oral health impacts an individual's psychological and social wellbeing, leads to nutritional deficiencies, chronic pain, microbial infections, the inappropriate use of emergency rooms, and the development of chronic diseases such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes (U.S. Department of Health and Human Services, 2000). Sixteen years after the release of this report, oral health still does not receive the same importance in the establishment of health policy as systemic health and the gap in access to dental care remains. While the enactment of the ACA expands access to insurance coverage for millions of American adults under age 65, addresses gaps in Medicare preventive and prescription drug benefits, and initiates testing of new Medicare payment models, oral health is all but ignored.

Left untreated, oral diseases will not resolve itself, will profoundly impact quality of life, and will increase the risk of adverse health outcomes (Griffin, Jones, Brunson, Griffin, & Bailey, 2012). Furthermore, many of the signs and symptoms of chronic diseases, certain cancers, and HIV/AIDS may be first detected through oral manifestations. Early detection and treatment prevents problems from developing into more complicated conditions requiring more expensive measures. Likewise, the treatment of periodontal disease improves metabolic control among persons with type 2 diabetes, enhancing oral hygiene care can prevent respiratory infections and death from pneumonia in the elderly, and frequent tooth brushing lowers levels of cardiovascular

disease (Griffin et al., 2012).

FINANCIAL BARRIERS TO DENTAL CARE

Medicare Part A, which provides free insurance for most individuals over age 65, covers inpatient care at a hospital or skilled nursing facility. However, the beneficiary is responsible to satisfy a deductible ($1,288 for 2016) before Medicare payments begins (Medicare.gov, 2016). Once the deductible is satisfied Medicare Part A will pay 100% of the cost of covered services for the first 60 days. Afterward, a tier-payment system requires the beneficiary to pay an escalating co-insurance until they are fully responsible for all charges. Medicare Part B is a supplemental insurance plan that covers basic medical services provided by doctors, clinics, and laboratories. Coverage under Part B requires the beneficiary to pay an annual premium ($104.90 for 2016), to satisfy an annual deductible ($166 for 2016), and to be responsible for a 20% co-insurance once the deductible is met. Prescription drug coverage is provided under Medicare Part D with out of pocket costs related to premiums, deductibles, copays and coinsurance, and coverage gaps being plan specific. The average national annual premium is $410.00 for 2016. Furthermore, Medicare payments for services are considerably less than actuals charges resulting in the provider potentially holding the beneficiary responsible for the difference. Additionally, Medicare does not provide coverage for routine expenses such as glasses, hearing aids, dental work, and dentures.

The overall result is that Medicare, on average, only pays about half the total cost of an individual's expenditures for care and requires beneficiaries to spend roughly 15 percent of their household budgets on health expenses, three times the amount that younger households spend on health care costs (Kaiser Family Foundation, 2013). With half of Medicare beneficiaries having a 2012 annual income of $22,500 or less, out-of-pocket spending represents a considerable financial burden for many (Kaiser Family Foundation, 2013). Research shows that the drive to secure dental care is highly correlated to the individual having dental insurance (Manski et al., 2011). Unfortunately, Medicare does not currently provide dental coverage for its beneficiaries and given that many retirees struggle to meet basic life needs, paying for private dental insurance is cost-prohibitive. The result is less than 20 percent of adults over the age of 65 have any form of private dental insurance. The lack of insurance, combined with the high cost of dental care deters older adults from seeking necessary preventive dental care, forcing them to neglect their oral health until a medical crisis develops (Moeller, Chen & Manski, 2010).

Lack of accessible, affordable dental coverage can lead to adverse health outcomes, with certain oral conditions including periodontal disease increasing the risk for heart attacks and strokes (Center for Medicare Advocacy, 2015). Conversely, many chronic health conditions can contribute to oral health problems, leading to further medical complications. In the absence of dental coverage, patients often present to the emergency department (ED) for long-delayed dental care when the condition has escalated to a complicated condition requiring more extensive and expensive measures. ED dental visits doubled from 1.1 million in 2000 to 2.2 million in 2012 and cost more than three times as much as a routine dental visit, averaging $749 if the patient does not require hospitalization (Wall & Vujicic, 2015). In 2011, individuals age 65-85

and 85 and over had 54.2 and 44.8 (per 100,000 population) ED visits with a principal diagnosis of dental condition (Agency for Healthcare Research and Quality, 2015). More than 90 percent of these older adults were treated and released. Overall, these visits cost the U.S. healthcare system $1.6 billion annually and the American Dental Association estimates that up to 79 percent of ED dental visits would be better served in a dental office or community setting (Wall & Vujicic, 2015).

METHODS

A large healthcare system in the northeast provided the number and payer type of ED visits from October 2012 through June 2016 in which the chief compliant was dental pain. This data was analyzed looking specifically for the reason for visit, age of patient, and source of payment for the visit. Interviews were also conducted with individuals from the budget office of this hospital in order to determine the complete charges for an ED visit for a dental problem. It was also important to ascertain the level of care extended to an individual presenting to the ED with a dental problem. In order to better understand ED procedures for this hospital system a discussion was held with the former clinic director.

RESULTS

The evaluation of the ED visits for dental pain over a four-year period yielded 6,211 visits at three locations of this rural healthcare system. Table 1 provides the breakdown of these visits by age and whether or not the visit was paid by Medicare. There were 447 individuals seen in this ED that used Medicare as their insurance coverage. This represents 7.2 percent of total dental pain ED visits during a four year time period for this particular rural hospital system.

Table 1
ANALYSIS BY AGE AND SOURCE OF PAYMENT

		Paid by Medicare		
		No	Yes	Total
Age	Under 65	5,723	327	6,050
	65 & older	41	120	161
	Totals	5,764	447	6,211

The analysis of the medical records for dental ED visits revealed that limited care was provided for the individual, generally restricted to medication for temporary pain relief. Minor, urgent, non-life-threatening issues like dental pain are billed to Medicare at this hospital at a charge of between $600 and $750 dollars per visit. This would include charges for physician assessment and treatment, facility charge, and any diagnostic tests, none of which solves the dental issue. A visit to a dentist would be billed at between $60 and $100 and would offer the patient a diagnosis along with permanent pain relief. Furthermore, the crisis may be averted all together if preventive care was available.

DISCUSSION

Health care reform in the United States focuses on improving access to care and encouraging health promotion and prevention efforts all designed to improve overall health and ultimately reduce the cost of care. Therefore, the goal of publicly funded healthcare should be to concentrate scarce healthcare dollars to the areas of need that will achieve the greatest health gain (Gold et al., 2007). The use of CEA assists in attaining this goal by identifying the wasteful use of resources and providing guidance to policy makers regarding which healthcare procedures should be covered or expanded. Economists argue that subjecting various clinical interventions to rigorous economic evaluation affords the ability to discover medical procedures that provide very little value and are cost ineffective (Emanuel, 2014). The savings from discontinuing or limiting coverage for these medical tests and procedures can in turn be applied to medical interventions that have a greater positive health outcome. Emanuel (2014) contends that our healthcare system has to begin paying for value in medical care. His argument is that our healthcare delivery system must focus on the value of what we do in healthcare along with the cost or price of the healthcare service. In some cases we will need to invest in interventions that will initially increase costs but in the long-term reduce expenditures and improve health.

Cost-effectiveness studies have shown that individuals with chronic diseases who receive preventative dental care spend less on their overall health care than individuals with the same conditions who did not receive preventative dental care. For example, a United Healthcare study found that for individuals with chronic conditions who regularly received recommended preventive dental care medical claims averaged nearly $1,500 lower per year than those with chronic conditions who received non-preventive dental care or no dental care at all. The study further concluded that chronically ill individuals who are compliant with both medical and dental care had the lowest medical claim costs. Even when individuals are compliant with dental, but not medical care, the impact on their health care costs is significant. Among a pool of 73,000 diabetics, those who were not medically compliant but received regular dental care their medical claims averaged $1,674 less per year than those not receiving dental care (United Healthcare, 2014). Furthermore, individuals receiving extractions, root canals, restorative treatments and other non-preventive dental care had the highest health care spending (United Healthcare, 2014). Another study estimated that the cost savings from medical screenings for diabetes, hypertension, and hypercholesterolemia in dental offices could save the health care system from $42.4 million ($13.51 per person screened) to $102.6 million ($32.72 per person screened) annually (Nasseh, Greenberg Vujicic, & Glick, 2014). Despite the overwhelming evidence providing that preventive dental care lowers overall medical expenses, dental coverage is not considered an essential benefit for Medicare recipients (Moeller et al., 2010).

As part of cost savings, Moeller et al. (2010) highlights that Medicare beneficiaries who received preventive dental work had a lower number of dental visits for expensive non-preventive procedures and overall lower dental expenditures. Therefore, not only could coverage improve the oral health of older adults, it could also reduce the costs of non- preventive procedural services – which are often needed on an emergency basis due to pain. It would also alleviate the burden of elderly dental patients turning to busy emergency departments. However,

until improved coverage is provided, the emergency department may be the only option for care for seniors who do not have a "regular" dentist because of the current lack of coverage.

The cost of healthcare delivery in this country cannot continue to increase for two primary reasons. First, consumer can no longer afford the escalating costs of healthcare insurance along with the out of pocket portion he or she pays for healthcare services. The second reason relates to the crowding out effect that occurs when a larger percentage of gross domestic product is allocated to healthcare and taken away for other important government programs such as infrastructure and education. The overall gaps in coverage are clear: approximately 24 percent of people age 65 years and over have private dental insurance, which is much lower than the insurance rates of children (54 percent) and also of adults of the typical working ages (60 percent) (Manski & Brown, 2007). It is also worth noting that in recent years, many industries have stopped providing retiree health benefits, which adds to the very low rates of private dental coverage among our seniors (Kaiser Family Foundation, 2013).

Since it is expected that the number of older Americans will rise by 80 percent from 40.2 million in 2010 to 72 million in 2030, the eventual cost savings for this coverage can be significant. Compared to past generations, the proportion of seniors who are able to keep their natural teeth into their later years is increasing and the rate of complete tooth loss has nearly fallen in half over the past few decades (Vincent & Velkoff, 2010). This increase in the proportion of seniors with a higher number of natural teeth still in place tells us that an increase in preventive dental care is warranted to help these seniors to keep their natural teeth versus seeking expensive denture care. However, without proper preventive insurance coverage for these services, the good news of the increased retention of natural teeth at a later age comes with the valid concern for an increased risk of both caries and periodontal disease. By providing the less-expensive preventive care coverage under Medicare for the natural teeth, much cost savings can be realized while allowing seniors to avoid costly extractions, oral surgeries, and/or eventual denture expenses.

Oral health is a public health concern because it affects a significant proportion of the population and is strongly linked to overall health status. Even though the oral health of Americans is improving, there are still significant differences among demographic subgroups that dental service coverage can address in a positive way. Dye, Thornton-Evans, Li, and Iafolla (2015) found that 41 percent of lower-income elderly (with household incomes below 100 percent of the federal poverty level) have untreated dental caries which is a rate that is almost three times higher than that of elderly persons with incomes over 200 percent of the federal poverty level. More than 70 percent of seniors were found to have periodontal disease, with 64 percent having either moderate or severe periodontal disease (Eke, Dye, Wei, Thornton-Evans, & Genco, 2012). Sadly, the majority of periodontal disease among older persons is preventable when consistent cleanings and scaling are provided by dentists or registered dental hygienists.

It is important to also consider the possibility that some health care interventions may initially increase costs while in the long term reduce costs and therefore, be considered an investment providing future savings along with improved quality of life. That seems to be the case with making dental care insurance available for the Medicare beneficiaries. The reduction of disparities caused by oral health problems in the elderly requires wide- ranging approaches that

would improve the opportunity for those over 65 on fixed income to be able to utilize preventive dental care. The most effective and least expensive way of accomplishing this objective would be to pass legislation extending dental coverage to Medicare recipients. With increasing numbers of older Americans living longer, retaining their natural teeth, turning to hospital emergency departments, and the limited access to covered dental services available, we strongly advocate for the expansion of publicly funded dental coverage for all seniors. This would not only improve seniors' oral health status as one aspect of overall health status, but it would also reduce the costs of expensive non-preventive dental procedures. Future research regarding specific cost savings on individual coverage items is certainly needed.

CONCLUSION

This small study of one rural healthcare system demonstrated the waste associated with using Medicare funds to pay for using the emergency room as a substitute for a subsidized visit to a dentist. The savings from this current wasteful practice can more than pay for a negotiated dental insurance package for Medicare recipients. The process of moving dental care emergencies from the very expensive emergency room to the dental office has the ability to not only save money but also improve the health of Medicare beneficiaries. It would seem that the wasted emergency room costs could be better used to pay for all or a portion of the costs of dental insurance for Medicare beneficiaries. Therefore, the use of cost-effectiveness analysis can inform ongoing and future policy discussions lending support to the inclusion of preventive dental coverage to Medicare. Preventive dental coverage would pay for itself through the reduction of expensive nonpreventative dental care and the early identification of and better management of chronic illness.

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LIBERALIZATION REFORM AND EXPORT PERFORMANCE OF INDIA

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ABSTRACT

This paper examines the impact of liberalization reform on export performance of India. The empirical analysis involves estimating an export demand-supply model for manufacturing and merchandised exports, applying ARDL approach to cointegration using annual data for the period 1975-2008. The main advantage of this approach is that, apart from providing robust estimations in small sample sizes, it needs no prior knowledge of the integration properties of the variables. The results suggest that manufacturing and merchandise export demand are mainly determined by world demand, while manufacturing export supply is determined by domestic manufacturing output, FDI and overall liberalization- initiated in the early 1990s. Contrary to the received view, this study failed to detect a significant negative impact of trade protection on export performance; however, overall liberalizations reforms seem to have positive impact in India's manufacturing export performance but this is not true in the context of merchandised export performance.

JEL classification: F1, F3, F10, P33, O53
Keywords: Exports, Liberalization, Trade, International Trade, India

INTRODUCTION

Improving export performance is one of the key objectives of liberalization reforms in developing countries. For over four decades since independence in 1947, India pursued import-substitution development strategy under stringent trade protection. During this period, export stagnation was a prominent feature of India's economic performance despite the strong wave of export promotion in global context. India remains a small player in the world trade accounting for around 1 per cent of world exports, even following the liberalization reforms when export growth has been much faster. This export scenario contrasts with the size of Indian economy.

There is a sizeable literature on Indian export trade that explored the various aspects of the Indian export performance *(See Section 2 for details)*. However, a few issues remain unanswered: has the liberalization reform improved the export performance in India? Why India's export performance during the reform era has not matched the initial expectations of the policy makers? What are the major determinants of export performance in India during pre- and post- reform period? To my knowledge, no systematic econometric analysis has so far been undertaken to address these issues. This study aims to bridge these gaps.

This study contributes to the literature in number of ways; firstly, it has made an intensive econometric analysis of Indian exports using Autoregressive Distributed Lag (ARDL) approach of cointegration, which has not been used previously to study Indian exports. ARDL approach is more reliable to fit the small data sample, and does not need any prior knowledge about the integration properties of the variables the common feature of time series data. Secondly, this study estimates both manufacturing and merchandised exports demand and supply model using a

wider coverage of variables compared to that of other studies in the context. Finally, unlike many studies, this study uses alternate measures of liberalization, which is measured by the average nominal protection coefficients to investigate the impact of liberalization reform in export performance.

The organization of this study is as follows: the next section presents a brief discussion on liberalization reform and export performance literature in the global and Indian context. Section 3 presents an overview of Indian policy reform and export performance; section 4 discusses about the model, data and research methodology used in the paper. Section 5 analyses the result from empirical estimations, and the final section concludes.

LIBERALIZATION REFORM AND EXPORT PERFORMANCE

Liberalization reform and its impact on trade, particularly exports, has been one of central issues among economists and policy makers in the global arena. The foundation of export led growth hypothesis led to pay the attention on how exports growth is possible in a country. This is the reason for shifting trade policies from adopting import substitution trade strategy to export promotion strategy since the early 1980s. This shift has created a wave of liberalization reform in the global context with the belief that export promotion helps to create more employment, increases output, earns foreign currency, mobilises domestic resources and saving optimally so that the economic benefits reach to the wider group of people. In the liberalised economic policy regime, a country participates in international trade reducing its tariff and non-tariff barrier so that business communities perform better and country successes to achieve the faster economic growth. Trade is the engine of economic growth as stated in Bhagawati (2000). This statement seems to be realistic via export growth of the comparative advantages products that improves the overall economic performance and activities.There is an evidence that, open developing economies grew faster than closed economies during 1970-1989; further, open developed economies also grew faster than closed developed economies and the speedy growth is found in developing economies as concluded by Srinivashan (1998). The supportive argument on liberalization says that disciplined liberal economic policy contributes to enhance the export performance by creating more competitive domestic environment, increasing saving and attracting foreign capital to improve the export performance.

Other than liberalization and reform, there are various aspects to determine the export performance, which can be categorised as supply side and demand side factors. In the supply side, domestic resources, labour costs, and international market accessibility are crucial; and in the demand side, international market situation play vital role. However, most concern is found on whether the liberalization is one of major determinants of export performance and how liberalization impact on export performance.

Recently, Athukorala (2011) studied export performance of East Asian countries and China shows that a country with more open trade policy boosts the export performance because they can benefit from the production sharing network and increase the national output in a nation, but why it has not been happened in India is important question to the trade policy makers in India. Paudel & Perera (2009) found the positive relationship of trade openness in economic growth as trade openness explores the role of trade in the economy by creating more employment and improves the export performance in Sri Lanka.

Awokuse (2008) investigated the contribution of trade openness on exports and imports to accelerate the economic growth and found that export promotion with import constraints may not contribute sufficiently to economic growth. Paudel and Shrestha (2006) Suggested that the trade openness contributes the economic growth even in the case of landlocked country, Nepal. Weiss (1999) suggests that the greater the magnitude of the trade liberalization provides the better performance of the export performance indicators, which are revealed comparative advantage measure of net trade balance, efficiency wage estimates of unit labour cost, total factor growth and export growth. These studies evidence show that if a country proceeds with clear vision on liberalization, their export performance can be improved significantly.

There are considerable attempts to study the export of India in the past, such as, Agrawal (1978), Wolf (1982) Joshi and Little (1994), Srinivasan (1998), Sharma (2000), and Srinivasan (2002). The most consensus issue from the literature of Indian trade is that, Indian export performance is not meeting the expectation of policy makers. Riedel, Hall and Grawe (1984) studied the determinants of Indian export performance in the 1970s and concluded that domestic market conditions strongly influence to export behavior. Srinivasan (1998) estimated a reduced form of Indian exports model for the period of 1963 to 1994, and as other studies, Srinivasan also suggested that domestic policies of India are more important to enhance the export performance. In this study, the crucial variables for the export performance in quantitative analysis were real output and real effective exchange rate. Sharma (2000) investigated the determinants of Indian export performance for the duration of 1970-1998 in a simultaneous equation framework, and found that demand for Indian export has a significant negative relation with Indian export price, and the appreciation of domestic currency (Rupees) affects adversely to the export demand while export supply is positively associated with relative domestic price. The role of FDI in export performance was not significant in the Indian context. However there are some contrary findings that India's productivity surge around 1980 was not due to liberalization and expansionary demand, it was due to pro-business policies rather than pro-market policy (Rodrik & Subramanian, 2005).

Pursell, Kishor and Gupta (2007) studied the manufacturing protection in India focusing on manufacturing trade policies and conclude that manufacturing sector is reformed and heading towards speedy openness despite the protection of the agriculture sector, which has been excluded from the liberalization and reform process.

Athukorala (2008) investigated the export performance of India analysing the total export and manufacturing exports performance in India. India accounts about 1 percent for the manufacturing export while there is the significant rise in manufacturing export in Asia lead by China's manufacturing exports. The progress in the services and merchandise exports lead by resource-intensive manufacturing and India's performance of labour intensive exports is not satisfactory. Because of this situation unskilled and semi-skilled labour remain unemployed, and on the other hand, much of FDI has been invested in to suit the domestic market rather than targeting the export. Kalirajan & Singh (2008) suggested that India should reduce duties and taxes compared to world standard, and needs to be more liberal in service sector on which India has a comparative advantage.

Krueger (2010) stated that import substitution (IS) strategy remained as the trade policy for long time in India as a major drawback for economic growth. Indian policy makers realised India needs the rapid industrialisation, which was possible through suitable trade policy reform. Indian export grew very slowly as the focus was the domestic market to substitute the imports. However, the data shows that Indian import grew on average of about 13 percent for the duration

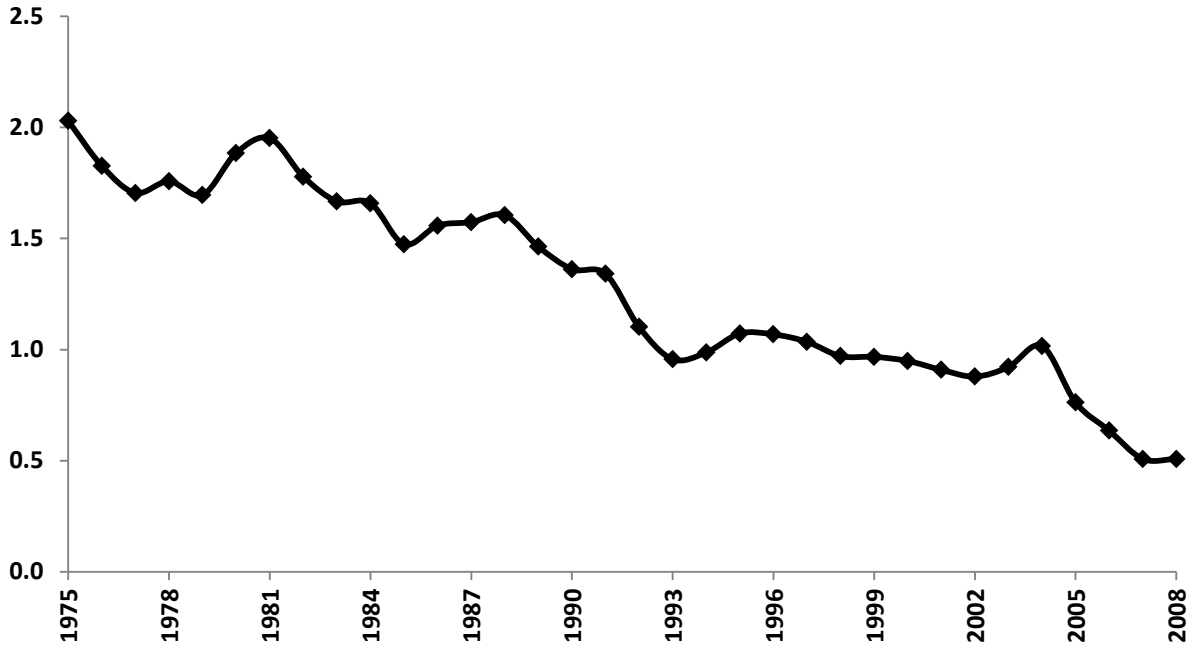
of 1975-2008, it was about 8 percent for the duration of 1975-1991, and it is 16 percent for the duration of 1991-2008 because of more demand in intermediate goods and raw materials. Another big problem for Indian economy had a constant nominal exchange rate in terms of US dollar until the mid-1960s and resulted the appreciation of Indian Rupees until the mid-1980s, which compelled Indian economy to introduce export incentive scheme such as concessional tariff for importing machinery to produce the exportable goods, duty exemption and concession on tax. This discussion shows that, a number of studies on Indian export performance in the reform era; so far no systematic econometric analysis has been undertaken encompassing both supply and demand determinants of the export performance. This study contributes to bridge this gap in the literature analysing both demand and supply sides aspects of export performance.

INDIAN LIBERALIZATION REFORMS AND EXPORTS: AN OVERVIEW

India formally started liberalization reform with the external sector reform in the light of balance of payment crisis in 1991. The initiation was taken with the measures; devaluation of the domestic currency, reduction in tariff rates, removal of restriction on import quota, capital inflows and FDI, and abolition of import licensing system. For example, Indian currency was devaluated by about 22.8 percent in July 1991 relative to a basket of currencies, meanwhile custom tariffs were reduced by more than 40 percent, a liberal policy was adopted for FDI with a mechanism of Foreign Investment Promotion Board (FIPB) to approve the FDI proposal, and virtually it was made more open in 2001. Public-sector reform was made removing the protection and involvement of private sector, private and financial sector also were made more competitive removing the varieties of the protections and restrictions. Trade reform initiated removing quota restrictions and tariff rate were reduced substantially; and licence raj system was eliminated in different phase of liberalization reform.

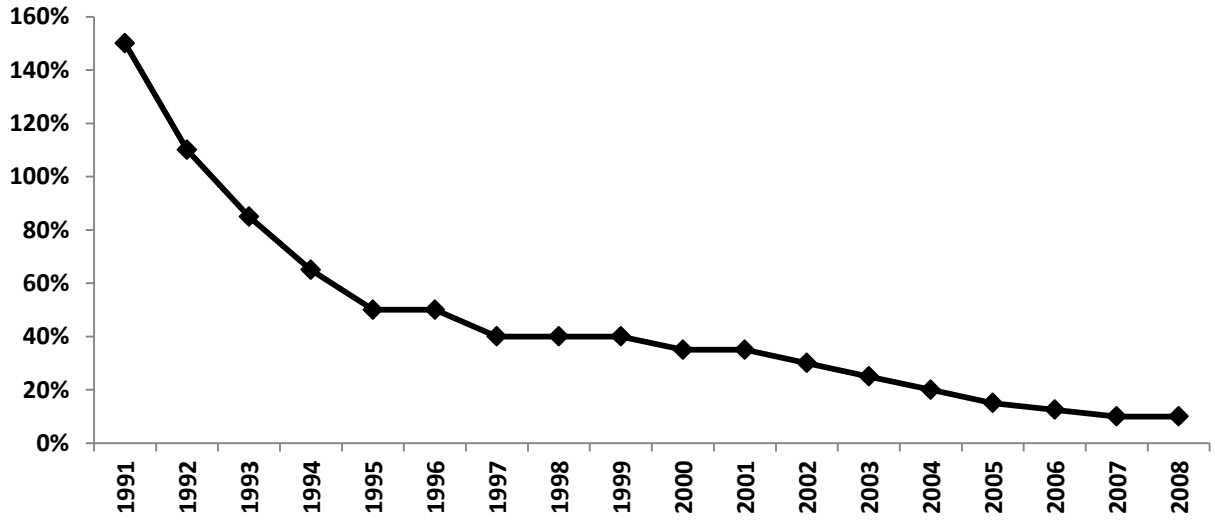
Notably, tariff coefficients are reduced significantly lower level until 2008; however these coefficients are decreasing after early 1980s as explained in the Figure 1. The sharp reduction is found in 1991-1993 and 2004 to 2007. Similarly, figure 2 shows the trend of customs tariff rates reduction since reform policy adopted; tariffs have been reduced to 10% in 2008 while the rate was 150% in 1991. More sharp reduction in the tariffs was made until 1995.

Figure 1
STRUCTURE OF INDIA'S TARIFF COEFFICIENTS: *FOR 1975-2008*



Data Source: Pursell, Kishor and Gupta (2007)

Figure: 2
STRUCTURE OF INDIA'S CUSTOM TARIFF RATES (%) 1991-2008



Data Source: Handbook of industrial Policy and Statistics, India

Despite the heavy reduction in tariff rate coefficients and customs tariff structure in the reform era, Indian exports accounts only 1 % of world's export share in 2008, coincidently equivalent to

the level of 1965 as explained in Table 1, which explores another important fact that Indian export performance was very weak despite the attention was given to export promotion in late 1960s. India could expand the volume of exports faster than other least developed countries (LDCs) but its relative performance remained very low, and export value has been increased since 1990 due to measures taken in reform but its export share in the world market remains deprived recording less than 1950s level and it shows that the desired fruit of liberalization has not been achieved yet.

Table 1
EXPORT VALUE OF INDIA AND ITS SHARE IN WORLD TRADE

Year	US$ billion Exports Value	Export Share
1953	1.1	1.4
1960	1.2	1.1
1965	1.7	1
1970	2	0.7
1975	4.4	0.5
1980	8.6	0.5
1985	9.1	0.5
1990	18	0.5
1995	30.6	0.6
2000	42.4	0.7
2003	59	0.8
2006	120	1
2008	195	1

Source: Anne O. Krueger (2010) and WDI.

Table 2
LONG RUN RELATIONSHIP-MANUFACTURING EXPORTS

Regressor	1 Demand	1(a) Demand	2 Supply	2(a) Supply
LRP1	-0.055 (1.011)	1.67 (5.74)		
LWMEXP	1.784*** (0.308)	3.01** (1.48)		
TRDLIB	-0.060 (0.153)			0.14 (0.27)
INPT	-7.065** (3.359)	-18.31 (19.40)	-6.367*** (1.033)	-9.92** (3.67)
LRP2			0.127 (0.387)	0.68 (0.72)
LMOUTPT			2.034*** (0.380)	2.74*** (0.93)
LFDI			0.209* (0.107)	0.01 (0.23)
LDMY		0.09 (0.28)	0.133** 0.049	
F Test	**4.80**	**4.18**	**4.94**	**4.05**

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

Table 3
LONG RUN RELATIONSHIP-MERCHANDISED EXPORTS

Regressor	3 Demand	3(a) Demand	4 Supply	4(a) Supply
TRDLIB	0.09 (0.37)			-2.53 (4.85)
INPT	-5.72 (4.78)	-6.67*** (1.82)	-1.12 (9.76)	27.27 (49.43)
LFDI			0.85 (1.09)	
LDMY		-0.27* (0.14)	-0.21 (0.41)	
LRP3	-0.630 (0.47	-0.42 (0.29)		
LWTEXP	1.74*** (0.56)	1.86*** (0.24)		
LRP4			1.13 (4.21)	-3.00 (6.54)
LOUTPT			0.06 (2.80)	-3.08 (8.73)
LFDI				0.96 (2.20)
F Test	**4.47**	**4.69**	**1.68**	**2.0**

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

Table 4
SHORT RUN RELATIONSHIP RESULTS (ECM ESTIMATES) – MANUFACTURING EXPORTS

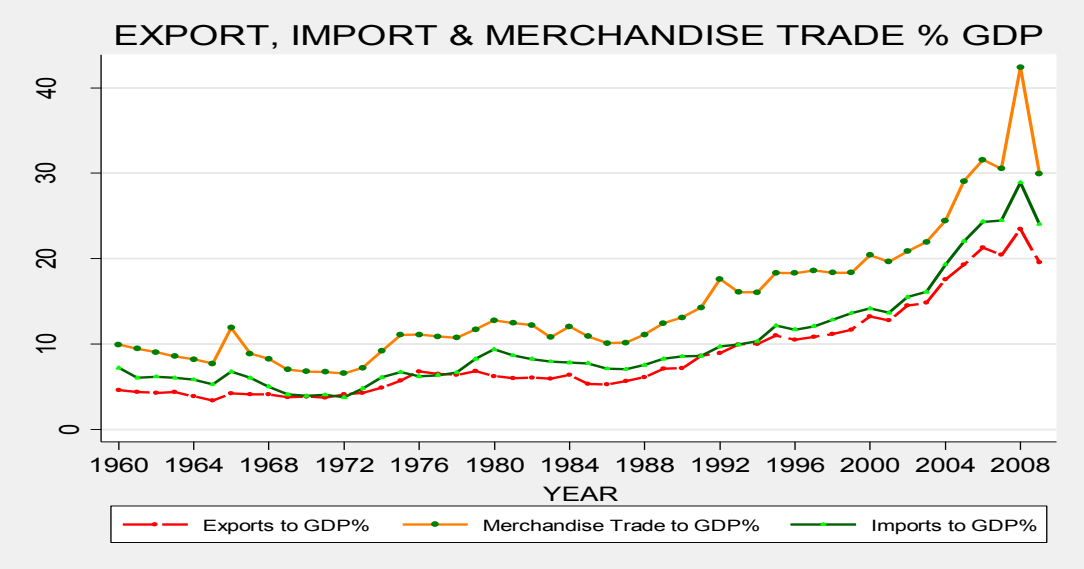
Regressor	1 Demand	1(a) Demand	2 Supply	2(a) Supply
dLMEXP1	0.468*** (0.152)	1.06*** (0.32)		
dLRP1	-0.825*** (0.117)	-0.85*** (0.18)		
dLRP1 1	0.381** (0.176)			
dLWMWXP	0.851*** (0.229)			
dLWMWXP 1	-0.692** (0.269)			
dTRDLIB	-0.011 (0.030)			0.05 (0.10)
dINPT	-1.313** (0.591)	-1.47 (1.48)	-4.398*** (1.11)	-4.09*** (1.27)
Ecm(-1)	-0.186** (0.105)	-0.08 (0.16)	-0.69*** (0.18)	-0.41** (0.17)
dLRP2			-0.559 (0.35)	-0.58 (0.38)
dLMOUTPT			1.405*** (0.39)	1.13*** (0.39)
dLFDI			0.144 (0.09)	0.003 (0.10)

dLDMY		0.001 (0.03)	0.092** (0.04)	
R-Squared	0.88	0.78	0.61	0.56
F-stat.	22.34***	21.58***	4.68***	3.30**
DW-statistic	2.34	1.85	1.72	1.88

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

Figure 3 explains the overall trade situation of India for the period of 1960-2009 covering the data for exports to gross domestic product (GDP) percentage, import trade to GDP percentage and merchandise trade to GDP percentage. Until late 1980, Indian merchandised trade's contribution remained about 10 percentage of GDP then it started to increase until 2008 and global financial crisis (GFC) forced it to turn down in 2009. Indian import trade is well above than export trade since 1978 and this situation has not been changed even since 1960, however the gap is different over time. Both import and export trade were limited almost 7 percentages of GDP until late 1980s and then import increased to about 25 percentage of GDP while export increased to about 20 percentage of GDP in 2008 showing the wider gap of trade balance since 2003.

Figure 3
TRADE % OF GDP



THE MODEL, DATA AND ECONOMETRICS

The Model

Previous empirical studies in the context of Indian export have used single equation reduced form model. The problem of the reduced form model is that it cannot capture both supply and demand side aspects that determine the export performance. In this situation, supply side determinants and demand side determinants of export performance are hard to investigate

properly and empirical result becomes more ambiguous. In such cases, mostly the variables such as trade policy, domestic resources, price level, and international market accessibility, demand in the international market, exchange rate, are ignored. Goldstein & Khan (1978), Athukorala (1991), Joshi and Little (1994), Srinivasan (1998), Sharma (2000), and Srinivasan (2002) are representative studies to examine the export trade performance in the context. Srinivasan (1998 and 2002) used single equation approach with the major explanatory variables; log of real GDP and log of real effective exchange rate to study the Indian export performance and found that real appreciation of Indian currency adversely affects exports in the long run, while real GDP and world export have strong positive association with export performance. But relative price is more appropriate variable than real exchange rate to capture the price competitiveness, the major determinant of export performance. In this sense, the data sets used in this paper are more advanced and appropriate to examine the determinants of the export performance.

So far in my knowledge, only Goldstein & Khan (1978) used a model with demand and supply equation (simultaneous approach) with the explanatory variables for supply equation; log of the ratio of price of exports to domestic price index and log of index of domestic capacity; and in the demand equation; the log of the ratio of price of exports to weighted average of the export prices of trading partner countries and weighted average of the real incomes of trading partners to analyse the export performance. Rest of the studied applied the single equation approach to examine supply side equation factors. Considering all these facts, this paper applies a model with multi equation approach using Goldstein & Khan, as this approach has not been applied to investigate the export performance of India before; however our model is more advanced to capture the liberalization and reform impact in the export performance.

The model has the following equations:

$$QXD_t = \boldsymbol{\alpha_1} + \boldsymbol{\alpha_2} RP_t + \boldsymbol{\alpha_3}\, WEXP_t + \boldsymbol{\alpha_4}\, LIB_t + \varepsilon_t \dots\dots\dots\dots (D)$$

Where, QXD_t is the export demand, RP is Indian export price relative to world export price, WEXP is the world demand and LIB is the liberalization reform measured in two ways, (i) trade liberalization which incorporates the tariff cuts and quota restriction and (ii) Overall liberalization dummy (LDMY). Trade reform is one of the major steps in liberalization that motivate the industries to import more advanced technologies to reduce the production cost and on the other hand to enhance the quality of product that helps to increase the export demand, overall liberalization creates more export friendly environment, and ε_t is the error term, subscript t denotes to the time trend. The equations will test the semi elasticity as both natural log and original form of the variables are tested together.

The coefficient of $\boldsymbol{\alpha_2}$ is expected to be negative and $\boldsymbol{\alpha_3}$ to be positive while $\boldsymbol{\alpha_4}$ is expected to be negative with trade reform and positive with LDMY.

$$QXS_t = \boldsymbol{\beta_1} + \boldsymbol{\beta_2} RP_t + \boldsymbol{\beta_3} OUTPT_t + \boldsymbol{\beta_4} FDI_t + \boldsymbol{\beta_5}\, LIB_t + \varepsilon_t \dots\dots\dots\dots (S)$$

Where, QXS_t is the export supply and RP is relative price calculated with the relationship of Indian export price to whole sale price index to capture the domestic price competitiveness of export with other sector in different equation. OUTPT is the real output of India, where as in the equation it appears for manufactured and total export in different variable, FDI is the foreign direct investment, and ε_t is the error term.

This study focuses on demand and supply sides factors of Indian manufactured product and Merchandised product export performance. As the fuel price has the most fluctuation, it has been excluded from the merchandised export. Based on the model as in equation (D) and (S), 4 equations are examined. Equation (1) and (2) are tested to analyse the manufacturing exports performance including demand and supply side aspects respectively; and similarly, equation (3) and (4) for demand and supply performance of total merchandised exports. For equation (1) and (2), RP1 and RP2 represent the RP of the model, referring international manufactured price competitiveness and domestic manufactured export price competitiveness that play role in export demand and export supply respectively. OUTPT of the model is replaced by manufacturing output and merchandised output so that the findings represent the more realistic situation.

$$LMEXP_t = \boldsymbol{\alpha_1} + \boldsymbol{\alpha_2} RP1_t + \boldsymbol{\alpha_3}\, LMWEXP_t + \boldsymbol{\alpha_4}\, TRDLIB_t + \varepsilon_t \dots\dots\dots\dots\dots\dots (1)$$

$$LMEXP_t = \boldsymbol{\beta_1} + \boldsymbol{\beta_2} RP2_t + \boldsymbol{\beta_3} LMOUTPT_t + \boldsymbol{\beta_4} \boldsymbol{L}FDI_t + \boldsymbol{\beta_5}\, LDMY_t + \varepsilon_t \dots\dots\dots\dots\dots (2)$$

In equation (3) and (4), RP3 and RP4 represent the RP of the model, referring international export price competitiveness and domestic export price competitiveness that play role in export demand and export supply respectively.

$$LTEXP_t = \boldsymbol{\alpha_1} + \boldsymbol{\alpha_2} RP3_t + \boldsymbol{\alpha_3}\, LTWEXP_t + \boldsymbol{\alpha_4}\, TRDLIB_t + \varepsilon_t \dots\dots\dots\dots\dots\dots (3)$$

$$LTEXP_t = \boldsymbol{\beta_1} + \boldsymbol{\beta_2} RP4_t + \boldsymbol{\beta_3} LOUTPT_t + \boldsymbol{\beta_4} \boldsymbol{L}FDI_t + \boldsymbol{\beta_5}\, LDMY_t + \varepsilon_t \dots\dots\dots\dots\dots (4)$$

In equation 1(a), TRDLIB in equation 1 is replaced by LDMY, similarly in 2(a), the LDMY is replaced by TRDLIB. Similarly, TRDLIB of equation 3 is replaced in equation 3(a) with LDMY and LDMY of equation 4 is replace with TRDLIB in equation 4(a) so that all 4 equations have used both the liberalization measures.

VARIABLES AND DATA

The model in this study includes 4 equations and 12 economic variables and 1 dummy variable (See Appendix A for details). TEXP (Total Merchandised Export of India excluding the fuel export) to measure the merchandise export performance of India, MEXP (Manufacturing export of India) to measure the manufacturing performance in India. Other variables included are; RP1, RP2, RP3 and RP4 to represent the relative price. Rest of the variables are WTEXP (world total merchandised export excluding the fuel export) to capture the world income to determine the demand of Indian exports, WMEXP (world manufactured export) to represent the demand of Indian manufactured exports, OUTPT (Real Gross Domestic Product) as a proxy of output capacity of the economy, MOUTPT (Real manufacturing value added) as a proxy of output capacity for the manufacturing output in the economy. The variables are FDI (Foreign Direct Investment Stock inflow), TRDLIB as a proxy of tariff rate and quota restriction reduction as a part of trade reform, LDMY (Liberalization Dummy) is to capture the impact of regime shift into the liberalization era.

The data for these variables have been compiled from the various sources (Appendix A) for the period of 1975 to 2008, some of the incomplete series have been linearly extrapolated. All the variables are in real terms at the final stage. The major sources of the data are World Bank Development Indicators, UN monthly bulletin of Statistics, Economic survey of India and Reserve Bank of India. The variable TRDLIB is in the original form as it is the coefficient term

and rest of the variables except LDMY are in the natural logarithm form. The variables FDI, TEXP, MEXP, WTEXP, WMEXP, OUTPT and MOUTPT are measured in US $ million.

ECONOMETRICS

I have conducted the unit root test using the Dickey Fuller (DF), Augmented Dickey-Fuller (ADF), Philips-Perron and Kwiatkowski-Philips-Schmidt-Shin (KPSS) test methods. The unit root test results have been summarised in the tables in Appendix B. The test results revealed that RP1 is I (0) in the test with a constant and a linear trend in all tests, LFDI is I(0) except ADF test, while RP1, RP3, RP4, and LWTEXP are I(0) under KPSS test only. So the variables which are not I(0) in all tests have been tested in first difference and the test results from table 4, found that all the variables are I(1) with a constant a linear trend except FDI which is I(1) only considering the results of DF, PP and KPSS. All the unit root tests have been conducted at 5 percent level of significance.

Some of the variables are I(0) and I(1) in nature from the unit root test, which seeks the use of the ARDL approach to cointegration so that the results are more accurate and reliable. Thus, following I applied here the ARDL approach to cointegration with bound test method (See Pesaran, Shin and Smith (2001) for details). A simple model as in equation (m) is converted into the ECM (error correction model) version of the ARDL as in equation (ECM):

$$\boldsymbol{Y_t = \alpha + \beta X_t + \gamma Z_t + \varepsilon_t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (\boldsymbol{m})$$

Where, Y_t, X_t and Z_t are three different time series, ε_t is the vector of error term and α, β and γ are the parameters.

$$\Delta \boldsymbol{Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i} \Delta \boldsymbol{Y_{t-i} + \sum_{i=1}^{p} \gamma_i} \Delta \boldsymbol{X_{t-i} + \sum_{i=1}^{p} \delta_i} \Delta \boldsymbol{Z_{t-i} + \lambda_1 Y_{t-1} +}$$

$$\boldsymbol{\lambda_2 X_{t-1} + \lambda_3 Z_{t-1} + \mu_t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots (\boldsymbol{ECM})$$

Where, the null hypothesis is $\boldsymbol{\lambda_1 = \lambda_2 = \lambda_3 = 0}$ shows the non-existence of long-term relationship among the variables. Alternative hypothesis is a long term relationship exists, which can be evaluated by the F-test given in Pesaran, Shin and Smith (2001). If calculated F-Statistic is greater than the upper bound of the F critical value for the selected model, we reject the null hypothesis in favour of alternate hypothesis and conclude that there is long run relationship among the variables. If the calculated F-statistics is smaller than the lower bound of the F critical value, we do not reject the null hypothesis concluding there is no long run relationship among the variables. The test becomes inconclusive when the calculated F value is in between the lower and upper bound of F-test critical value. In this case the efficient way of establishing cointegration is by applying the ECM version of the ARDL model as suggested by Bahmani-Oskooee & Nasir (2004).

I choose SBC (Schwartz Bayesian Criterion) model selection criteria to estimate the separate equations as SBC is more parsimonious than AIC (Akaike Information Criterion). Considering the number of observation, two lags have been considered.

RESULTS

The estimations results are of three folds for each equation; the F-test, long run relationship and error correction results for the short run elasticity of the variables. F test and long run relationship results for manufacturing export performance with demand and supply equations have been presented in table 2. Table 3 presents the F-test and long run relationship for merchandised export performance. Table 4 and 5 present the short run elasticity results for manufacturing export and merchandised export performance.

The F-test for manufacturing export demand equation (1) is 4.80, which is well above than the upper bound of F statistics indicating the long run relationship. The long run relationship results are presented on Table 2, which shows that world manufacturing export demand is the main determinant of Indian export demand and 1 percent increase in world demand of manufactured goods results to increase the Indian export demand by more than 1.5 percent. The long run results from equation 1(a) are not significantly different the results of equation 1 but the short term results have a big difference. The relative price and import tariff coefficient are not significant; however, all the signs of the equation are as expected, the result about the relative price contradicts with Sharma (2000). The ECM coefficient shows how quickly/slowly variables return to equilibrium and it should have a statistically significant coefficient with a negative sign. For this equation, the ecm(-1) is significant at about 5 percent level of significance with correct sign stating that about 20 percentage adjustment of export demand are made in the following year as in the Table 4, the ecm(-1) results are not significant.

The manufacturing export supply equation (2) has the F-test 4.94, which is above the upper bound of the F statistics indicating that there is a long run relationship among the variables. The results in Table 2 show that manufacturing output, FDI and liberalization dummy are main variables stating that 1 percent increase in manufacturing output contributes to increase the manufacturing exports supply by 2 percentage, 1 percentage increase in FDI contributes to increase the manufacturing export by 0.2 percentage, which contradicts with Sharma (2000); and the liberalization has contributed the manufacturing export to increase by 13 percentage. Here, all the signs are as expected. FDI is not statistically significant in equation 2(a) and equation 2 shows the better results compared to 2(a). TRDLIB in 2(a) is not significant unlike LDMY in equation 2. The domestic manufacturing export price is not significant though it has the correct sign, it means that most of the manufactured are targeting the domestic market rather than to export. The Table 4 presents the ecm(-1) result is statistically significant with correct sign and shows the adjustment of manufacturing export supply very high about 70 percent in the following year. In the short run, manufacturing output and liberalization impact significantly to the manufacturing export performance.

The merchandise export demand equation (3) has the F-test 4.47, which is above the upper bound of the F statistics indicating that there is a long run relationship among the variables. The long run relationship result from Table 3 shows the world export demand is the major determinant for the demand of Indian total export; 1 percentage increase in the world export demand results to increase the Indian total export demand by about 1.7 percent. RP3 has the correct sign but not statistically significant even in 10 percent level, referring that the poor performance of Indian export demand is not due to high price, may be more quality and trust

matter is playing role on it. The tariff cut is not significant statistically and it has the opposite sign than the expectation, while LDMY in 3(a) has significant impact but opposite than the expectation. It means that the Indian merchandised export sector has not been benefited due to tariff reduction, seems natural because almost 30 percentage of merchandised exports comes from primary sector. The ecm(-1) result from Table 5 conforms that ecm (-1) is statistically significant with correct sign with very low adjustment capacity, about 17 percentage of the fluctuation in the Indian export demand can be adjusted in the following year. Price competitiveness and world demand of exports have significant impact in the short run with correct sign. Tariff rate is not significant in both long run and short run elasticity.

The merchandised export supply equation 4 and 4(a) have the F-Test 1.68 and 2 respectively, which are lower than the lower bound of the F-statistics. It shows the variable of this equation do not have significant long run relationship, the further tests results have been present in Table 2 and 4 for the reference only, the reason may be the contribution of primary sector in the merchandised output value added.

Table 5
SHORT RUN RELATIONSHIP RESULTS (ECM ESTIMATES)- MERCHANDISED

Regressor	3 Demand	3(a) Demand	4 Supply	4(a) Supply
dTRDLIB	0.016 (0.06)			0.06 (0.12)
dINPT	-0.96** (0.45)	-1.36*** (0.29)	-0.13 (1.09)	1.58 (1.57)
Ecm(-1)	-0.17** (0.10)	-0.20*** (0.07	-0.11 (0.09)	-0.06 (0.09)
dLDMY		-0.06** (0.02)	-0.02 (0.05)	
dLRP3	-0.675*** (0.08)	-0.65*** (0.06)		
dLWTEXP	0.293 (0.11)**	0.38*** (0.10)		
dLRP4			-0.63 (0.40)	-0.17 (0.38)
dLOUTPT			0.01 (0.32)	-0.18 (0.36)
dLFDI			0.10 (0.13)	0.06 (0.09)
R-Squared	0.86	0.88	0.37	0.41
F-stat.	38.36***	48.46***	2.94**	3.19**
DW-statistic	1.78	1.76	1.78	1.85

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

The model passes through all the diagnostic tests i.e. R squared for all the equations are considerably higher in aggregate and F stats are significant to show the goodness of the fit in the model. Durbin Watson test (DW test are very close to 2 indicating the no serial correlation among the tested variables.

The findings of this study have given mix evidence to support the previous studies on the export performance of India. The finding on real output, world export and lagged of Indian exports in case of manufacturing export performance as the major determinant, supports the finding of Srinivashan (1998 and 2002), however the finding about the relative price in both cases contradicts with Srinivashan. The contribution of liberalization reform in the export trade have not been analysed empirically in the Indian context recently but it contradicts with the conclusion of Rodrik and Subramanian (2005). These findings about trade reform conclude that it needs to be followed by overall liberalization.

CONCLUSION

This study analysed the impact of liberalization reform on export performance in India considering the determinants of India's export, using annual time series data for the duration of 1975-2008. This paper has followed the standards of time series econometric analysis, conducting the unit root test applying DF, ADF, PP and KPSS method. The results showed that the variables are both I(0) and I(1), so the ARDL approach to cointegration with bound test method is applied to test the impact of the selected variables in manufacturing and total export demand and supply. The results revealed that the major determinant of manufactured export demand is the world demand, the proxy of world income; while manufacturing output is the major determinant of manufacturing export supply. Similarly, FDI invested in manufacturing sector is more important to boost the manufacturing exports. Liberalization has contributed significantly to increase the manufacturing exports supply. Contrary to the received view, this study failed to detect a significant negative relationship between trade protection and export performance. Overall, liberalizations reforms seem have positive impact in India's manufacturing export performance but not the merchandised export performance.

The major policy inferences from these findings are; India's export performance comes from the manufacturing sector, therefore, FDI in the manufacturing sector should be made more open to fulfil the capital requirement in this sector. Overall liberalization of the economy, not just the liberalization of trade is playing important role in export performance. Foreign investment policy reforms need to be treated as a core element of the reform process.

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Note: In the model, you see the different variables, Please replace M=Manufacturing and T=Total for the variable i.e. EXP in the model refers MEXP and TEXP for manufactured Export and Total Export.

Table 3
LONG RUN RELATIONSHIP-MERCHANDISED EXPORTS

Regressor	3 Demand	3(a) Demand	4 Supply	4(a) Supply
TRDLIB	0.09 (0.37)			-2.53 (4.85)
INPT	-5.72 (4.78)	-6.67*** (1.82)	-1.12 (9.76)	27.27 (49.43)
LFDI			0.85 (1.09)	
LDMY		-0.27* (0.14)	-0.21 (0.41)	
LRP3	-0.630 (0.47	-0.42 (0.29)		
LWTEXP	1.74*** (0.56)	1.86*** (0.24)		
LRP4			1.13 (4.21)	-3.00 (6.54)
LOUTPT			0.06 (2.80)	-3.08 (8.73)
LFDI				0.96 (2.20)
F Test	**4.47**	**4.69**	**1.68**	**2.0**

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

Table 4
SHORT RUN RELATIONSHIP RESULTS (ECM ESTIMATES) – MANUFACTURING EXPORTS

Regressor	1 Demand	1(a) Demand	2 Supply	2(a) Supply
dLMEXP1	0.468*** (0.152)	1.06*** (0.32)		
dLRP1	-0.825*** (0.117)	-0.85*** (0.18)		
dLRP1 1	0.381** (0.176)			
dLWMWXP	0.851*** (0.229)			
dLWMWXP 1	-0.692** (0.269)			
dTRDLIB	-0.011 (0.030)			0.05 (0.10)
dINPT	-1.313** (0.591)	-1.47 (1.48)	-4.398*** (1.11)	-4.09*** (1.27)
Ecm(-1)	-0.186** (0.105)	-0.08 (0.16)	-0.69*** (0.18)	-0.41** (0.17)
dLRP2			-0.559 (0.35)	-0.58 (0.38)
dLMOUTPT			1.405*** (0.39)	1.13*** (0.39)
dLFDI			0.144 (0.09)	0.003 (0.10)
dLDMY		0.001 (0.03)	0.092** (0.04)	
R-Squared	0.88	0.78	0.61	0.56

F-stat.	22.34***	21.58***	4.68***	3.30**
DW-statistic	2.34	1.85	1.72	1.88

*Note: *** indicates at 1%, ** indicates at 5%, and * indicates at 10% level of significance. The values in the parenthesis are standard error.*

Appendix A
VARIABLES DESCRIPTION AND DATA SOURCES

Variables	Description	Data Sources
TEXP	Total Indian export US$/Indian total export unit value index US$)*100	Various Issues of UN monthly Bulletine of Statistics, UNO (Various Years)
MEXP	Indian Manufacturing Export US$/Indian Manf. Export Unit value index US$)*100	
RP3	Indian export unit value index$/developing countries unit value index $)*100, base year 2000=100	
RP1	Indian Manufactured export unit value index$/developing countries manufactured export unit value index $, base year 2000=100	
RP4	India's export unit value index Rs. /India's wholesale price Index Rs.)*100, Base year 2000=100	Economic Survey, Reserve Bank of India, various issues RBI (Various Years)
RP2	India's manuf. export unit value index Rs. /India's manuf. wholesale price Index Rs.)*100 , base year, 2000=100	
WTEXP	World Total Merchandise Export/world export unit value indices)*100, base year 2000=100 In this series, fuel export has been excluded.	(Worldbank, 2010) and Various Issues of UN monthly Bulletine of Statistics.(UNO, Various Years)
WMEXP	world Manufactured export/world manufacturing export unit value, indices)*100, base year 2000=100	
OUTPT	Real GDP of India, base year 2000=100	World Bank (2010)
MOUTPT	Real Manufactured value added, base year 2000=100	
FDI	FDI US$ million)/GDP Deflator (Deflators base year 2000=100)	UNCTAD (2010)
TRDLIB	Average of nominal protection low and High coefficients. Data series obtained from the source until 2004 and onward to 2008 calculated based on the Handbook of Industrial Policy and Statistics 2007-2008 for India)	Pursell, Kishor and Gupta.(2007) RBI (RBI, 2007-2008)
LDMY	Liberalization Dummy, “0” until 1990 and “1” onward	Dummy Variable

Appendix B

Table B1
TEST OF INTEGRATION OF VARIABLES (LEVEL)

Variables	**Test with a constant**			
Level	**DF**	**ADF**	**PP**	**KPSS**
LTEXP	0.98	1.56	1.13	0.51
LMEXP	1.25	1.16	2.75	0.68
LRP3	-1.83	-1.96	-1.31	0.47
LRP1	-3.14*	-2.14	-3.23*	0.5
LRP4	-1.67	-2.18	-1.73	0.42*
LRP2	-0.63	-1.11	-0.62	0.66
LWTEXP	0.23	0.49	0.55	0.66
LWMEXP	1.6	2.24	1.49	0.68
LOUTPT	1.97	1.98	4.27	0.68
LMOUTPT	0.76	1.36	1.54	0.68
LFDI	-0.38	1.94	1.48	0.65
TRDLIB	-0.11	-0.23	-0.45	0.68
Critical Value 5%	**-2.97**	**-2.97**	**-2.95**	**0.46**

*Note: * indicates Significant at 5% level of significance*

Table B2
TEST OF INTEGRATION OF VARIABLES (LEVEL)

Variables	**Test with a constant and a trend**			
Level	**DF**	**ADF**	**PP**	**KPSS**
LTEXP	-0.48	-0.16	-1.17	0.19
LMEXP	-1.94	-2.05	-0.39	0.19
LRP3	-1.11	-1.37	0.84	0.14*
LRP1	-4.08*	-3.95*	-4.26*	0.1*
LRP4	-1.01	-1.52	-1.61	0.12*
LRP2	-2.29	-3.54	-1.92	0.07*
LWTEXP	-1.73	-2.74	-1.82	0.14*
LWMEXP	-1.57	-1.09	-0.97	0.19
LOUTPT	-0.35	-0.16	-1.16	0.19
LMOUTPT	-2.4	-3.57	-1.7	0.16
LFDI	-5.91*	-1.68	-5.14*	0.14*

TRDLIB	-2.81	-3.53	-2.84	0.07 *
Critical Value 5%	**-3.57**	**-3.57**	**-3.55**	**0.15**

*Note: * indicates Significant at 5% level of significance*

Table B3
TEST OF INTEGRATION OF VARIABLES (FIRST DIFFERENCE)

Variables	**Test with a constant**			
Difference	**DF**	**ADF**	**PP**	**KPSS**
LTEXP	-3.21*	-3.7	-3.72*	0.37*
LMEXP	-4.7*	-3.17*	-5.04*	0.37*
LRP3	-5.61*	-5.01*	-4.6*	
LRP4	-2.98*	-3.41*	-2.01	
LRP2	-3.98*	-4.55*	-3.65*	
LWTEXP	-5.48*	-5.90*	-5.60*	
LWMEXP	-4.43*	-4.1*	-4.8*	0.3*
LOUTPT	-4.18*	-3.27*	-5.46*	0.52
LMOUTPT	-4.05*	-4.74*	-4.68*	0.31*
LFDI		-4.19*	-7.26*	0.48
TRDLIB	-5.05*	-4.72*	-5.64*	
Critical Value 5%	**-2.97**	**-2.97**	**-2.95**	**0.46**

*Note: * indicates Significant at 5% level of significance*

Table B4
TEST OF INTEGRATION OF VARIABLES (FIRST DIFFERENCE)

Variables	**Test with a constant and a trend**			
Difference	**DF**	**ADF**	**PP**	**KPSS**
LTEXP	-4.21*	-4.53*	-4.51*	0.09*
LMEXP	-5.01*	-3.59*	-6.4*	0.14*
LRP3	-6.88*	-6.09*	-4.53*	0.11*
LRP4	-3.91*	-4.33*	-3.51*	0.14*
LRP2	-3.6*	-4.53*	-3.86*	0.13*
LWTEXP	-5.73*	-5.75*	-5.76*	0.07*
LWMEXP	-5.24*	-5.53*	-5.72*	0.08*
LOUTPT	-4.8*	-3.86*	-7.86*	0.08*
LMOUTPT	-3.88*	-4.95*	-6.32*	0.13*
LFDI		-3.87*	-6.77*	0.13*
TRDLIB	-4.87*	-4.55*	-5.62*	0.12*
Critical Value 5%	**-3.58**	**-3.58**	**-3.56**	**0.15**

*Note: * indicates Significant at 5% level of significance*

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