

THE ECONOMIST DIWAN

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ABOUT THE JOURNAL

The Economist Diwan is a student-run academic journal that provides an opportunity to publish the best research done in economics and related fields at the American University of Sharjah (AUS). Starting its first publication in Spring 2017, this journal operates under the AUS Department of Economics in the School of Business Administration (SBA). Our aim is to publish research carried out by students in the American University of Sharjah (AUS), exchange students at AUS and potentially extending our reach to publishing undergraduate research from other universities in the region as well.

Through this journal, the AUS Department of Economics intends to promote the diverse application of economics related concepts amongst its current and prospective students. For any other inquiries or if you wish to contribute, feel free to contact us via economistdiwan@aus.edu.

EDITOR'S NOTE

The Economist Diwan is a journal meant for students to have an overview of the research fellow students have conducted in Economics. One of the aims of this student-run journal is for other undergraduates to understand the various applications of the theories and empirical methods pursued in Economics to explore and gain a different perspective of topics beyond the customary demand and supply applications in the classroom. Economics is a social science, and a rather unique one at that. Using a few concepts from many fields of study such as Physics, Mathematics, Business and applying a behavioral context to qualitative data, economists analyze datasets and results in a different perspective from fellow peers in other streams of study.

It has become a common phenomenon for sociologists, economists and mathematicians, for example, to confront a research topic together to maximize analysis and results. The quality of research publications has certainly improved over the past decades along with the refinement of economics as a field of study. Many political and behavioral theories are in existence today thanks to the empirical methods economics has to offer.

What we hope is for this journal to become, in the future, a gateway and foundation for aspiring and self-motivated young economists to be able to independently conduct research, even at the undergraduate stage and experience its publication. We envision this student-run journal to be one that even students outside AUS will proudly contribute to. We want to plant seeds that will hopefully bloom into what is a student research community in the UAE.



Mehr Patni
Chief Editor & Co-Founder
BA, Economics
g00056635@aus.edu



Jason Paulo Torion
Chief Editor & Co-Founder
BSBA, Economics
b00053455@aus.edu

MESSAGE FROM THE DEAN

Teaching and research are the pillars of academia. Professors transfer knowledge to their students and simultaneously conduct analytical studies that help expand the boundaries of their respective disciplines. The results of this research find its way back to the students and enrich classroom discussions and directed studies. As students go through their degree programs and evolve from memorizing to understanding to applying and finally to synthesizing knowledge, they increasingly become part of this academic cycle. The brightest of them transform from being mere consumers to seekers and creators of knowledge, using an array of analytical tools. Examples of this student-based knowledge creation that touch on a variety of exploratory topics in Economics are showcased in this new research journal. I hope that by publishing their early work, our student authors will achieve two objectives, offer interesting reading to peers in their discipline and incentivize fellow students to follow suit and start engaging in quality research too. For academics, research is a fascinating part of life. The student authors featured in this journal's first edition have shown great promise and could possibly one day, if they continue on this path, join the professorial ranks themselves.

Well done!

Jorg Bley, PhD

MESSAGE FROM THE HEAD OF THE DEPARTMENT OF ECONOMICS

A well rounded university education is a first step to a successful career in the ‘real’ world. It is becoming more and more clear that no educational experience is complete unless they provide students with an opportunity to apply what they learn in the classroom. That is why, we at the Department of Economics in the AUS strive to prepare our students for future challenges while paying close attention to present circumstances around us. Our students know all too well that obliviousness to this fact comes at a huge cost down the road. Just to illustrate, knowing that ‘demand curve slopes downward’ could only get you so far, but not the whole way to the target. Therefore, cognizant of this point, our students set out to produce an outlet to showcase their efforts in connecting theory with empirics, and thus, classroom with the world around. Then came this journal. This was a challenge, but they knew that every challenge was an opportunity. They worked hard, and they finally made it happen. The journal represents some of the valuable examples of quite competent student scholarship in the department. The topics and methods employed in all these papers are fascinating given the academic level of the authors. We the faculty and administration are so proud of them! With this journal, we hope to transform classroom knowledge into permanent public records for the benefit of everybody for all times.

And, the next step is to broaden the authorship (and hopefully the readership) of the journal to all interested parties in the school, university, country, region, and the world. But all these will take time and endless efforts, with unquestionably extraordinary rewards.

Congratulations young scholars! You have done a great job!

Ismail H. GENC, PhD

INVESTIGATING THE ASYMMETRIC IMPACT OF UNEMPLOYMENT ON PROPERTY CRIME

Pallavi Mandar Bichu
School of Business Administration
American University of Sharjah
Email: g00049736@aus.edu

ABSTRACT

We use data for 50 US states and the DC area over the period 2003- 2012 to examine the relation between property crime and unemployment, the asymmetries that exist in that relationship, and how economic cycles affect this relation. Using panel data analysis, we find that the relationship between property crime and unemployment is positive, which is in line with the literature. However, we find that during economically stable time periods, the impact of unemployment on property crime is more pronounced than during economic downturns. We also show that the enrollment rate, defined as the total number of students enrolled in public schools in each state, negatively impacts property crime. Firearm checks per capita and law enforcement officials per capita, however, have no statistically significant impact on property crime. We conclude by putting forward a few reasons as to why these trends are observed.

INTRODUCTION

The link between crime and unemployment has been well tested in the past, right from the time of Gary Becker's (1968) seminal work on the rational crime model wherein he put forward the theory that individuals decide whether to commit a crime or not by comparing its costs and benefits. Empirical studies on property crime and unemployment have focused on the direction and intensity of the relationship. Cantor and Land (1985) point out that unemployment affects criminal motivation in that it increases desperation and social strain, however, it also impacts target availability by decreasing the number of vulnerable targets—laid off workers are more liable to stay at home and zealously guard their property.

Our contribution to this field is to test whether there exist asymmetries in the unemployment-property crime relationship. Business cycles affect society most visibly through unemployment. Therefore, it is worthwhile to see whether these cycles have differing impacts on property crime through changing unemployment rates.

To do this, we utilize panel data collected from all 50 US states as well as the DC area over the period 2003- 2012. We find that property crime is positively related to unemployment. We also show that unemployment asymmetrically influences property crime. In stable economic periods, unemployment has a larger impact on property crime than in periods of economic turbulence. This may be due to the lack of target availability in bad times, and higher criminal motivation during good times.

The rest of the paper is organized as follows: Section 2 presents the related theory and existing findings. Section 3 reviews the data, methodology and empirical results. Section 4 discusses the reasons for the observed trends as well as policy implications and concludes the study.

LITERATURE REVIEW

THEORETICAL FRAMEWORK

We look at a simple work-crime model formulated by Edmark (2005), wherein legal work is considered as an alternative to crime. Basically, an individual only commits a crime if the expected return from crime $E(W_b)$ is greater than the expected return from honest work $E(W)$, keeping in mind the psychological cost of crime (C_n):

$$E(W_b) - C_n > E(W)$$

Let the probability of getting caught be “p” and the cost of punishment be “s”. Then the expected return of the crime can be calculated as follows:

$$E(W_b) = (1 - p) W_b + p (W_b - s)$$

Adding unemployment to the picture affects the expected wage. Let “u” be the probability of being unemployed and “A” be the unemployment benefits received, then:

$$E(W) = (1-u) W + uA$$

This model makes it clear that increases in the probability of being unemployed (u) or the return from crime (W_b) will increase the aggregate supply of crime, whereas increases in return from honest work (W), punishment costs (s) and unemployment benefits (A) will reduce it. Therefore, the individual will choose crime only if the expected income premium (i.e. $E(W) - E(W_b)$) is higher than his perceived cost of committing the crime (C_n), such that:

$$C_n < ((1 - p)W_b + p(W_b - s)) - ((1-u)W + uA)$$

To further understand the relationship between economic activity and crime, Cantor and Land (1985) look at the two-way effect of economic activity on criminal motivation and availability of criminal targets in the context of property crime. An economic downturn wherein unemployment rises is hypothesized to increase criminal motivation, driven by social strain and desperation. At the same time, individuals who have been laid off would be prone to guarding their property, life and family with added zeal. They would have more contact with

them, since they would be at home more than if they were at work. This would naturally decrease the availability and vulnerability of criminal targets. The net effect of this increase in motivation and decrease in targets is difficult to assess. This may lead to weak and sometimes counterintuitive negative relationships between unemployment and crime, most notably property crime.

EXISTING EMPIRICAL EVIDENCE

Raphael and Winter- Ebmer (2001) use US state level data from 1971- 1997 to estimate the impact of unemployment on violent and property crime rates. They use both Ordinary Least Squares (OLS) and Two-stage Least Squares (TSLS) techniques. They include in their models oil shock exposure measures and prime defense contracts given to states as instrumental variables for unemployment. They also make use of state-specific time trends, state effects, and year effects. In addition, they control for various factors such as alcohol consumption, income for worker, and population living in poverty and distribution across race and age categories. Their main finding indicates that unemployment positively impacts property crime.

A similar study was undertaken by Altindag in 2011, but it utilizes a multi- country approach, specifically in Europe. Altindag's results too are in line with previous studies, finding positive relationships between all kinds of crime and unemployment. He also emphasizes that the TSLS coefficient estimates were higher than the OLS coefficient estimates and concludes that instrumental variables worked better to predict the relationship. Such findings may also indicate that there exists a reverse causality from crime to unemployment.

Edmark (2005) uses panel data analysis to study the relationship between crime and unemployment for 21 different Swedish counties during a period of financial volatility in 1988-1999. In line with the literature, he shows that unemployment has a significant positive effect on property crime. Scorcu and Cellini (1998, p.279) use a time series approach when looking

at data from Italy and find that “the long run pattern of homicides and robberies can be better explained by consumption, whereas thefts are better explained by unemployment”.

MIXED RESULTS ON THE UNEMPLOYMENT CRIME RELATIONSHIP

The seminal ‘review study’ conducted by Chiricos in 1987 casts doubts on the statistical significance and indeed even direction of the crime-unemployment relationship. Reviewing the findings of 63 other studies and using probabilistic evidence, Chiricos (1987) finds that the positive relationship holds well for property crime and unemployment, but the magnitude of the effect varies considerably from study to study. Yet, using Cantor and Land’s (1985) study as a basis, he theorizes that the increased criminal motivation exceeds the decrease in criminal opportunity for some property crimes during economic downturns and periods of high unemployment. However, even some categories of property crimes demonstrate weak statistical significance in this regard.

An important point raised by Levitt (2001) is that many crime-unemployment studies do not fully take into account the lagged effect of unemployment on crime. Most studies use unemployment of the same time period, whether it is panel or time-series data. Another issue with using aggregated data is that causal relationships are rarely clarified, as the excessive emphasis on empirical testing leads to counterintuitive results, which need backing from largely unavailable qualitative data.

Phillips and Land (2012) try to account for this using disaggregated US data at the county level for the period 1975-2005. Their results are largely in line with previous studies. Further, they explain why more recent data was not used:

“The data used in this study do not include the 2008–2011 period, the years of the Great Recession and the subsequent slow recovery, during which the US

experienced national unemployment rates approaching 10%. To the surprise of many criminologists, national level crime rates for all major offenses have continued to decline during this period, although there are variations across cities.” (Phillips and Land, 2012, p.692)

They hypothesize various reasons for this declining trend– increase in unemployment benefit duration; middle class layoffs as compared to lower class joblessness; changes in social structure wherein criminal opportunities are reduced, especially with increased reliance on the internet and technology which warrants staying at home; increased incarceration levels and changes in drug use.

Donohue and Levitt (2001) propose another interesting reason for the decline in crime rates– the 1973 Roe vs. Wade ruling that effectively legalized abortion. They argue that this led to a large number of unwanted pregnancies being terminated, thus reducing the number of children being born in conditions of poverty or other social stigmas that could have influenced them to turn to crime. These effects would be seen 15 to 20 years later, i.e. in the early 90s, but would also have a cumulative effect as successive cohorts entered their prime high-crime years, thus contributing to a decline in crime rates year after year.

Blomquist and Westerlund (2014) use panel data analysis to disprove the positive crime-unemployment relationship. They question the validity of previous studies like Edmark (2005) and Scorcu and Cellini (1998) by testing for co-integration. The paper discovers that previous cross-sectional and time series analyses do not fully take into account trending behavior in that crimes tend to co-move. Past studies also generally look at fewer time periods, use aggregate national levels which may not be comparable across countries and ignore much econometric analysis in choosing static models over dynamic ones. They look at Swedish county data from 1975-2010 and find that a nation-wide pattern emerges which is both time-

sensitive and non-stationary. They do not find any evidence of positive correlation between unemployment and crime rates, indeed, they come across a negative one. In this regard, they state that “much of the existing evidence of a positive unemployment effect can be due to unattended non-stationarity and/or cross-correlation” (Blomquist and Westerlund, 2014, p.124).

METHODOLOGY AND EMPIRICAL RESULTS

Studies so far have generally shown a positive relationship between unemployment and property crime. Using the model formulated by Edmark (2005), we see that property crime can be defined as a function of unemployment. Keeping in mind Levitt’s (2001) criticism about the lack of models with unemployment as a lagged independent variable, we take property crime in year t as a function of unemployment in year $t-1$ ¹. This study is unique, however, in its investigation of the asymmetry in the impact of unemployment on property crime, specifically in times of stable economic performance (good times) and periods of economic turbulence (bad times). Our panel data study looks at the 50 states of the US plus the DC area over the 2003-2012 period. As the first step, we formulate the following model:

$$P_{it} = \beta_0 + \beta_1 D * U_{it-1} + \beta_2 (1-D) * U_{it-1} + \mu_{it} \quad (1)$$

where:

P_{it} = property crime rate

U_{it-1} = unemployment rate

D = dummy variable

μ_{it} = error term

¹ Our results indicate that unemployment in year t does not affect property crime in year t .

The data on the dependent variable (property crime rate) is taken from the Federal Bureau of Investigation (FBI) Uniform Crime Reports (UCR)², and it is adjusted by state population. Unemployment rate and population data come from the Bureau of Labor Statistics (BLS) reports.³ In generating the dummy variable to test for asymmetry, we first calculate the average unemployment rate over the time period 2003-2012 in each state, and then separate those years in which the unemployment rate exceeded the average rate with $D = 1$. Thus, the dummy variable $D=1$ indicates economically bad times, whereas $(1-D) = 0$ would indicate economically good times. Accordingly, β_1 measures the impact of unemployment on property crimes during economically bad times, and β_2 measures the impact of unemployment on property crimes during economically good times.

We start by estimating Model (1) using the Ordinary Least Squares (OLS) method, with the results reported in Column 1 of Table 1. Columns 2 and 3 report, respectively, the corresponding random effect and fixed effect estimates. The OLS estimates do not account for unobserved heterogeneities across states, which may lead to misleading results. The random effect estimates control for unobserved heterogeneities but assume that these state-specific effects are not correlated with the error term. If there is a correlation between state effects and the remainder of error term, then an endogeneity issue may arise. This would make the random effect results biased and inconsistent. The fixed effect estimates address this endogeneity issue. Moreover, the fixed effect model is consistent irrespective of correlation between unobserved effects and the error term as well.

We use the Hausman test to examine the null hypothesis that the fixed effect model estimators and the random effect model estimators do not differ significantly. The reported Hausman test p -value of is 0.0049 which is below the 1% level of significance. This leads us

² <https://www.fbi.gov/about-us/cjis/ucr/ucr-publications#Crime>

³ <http://www.bls.gov/lau/#tables>

to reject the null hypothesis and hence the fixed effect model is preferred to the random effect model. Thus, in what follows, we use the fixed effect model.

Results show that unemployment positively affects property crime. We also see that asymmetry exists in the property crime-unemployment relationship. Using the Wald test, we test the null hypothesis that $\beta_1=\beta_2$. Since the p -value of the test is 0.003, we reject the null hypothesis and conclude that unemployment asymmetrically influences property crime.

Table 1: OLS, random effect and fixed effect model estimates

	<u>Model 1</u>		
	OLS estimates (1)	Random effect estimates (2)	Fixed effect estimates (3)
D* U _{it-1}	0.181 (1.662)	0.188 (1.732)	0.494 (3.330)
(1-D)* U _{it-1}	0.307 (0.172)	0.318 (1.852)	0.795 (3.372)
State fixed effect	NO	NO	YES
State random effect	NO	YES	NO
Standard error of regression	4.629	4.617	4.574
Hausman test <i>p</i> -value	-	-	0.005
Wald test <i>p</i> -value (H ₀ : β ₁ = β ₂)	-	-	0.003
Observations (Years=9, States=51)	459	459	459

Notes: Numbers in parentheses are absolute t-ratios for the respective coefficients.

Specifically, we see that unemployment has a larger impact on property crimes during economically good times than in economically bad times.

In order to check the robustness of our asymmetry results, we re-specify the above model by including three control variables as follows:

$$P_{it} = \beta_0 + \beta_1 D * U_{it-1} + \beta_2 (1-D) * U_{it-1} + \beta_3 E_{it} + \beta_4 FC_{it} + \beta_5 LEO_{it} + \mu_{it} \quad (2)$$

where the control variables are:

E_{it} = enrollment rates per state

FC_{it} = firearm checks per capita

LEO_{it} = law enforcement officials per capita

The data on enrollment rates (defined as the total number of students enrolled in public schools in each state)⁴ come from the CPS Annual surveys released by the Census Bureau⁵. The data on firearm checks comes from the National Instant Criminal Background Check System (NICS),⁶ and the data on law enforcement officials per capita is obtained from the FBI UCR reports.

The fixed effect estimates of Model (1) in column 2 of Table 1 are reported again in column 1 of Table 2. Column 2 of Table 2 reports the fixed effect estimates of Model (2). As can be seen, the estimate of β_3 with an expected sign is significant, indicating that an increase in the enrollment rate reduces property crime. However, the estimates of β_4 and β_5 are not significantly different from zero, indicating that both firearm checks and law enforcement officials per capita do not significantly affect property crime. Accordingly, we exclude these control variables and rerun the model with the results reported in column 3 of Table 2:

$$P_{it} = \beta_0 + \beta_1 D * U_{it-1} + \beta_2 (1-D) * U_{it-1} + \beta_3 E_{it} + \mu_{it} \quad (3)$$

⁴ The enrollment rate variable includes White, African-American and Hispanic students.

⁵ <http://nces.ed.gov/ccd/elsi/expressTables.aspx>

⁶ https://www.fbi.gov/about-us/cjis/nics/reports/nics_firearm_checks_-_year_by_state_type.pdf

Table 2: Fixed effect model estimates

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
D* U _{it-1}	0.494 (3.368)	0.485 (2.851)	0.434 (2.760)
(1-D)* U _{it-1}	0.795 (3.487)	0.950 (3.761)	0.878 (3.601)
Control variables:			
E _{it}	-	-1.522 (1.866)	-1.456 (1.811)
FC _{it}	-	0.003 (0.001)	-
LEO _{it}	-	1.259 (0.996)	-
Standard Error of Regression	4.629	4.553	4.543
Wald test <i>p</i> -value (H ₀ : β ₁ = β ₂)	0.003	0.001	0.002
Observations (Years=9, States=51)	457	457	457

Notes: Numbers in parentheses are absolute t-ratios calculating using Newey- West Standard Errors.

Again, the Wald test, with a p -value $0.002 < 1\%$ level of significance leads us to reject the null hypothesis that $\beta_1 = \beta_2$. This again means that asymmetry does indeed exist in the unemployment-property crime relationship, subject to economic downturns. Specifically, as before, the effect of unemployment on property crime is more pronounced during periods of stable economic growth. During economic downturns, we see a reduced positive effect of unemployment on property crime.

We also see that increased enrollment has a negative effect on property crime, as the literature suggests (Scorcu and Cellini, 1998). However, it is worthwhile for future studies to look at these enrollment rates divided by race. Does an increase in enrollment of children of African-American or Hispanic descent have a greater impact than an increase in enrollment of white children, for example?

The literature surveyed has specific suggestions for the inclusion of complements to crime, including alcohol, guns and drugs (Phillips and Land, 2012). Data for alcohol consumption and drug abuse proved difficult to find for the specified time period and geographic units. However, the NICS system reports proved to be useful as they effectively constitute a gun registry. Every time a customer walks up to a gun seller, the seller is required to run an obligatory background check on him/her. These checks go through the NICS system, so as to look at previous criminal history, history of mental health problems or drug abuse and the like. Not all checks necessarily result in the gun being sold, however, these do constitute the only official data source on the number of registered guns in the economy. It could be hypothesized that the number of firearm checks are positively related to the crime rate. However, it is also likely that there is no statistical significance to that relationship as it could be argued that crimes are not necessarily committed by those who have registered firearms, but rather, those who possess illegal, unregistered ones. This notion is what our model provides support for, as there is no statistically significant link between firearm checks and property crime rate.

The presence of law enforcement officials per state is expected to decrease crime rates, as per theory from economics and criminology (Chiricos, 1987). In such a scenario, it is useful to see whether this theory truly holds up. However, it is important to note that just the presence of enforcement does not constitute an indicator of its effectiveness, which might be better explained by solved crimes or arrests. Yet, for the purposes of our study, it is hypothesized that since the number of law enforcement officials is the most visible hand of the law in action, that too should provide a deterrent for property crime. This theory does not empirically hold up in this study, since there is no statistically significant link between the number of law enforcement officials and property crime. There may be a potential simultaneity issue involved with the inclusion of such a variable, i.e., higher crime rates could also be the reason for more law enforcement officials being employed by the state. We tried to account for this by testing the lagged independent variable, and the results still hold. However, future studies would do well to recognize the issues involved in such testing.

CONCLUSIONS

Our findings largely conform with previous literature in that we do see a positive relationship between property crime and unemployment. However, the study also sheds light on a surprising finding—the impact of unemployment on property crime rates is greater in stable economic times than in periods of economic turmoil. We propose some reasons for this trend, wherein the lack of target availability outstrips criminal motivation as per theories advanced by Cantor and Land (1985).

The 2008 financial crisis resulted in large cyclical unemployment. People were laid off from positions that required above average educational attainment, as opposed to chronic unemployment. Such educated unemployed individuals would not necessarily resort to crime as a way out of their situations—so a crime surge would not occur. Instead, what could have happened was that there would be a decline in availability of targets for potential property

crimes, as the unemployed would be home more often and would be more prone to zealously guarding whatever they had left— resulting in a decrease in property crime rates which would be more in tune with the general trend of crime rates all over the world, and in USA in particular (Cook and Wilson, 1985).

A more nuanced psychological reasoning can be employed in order to interpret these results— in stable economic times, the impact of losing one’s job is felt much more acutely than in a recession where everyone is suffering. In such a situation, one would turn to last-ditch measures like thievery more easily when everyone around him/her was doing better than when everyone was in the same boat. Wilkin (2015) calls this an “equity restoration behavior”, wherein unequal distributions lead to frustration and a sense of trying to restore the balance, while equal distributions, like the ones produced in a recession, would constitute “distributive justice”. Wilkin (2015) also puts forward the view that if an individual were to lose his/her job, he/she would be more likely to be driven to self-harm or domestic violence rather than manifest desperation in more overt actions like stealing, which would make him/her easily prone to being caught by the police. This would be even more apparent in a recession where the probability of finding a new job was greatly reduced, desperations would run high and therefore, “disappointed individuals would be more likely to quit or withdraw because although they expected a positive outcome, they have unmet expectations and feel powerless” (Wilkin, 2015, p.161). Wilkin believes that these individuals would be unlikely to resort to stealing in order to cope with such emotions.

In terms of education being linked to lower rates of crime, Lochner and Moretti (2004) find a clear link between changes in schooling laws in US states that increased access to education, and a reduction in incarceration and arrest rates. They use high school graduation rates as a proxy, while we use enrollment rates, defined as the total number of students enrolled in public schools in each state. Enrollment rates do not necessarily capture attainment,

however, they do give us a valuable understanding of whether just being part of an educational system helps in reducing crime. We find a negative link between property crime rates and enrollment rates, thus providing support for this view. There are many other control variables that could have been added to make the model more robust, namely– age and race variables, population living under the poverty line, worker incomes etc. Data for these for the time period studied are not available, as they come from Census data that is only collected every five years or so. However, future studies could benefit from adding such controls. Indeed, increased emphasis must be placed on making education available to children from disadvantaged backgrounds. Racial discrimination too plays an important role in contributing to continued social inequality, and in the absence of policies such as affirmative action that level the playing field, these children could be sucked into a continuing spiral of crime and illegal activities.

Finally, we turn to the control variables that were statistically insignificant– firearm checks and law enforcement officials. Specifically, this study finds no significant link between property crime and the number of registered gun checks. Although this link is tenuous at best, with firearms being complements to violent crime rather than property crime, it is worthwhile to conduct more detailed studies with better data on the link between guns and crime. As mentioned before, premeditated or repeat crimes are probably not committed with registered guns, and it is almost impossible to get data on actual gun sales owing to a large underground market. Similarly, we find no statistically significant link between the number of police officers and property crime. Property crimes by nature are stealthier and more advanced than violent crimes, which makes personal surveillance more important, rather than police surveillance. Also, an increase in law enforcement could be caused by an increase in crime as well, leading to a simultaneity problem that is hard to correct or account for.

REFERENCES

- Altindag, D. (2012). Crime and unemployment: Evidence from Europe. *International Review of Law and Economics*, 32(1), 145-157.
- Blomquist, J., and Westerlund, J. (2014). A non-stationary panel data investigation of the unemployment–crime relationship. *Social Science Research*, 114-125.
- Cantor, D., and Land, K. (1985). Unemployment and Crime Rates in the Post-World War II United States: A Theoretical and Empirical Analysis. *American Sociological Review*, 50(3), 317-332.
- Chiricos, T. (1987). Rates of Crime and Unemployment: An Analysis of Aggregate Research Evidence. *Social Problems*, 34(2), 187-212.
- Cook, P., and Wilson, J. (1985). Unemployment and Crime- What is the Connection? *The Public Interest*, 79, 3-8.
- Donohue, J. J., and Levitt, S. D. (2001). The Impact of Legalized Abortion on Crime. *The Quarterly Journal of Economics*, 116(2), 379–420.
- Edmark, K. (2005). Unemployment and Crime: Is There a Connection? *The Scandinavian Journal of Economics*, 107(2), 353-373.
- Levitt, S. (2001). Alternative Strategies for Identifying the Link Between Unemployment and Crime. *Journal of Quantitative Criminology*, 17(4).
- Lochner, L., and Moretti, E. (2004). The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports. *American Economic Review*, 94(1), 155-189.
- Phillips, J., and Land, K. (2012). The link between unemployment and crime rate fluctuations: An analysis at the county, state, and national levels. *Social Science Research*, 41(3), 681-694.
- Raphael, S., and Winter- Ebmer, R. (2001). Identifying the Effect of Unemployment on Crime. *The Journal of Law and Economics*, 44(1), 259-283.

Scorcu, A., and Cellini, R. (1998). Economic activity and crime in the long run: An empirical investigation on aggregate data from Italy, 1951–1994. *International Review of Law and Economics*, 18(3), 279-292.

Wilkin, C., and Connelly, C. (2015). Green with envy and nerves of steel: Moderated mediation between distributive justice and theft. *Personality and Individual Differences*, 72, 160-164.

QUANTIFYING THE OIL PRICE PLUNGE

Husain Rangwalla

School of Business Administration

American University of Sharjah

E-mail: b00046779@aus.edu

ABSTRACT

From early June 2014 until date, the global economy has experienced a sudden, unexpected and rather intriguing drop in oil prices. In spite of the extensive research in this field, the question of why oil prices have plunged remains unanswered. Additionally, amidst the umpteen determinants driving oil prices and their speculations, no single factor remains solely attributable to the same. This paper will attempt at providing an explanation to the current crisis by running a quantitative analysis on the potential factors driving the recent trend in the oil prices. Given the insight derived from the quantitative analysis, this paper will make policy recommendations to sustain the plunge and reverse the trend through substantive and constructive policy action. Not only will this avoid a replay of the mid 1980's oil crisis but also provide an economic stimulus to avoid economic turmoil and entrenchment in the long-run.

INTRODUCTION

From early June 2014 until date, the global economy has experienced a sudden, unexpected and rather intriguing drop in oil prices. To explain the same, there have been misleading theories on oil prices aimed at destabilizing the Russian economy (Gladstone & Krauss, 2015) or bringing economic insecurities to the Iranian drilling efforts (Gause, 2015). On the other hand, there has been extensive economic research conducted to identify and explain the economic drivers of the plunging oil prices but with limited success.

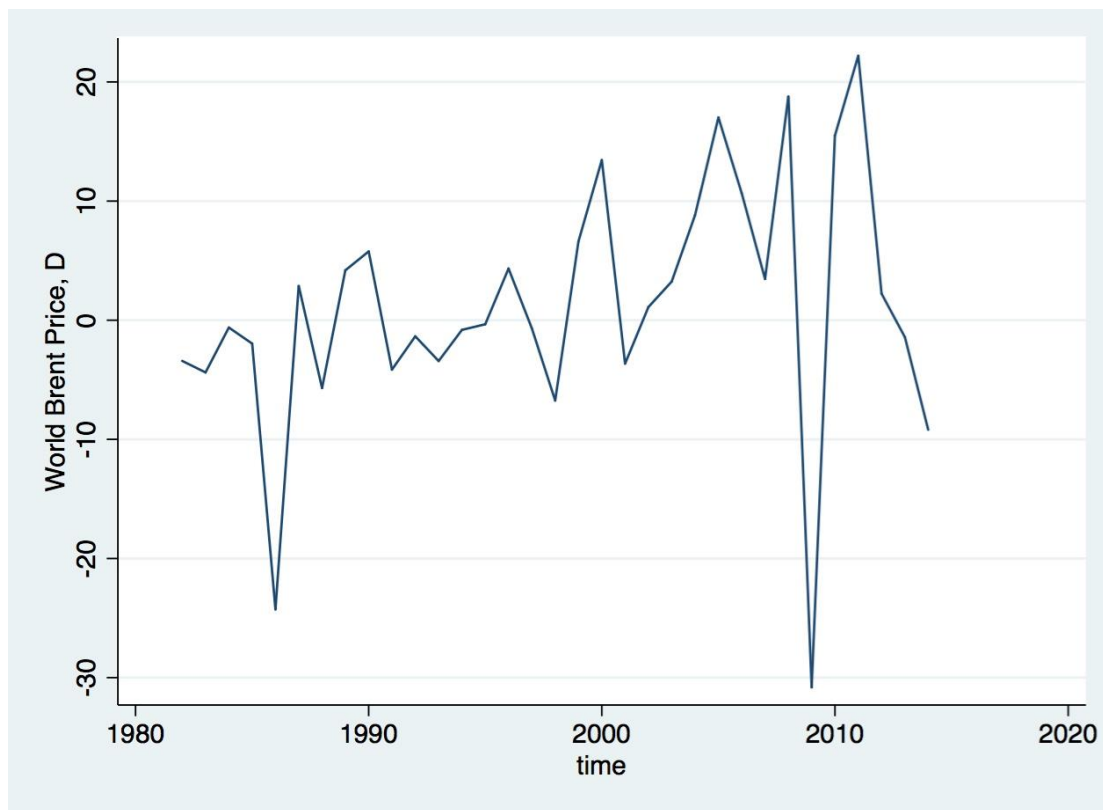


Figure 1. The First derivative Change in Oil Prices (\$/barrel).

The 1980's saw a similar stagnation in oil prices which was followed by a sudden drop of over 67% in a four-month window (Loder, 2014). The sudden plunge in this historical crisis was triggered by a price war orchestrated by Saudi Arabia which created negative global implications. While U.S. industrialization faced the major brunt of the uncalled for competition, global economic activity slipped into a trough until the mid-1990's (Gately, 1986,

p. 245). On this premise, the current oil price plunge seems to be a replay of the 1980's crisis from the periphery, but the contributing factors are completely different. However, this does not rule out the policy lessons we've learned which will enable us to salvage the plunging oil prices.

With a background of higher commodity market speculations, unprecedented volumes of futures trading, unusual OPEC (Organization of Petroleum Exporting Countries) policy, the reorganization of the US Shale Fracturing Industry and the catalysed industrialization of the developing Asian economies, the question of why oil prices have plunged, remains unanswered. Amidst the umpteen determinants driving oil prices and their speculations, no single factor remains solely attributable to the same.

This paper will attempt at providing an explanation to the current crisis by running a quantitative analysis on the potential factors driving the recent trend in the oil prices. Beginning with enumerating the causes of the price drop, to understanding the effects of the same, the paper will quantify the variables to enable a regression analysis. The results from the same will look towards the future to explain potential policy actions which can stabilize oil prices and simulate an upward trend in the long-run.

ESTABLISHING THE CAUSES

The given section outlines the four principle causes of the plunge in oil prices

WEAK OUTLOOK OF DEMAND

In an article titled "Why the Oil Price is Falling," published in the Economist, the author attributes global oil demand to be a contributing factor towards the drop in oil prices. The author explains how increased efficiency in production coupled with an upsurge in the use of alternative fuel sources, has reduced the global demand for oil. The declining demand has led

to the initial drop in oil prices and which has resulted in a further ‘investment drought’ in the oil and gas sector of the economy. This weak economic outlook of the oil and gas sector has further aggravated the drop in oil prices.

Looking ahead, an article titled “Global Oil Demand Growth to Slow down in 2016,” published in The Wall Street Journal expects the economic uncertainties to prevail maintaining the weak demand and further dropping the oil prices if not for any structural adjustments.

The graph below (Figure 2) graphically represents the consumption of Petroleum. While the mid 1980’s experienced a drop in consumption, the oncome of the decade of 2010 too saw a plunge in demand owing to the factors discussed above.

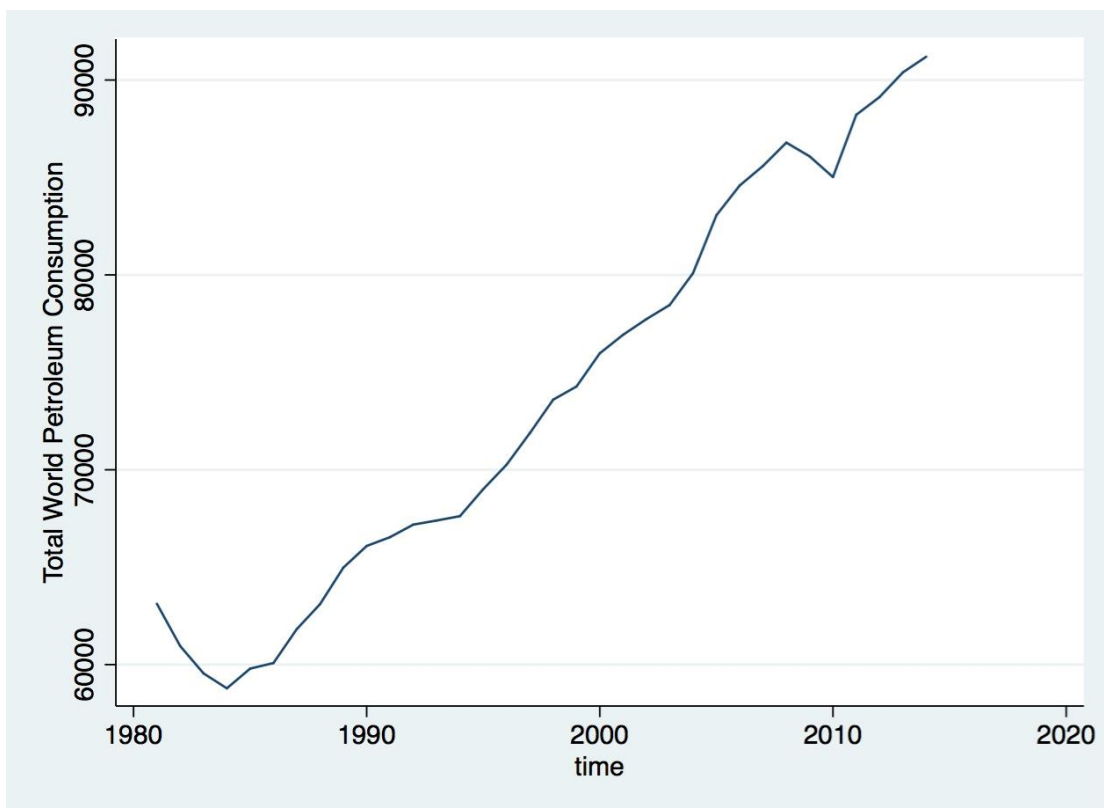


Figure 2. Total World Petroleum Consumption (Thousand Barrels/Day)

CURRENT STATE OF OVERSUPPLY

In an article titled “Oil Prices Could Keep Falling Due to Oversupply, Says IEA,” published by The Guardian, three factors have been accounted as responsible for the oversupply of oil in the global markets. Firstly, the exploration of oil fields followed by drilling in Venezuela and Nigeria. Secondly, the quickly growing US Shale Fracturing and lastly the falling demand for oil. However, these factors could have been balanced out by adjustments in the OPEC Supply Policies, if not for the tough stance of Saudi Arabia.

Amidst the current state of oversupply, in an article titled “Oil Demand Growth to Slow, IEA says, but is OPEC Listening,” published by C.N.B.C., Holly Ellyatt blames the OPEC for lack of policy action after sighting selfish incentives during the time of a commodity crisis. While the OPEC cartel can single-handedly rebalance the oil market towards equilibrium, the OPEC refuses to do so in order to drive the oil-dependent economies like Russia and Brazil out of business and capture their market share in turn. Therefore we see that oversupply will remain an upward trend creating further stimulus for falling oil prices.

The graph (Figure 4) explains the accelerated increase in oil in the years 2012-2014. This oversupply, as explained above is a potential cause of the current plunge in prices.

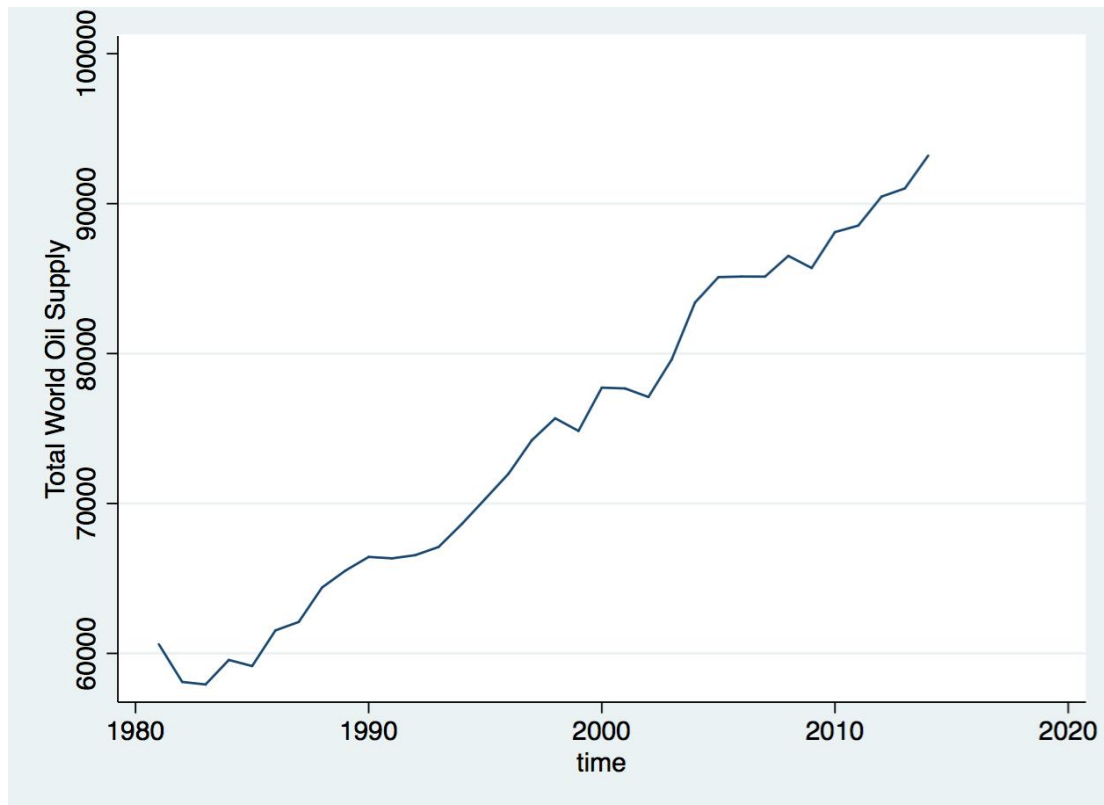


Figure 3. Total World Oil Supply (Thousand Barrels/ Day).

APPRECIATION OF US DOLLAR

In an article titled “Crude Oil Prices Fell Due to the Appreciating US Dollar,” published by Market Realist, the high volumes of appreciation in the US dollar have laid heavy stress on the dollar denominated oil prices. There has been a 10% appreciation in the US Dollar relative to the major trade-weighted currencies in the world (World Bank, 2015). This increase in prices encompasses the first two factors of the oil plunge. Firstly, decreasing demand through a reduced purchasing power globally and secondly, increasing supply through higher export margins. Thus the appreciation of the US Dollar has had a multi-fold impact on oil prices during 2014-2015.

PRICE OUTLOOK OF OIL

In a report titled “The Great Plunge in Oil Prices: Causes, Consequences and Policy Responses,” published by the World Bank, the price outlook of oil is a factor which directs the

trend in oil prices. This is to say that prior to the plunge high oil prices forced substitution to biofuels and solar power. After the plunge, shale fracturing halted majority operations. Both these events are different in their audiences and effects but similar in their long term horizon which requires immediate reversal through sustainable policy action.

QUANTIFYING THE DETERMINANTS

This paper will now quantify the factors contributing towards the determination and plunge in the oil prices. A period of 34 years will be considered from 1981-2014. This period of time is characterized by 3 major fluctuations in oil prices, the 1980's crisis, the recession of 2007-08 and lastly, the recent oil price plunge of 2014.

GLOBAL OIL SUPPLY

U.S. Energy Information Administration

The Global Oil Supply in Thousand Barrels per Day will be obtained from the dataset provided by E.I.A. This dataset will be treated as four individual variables:

1. **Global Oil Supply:** This variable will add an overall outlook to the effect of supply on global oil prices
2. **O.P.E.C. Oil Supply:** This variable will represent the OPEC Export and Production policies.
3. **O.E.C.D. Oil Supply:** this variable will represent the new entrants and increase in production as well as supply in the OECD countries.
4. **U.S. Oil Supply:** This variable will represent the major effect of Shale Fracturing on global oil prices.

GLOBAL PETROLEUM CONSUMPTION

U.S. Energy Information Administration

The Global Petroleum Consumption in Thousand Barrels per Day will be obtained from the dataset provided by E.I.A. This dataset will be treated as three individual variables:

1. **Global Petroleum Consumption:** This variable will represent the overall outlook of global oil demand and consumption patterns.
2. **Asia & Oceanic Petroleum Consumption:** This variable will represent the growing oil consumption in the developing nations of south-east Asia and the Far East
3. **China Petroleum Consumption:** This variable will account for the massive growth of Chinese industrialization which has contributed significantly towards the global oil demand.

OIL RENTS AS A PERCENTAGE OF GDP

The World Bank

“Oil rents are the difference between the value of crude oil production at world prices and total costs of production” (World Bank, 2011). This dataset will be treated as three individual variables:

1. **China’s Oil Rents as % of GDP:** China being the biggest economy in the East is used as a representative variable in this section.
2. **US’ Oil Rents as % of GDP:** US Shale Gas Rents which make US the current largest producer of oil are represented by this variable.
3. **Saudi Arabia’s Oil Rents as % of GDP:** The world’s former largest oil producer’s income is represented in this variable.

CRUDE OIL RESERVES

U.S. Energy Information Administration

The Crude Oil Reserves in billion barrels will be obtained from the dataset provided by E.I.A. This dataset will be treated as three individual variables:

1. **World Crude Oil Reserves:** This variable will be representative of the global crude oil stock.
2. **O.P.E.C. Crude Oil Reserves:** This variable will represent the OPEC reserves, which is a source of bargaining power for the cartel.
3. **O.E.C.D. Crude Oil Reserves:** This variable represents the limited reserves held by the OECD cartel, which makes it vulnerable to the current crisis.

OIL IMPORTS AS A PERCENTAGE OF GDP

The World Bank

From the global data set a single variable will be used:

1. **U.S. Oil Imports as a % of GDP:** Until off-late, the U.S. used to be the biggest oil importer of the world which laid sufficient influence on the pricing of the oil barrel. This variable will represent the same.

U.S. DOLLAR VALUE AS COMPARED TO OTHER CURRENCY UNITS

The World Bank

From this comprehensive currency comparison dataset a single variable will be used:

1. **U.S. Dollar Value as compared to the British Pound:** This variable will help study the effect of the U.S. Dollar Appreciation on the recent oil plunge.

ALTERNATE ENERGY AND NUCLEAR ENERGY AS A PERCENTAGE OF ENERGY USE

The World Bank

This single variable will help study the effect of alternate energy sources on the demand and pricing of the oil barrel.

WORLD INFLATION INDICES

The World Bank

A single variable of U.S. Inflation will be used from the dataset to represent the contribution of the overall increase of prices in the economy as compared to oil.

DATA ANALYSIS

Given the following independent variables, we regress them with the dependent variable, World Brent Price, to understand the contribution of each determinant towards the changes in oil prices. We use Stata to perform the operation and receive the following results.

UNDERSTANDING THE SIGNIFICANT VARIABLES

US INFLATION RATES

The U.S. Inflation Rate has a significant and a positive output on the price of oil. Economically, inflation is a positive indicator of economic activity. According to Philip's Curve an economy closer to full employment will have a higher inflation rate. Therefore, to explain the \$6.03 increase for every 1 point increase in inflation, the economy features higher employment, resulting in higher economic activity, which requires more oil. An increase in the demand of oil, by the law of demand increases the price of oil.

OECD OIL SUPPLY & OPEC OIL SUPPLY

Both the given variables have a negative impact on the price of oil. For every 1 million barrels per day increase in oil supply from OECD and OPEC, the price of oil would drop by \$242 and \$218 respectively. This operation does not occur in isolation though. Coupled with increased demand as a stimulus, decreasing reserves as a result the impact of

World Brent Price	Coef.	t	P>t
China's Oil Rent	1.13	0.17	0.865
US' Oil Rent	5.61	0.24	0.813
Saudi Arabia's Oil Rent	0.05	0.11	0.912
OECD Crude Oil	-0.03	-0.07	0.946
OPEC Crude Oil	-0.02	-0.05	0.958
World Crude Oil	0.03	0.1	0.923
US Oil Imports	-0.15	-0.08	0.938
USD against British Pound	-12.29	-0.34	0.738
US Inflation Rates	6.03	3.54	0.003
Alternative and Nuclear Energy	1.33	0.28	0.78
Log(OECD Crude Oil)	-242.81	-2.12	0.05
Log(OPEC Crude Oil)	-218.63	-3.43	0.003
Log(Total Petroleum Consumption)	-335.91	-1.6	0.123
Log(Asia and Oceanic Petroleum Consumption)	216.97	2.04	0.059
Log(China Petroleum Consumption)	50.03	0.78	0.446
Log(US Oil Supply)	24.76	0.31	0.762
Log(World Oil Supply)	207.65	1.37	0.188
_cons	3328.63	1.79	0.092

the increase in supply would be considerably lesser. However, the negative coefficient highlights the argument of an oil price plunge owing to the oversupply of oil by the OPEC.

ASIA AND OCEANIC PETROLEUM CONSUMPTION

According to the regression coefficient for every million barrels per day increase in the consumption of the Asia and Oceanic Petrol Consumption, oil prices will increase by \$217. In lines with the economic theory of demand, this is a plausible claim. On the other hand, given that the demand for oil in this region is growing but at a declining rate, this contributes towards the current oil plunge. With the increased use of alternate fuels and efficient technology, the developing world is reducing its dependence on oil.

TESTING FOR SERIAL CORRELATION

Given that we are using a time-series dataset, we use the Breusch Godfrey test for serial correlation. In the context of the research question we conduct the test using a 10 period (year) lag variable, to test for the null hypothesis claiming no serial correlation. Given a low p-value, we reject the null hypothesis of no serial correlation. The presence of serial correlation by definition implies that past values of a time-series dataset, set a trend to be repeated in the future. Hence, as stated earlier we can use policy lessons and defence mechanisms from the 1985-86 oil plunge to stabilize oil prices and stimulate an upward trend at the earliest.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Given the insight derived from the significant variables in the data analysis in the earlier section, this section will make policy recommendations to sustain the plunge and reverse the trend through substantive and constructive policy action.

MONETARY POLICY

Oil plays the role of an intermediate good in every production process. Given the decrease in oil prices, production costs will decrease, which will be shortly followed by a

decrease in prices to the benefit of consumers. However, the drop in prices will initially ease inflation only to add deflationary pressures to the economy in the longer run. In the case of sticky prices, a sustained price drop will only create further turmoil in the economy (World Bank, 2015).

Given the linear relation between inflation and oil prices, inflation must be maintained to aid a pleasant recovery of oil prices. Therefore, from the monetary policy standpoint, the money supply in the economy must be increased coupled with lower interest rate targeting to maintain economic momentum and increase the energy use via catalysed economic activity.

FISCAL POLICY

As explained by a report titled “The Great Plunge in Oil Prices,” published by the World Bank in 2015, low oil prices create opportunity for radical fiscal reform. Given the lower oil prices, subsidies on oil can be redirected towards infrastructural development which can boost economic activity and increase the investment attractiveness of an economy. Additionally, as explained by the same report, investments should be directed towards the energy sector as opposed to liquidation, to create sufficient stimulus to boost demand for oil in the global energy use index (World Bank, 2015, p.42).

CONCLUSION

The role of the governments and economists of the world is to take immediate action to prevent a downturn of events as previously experienced in the mid-1980s. Given a recent recovery from the Great Recession of 2007-08, another crisis would spell danger for the developing as well as the developed economies of the world. As the price trend could mirror in other commodity markets too, recovery will be a harder and longer economic process. Therefore, given the extensive research, to re-emphasize the objectives of the paper, immediate fiscal and monetary policy actions must be taken coupled with untiring lobbying efforts to

curtail the supply by the oil cartels in existence. In light of sufficient economic stimulus, a decade of economic entrenchment will be unnecessary.

REFERENCES

- Baffes, J. (2015). *The great plunge in oil prices causes, consequences, and policy responses*. Washington, D.C.: World Bank Group, Development Economics.
- EIA short-term US Energy outlook. (2015, December 8). *U.S Energy Information Administration*. Retrieved January 7, 2016, from <http://www.eia.gov/forecasts/steo/>
- Ellyatt, H. (2015, October 13). Oil demand growth to slow, IEA says, but is OPEC listening? *CNBC*. Retrieved January 7, 2016, from <http://www.cnbc.com/2015/10/13/oil-demand-growth-to-slow-iea-says-but-is-opec-listening.html>
- Energy imports, net (% of energy use). (n.d.). Retrieved January 7, 2016, from <http://data.worldbank.org/indicator/EG.IMP.CON.S.ZS>
- Gold, R. (2015, January 13). Back to the Future? Oil Replays 1980s Bust. *The Wall Street Journal*. Retrieved January 7, 2016, from <http://www.wsj.com/articles/back-to-the-future-oil-replays-1980s-bust-1421196361>
- International Energy Statistics - EIA. (n.d.). Retrieved January 7, 2016, from <https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=53&aid=1>
- International Energy Statistics - EIA. (n.d.). Retrieved January 7, 2016, from <https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=5&aid=2>
- International Energy Statistics - EIA. (n.d.). Retrieved January 7, 2016, from <https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=57&aid=6>
- Iran oil minister blames OPEC oversupply for low crude prices. (2015, December 6). *Reuters*. Retrieved January 7, 2016, from <http://www.reuters.com/article/iran-opec-idUSL8N13V09I20151206>

Krauss, C., & Gladstone, R. (2015, August 24). From Venezuela to Iraq to Russia, Oil Price Drops Raise Fears of Unrest. *The New York Times*. Retrieved January 7, 2016, from http://www.nytimes.com/2015/08/25/world/from-venezuela-to-iraq-to-russia-oil-price-drops-raise-fears-of-unrest.html?_r=0

Kristopher, G. (2015, November 18). Crude Oil Prices Fell Due to the Appreciating US Dollar. *Crude Oil Market: Bearish Traders Fed by More Supply News*. Retrieved January 7, 2016, from <http://marketrealist.com/2015/11/crude-oil-prices-fall-due-appreciating-us-dollar/>

Loder, A. (2014, November 26). Oil Bust of 1986 Reminds U.S. Drillers of Price War Risks. *Bloomberg Business*. Retrieved January 7, 2016, from <http://www.bloomberg.com/news/articles/2014-11-26/oil-bust-of-1986-reminds-u-s-drillers-of-price-war-risks>

Official exchange rate (LCU per US\$, period average). (n.d.). Retrieved January 7, 2016, from <http://data.worldbank.org/indicator/PA.NUS.FCRF>

Oil prices could keep falling due to oversupply, says IEA. (2015, July 10). *The Guardian*. Retrieved January 7, 2016, from <http://www.theguardian.com/business/2015/jul/10/oil-prices-keep-falling-international-energy-agency-oversupply>

Oil rents (% of GDP). (n.d.). Retrieved January 7, 2016, from <http://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS>

Said, S. (2015, November 13). Global Oil Demand Growth to Slow in 2016, IEA Says. *The Wall Street Journal*. Retrieved January 7, 2016, from

<http://www.wsj.com/articles/global-oil-demand-growth-to-slow-in-2016-iea-says-1447405406>

Why the oil price is falling. (2014, December 8). *The Economist*. Retrieved January 7, 2016, from <http://www.economist.com/node/21635751/print>

**A CROSS-COUNTRY PANEL STUDY OF THE RELATIONSHIP BETWEEN
URBANIZATION AND SUICIDE IN JAPAN AND KOREA**

Jason Torion

School of Business Administration
American University of Sharjah
Email: b00053455@aus.edu

ABSTRACT

Suicide has not been a major global issue until recently. Over the years, suicide incidents have risen steeply and research is still being conducted on the causes. Increasing suicide rates reflect a society's mental wellbeing and in some countries it could be, in fact, considered a norm to see so many suicide incidents reported on the news. Japan and the Republic of Korea (South Korea) are known to both have the highest suicide rates in the Asian Region. Japan ranks 9th in the world, and South Korea follows at 10th in an International Suicide Statistics Ranking published by the World Health Organization. These two countries are also the only two Asian countries in the top ten ranking, with the rest of the other eight countries being European. Despite both being two of the most economically developed countries in Asia, their alarmingly high suicide rates suggest that their population's mental health has degraded over the years. This paper will empirically explore the economic reasons, if any, behind the high suicide rates with panel data evidence from 1991 to 2010. The main focus will be confirming the impact of increased urban population (urbanization) on suicide rates in comparison to other economic and socio-economic facts such as unemployment, individual (average) income levels, alcohol consumption and the like, in order to validate various literature and empirical studies conducted on the topic.

LITERATURE REVIEW

Majority of the literature published consider unemployment and individual income levels the main two indicators behind increasing suicide rates. Noh (2009) states that individual income levels can be used to explain the population's level of happiness. Higher income levels could be correlated with lower suicide rates but it should be their **relative** income (i.e. GDP per Capita *growth* rate) because "happiness is affected more by one's sense of relative income than by absolute income".

Shah (2008) and his findings on Urbanization and Suicide Rate in the Elderly Population was part of the motivation behind this research paper. Shah conducts his study on the underlying premise that 'Urbanization' leads to the weakening of family ties and social bonds, including bonds with local religious societies. These, alongside the difficulties in adjusting towards urban lifestyles are all possible reasons towards increased suicide rates. Although this study was geared towards the Elderly Population, I will be adopting a similar perspective in this paper. Interestingly, Oguro & Kaido (2009) find that Japan has a reputation of being a 'Suicide Society' and find that social factors play a huge part in the alarming increase in suicide rates in Japan alone. Unfortunately, trustworthy data on social factors are very difficult to find and aggregate, hence 'Urbanization', along with fertility rate and female participation in the labor force will be used to control for social factors instead.

Shah (2010) discusses the conflicting results from various authors. Results vary from positive, negative, or no relationship between urbanization and suicide incidents. Stack (2000) proposes a curvilinear relationship model to explain the conflicting findings but as Shah (2010) replicates this model with much more recent data, he finds that there is an absence of such a relationship.

DATA

Data was collected and aggregated from authentic secondary resources and data repositories such as the World Bank, World Health Organization, and the OECD. Table 1 shows a summary of all the data used in the regression, and Table 2 will show descriptions for all of the data gathered, along with their sources.

While Japan's economic and socio-economic indicators are all perfectly present, South Korea's datasets have missing values, such as unemployment rate from 1991-1995, and obesity rates from 1991 – 1997, 1999 – 2000, 2002 – 2004 and 2006. A simple linear graph of reported suicides in Korea and Japan (see Figure 1) will show an increasing trend for both. Similarly, urbanization for both countries shows the same, although Korea seems to be a bit steadier in the increase than Japan (see Figure 2).

Table 1: Summary Statistics

Variables	Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
Years	40	2000.5	5.84	1991	2010
Ccode	40	401	9.12	392	410
Country	0				
Suic	40	17974.5	10407.4	3069	32118
Rdgpcap	40	25562.5	10737.5	9591.3	42909.2
Unemp	40	3.75	1.16	2	7
Rgdpcapgrowth	40	2.79	3.52	-6.39	9.95
Oldpop	40	12.61	5.57	5.17	22.94
Gdp_growth	40	3.25	3.75	-5.73	10.73
Urb	40	80.77	3.82	74.97	90.52
Fert	40	1.38	.166	1.076	1.76
Flabor	40	40.72	.722	39.26	42.48
Unemexp	35	.330	.177	002	.63
Penexp	40	4.43	3.21	.787	10.07

Alcohol	40	8.28	.896	6.89	11.45
Obese	27	25.19	2.998	215	31
Dependency	40	43.82	5.26	37.61	56.82
Unem_rgdpcap	40	99074.1	54543.16	23019.11	214546.2

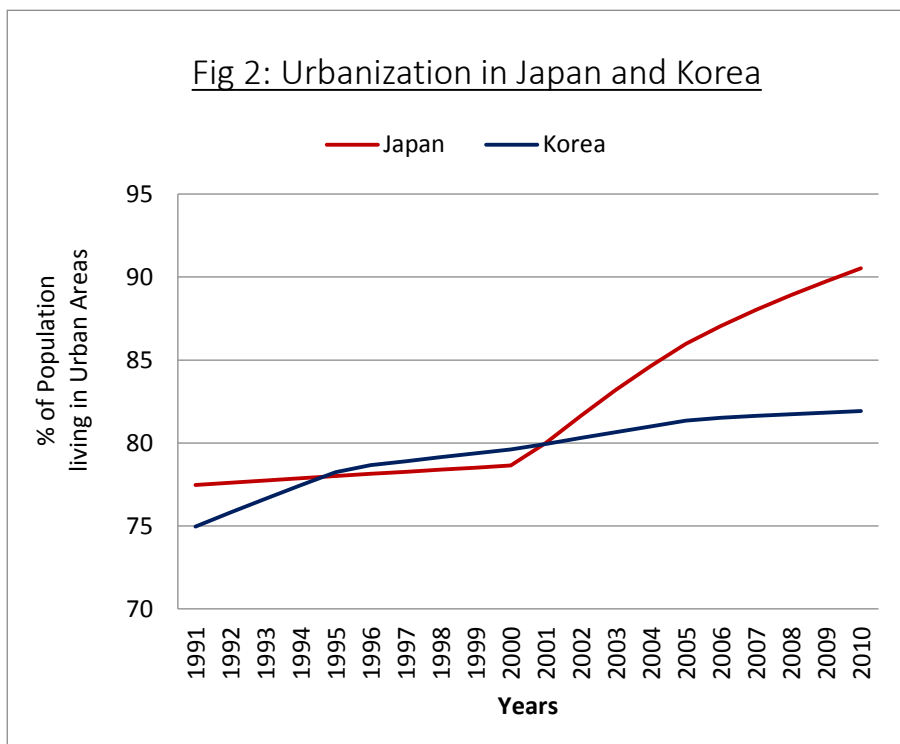
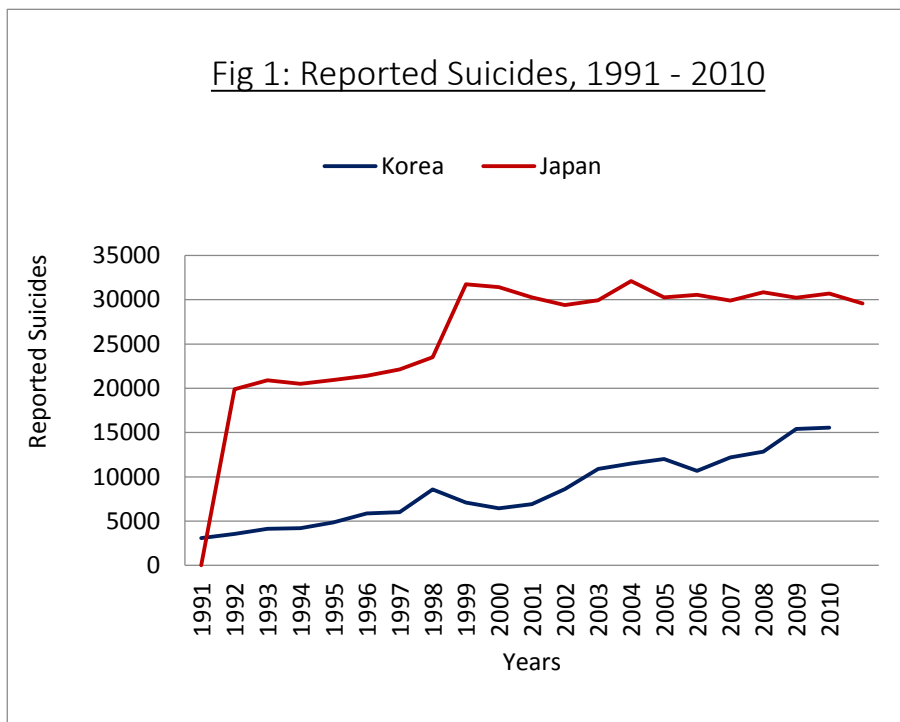


Table 2: Data Descriptions

Variable	Name	Description/Notes	Source
ccode	Country Code	3 digit country code as per the UNSD	UNSD
years	Years	Years of observations from 1991 - 2010	-
country	Country	The country the specific observation belongs to	-
suic	No. of Reported Suicides	Total number of deaths by intentional self-harm	WHO
rgdpcap	Real GDP per capita	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2005 U.S. dollars.	World Bank Databank
unemp	Unemployment Rate	Total percentage of the total labor force unemployed	World Bank Databank
gdpcapgrowth	GDP per capita growth (annual %)	Annual percentage growth rate of GDP per capita; aggregates based on constant 2005 U.S. dollars.	World Bank Databank
oldpop	Population ages 65 and above (% of total)	Population ages 65 and above as a percentage of the total population.	World Bank Databank
gdp_growth	GDP growth (annual %)	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars.	World Bank Databank
urb	Urban population (% of total)	Urban population refers to people living in urban areas as defined by national statistical offices.	United Nations
fert	Fertility rate, total (births per woman)	Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.	World Bank Databank
flabor	Female Labor Force (% of total labor force)	Female labor force as a percentage of the total shows the extent to which women are active in the labor force.	World Bank Databank
unemexp	Public unemployment spending	Government expenditure on people to compensate for unemployment. Calculated as Total, % of GDP.	OECD
penexp	Public Pension Spending	Public Pension spending is defined as all government expenditures (including lump-sum payments) on old-age and survivors pensions. Total, % of GDP	OECD
alcohol	Alcohol per capita consumption	Recorded amount of alcohol consumed per capita (15+ years) over a calendar year in a country	WHO
obese	Percentage of population Obese	Percentage of the total population that are obese. Includes both measured and self-reported.	WHO
dependency	Age dependency ratio (% of working-age population)	Age dependency ratio is the ratio of dependents--people younger than 15 or older than 64--to the working-age population--those ages 15-64. Data are shown as the proportion of dependents per 100 working-age population.	World Bank Databank
unem_rgdpcap	Interaction term; unemp*rgdpcap.	Tests whether countries of different income levels respond to a given change on unemployment rates in a different way.	-

EMPIRICAL APPROACH

For Panel Data suitability, we use the random effects panel data model to estimate the population model with the aforementioned variables with *Suicide* as the discrete dependent variable. The use of the random effects model is determined through the Hausmann Test. We are testing the hypothesis of whether or not urbanization, inclusive of all other economic and socio-economic variables, is a possible cause and/or a major indicator of the increasing suicide numbers in Japan and Korea. To deal with the issue of heteroscedasticity, we use Robust Standard Errors during the regression. The variables used are similar to those that Noh (2009) had used, with the exception of CO₂ consumption – instead we use obesity rate as a proxy for the country's population's health.

Theoretically, we expect a negative relationship between suicide and Real GDP per Capita, Unemployment rate, GDP per Capita Growth, GDP Growth, Fertility Rates and Government Expenditure on Unemployment and Pension. A positive relationship is expected between suicide and urban population, alcohol consumption, obesity rate and age dependency ratio. The expected effect of the elderly population and the interaction term are ambiguous. We add an interaction variable between unemployment rate and real GDP per capita to control for the difference in response of different income levels to a given change in unemployment rates in different countries.

EMPIRICAL RESULTS

The regression results are as seen in Table 3. Overall, the independent variables explain 98% of the variations and/or changes in suicide incidents (R-squared). Out of the 14 predictors used to predict suicide, the estimated coefficients of Real GDP per Capita, Unemployment Rate, the elderly population, Urbanization, Government Expenditure on Unemployment and Pension, as well as the interaction variable between unemployment rate and real GDP per

capita are the only ones that are statistically significant in predicting Suicide at 5% significance level. Alcohol consumption, with a p-value of 6.7%, is statistically significant at the 10% significance level. Due to the lack of data within some variables, only 27 observations out of 40 were used in the regression over the two countries from 1991 – 2010. The standard error of the GDP per Capita Growth exceeds its coefficient, and the same for GDP growth, fertility rate and female labor force participation rate. The standard error for unemployment expenditure by the government is more than half of its coefficient. Assuming *ceteris paribus*, in the case all variables are zero, there will be 171,690 predicted reported suicides. The random effects panel data model equation predicts suicide incidents follows:

$$\begin{aligned}
 \text{**suic} = & 171691 - 0.411(\text{rgdpcap}) - 1021(\text{unemp}) + 544(\text{gdpcapgrowth}) + 3932(\text{oldpop}) - \\
 & 923(\text{gdp_growth}) - 1660(\text{urb}) - 1644(\text{fert}) - 528(\text{flabor}) - 15819(\text{unempexp}) - \\
 & 247(\text{penexp}) - 745(\text{alcohol}) + 351(\text{obese}) - 742(\text{dependency}) + \\
 & 0.057(\text{unem*rgdpcap})
 \end{aligned}$$

**** Variable descriptions can be found in Table 2**

Table 3: Regression Results

	suic
rgdpcap	-0.411 (0.087)**
unemp	-1,021.274 (301.276)**
gdpcapgrowth	543.921 (3,564.960)
oldpop	3,932.265 (235.081)**
gdp_growth	-922.514 (3,500.669)
urb	-1,660.462 (618.194)**
fert	-1,644.413 (6,342.442)
flabor	-527.579 (884.456)
unemexp	-15,819.394 (8,038.505)*
penexp	-247.593 (59.357)**
alcohol	-745.353 (407.287)
obese	351.331 (162.705)*
dependency	-742.036 (195.273)**
unem_rgdpcap	0.057 (0.011)**
_cons	171,690.136 (8,942.412)**
<i>N</i>	27
<i>Overall R²</i>	98.31%

* $p < 0.05$; ** $p < 0.01$

CONCLUSION

From these results, we can infer that urbanization is in fact a significant reason behind the increasing suicide rates in Japan and Korea, however the relationship is negative, i.e. as urbanization increases, suicide incidents do in fact fall. This validates *some* of the previous

studies that have concluded their research similarly (Otsu *et al.*, 2004). As aforementioned, many studies have also concluded with conflicting results.

However, this model may not be able to accurately predict suicide incidents. We have missing values from obesity rates in Korea which could have greatly affected the results. Since suicide is usually unpredictable, it has to do with a person's mental wellbeing. A variable that will proxy psychological factors should be used. Other than family help and social ties, another variable should be added to determine a person's religiousness, since it also affects a person's psychological state. In Japan and Korea, it is common to see mothers that have jobs occasionally (part-time or temporary). Hence, unemployment rate and female labor force participation (as well as dependency ratio) may not capture the effect needed to proxy for social ties and family help since such mothers are usually housewives reported to be unemployed. We suspect some endogeneity in the model as well. There could be a chance that as suicide increases, alcohol consumption increases (from the friends and relatives left behind), which could in turn also increase suicide. More investigation needs to be done on such predictors.

The model is also too widespread, i.e. we predicted it for the population as a whole. We may be able to gain more insight by investigating and dividing data to predict suicides separately between males and female. This result could also only be limited to Japan and Korea, since they are both collectivist Asian Countries, perhaps other countries' data should also be added into the regression to get a more accurate model. An overall policy recommendation would be for a government to ensure and secure government funds for pension and unemployment expenditures should they want to reduce suicide incidents in their country.

REFERENCES

- Hamermesh, Daniel S., & Soss, Neal M. (1974). *An economic theory of suicide*. Journal of Political Economy. Retrieved from <http://www.jstor.org.ezproxy.aus.edu/stable/1830901?pq-origsite=summon>
- Noh, Y. (2009). *Does unemployment increase suicide rates? The OECD Panel Evidence*. Journal of Economic Psychology, 30(4), 575-582. Retrieved from <http://www.sciencedirect.com.ezproxy.aus.edu/science/article/pii/S0167487009000361>
- Oguro, J., & Kaigo, M. (2009). *Suicide society: Media responsibility and suicide in Japan*. Media Asia, 36(1), 16-22. Retrieved from <http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/211508531?accountid=16946>
- Otsu, A., Araki, S., Sakai, R., Yokoyama, K., & Scott Voorhees, A. (2004). *Effects of urbanization, economic development, and migration of workers on suicide mortality in Japan*. Social Science and Medicine. Retrieved from <http://www.sciencedirect.com.ezproxy.aus.edu/science/article/pii/S0277953603002855>
- Shah, A. (2008). *A cross-national study of the relationship between elderly suicide rates and urbanization*. Suicide & Life - Threatening Behavior, 38(6), 714-9. Retrieved from <http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/224878832?accountid=16946>

- Shah, A. (2010). *A replication of a cross-national study of the relationship between elderly suicide rates and urbanization*. *International Psychogeriatrics*, 22(1), 162-3. Retrieved from <http://search.proquest.com.ezproxy.aus.edu/docview/223739239?pq-origsite=summon>
- S. Stack (2000). *A replication of a cross-national study of the relationship between elderly suicide rates and urbanization*. *Suicide and Life Threatening Behaviour*, 30, 163-176.
- The Organization for Economic Co-operation and Development (OECD). (2015). *Government Expenditure on Unemployment and Pension* [Data file]. Available from <https://data.oecd.org/>
- The World Bank. (2015). *World Development Indicators (1991-2010) for Japan and Republic of Korea* [Data file]. Available from <http://data.worldbank.org/>
- World Health Organization. (2015). *WHO Mortality Database* [Data file]. Available from http://www.who.int/healthinfo/statistics/mortality_rawdata/en/