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BITCOINS
WON'T MAKE IT AS MONEY

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I'm going to come right out and say it: Bitcoins make terrible money. And no, it's not because they're electronic, or private, or have a connection to Silk Road and other shady commerce. Bitcoins aren't cut out to be useful money because of some basic monetary economics that most people, even economists, seem to have overlooked lately.

Nobody knows for certain who created Bitcoins, but one thing that seems to be sure is that they weren't invented by someone who knew any macro. This is obvious because there's a fixed supply of Bitcoins, or at least that is the claim. A total of 21 million of them are supposed to be released, through digital mining, over a period that could last decades. The argument that follows takes this claim seriously.

Suppose that Bitcoins were to displace other currencies as the main money used by everyone. What would happen to output and prices? We know that in the long run, Milton Friedman is basically correct and inflation is always and every-where a monetary phenomenon. Thus, if the growth rate of Bitcoin money is zero, then inflation should be about zero in the long run.

But the actual long-run condition linking money and prices is the equation of exchange, MV = PY, where M is the money supply, V is the velocity of circulation, P is the price level, and Y is the level of real GDP. If the growth of M is zero, then the inflation rate will also be zero only as long as the growth rate of velocity is equal to the growth rate of real GDP. In the long run, we believe that real GDP will keep on growing because of population growth and growth in technology. So in order to have inflation of zero, velocity will have to rise proportionally with real GDP.

This may happen, but it is unlikely because of the fixed supply of Bitcoins. Bitcoin velocity won't rise proportionately with real GDP because of the propensity to hoard Bitcoins. Since the Bitcoins are in fixed supply, their holders have a significant incentive to hold them and only spend them when absolutely necessary. If they do this, then the value of the Bitcoins, in terms of all other goods and services, rises. That is, holders of Bitcoins will see appreciation in their money wealth and be able to buy more later. This has already proven to be a strong motivation for people to hold Bitcoins, since their price rose from under $100 per coin to over $1000 per coin within one year (though it has fallen since then).

The hoarding tendency will be especially pronounced during a transition to using Bitcoins as money instead of other currencies. The demand for Bitcoins will literally explode, pushing up the price of Bitcoins in terms of other currencies, and in terms of goods and services, up at a significant rate. The higher the rate of price appreciation of Bitcoins, the stronger the incentive will be to hoard rather than spend them. And this is where the problem occurs for the economy. Bitcoins are deflationary money. If the price of Bitcoins in terms of other goods

Number of Euros it takes to buy a single Bitcoin
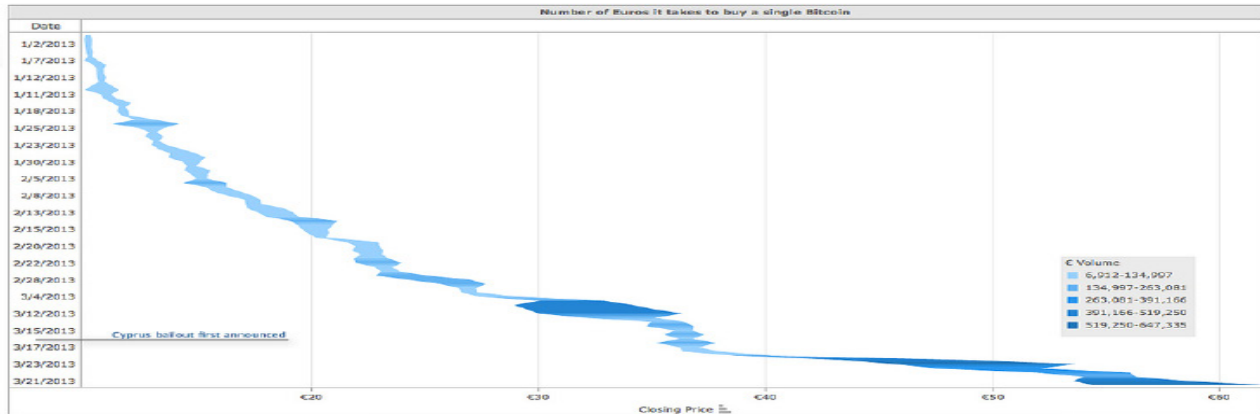
and services rises, this means that the general price level, which is the price of goods and services in terms of the currency, must fall. What are the production and consumption incentives in a deflationary environment?

The short answer is that they are frightening. When prices fall rather than rise, this greatly weakens the incentives to produce and consume. As mentioned above, consumers try to spend as little currency as possible, so that they can enjoy the returns on their monetary wealth. Companies also find that production and distribution become too risky. A company can pay for supplies and labor today, and in the time it takes to produce, distribute, and sell the product, the revenues from the product may turn out to be less than the costs because of the decline in prices. Thus, companies will produce less. And neither consumers nor companies will want to borrow, since they'll have to pay back their loans with more expensive money in the future.

This is a recipe for recession, and it's why economists fear deflation more than hyperinflation. In late 2013 and early 2014, concerns arose in the Euro zone because inflation there had fallen below one percent per year. Inflation is fairly difficult to measure accurately—modern

attempts such as the Billion Prices Project nothwithstanding—and economists worry that inflation rates below a measured two percent rate may actually be negative in reality. If prices in the Euro zone are actually falling, then this will prolong the misery in places like Spain and Greece.

> "BITCOIN VELOCITY WON'T RISE PROPORTIONATELY WITH REAL GDP BECAUSE OF THE PROPENSITY TO HOARD BITCOINS."

If Bitcoins were the main money supply, everyone could get to share that kind of joy, all the time. The money would always be appreciating in value, so people wouldn't want to spend it, companies wouldn't want to produce, and nobody would want to lend or borrow. Bitcoins would be a drag on real economic activity and growth, if they were the main form of money.

Fortunately, Gresham's Law will probably save us from that future. Gresham's Law simply says "bad money drives out good." What this really means is that people would rather use bad money—cheap mon-

ey, that is—than expensive, good money. In the old days, people called the bad money "soft" and the good money (such as specie) "hard." Because most fiat currencies are expanding fast enough to produce nontrivial inflation, they are becoming significantly cheaper each year, in terms of goods and services. In other words, they are bad or soft enough to be really attractive to consumers, firms, and borrowers—as long as they don't become too cheap, too quickly.

But it's unlikely that Bitcoins will disappear, and this is perfectly fine. For many investors, they are filling one of the roles of money—the store of value role—in an exciting way. There will always be people who fear inflation and believe that only hard money should be used, and they will add Bitcoins to the stacks of Krugerrands and crates of canned goods, whiskey and ammunition in which they prefer to invest their precautionary savings. Bitcoins make a great speculative investment that will probably be liquid enough for some people to use them in place of money, but don't count on them to be a medium of exchange or unit of account for the rest of humanity.

BETABALL
USING FINANCE TO EVALUATE BASEBALL CONTRACTS

James Gregory O'Donohue III

UNIVERSITY OF NOTRE DAME

When I negotiated Bob Stanley's contract with the Red Sox, we had statistics demonstrating he was the third-best pitcher in the league. They had a chart showing he was the sixth best pitcher on the Red Sox.

- Rob Woolf, Agent

I. Introduction

Over the past few decades, baseball has become a hotbed for statistical analysis. Sabermetrics – a statistical method for evaluating Major League Baseball players - gained momentum with the Oakland Athletics and Moneyball in the early 2000's. However, I recently recognized a need in Major League Baseball to evaluate players based not only on their performance, but also on how much teams are willing to pay them. Past statistical analysis of MLB players has considered dozens of advanced performance measures, like Wins Above Replacement and Fielding Independent Pitching. These analyses, however, do not consider that the Yankees are willing to pay significantly more for a player than the Pirates would pay for the same player.

In this paper, I use common financial and econometric practices to determine the true value of players based on their contracts. I essentially treat each MLB team as a stock and MLB at large as a market. Doing so allows me to treat each player as a project that can be undertaken or not. As one might do for a stock, I calculate the returns for each MLB team, as well as the volatility of returns, expressed as Beta. The contract of each player can be assessed with a Net Present Value analysis, which is used in the finance world to determine whether a project should be completed. I also use Ordinary Least Square regressions to approximate how MLB teams have paid players in the past. Based on the financial concept of a Random Walk, I reason that the best estimate of how teams will pay players in the future is how teams have paid players in the past. We would not expect the Pirates to spend $200 million on a player, mainly due to the fact that they have never done so in the past. Rather, such contracts are generally characteristic of teams like the Yankees, Red Sox, and Dodgers.

Specifically, I focus on Robinson Cano to convey my findings. Cano, who recently signed with Jay-Z's Roc Nation Sports, is reportedly requesting a 10-year, $300 million contract from the Yankees. In September, Jon Heyman of CBS Sports wrote about how Cano is "seeking to become baseball's first $30-million-a-year player." Cano would need to perform extraordinarily well over the next 10 years to make such an enormous contract beneficial for the team that signs him. However, we do not currently have any tools that combine financial measures with baseball performance to determine whether this contract is a good idea, thus creating a need for such a contract evaluation tool. Ultimately, my purpose in this paper is to fill this need by showing how Cano's requested contract can be evaluated using

common financial and econometric tools along with his forecasted future performance.

II. Broad Overview of Procedure

Each MLB team values players differently. A player's value is a function of both his inherent value (based on performance) as well as how the team values that performance. In this model, I use salary to quantify a player's value to the team. In other words, past contracts serve as a proxy for what teams are willing to pay for players with certain levels of performance. For example, if the Yankees agree to pay Robinson Cano $30 million in 2014, they are essentially saying, "We believe Robinson Cano's services are worth $30 million to us."

The first step in my research was obtaining a cost of equity for each MLB team. This cost of equity is the rate that will be used to "discount" the estimated worth of a player each season. By "discounting", I mean the process of expressing cash flows in present terms. This is a common practice in finance as it allows one to determine the fair value of cash flows TODAY instead of when they actually occur. By obtaining a discount rate for each team, I can assess players' future values in today's terms[1].

After obtaining the cost of equity for each team, I created a regression for estimating a player's salary based on a variety of factors, eventually settling on one that relates player salaries' to games played, plate appearances, doubles, triples, home runs, and on-base percentage (all for a single season). This regression yields the salary a player should expect to earn in a season.

I applied my findings to Rob-

inson Cano, in particular, to determine whether he warrants a 10-year, $300 million from the Yankees. To do this, I forecasted out Cano's relevant statistics over the next 10 years to determine his salary according to the regression model. The yearly salaries that I obtain are used as Cano's annual worth because this is the expected benefit, in dollars, he contributes to the Yankees based on his performance and the team's valuation of it. By subtracting Cano's actual salary from his worth, I find Cano's net

worth – what he is actually worth for the Yankees after accounting for his salary. This is essentially a cost-benefit analysis, in which I subtract Cano's costs (salary) from his benefits (worth). Because there is a different regression for each team, which I will go into further detail about later, each team will have a different valuation for each player.

To further characterize the model for each team, I discounted the player's (Cano in this case) net worth back to the present day using

the team-specific discount rate. This makes my evaluation a Net Present Value (NPV) calculation such that the player's net worth is expressed in today's terms. If the NPV of a contract is positive, the team should agree to it because the present value of the player's annual benefits exceed the present value of his annual costs. Similarly, if the contract's NPV is negative, the team should not agree to the contract. This allows us to assess whether the Yankees should agree to Cano's desired 10 year, $300 million contract.

III. Explanation of Model

Applying CAPM to MLB Teams to find the Cost of Equity

In finance, the Capital Asset Pricing Model (CAPM) is often used to determine the cost of equity for a company. The cost of equity is the rate of return required to compensate equity owners for taking on risk. Applying this concept to Major League Baseball, the cost of equity can be thought of as the returns required to compensate an owner for the risk of his/her team losing value. Here, I use the cost of equity to discount the net worth of players back to present-day terms. I began finding the cost of equity by obtaining every team's value for each of the past 10 years, according to Forbes. Once I had these values, I calculated each team's annual returns, where return is change in value / old value. Then, I took the geometric averages of the returns across baseball for each year, using these averages as the market rate of return in the CAPM equation. In finance, Beta is used to describe the volatility of a stock relative to the market as a whole and can be calculated as covariance (x, y) / variance (x). I calculated the vari-

ance of each team's returns across the 10-year period as well as the covariance between their returns and the average market return, where MLB is treated as the "market". Once I had the Beta for each team, I was ready to use CAPM to find the cost of equity. According to the CAPM equation,

$$k_e = r_f + \beta(r_m - r_f). \text{ [2]}$$

For the risk-free rate, I used 2.71%, which is the current rate on 10-year US Treasury Bonds. These are as close to risk-free as possible because the US government has nearly zero risk of default.

Regression and Forecast

Once I found the cost of equity for each team, I generated an Ordinary Least Squares regression to measure each player's salary, which represents net worth. To create the sample, I pulled statistical data from Baseball-Reference for each batter under contract with the Yankees as of opening day between 2004 and 2013. I only used players from the Yankees in order to capture their willingness to pay for players. This provides a more accurate depiction of what the Yankees, as opposed to MLB in general, would be willing to pay Robinson Cano. Later, I repeat these steps for the Pirates as well to show that the Pirates' willingness to pay players is significantly lower than that of the Yankees. Additionally, I only pulled statistics for batters because the player I am assessing in this case is a batter (Cano). Had I been assessing a pitcher's worth (i.e. CC Sabathia), I would have used pitchers' statistics instead.[3]

Once I had compiled all the necessary statistics, I regressed salary on more than twenty independent variables, including batting average, slugging percentage, age, games played, stolen bases, walks, and strikeouts. After trying numerous iterations, I settled on a model that regressed salary on games played, plate appearances, doubles, triples, home runs, and on-base percentage. As I will discuss in my findings, this regression provided the most accuracy with variables that were statistically significant.

Upon settling on a regression, I forecasted future statistics for Robinson Cano based on his past performance and JC Bradbury's findings on peak performance ages in baseball. In a January 2010 article for Baseball Prospectus, JC Bradbury published his findings regarding when baseball players' specific skills peak. He found that players' OBP peaks at 30 years old, doubles and triples rate peaks at 28.3 years old, and home run rate peaks at 29.9 years old. Using these peak ages, I treated Cano's career performance as a bell curve, in which his best seasons would be centered on his peak age for each statistic.

Assessing Net Worth

After I forecasted Cano's performance for the next 10 years, I entered his statistics into the regression to estimate each year's salary. This estimation of salary represents the benefit (worth) Cano contributes to the Yankees each year. His cost is the salary he actually earns from the Yankees. Thus, Cano's net worth is the difference between his benefit and his cost. Using the cost of equity I calculated for the Yankees, I discounted Cano's net worth back to present-day terms. If his net worth is greater than zero, then the Yankees should sign Cano to the proposed contract. If his net worth is less than zero, the Yankees should not sign Cano to the proposed contract because the present value of his costs are greater than his benefits.

IV. Data and Results
Beta Calculations

In finance, the Beta value indicates a stock's volatility of returns relative to the volatility of the market, which in this case is Major League Baseball. Volatility is synonymous with risk: the more volatility in a stock's returns, the more risky the stock is. The stock's cost of equity moves with its Beta value (i.e. an increase in Beta leads to an increase in cost of equity and vice versa). The Yankees have one of the highest costs of equity across MLB, which means their returns on value have been highly volatile over the past 10 years. Interestingly enough, the Yankees' value has been increasing across the 10-year period, but in an inconsistent manner (i.e. steep increases in value followed by smaller increases). The geometric averages of returns across baseball decreased dramatically during 2009-2010 before increasing again in the past couple of years. This phenomenon can likely be attributed to the 2008 financial crisis, which had a particularly detrimental impact on industries like sports because they have a highly elastic demand (i.e. in a financial crisis, consumers will give up baseball tickets before necessities like food and water).

Regressions

In order to compare Robinson Cano's benefit to his costs, I needed some way to quantify his benefits. His costs are merely what the Yankees pay him each year, but estimating his benefits was more difficult. The best way to do this was to estimate his worth in terms of salary because his costs were already in salary terms. Therefore, I needed

to find the salary Cano deserved based (1) on his performance and (2) how the Yankees have paid in the past for similar levels of performance. I generated an Ordinary Least Squares regression model to determine how the Yankees pay for different performance measures. I used statistics for all Yankees' hitters as of opening day for the past 10 years to create a regression for salary in the following form:

Salary = β_0 + $\beta_1$games$_i$ + $\beta_2$plate_appearances$_i$ + β3doubles$_i$ + $\beta_4$triplesi + $\beta_5$home_runs$_i$ + $\beta_6$on_base_percentage$_i$ [4]

For the independent variables, I chose to use games played, plate appearances, doubles, triples, home runs, and on-base percentage because this combination of variables yielded a fairly high R2 value: the independent variables do a good job in predicting the value of the dependent variable (Figure 1). Each coefficient on the independent variables was statistically significant at a 95% confidence level. Choosing these variables also avoided multicollinearity problems in which the independent variables are correlated with each other (i.e. plate appearances and at-bats are highly correlated, so I did not include a variable for at-bats in the model).

In the regression, the coefficients on games, doubles, and home runs are negative, which may seem counterintuitive. One might wonder, "If a player hits more triples, why would his salary actually decrease?" The reason for these negative values is that the model compensates for a highly positive coefficient elsewhere. For example, the coefficients on doubles and triples are negative because the coefficient on home runs is significantly positive. In aggregate, the total number of doubles, triples, and home runs will have a positive impact on a batter's salary. Another point to consider is that so few triples are actually hit that its negative coefficient will have a minimal impact on the model anyway. When I input Cano's 2013 statistics into the regression, his salary is expected to be $15,350,606.59. This value is similar to his actual salary of $15,000,000, so the model appears to be quite accurate (2.34% error). This difference also shows that the Yankees received a positive net worth from Cano because his contribution was higher than his actual salary. As I will demonstrate next, this would not prove to be the case for the rest of his career if the Yankees agree to the proposed contract.

Cano's Net Worth

To forecast Cano's statistics over the next 10 years, I divided JC Bradbury's peak ages by Cano's age at the time and multiplied this factor by an average of his past performance, centered on his peak age. For example, to forecast Cano's doubles when he is 31 years old, I divided the peak age for doubles, 28.3, by 31, and multiplied this by his average doubles per year between the ages of 28 and 30. To forecast Cano's doubles when he is 32 years old, I divided the peak age for doubles, 28.3, by 32, and multiplied this by his average doubles per year between the ages of 27 and 29. This type of calculation generates a bell curve in which Cano's performance improves until he reaches his peak age and then declines thereon after (Figures 2

and 3).

Once I forecasted Cano's statistics for the next 10 years, I used the regression model to estimate his worth for each year in terms of salary. By subtracting the actual salary the Yankees pay Cano each year, we can see Cano's true net worth to the Yankees in regards to his costs and benefits. The last step in this process is to discount his net worth for each year back to present day terms by using the Yankees' cost of equity calculated earlier.

My findings indicate that the Yankees should NOT sign Cano to the 10 year, $30 million contract he wants because such a contract would cost the Yankees more than $109 million of losses (Figure 4).

V. Implications
Yankees Contract with Cano

Cano's benefits for the Yankees never top $12 million in any of the next 10 years because his peak age has passed. Now that he is 30 years old, one would expect his performance to decrease over the remainder of his career. Therefore, it would not be advantageous for the Yankees to pay Cano such a high salary.

Suppose the Yankees agree to the 10-year term of the contract, but want to pay $8 million per year instead of $30 million. If the Yankees sign Cano to a 10-year, $80 million contract, they will receive a positive Net Present Value of more than $10 million on the contract. Instead of losing a tremendous amount of money, they are actually gaining. The problem, though, lies in actually signing Cano to such a contract when he could certainly get more money by signing with another team. The question is,

"Who is willing to overpay the most for Cano?"

In finance, one often tries to find the break-even point - where benefits and costs are zero and an organization literally breaks even. Retailers often use a break-even analysis to figure out what price they must charge customers to break even, given their cost structure and expected output. In this case, I use a break-even analysis to determine the highest salary the Yankees could pay Cano each year for 10 years and still not lose. I find the break-even salary to be $9,876,163.72 per year. If the Yankees pay Cano more than this per year, the contract NPV will be negative. If the Yankees pay him less per year, the contract NPV will be positive and beneficial for the Yankees.

The final aspect of the model I investigate is how the length of the contract affects the break-even point. Suppose the Yankees offer Cano a 5-year contract instead of a 10-year contract. The break-even salary increases to $10,827,163.72, demonstrating the time-value of money. Salaries paid 10 years from now are more impacted by the cost of equity than salaries paid 3 years from because of compounding interest. In other words, the salary paid in 2023 is divided by $(1+k_e)9$ while the salary paid in 2016 is divided by $(1+k_e)2$. Therefore, shorter length contracts will be less impacted by the cost of equity. Pirates Contract with Cano

Now suppose the Pirates decide they want to sign Robinson Cano. Their valuation for Cano is different from the Yankees' valuation because they are on a smaller budget and have different needs,

similar to how a company would value projects differently (i.e. Wal-Mart would likely pay much more for a storage warehouse than a local convenience store because Wal-Mart has greater resources and needs).

To assess the Pirates' valuation for Cano, I needed to generate a regression for how the Pirates value players, just as I had done for the Yankees (Figure 5). The Pirates regression has a smaller R2 value and not all of the coefficients for independent variables are statistically significant. However, I used the same variables as in the Yankees regression in order to maintain consistency for easier comparison between models. I discounted

> *"I essentially treat each MLB team as a stock and MLB at alrge as a market. Doing so allows me to treat each player as a project that can be undertaken or not."*

benefits and costs using the Pirates' 11.587% cost of equity instead of the cost of equity I used before in the Yankees' valuation.

As one might expect, the 10-year, $300 million contract is even worse for the Pirates than for the Yankees; such a contract would result in a negative NPV of more than $177 million for the Pirates. Even the 10 year, $80 million contract has a negative NPV for the Pirates and should therefore not be signed (Figure 6).

A break-even analysis of a 10 year contract shows the Pirates can afford to pay Cano $2,312,409.26

per year for 10 years – significantly less than the nearly $10 million salary the Yankees could pay Cano for 10 years. If the Pirates sign Cano to a 5-year deal instead, they can pay him $2,391,623.99 per year. The implication of this finding is that the Pirates cannot compete with other teams to sign a player of Robinson Cano's stature, given what they have paid for players in the past. This helps explain why teams like the Yankees, Red Sox, and Dodgers continue to sign many of the big names in the free agency market.

My findings show that Robinson Cano is not worth the $30 million per year he is reportedly requesting from the Yankees. In fact, there is likely no player worth that much money. In the recent free agency environment, players like Josh Hamilton, Albert Pujols, and Alex Rodriguez have received long, high-paying contracts only before failing to meet performance expectations. By analyzing how teams have paid for players in the past, I was able to determine how these teams should pay for players in the future.

VI. Limitations of Model

One of the major limitations of the model is that the Random Walk does not hold in Major League Baseball free agency. In finance, the Random Walk says that the best estimate of a stock's price today is the price yesterday. In other words, future prices are based on past prices. In this paper, I have assumed that teams will pay future players similarly to how they have paid players in the past. However, this may not always be the case, especially when organizations have undergone

significant management or owner-ship change. Similarly, it seems we are in a transitional era for baseball contracts. Prominent agents like Scott Boras and developments in the most recent Collective Bargain-ing Agreement have contributed to an era of generally higher salaries across MLB. If I were to write this paper again in 10 years, my find-ings would be much different. VI. Limitations of Model

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Another limitation is that there may be important factors for salary that are exogenous to my model. The regressions I use only include 6 independent variables and are cer-tainly not comprehensive. Maybe some teams value on-base percent-

age more than others. Similarly, some teams value slugging percent-age more than on-base percentage because they are more concerned with extra-base hits. Players may also contribute non-baseball bene-fits that are difficult to quantify, like popularity and leadership. While these contributions are palpable, they are not included in my cur-rent model because of how difficult they are to measure. In the future, I would look to build more variables into the model.[5]

Furthermore, this paper only analyzes generic contracts of a standard amount of time. In prac-tice, MLB contracts often have in-centive clauses or player and team options. For future versions of this paper, I will look to include these special terms into my analyses.

VII. Summary and Conclusion

In this paper, I have demon-strated how common financial and econometric principles can be used to assess Major League Baseball free agency contracts. Using tools like Net Present Value analyses and Ordinary Least Squares regres-sions, I showed why the Yankees should not sign Robinson Cano to a 10-year, $300 million con-tract. Generating a regression for the Pirates' salaries over the past 10 years allowed me to show how Cano's contract is even worse for the Pirates than for the Yankees. Overall, a team's valuation of a player should be based on (1) that player's forecasted future perfor-mance as predicted by his past performance and (2) how the team has paid players with similar levels

of performance in the past.

If front offices across Major League Baseball incorporate sim-ilar techniques into their evalua-tions of players' contracts, they will be able to make more educated, intelligent decisions. It is my belief that using these tools, MLB organi-zations would be less likely to sign players to incredibly lucrative con-tracts that are unwarranted given their past performance.

End Notes
1. In this paper, I use the terms "value" and "worth" interchange-ably.
2. Where k_e is the cost of equity, r_f is the risk-free rate, β is the Beta coefficient, and rm is the market rate of return.
3. This leaves a significant amount of room for future research in the area of pitchers' contracts.
4. Where β is the coefficient on the variable and i is the number obser-vation out of the n total number of observations. Salary is the depen-dent variable and is being regressed on games, plate appearances, doubles, triples, home runs, and on-base percentage.
5. That being said, the reason I do not include more variables in this model is to avoid multicollinearity, which describes when two or more variables in a model are highly correlated. The more independent variables I added, the greater the presence of a multicollinearity problem, thereby skewing the results.

VIII. Figures

Figure 1 – Forecast of Cano's Statistics

Year	Age	Games	PA	Doubles	Triples	Home Runs	OBP
2005	22	132	551	34	4	14	0.320
2006	23	122	508	41	1	15	0.365
2007	24	160	669	41	7	19	0.353
2008	25	159	634	35	3	14	0.305
2009	26	161	674	48	2	25	0.352
2010	27	160	696	41	3	29	0.381
2011	28	159	681	46	7	28	0.349
2012	29	161	697	48	1	33	0.379
2013	30	160	681	41	0	27	0.383
2014	31	158	664	41	3	28	0.371
2015	32	154	648	40	3	28	0.359
2016	33	147	622	39	3	25	0.348
2017	34	140	589	34	3	20	0.338
2018	35	134	565	33	3	17	0.328
2019	36	119	503	31	2	13	0.319
2020	37	111	467	30	2	13	0.311
2021	38	108	455	29	2	13	0.302
2022	39	105	443	28	2	12	0.295
2023	40	102	432	27	2	12	0.287

*Yellow highlighted cells represent future projections.

Figure 2 - Graphical Forecast of Cano's Statistics
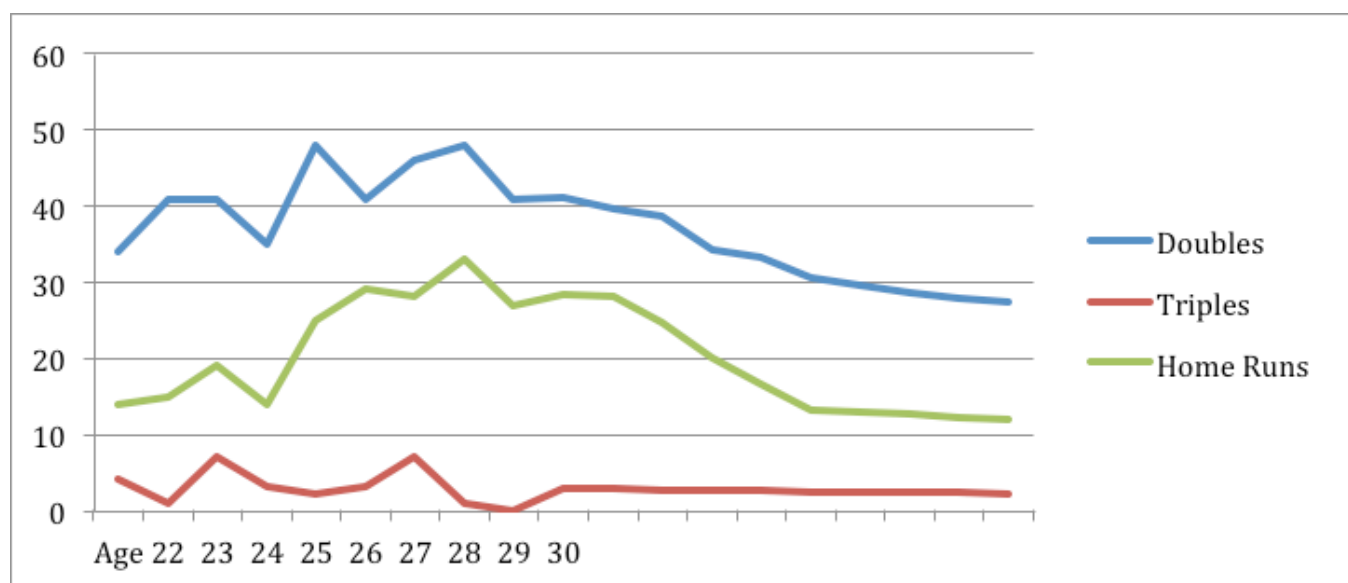
Wall Street Ethics

Darwin Li

Princeton University

To what extent do the ethical transgressions and corporate governance issues on Wall Street stem from the flawed character of those involved?

In light of the 2012 Libor rigging scandal, the high-profile SAC Capital and Raj Rajaratnam insider information cases, J.P. Morgan's $7B trading mishap, and many other recent scandals pervading the financial industry, an anonymous survey commissioned by law firm Labaton Sucharow was administered to professionals in the field[1]. Alarmingly, without even accounting for socially desirable responding bias, more than 25 percent of respondents reported having personally witnessed wrongdoing in the workplace and 24 percent believed that breaking the rules was imperative for success. The recent spate of corporate scandals by some of the industry's most lauded, and the skeptical view of Wall Street by even financial professionals cannot be accounted for by a few rotten apples. Though there may be evidence that the financial services industry attracts innately more unethical personalities, further analysis comes to show that it is the hierarchical structure and highly competitive environment of the industry that create moral blind spots, and produce an environment conducive to unethical behavior by otherwise conscientious individuals.

It is easy to attribute the rampant ethical transgressions committed on Wall Street to the general disposition of individuals the profession attracts. But despite correlational findings by some studies supporting this belief, there are many issues left unaddressed. For example, in a personality inventory test conducted by SimilarMinds[2], the top traits found among finance, economics, and business degree holders (feeder degrees into Wall Street) included the need to dominate, materialism, and extravagance. These are the same traits of many individuals who have answered yes to the question "Have you at times taken advantage of others to achieve your ends?" in a separate inventory test. Though one cannot dismiss the correlation, there is still no basis for causation. Additionally, given these findings, why are there fewer ethical transgressions in places such as the Federal Reserve, commercial banks, and various federal departments, all of which also have a high concentration of economics, business, and finance majors? And how can normally upstanding characters such as Rajat Gupta, who served on the board of numerous global health initiatives and global business initiatives (including those for the UN), and who for the most part does not possess the stereotypical "shady banker" traits, be led into something as illegal as an insider trading scheme?

A more logical and complete reason for the unethical behavior of finance professionals can be attributed to the highly competitive environment of the industry. Thirty percent of the Labaton survey respondents reported that compensation prospects combined with the

numerous conflicts of interests that permeate Wall Street create pressure to engage in unethical and illegal behavior. A deeper look into the industry reveals more. It begins with the accentuation of many biases, including in-group bias (favoring those around you) and discounting the future, as a result of the countless encounters with ethically controversial situations that are less frequent or otherwise not present in other industries[3]. A general example that occurred widely prior to, and served as a cause of the 2007 financial crisis is the behavior of employees of auditing firms. After repeatedly witnessing coworkers and superiors give an OK to subprime securities (in-group bias) without suffering repercussions, many auditors would feel a certain pressure to do the same as they begin to favor lucrative incentives to whatever improbable consequence may occur if caught (discounting the future). Furthermore, after the first incident of moral disengagement (creating excuses to justify unethical behavior) and ethical transgression, it becomes easy to slip into moral fading (engaging in increasingly more unethical activities) followed by selectivity of memory which desensitizes individuals from their immoral behaviors. This process explains how unethical actions may lead to illegal ones. One example, among others, is the infamous case of Bernard Madoff who ran a $65 billion Ponzi scheme, the largest in all of US history. Upon making several poor trades, Madoff began paying a small portion of investors with the money from other investors to cover for the losses (moral disengagement). Despite being able to make payments when required to in the beginning, this practice of covering up losses

was repeated in larger increments upon further losses (memory selectivity and moral fading). And the rest of the disconcerting story is well-known.

Other examples include those of infamous insider trading cases. The 1980s were an exciting time for Wall Street as improved technology and increased information flow revolutionized the finance industry. Stock markets reacted with much greater speed and efficiency to market events including IPOs, earnings reports, and other company information. With these improvements, however, came increased incentives

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"The hodgepodge of social signals bankers receive about what their peers are doing, how their actions harm/help in-group members, and most importantly, what their boss expects is hard to change and inhibits whistleblowing."

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to obtain information regarding company news quickly, especially mergers and acquisitions. Inevitably, this paved the "silk road" for many traders to illegally seize and act upon insider information. At first, the overwhelming majority of traders knew acting on inside information was illegal, and could result in severe repercussions (fines, prison, job license, etc.). Yet as other traders remained elusive to the SEC, and began to climb up the corporate ladder, the pressure to engage illegally was overwhelming. Using excuses such as, "everyone else is doing it" and "I'll just trade a few

shares illegally, I'll never get caught", traders underwent the process of discounting the future and moral disengagement. Such was the case of Dennis Levine and Robert Wilkis who had developed a close relationship while working at Citi together in the late 70s. Pulitzer Prize winner James Stewart describes how Levine pulled Wilkis into trading on inside information in his book <u>Den of Thieves</u>[4].

"Levine asked whether Wilkis might be able to get him information about pending deals at Lazard which would help him …. Wilkis was apprehensive. He knew …employees could be fired even for opening a brokerage account without telling the firm so the trading could be monitored by compliance departments. And there was no doubt that insider trading was a crime. 'It's illegal, Dennis.' Wilkis said. 'I'm scared.'" (pg. 66).

However, with time, Wilkis began to undergo moral fading as he started falling behind his peers in the workplace, and saw the lavish lifestyle Levine was enjoying through his illegally obtained profits.

"It was true, he rationalized, that everyone on Wall Street seemed to be turning confidential information to their advantage. What was the real harm? Didn't the legitimate work he was doing often enrich the investment bankers with little or no corresponding social good anyways?"

From this example it can be seen that the everyday trader did not go into Wall Street without a moral conscious. Most if not all financiers have a keen sense of what is right and wrong. But due to certain environmental conditions, any professional

in the industry may slide down the slippery slope and go from behaving lawfully to unethically to illegally. Ultimately, both Levine and Wilkis were exposed and punished. And through the plea bargaining system, a whole viper's nest of other white collar criminals was discovered—each of whom was dragged into the affair in a manner similar to Wilkis'.

Though this process explains why finance professionals may be more tempted to engage in unethical behavior, an equally important issue is why such behavior goes unreported by observers. The answer to this question lies in the culture of Wall Street. The hodgepodge of social signals bankers receive about what their peers are doing, how their actions harm/help in-group members, and most importantly, what their boss expects is hard to change and inhibits whistleblowing. Furthermore, reporting unethical behavior often harms the whistleblower more than the wrong-doer. Take Michael Winston for example, a former corporate strategist at Countrywide. In 2006, the president of Countrywide, Dave Sambol, asked him to come to New York and fabricate a story to Moody's, a credit rating agency, to cover up the fact that Countrywide had gone without a president or COO for five months without informing investors. When Winston refused to lie, CEO Angelo Mozilo demanded Winston's relocation, salary decreased, responsibilities cut, and, ultimately, termination. After months of pursuing a series of court cases against Countrywide, Winston eventually failed in prosecuting the bank, had to pay exorbitant legal fees as well as retribution costs to the bank, and could never find work after the ordeal[5]. Though programs incentivizing whistleblowing are in place[6], nothing has been done to reinforce the protections outlined in these provisions. As for reporting insider trading, many individuals do not report colleagues engaging in the illegal activity because 1. They do not want to go through the hassle of the whistleblowing process and get caught up in the quagmire, 2. They do not want to have the reputation of a die-hard rule follower, and the negative stigma that comes from it (and face the negative treatments Winston faced prior to his termination), 3. They themselves have some sort of dirt and in the quid-pro-quo nature of the matter, would rather not risk their secret being found out either through other whistleblowers or an in-depth investigation into them (such was the case for insider trader Ivan Boesky).

Though solving an issue as large and deeply rooted as the environment at Wall Street may prove difficult, obvious first steps include giving the SEC and other regulators greater power with funding and resources, making sure that whistle-blowers are rewarded, and that the protection program from retaliation is actually carried through while potential whistle-blowers are aware of those rewards and protections, examining and ensuring pay-for-performance as well as other merit pay plans with a skeptical eye to make sure they aren't actually pay-for-misconduct schemes.

Humans are governed by the principles of Skinnerian psychology: We blindly abide to authority, we repeat what works, and we conform to the culture around us. Such traits are an inherent component of human nature, but when pitted against an incentive-based system and culture such as the one in the finance industry, otherwise ethical individuals will be driven towards the wrong direction. Though there have been attempts to regulate and reduce the risk of the industry with legislation, and though professionals are taking more caution when making decisions due to increasing scrutiny, the root of the issue, the environment, is still to be adequately addressed. Until this happens, scandals on Wall Street will continue to persist.

Has the Financial Crisis Changed Attitudes Towards Major Selection?

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Introduction

The search for higher living standards has been an important area of discussion for academics and policy makers alike in the attempt to systemically alleviate poverty. Although popular beliefs espouse the role of investment in the markets, capital accumulation is only one component of economic growth. Economic modeling based on empirical evidence, chiefly written by Robert Solow, demonstrates that roughly 80% of long-term American growth is based on technological progress. Not surprisingly, economists and many other empiricists and social scientists have obsessed over identifying the underlying causes of higher productivity. While we have yet to see formal models that takes these qualitative factors into account, there is large consensus that important ones include the rule of law and property rights, health and perhaps most significantly, education.

In an increasingly complex world, both policy makers and business-es are finding that new workers require ever more skills to cope with the pace of change. Not surprisingly, college enrollments in the United States are skyrocketing. Between 2000 and 2010, full-time college enrollment increased by 45% while female students, relatively new to higher education, increased enrollment by 39%. When compared to the returns to education, these trends are hardly surprising. However, attending college is generally a pricey proposition, with average yearly state school price tags reaching $22,261 private school counterparts reaching $43,289. Although most students receive loans and grants to help pay for school, the global financial crisis has made the upfront cost of college ever more difficult to bear.

This paper will examine the impact of the recent financial crisis on student attitudes towards major selection. From a public policy standpoint, there are many reasons to care about the types of subjects students study in college. For example, the very definition of technological progress in the Solow Model implies that the nation's understanding of science and engineering should be improving. Thus, policy makers need to understand if financial insecurity is increasing or decreasing enrollment in Science, Technology, Engineering and Mathematics majors (STEM). However, we stress that no attempt will be made to answer normative questions of the merits of selecting one field of study over another. Instead, we will choose to answer positive questions linking predictors such as debt burden and future career interests to examine the trade-offs that students make in choosing their academic majors.

One could imagine many applications for the research. Although the financial crisis negatively impacted all college students (albeit some more than others), there is no literature that explicitly suggests a link between the financial crisis and major selection or other variables that might play a role in future careers. There need not be a

large-scale recession to impact the socioeconomic standing of a college student. Illness, divorce and other unforeseen circumstances can impact the financial resources of a student in the same way that the financial crisis did for much of the American population. Thus, while the questions focus primarily on the financial crisis of 2007, some of the results can be generalized to provide insight on the behavior of students when faced with financial hardship. We hope that this insight can improve the knowledge of school leaders and policy makers and inform future decisions on higher-level education subsidies, academic standards and curriculum design.

Literature Review

The majority of the current literature is focused on improving enrollment in STEM fields that policy makers have identified as critical to the national interest of the United States. Currently, less than one in five American students are enrolled in STEM subjects such as biology, chemistry, or computer engineering. The problem is even more acute among non-white minorities: for instance, Hispanic students are less likely to be enrolled in a STEM field than their white peers. In studying all STEM students, Maltese recognizes seven fundamental blocks for STEM enrollment:

1. Demographic and inherited attitudes towards math and science;
2. STEM coursework in 9th and 10th grade;
3. Follow-up surveys for high school freshmen and sophomores;
4. STEM coursework in 11th and 12th grade;
5. Follow-up surveys for high school juniors and seniors;
6. Grades from high school tran-

scripts;
7. Postsecondary enrollment in STEM courses, grades achieved and long-term career and life expectations.

The researcher used a logistic regression to integrate these explanatory variables into a model that predicted the probability that a student would enroll in a STEM subject and retained all variables, regardless of statistical significance. He found that while socioeconomic status had no impact on STEM completion (as

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"The impact of the financial crisis on major selection is examined. Socioeconomic factors are not as immportant as passion in determining likelihood of finishing STEM majors."

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determined by gender, ethnicity and parental education background), passion for STEM fields was significantly more important than any other variable. Students who believed that science and math would be useful in their future career and could see themselves in the field at age 30 were the best predictors of STEM degree completion. Although the odds ratio was also very high for Asian-American ethnicity and college preparedness, desire to be in STEM fields upon graduation far outweighed any other variables. On the other hand, Crisp and her team of researchers found that environmental factors and demographics played an important role in determining whether or not the student chose to major in a STEM field, especially

for Hispanics and other disadvantage minorities. While many of the same insights were derived, some of her results contradict Maltese's findings. For instance, socioeconomic background did play an important role throughout the major selection process. Surprisingly, in addition to receiving more Pell Grants (scholarship money for economically disadvantage students) and other federal aid, Hispanics were more likely to declare and complete a STEM major. More importantly, high school preparation played an important role in STEM degree completion. Students enrolled in Algebra I were 2.74 times less likely to graduate with a STEM degree; moreover students enrolled in Biology I were 5.74 times less likely to graduate with a STEM degree. However, this most likely correlates well to high school preparation. Most students who are termed "well-prepared" for college STEM majors have already taken calculus, physics, chemistry and biology in high school, precluding the need to enroll in Algebra I or Biology I their first semester of college.

Thus, how do we best explain the large discrepancy between the two studies? Both used the same statistical tools (large samples using logistic regression to determine the likeliness of graduating with a STEM degree based on many of the same categorical predictor variables). First, Crisp's study included 1925 students, over twice the size of Maltese's pool of data. Another important consideration is multicollinearity between the explanatory variables. Maltese's model includes variables such as excitement about math and science classes in addition to demographic variables on income and expecting a STEM career at age 30. It is possible that there exists a

strong correlation between ethnicity and parental education level on expectations of a STEM career. For instance, Asian culture tends to promote studying the natural sciences in secondary school while parents with higher education levels could be encouraging their students to study STEM fields. If the correlations are strong enough to drive up the variation inflation factors (VIF), the logistic regression could be severely weakened by multicollinearity. In this case, a ridge regression would be necessary. Crisp's study, which left out attitudes, seems to acknowledge the possibility that demographics are affecting student attitudes towards STEM fields (and thus degree completion). However, it should be noted that in her sample consists of high-achieving Hispanic students with average class rankings above that of their white peers, potentially biasing the results. This is not representative for the United States as a whole.

Closer empirical analysis is necessary to understand the underlying forces behind major selection. Clearly, passion for the field, whether in science, economics or literature, matters a lot. However, analytic removal of multicollinearity while introducing other factors

may be necessary to better establish the causal relationship of financial resources to major selection. In the case of STEM fields, it is not at all obvious how financial shocks (including the recent crisis) would affect college major selection. On the one hand, if we assume that STEM fields make on average more than non-STEM fields, the income effect will increase STEM enrollment when financial resources decrease because the cost of completing the major is the same regardless of subject, making non-STEM fields more expensive on a relative basis. However, the substitution effect could be so large in the negative direction that STEM enrollment falls during times of financial hardship. Since substitution is determined by preferences, it is especially important to determine these preferences through empirical studies.

Thus, the logical first step is to understand the size of the hardship on students caused by the financial crisis. It is not enough to compute reductions in family income because universities have considerable funds (endowments) that provide financial support on the basis of both need and merit. As a result, the financial position of universities is paramount to determining

the financial position of students, as very few students of interest pay the full price tag (if students are reasonably wealthy and can afford to pay $60,000 to attend a top private university, then we can assume that financial shocks have no bearing on major preferences).

Nevertheless, universities have had to increase financial aid packages in the wake of the recession. Although universities are able to price discriminate because they command brand loyalty and know the financial position of every applicant (CSS and FAFSA forms), there is sufficient competition in the market to equilibrate at higher aid packages. There is also an altruistic component: universities are not-for-profit institutions that have a public mission and therefore care about the financial means of their students. Thus, while the financial crisis has severely hurt the most vulnerable demographics and their affordability of graduating from college, universities have done all they can to help reduce the financial burden. As a result, absolute debt burdens rather than relative ones based on attendance costs are more important to study.

In addition to demographic and financial components, we look to

understand the attitudes of major selection, including psychological responses to the recession. While no rigorous study has ever quantified the "difficulty" of various majors, accepted evidence shows that STEM fields and other quantitative subjects such as economics are more difficult to complete than qualitative majors such as communications and gender studies because of the challenge of building up a broad and deep knowledge base. Thus, one can reasonably expect that students struggling with psychological well-being are less likely to pick quantitative. Studies have shown that the financial crisis has had some impact on the well-being of students. In a paper written by three German psychologists, college students are in slightly lower general health and have higher stress levels than employees currently in the work force. The distress effect is most pronounced for female students, who fear that their job prospects have worsened due to the financial crisis. Although the overall effects are not drastic, the additional psychological burden may have some impact on major selection, possibly to the detriment of STEM fields. Therefore, our research will focus on finding and quantifying those effects, if any.

Haven taken into account the primary first-order effects of the recession, we can seriously begin to pose questions to students that will elicit their attitudes towards major selection. For instance, has the financial crisis sparked greater interest in fields of personal interest or has job security been the main determinant of course selection? With the help of collected data, we hope to build on the current pool of knowledge regarding academic course selection.

Methods

In order to determine the effects of the financial crisis on course selection, a series of questions were posed to current college students across schools across the nation. The questions were divided into demographic, career preference, and academic attitude categories. The questions are outlined below:

1. What is your gender?
2. What is your graduation year?
3. What are your majors?
4. What are your minors and certificates?
5. What is your level of debt?
6. What are your top two career choices? (Choices included general management, finance or consulting, education, engineering, medicine, applied math and science, research, agriculture and farming, government, social work, or other not listed)
7. How important is monetary compensation in your future career?
8. How important is making a positive impact in your future career?
9. How important is a good working environment in your future career?
10. How important is work-life balance and having time to raise a family in your career?
11. How important is advancement in your future career?
12. The financial crisis has made me more aware of job insecurity?
13. Are student loans a deterrent to attending college?
14. Is it more important to study something practical than something enjoyable?
15. STEM is a good way to establish a career?
16. I am satisfied with my major. For questions 7-16, respondents were instructed to select from a scale of 1-5, where 1 was the worst (or least agreement) and 5 was the best (or most agreement).

Each subsection and question had a unique purpose. The demographic questions are meant to control for underlying socioeconomic biases in the data. Although previous research has found that demographic data does not always predict participation in STEM majors, there may be multicollinearity effects with other variables that are important in the analysis. The use of demographic data is intended to provide response variables of interest (namely, majors and minors) as well as discover if gender biases or indebtedness (the costliness of attending college) are of concern. On the other hand, questions 6-11 deal with career interests and the employment attributes that students desire in their future career. These are important considerations in major selection. For instance, if a student desires to make an impact by working in the social sector and taking less pay, it is possible that they are less likely to select a STEM major. On the other hand, if career advancement in the engineering profession is important to the respondent, then selecting a STEM major will be absolutely essential. Finally, the concluding five questions ask about the personal preferences of the student as they concern academic studies. Although a particular person may have wish to pursue a particular job or walk of life, he or she may also feel that the particular choice set is not within his or her grasp. For example, while a student may want to work as a

defense lawyer, he or she could feel severely constrained by student debt and thus decide to select a major that is more practical to his or her future financial stability. Taken collectively, these questions seek to find some of the important factors that drive the decision to choose one set of academic majors over another.

Unfortunately, there are practical limits to the survey's reach. In the perfect world, researchers could ask many questions to pry as many data points as possible. However, this is not the case. Asking too many questions would irritate respondents, reducing the number of data points collected. Thus, we were required to make the optimal tradeoff between the number of people taking the survey and the depth of information, leaving some areas unanswered (i.e. ethnicity). However, questions were selected in such a way that maximized the amount of new information that could be collected because previous literature has researched some of the potential predictor variables that were left out of the survey and therefore the model.

Moreover, without unlimited funds to distribute questions through traditional means, the survey was posted on Facebook groups, emailed to acquaintances, and passed along through secondary channels that people taking the survey may have accessed to spread it to their friends. In order to incentivize students to take the survey, a prize of $40 was offered to a random person who completed all questions. The survey was kept open for six weeks starting in late October and closed in early December and garnered 112 responses from various universities, backgrounds and career outlooks, maximizing the amount of time that students could provide information. Although there were initial concerns about the amount of quality of data available, enough information was collected to draw some conclusions on the behavior of students with regards to major selection.

After collecting the data, we made several manipulations to make the data available for model creation. First, the response variables were turned into binary categorical variables. Persons majoring in non-STEM fields were given a value of 0 while those with STEM majors were given a value of 1; likewise, a separate variable was created for minors with the same 0 and 1 variables. In order to account for the possibility of double or even triple majors split between STEM and non-STEM fields (i.e. mathematics and economics), respondents with at least one STEM major received a value of 1. However, a new binary categorical variable was created to capture the possibility of multiple majors. Those with only one major were given a value of 0 whereas people with two or more majors received a value of 1. However, the same manipulation was not carried out for multiple minor fields because on average, they are not significant enough to substantially change career trajectories. Finally, those who had no interest in STEM careers were given a value of 0, whereas those interested in a career in at least one STEM field (defined as engineering, applied math and science and medicine) were given a value of 1.

After converting the data into the necessary categorical variables, statistical package Minitab 16 was used to conduct the analysis. Since the response variables (STEM versus non-STEM majors and STEM versus non-STEM minors) are binary categorical variables, the binary logistic regression program was used to determine the odds ratio of each of the variables. In turn, the odds ratio determines the probability that the response variable increases with an increase in the predictor variable. Although many of the variables are not statistically significant at the .05 level, the regressions still delivers practically important results because they provide insight into key policy questions relating the impact of financial shocks such as the recent crisis on the academic choices and career interests of students. Before proceeding with qualitative analysis, an ordinary multiple regression was conducted to determine the VIFs and rule out the possibility of multicollinearity. VIFs within the range of 1-5 display little correlation while those in the 5-10 range show mild multicollinearity and numbers above 10 raise concerns about the validity of the model due to the interrelated effects of variables. In these cases, the variable may need to be explained or adjusted using ridge regression. Finally, after creating the multiple regression models, ordinary least squares were used between predictors to tease out other interesting information. Using this mode of analysis, we are able to provide meaningful results that have possible cultural and policy implications.

Results

After running the binary logistic regression for STEM versus non-STEM major enrollment, Minitab provided the following results: see Table 1.

From these data, it is clear that there is the correlation between

variables is relatively weak. As a result, alternative techniques such as ridge regression to remove multicollinearity are unnecessary as there is not adverse impact on the validity of the model. On the other hand, many of the p-values are excessively high; only two predictors are statistically significant at the .05 level, while a third can be considered at the 0.1 significance level. While the conclusions can be somewhat hampered, we can still draw some general ideas. See Table 2.

Again, it is apparent that there are no multicollinearity effects in the data. However, the p-values are even less significant for minor selection than for major selection, diluting the ability to make definitive conclusions. Although this makes intuitive sense for reasons that will be discussed later, the range of conditions that recommendations will be made for is not as broad as would otherwise be the case had the p-values been more significant.

Below, three ordinary linear regressions are presented linking the impact of beliefs of job insecurity due to the financial crisis on the importance of picking a practical major, desirability of STEM fields as a way to launch careers and the importance of making an impact during work. In addition to the model on major and minor selection, these models will be used to make meaningful conclusions on how particular career and academic beliefs are formed in relation to financial disturbances. See Chart 1, 2, 3.

Discussion

The nature of the survey and the means available at our dis-

posal presents difficulties in analyzing the results. First, although the sample size was 112 students, more responses would have been necessary to reduce the p-values to acceptable ranges. Moreover, it is highly unlikely that the sample was a random sample of American college students. Nearly all of the students of the survey attended elite institutions of higher education in the United States, including Northwestern University, the University of Rochester, and the University of Florida. They leave out an important portion of the American student population, namely those in community colleges and lesser-known universities, who are in no way less important to policy making than the students who responded to the survey (they are arguably more important because students attending those schools are less wealthy and more likely to respond to shifts in financial means). However, we did not remove any predictor variables, as doing so would be somewhat arbitrary at the relatively low sample size.

Nevertheless, there are several key features to note from the regression analysis. First, the logistic regression model for major selection shows that career interests are by far the most important determinant of major selection. With an odds ratio in the triple digits, there is no doubt that job aspirations influence major selection. However, this insight is not particularly revealing, as any model that predicted an inverse relationship between career interests and major selection would be immediately disregarded as nonsensical. On the other hand, debt level seems to have a neutral

effect on major selection (odds ratio of 1). From a policy point of view, this is a positive development: agents are acting optimally if they allow their interests, not financial constraints, drive their academic and career aspirations. Otherwise, policy makers could reasonably worry about distributional effects because students from less wealthy backgrounds would see distort their major choices to fit financial means. Moreover, societies that permit their citizens to follow their preferences tend to be happier and perform better economically because they become innovative and diverse rather than stale and narrow. However, sample bias could explain this effect since respondents tended to be relatively well off; the results need to further considered before making definitive recommendations.

Based on other variables, there does seem to be an underlying contradiction between the relationship of debt and major selection and other predictor variables. Students who believed that student loans are a deterrent to attending college and that studying practical fields are more important than enjoyable ones are more likely to select STEM fields (odds ratios of 1.42 and 1.84, respectively). This tends to agree with Crisp's findings, which found that students receiving Pell Grants were more likely to declare and complete STEM majors than those without them. As a whole, the major selection seems to be primarily driven by career interests as well as beliefs about the necessity of choosing a major with "a stable future." Nevertheless, this effect could be driven by sampling bias because the primary

channels of spreading the survey included the Facebook group pages of engineering students, which may also partially explain the large odds ratio for years in college.

On the other hand, searching for the drivers of minor selection in STEM versus non-STEM fields is substantially more challenging and potentially insignificant. College students typically select minors to pursue an area of intellectual interest or to improve their "employability." Thus, the relatively high odds ratios for career interests (2.68), working environment (2.09), work-life balance (2.09), and major satisfaction (2.96) seem to support this hypothesis. However, the p-values for minor selection are even higher than those for major selection, with the lowest still above the 0.1 threshold. Thus, an important question is whether or not the p-values inherently high or if the survey is too biased to draw conclusions. To be sure, improvements could be made to the data collection. However, a glance at the OLS regressions connecting the impact of the recent financial crisis on attitudes towards practical majors, STEM fields and making an impact at work illustrate the underlying randomness of the data. In fact, none of the r-squared values exceeded the low single digits!

At first glance, this seems like a bad result because the model inherently lacks statistical validity. However, this does not preclude practical significance. If agents were acting according to their preferences, we should expect to see more or less random responses to questions about career and academic attitudes. Every individual has different utility and risk preferences, and therefore, there should be little if

any correlation between neither the underlying variables in the model nor tightness in the spread of data. If there were, incentives in the education field would not be properly functioning.

The strongest example of this effect is the relationship between the financial crisis and the importance of making an impact at work. Some people are driven primarily by financial rewards while making a positive societal impact motivates others. In the optimal world, there should be little if any correlation between the recent meltdown and job utilities as a function of impact and pay since agents' innate preferences should not respond to temporary shocks. This is precisely what the data bears out: there is zero correlation between the two variables! Thus, from the policy maker's point of view, these results validate the current course of action with respect to incentives for academic career selection because students are enrolling in subjects that generally make them happiest in the long run. The true underlying issue is thus access to higher education, which is beyond the scope of this paper.

Conclusions

In the beginning, we sought to discover whether or not the recent financial crisis had any impact on the academic aspirations of students especially as they pertained to STEM major selection. After collecting data from currently enrolled university students across the United States, we found that career interests and concerns about loans and practicality dominated the decision to major in STEM fields. On the other hand, the decision to complete STEM minors was pri-

marily driven by satisfaction with the respondent's major and career aspirations in addition to future work interests. The financial crisis itself seems to have made no impact on students' attitudes towards major and minor selection.

There are certainly limitations of this study due to the relatively small sample size and the narrow selection of students who partook in the study. Nevertheless, these can be fixed by future studies with more connections and financial resources to expand the sample size into the thousands across a range of higher education institutions from community colleges to Ivy League universities. Despite its limitations, the paper has several important results. Students really do select majors because they love the subject and want to spend the rest of their careers in the field. While debt and concerns about practicality invariably have some effect, they are relatively small in comparison to the underlying preferences of the student. For policy makers, this means that the best way to influence major selection is not by providing subsidies to certain fields of study but to promote STEM subjects relatively early on in a child's education. Most importantly, government officials can rest assured that for the most part, the higher education system does not distort students' internal incentives to select majors, and the real burden rests on improving access to universities and the quality of preparatory schoolwork. For a nation struggling with many important decisions, this is welcome news indeed.

Predictor	P-value	Odds ratio	95% CI odds lower	95% CI odds upper	VIF
Gender	0.450	0.52	0.10	2.80	1.238
Years in school	0.616	9.83	0.40	1.73	1.069
Double major	0.737	1.35	0.24	7.68	1.159
Debt	0.068	1.00	1.00	1.00	1.511
Career choices	0.000	135.15	19.64	929.8	1.188
Pay	0.556	1.38	0.47	4.02	1.780
Positive impact	0.957	1.03	0.39	2.71	1.360
Working environment	0.857	1.13	0.30	4.19	1.294
Work-life balance	0.641	1.25	0.49	3.21	1.327
Career advancement	0.841	0.90	0.32	2.56	1.482
Awareness of job insecurity	0.045	0.42	0.18	0.98	1.170
Student loans are deterrent	0.276	1.42	0.75	2.68	1.138
Practical vs. enjoyable major	0.124	1.84	0.85	4.02	1.707
STEM is good career	0.690	0.85	0.37	1.92	1.591
I am satisfied with my major	0.903	0.94	0.37	2.42	1.313

Table 1: Regression values for binary logistic model on major selection

Predictor	P-value	Odds ratio	95% CI odds lower	95% CI odds upper	VIF
Gender	0.194	0.23	0.03	2.10	1.238
Years in school	0.647	1.27	0.46	3.54	1.069
Double major	0.410	0.41	0.05	3.46	1.159
Debt	0.432	1.00	1.00	1.00	1.511
Career choices	0.381	2.68	0.30	24.20	1.188
Pay	0.924	1.07	0.28	4.04	1.780
Positive impact	0.575	1.74	0.25	11.93	1.360
Working environment	0.516	2.09	0.23	19.35	1.294
Work-life balance	0.348	2.09	0.23	5.60	1.327
Career advancement	0.113	0.34	0.09	1.30	1.482
Awareness of job insecurity	0.454	1.79	0.39	8.28	1.170
Student loans are deterrent	0.467	2.35	0.94	5.87	1.138
Practical vs. enjoyable major	0.882	0.92	0.39	2.67	1.707
STEM is good career	0.534	1.46	0.44	4.87	1.591
I am satisfied with my major	0.203	2.96	0.56	15.73	1.313

Table 2: Regression models for binary logistic model on minor selection

The impact of financial crisis on choosing practical or enjoyable majors

Practical major or enjoyable major? vs. The financial crisis has made me aware of job insecurity
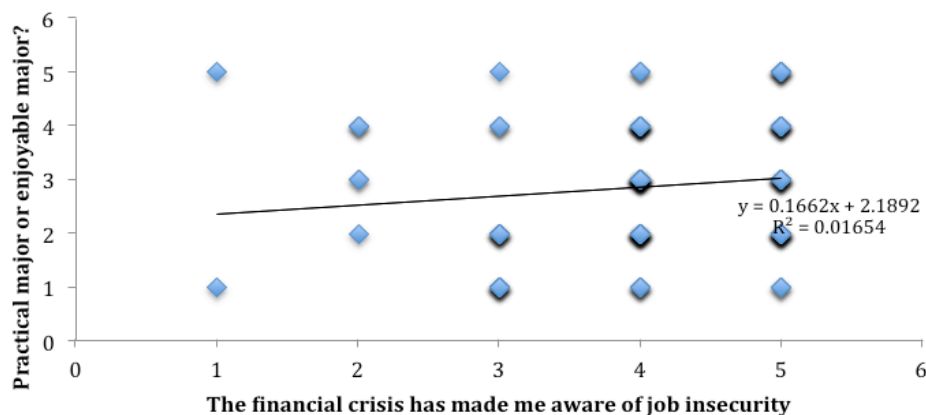
$y = 0.1662x + 2.1892$
$R^2 = 0.01654$

Chart 1: The impact on the financial crisis on attitudes towards practical versus enjoyable majors

The impact of financial crisis on career desirability of STEM fields

STEM is a good way to establish a career vs. The financial crisis has made me aware of job insecurity

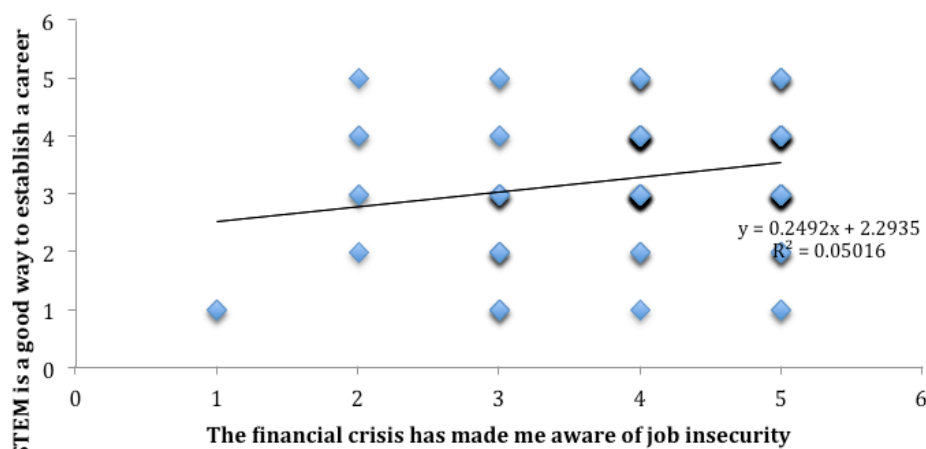$y = 0.2492x + 2.2935$
$R^2 = 0.05016$

Chart 2: The impact on the financial crisis on attitudes towards the attractiveness of STEM careers

The impact of financial crisis on the importance of making an impact in future career
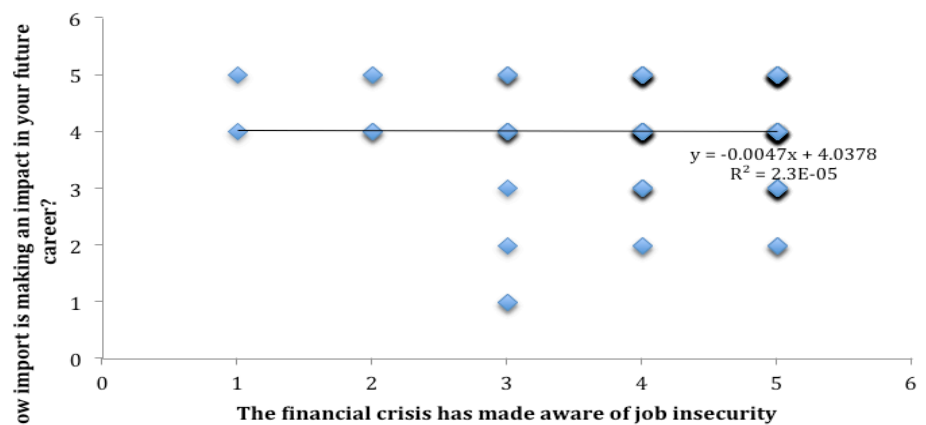
How import is making an impact in your future career? vs. The financial crisis has made aware of job insecurity

$y = -0.0047x + 4.0378$
$R^2 = 2.3E\text{-}05$

Chart 3: The impact on the financial crisis on the importance of making an impact at work

Rethinking "Das Adam Smith Problem"
Self-Interest and Sympathy

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It has been the tradition of mainstream and neo-classical economists to regard Adam Smith's "invisible hand" as the key to economic growth. If we just let everyone pursue their own self-interests we would be better off. Much less attention has been paid to his first major work, published more than sixteen years before The Wealth of Nations and one that he was most proud of, The Theory of Moral Sentiments. In it we find in the opening sentence that no matter how selfish an individual may be, there is an inherent tendency for him to seek the happiness of others, and gain pleasure from it even though he may not forsee any reciprocity. This seems starkly different from what we hear and read in the current time period; which is mostly individualistic and often synonymous with avarice and a callous regard for others. Smith actually intended self-interest found in Wealth to be grounded in the context of sympathy he established in Moral Sentiments. This contradictory façade goes clear back to German scholars in the nineteenth century whence they termed it "das Adam Smith problem." The purpose of this paper is to explain the principle of sympathy and also cover the topic of self-interest within that context. I will quickly cover the topic of self-interest as it has been exhaustively exposed and then put more emphasis on the lesser known principle of sympathy.

> "Smith actually intended self-interest found in The Wealth of Nations to be grounded in the context of sympathy he established in Moral Sentiments. "

First, it is necessary to get an idea on the type of man Adam Smith was with a brief history of his academic life. This will allow for a better understanding of the philosophic brilliance of whom all economists agree is the most sophisticated moral philosophers of all time, and rightly dubbed the "father of modern economics." Adam Smith was notorious for being absent-minded. There are several notable accounts of his scatty behaviors. For example one account recalls a phatic conversation between Smith and his colleague falling into a tanning pit (Heilbroner 1999, p.42). Other accounts recall Smith clothed in a dressing gown entering his garden and while falling into a reverie, walked fifteen miles to Dunfermline before coming to. "Citizens of Edinburgh were frequently amused with Smith attired in a light-colored coat, knee breeches, white silk stockings, buckle shoes, flat broad-brimmed beaver hat, and cane, walking down the cobbled streets with his eyes fixed on infinity and his lips moving in silent discourse. Every pace or two he would hesitate as if to change direction or even reverse it; his gait was described by a friend as 'vermicular'" (Heilbroner 1999, p.45). He was also not the most handsome individual. Most pictures we see

are profiles showing large bulging eyes gazing from heavy lids, an aquiline nose and a protruding upper lip. Throughout his life, he endured a nervous affliction of head shaking while possessing odd and stumbling manner of speeches (Heilbroner 1999, p.45).

The absent-minded professor, however, was brilliant in his philosophic endeavors. While showing off his immense library collection to a friend, he described himself as "[A] beau in nothing but my books" (Heilbroner 1999, p.45). At the age of 14 he entered the University of Glasgow, an age that was common at the time, although currently it is reserved for prodigies. He won a scholarship to Oxford, where he spent six years dismayed by the low level of intellectual activity and immorality by his fellow students (Fusfeld 1994, p.23). He also was upset at the quality of instruction at Oxford, where professors were paid without due regard to their efforts (Rima 2009, p.95). In 1751 Smith went to the University of Edinburgh and took up the position of professor of Logic at Glasgow the next year. The most honorable position for him became available in 1753; professorship of moral philosophy, which was Smith's favorite subject. He went on lecturing on ethics and in 1759 he published The Theory of Moral Sentiments (hereafter cited as TMS), a work that he was most proud of, more so than The Wealth of Nations (hereafter cited as WN), since at the time TMS caught the eye of the chancellor of the exchequer, Charles Townshend. Resolving to acquire the best, Townsend wanted Smith to tutor his stepson, the Duke of Buccleuch, for three years on a sojourn to France. In those times, when you wished to learn about An-

cient Greece, the gods, the coliseum, and Rome, you went to Greece and learned by actually being there. This tutorship earned Smith a lifetime pension of three hundred pounds a year, about fifteen hundred dollars nowadays (Fusfeld 1994, p.24), allowing Smith to live comfortably while continuing to pursue academics culminating in his finest work we know today, The Wealth of Nations.

It is in Smith's two greatest works that two phrases, on their face, seem to contradict each other:

"It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves not to their humanity, but to their self-love, and we talk to them not of our necessity, but of their advantages." (WN [1776] 1976)

"How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it." (TMS [1759] 1817)

In the first quote we have a selfish motive to maximize personal gain, and in the second one an altruistic regard for others. This contradiction was subject to brute criticism in the nineteenth century as German scholars dubbed it "das Adam Smith problem". It must be confronted how humans, captive of their own self-interests, can cast aside their selfish considerations to form disinterested moral judgments (Heilbroner 1986, p.58). Can the juxtaposition of these two seemingly contradictory phrases be reconciled

to describe human nature in a socially beneficial manner? I believe the answer is yes, if one think of individual self-interest in the context of sympathy established in TMS.

Smith identifies the basis of all morality as the inherent and natural tendency human beings have to sympathize with the feelings of others. Sympathy is the similarity in perceptions of feelings of two people (Bishop 1995). Moral judgment is explained by our ability to empathize with the situations and actions of others. Heilbroner (1986) pithily describes sympathy as "[T]he way in which we arrive at canons of virtue and criteria of vice." Smith uses the notion of sympathy to explain two kinds of moral judgments: the propriety of an action, and the merit or demerit of an action. The propriety of an action depends on whether our judgment of the act, right or wrong, is deemed appropriate to the situation. In order for this to occur, when we observe another person's actions, or reactions, we enter into vicarious experiences in which we sympathize with their pleasures and their pains. Smith referred to this as the "every spectator", but we would call this the average spectator; having the ability to remove oneself from the situation and judge as a third person. For example, suppose I observe Sally Helperton assist an elderly woman across the street, I sympathize with her action and as a result approve it as morally right. I am able to put myself in Sally's situation and judge that action as appropriate since I would have responded the same way. As a second form of approval, I also sympathize with the elderly woman's feeling of gratitude and thus judge the action as praiseworthy. Taking the opposite situation, suppose I observe Dan

Madman kick a dog that got in his way, I would feel antipathy towards Dan's action and sympathy towards the dog's resentment. The antipathy directed towards Dan results in a judgment of disapproval of his action as morally wrong, while the sympathy I feel towards the dog is an additional and different form of disapproval of the action as blameworthy (Raphael 1985, p.30). Heilbroner (1986) notes we do not spontaneously identify with the emotions of others unless we understand the context of their particular situation or the causes of their feelings. Until we know the context of the observed behavior, we cannot know whether our own judgment will be "positive sympathy" or "negative revulsion."

The judgment of approval or disapproval as a result of sympathy is not necessarily an awareness of an actual feeling that reproduces the motives of those who act or the reactions of those whom the action affects (Raphael 1985, p.31). The awareness derives from imagining what you would feel in the situation of those who are actually involved, rather than actual feelings. For example, if a person was to walk into a glass door, unaware of its existence causing a painful contact, we would imagine the feeling and flinch or cower in deflection, without ever actually experiencing it. It is imagination, therefore, that takes the place of experience and enables the vicarious sympathizing of another's feelings (Rima 2009, p. 96).

How then are we to explain our own actions, when we are the ones being judged, and not the judges? Smith answers this question as imagining ourselves in the shoes of a spectator, one of personal detachment and unbiasedness. My actions are judged by the approval or disapproval of the "impartial spectator". If I know that others would disapprove of my proposed actions, then I will not engage in actions that would be morally wrong. This "impartial spectator" is the mechanism by which I tune my behavior to the pitch of what others would find appropriate and acceptable (Heilbroner 1986, p.58-59). Thus, sympathy is a socializing agent; I feel pleasure through others' approbation of my actions that correspond to the feelings and reactions they
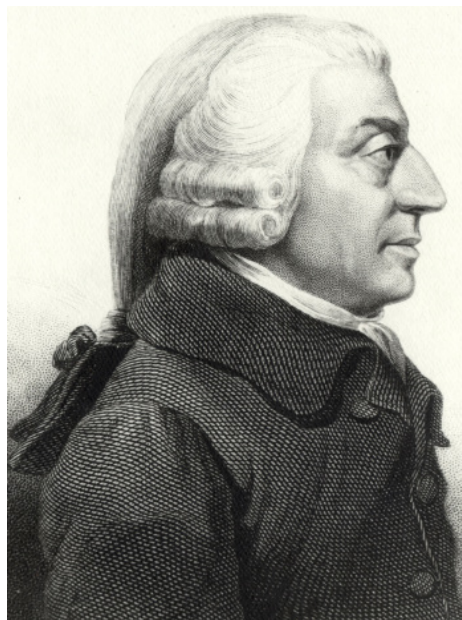
would have if they were in my situation. Conversely, if my feelings and reactions are different from those of the common norm, I will be met with disapproval resulting in uncomfortable tension. This anticipation of approbation or disapprobation induces conformity to social norms both in behavior and in attitude. The desire to have the positive opinions of our peers causes people, generally, to be helpful to each other and not to do harm. It must be noted that sympathy is not coterminous with compassion, and Smith is clear in his definition of sympathy, broad as it may be, as contrasted with compassion. Compassion may cause

one to act in a benevolent way and to offer help in a moment of need, but sympathy is not the justification of moral action, it merely explains decisions of moral judgments. As mentioned above, the context of a given situation allows us to make an appropriate moral judgment. A person, on the other hand, can go against popular sentiment because he may be in a better position knowing all of the relevant facts. He can be biased by his own interests, however, which is why it is imperative for the spectator to judge impartially; "knowledgeable of all the facts, yet is not personally involved (Raphael 1985, p.35)."

One question that Smith was confronted with was the standard to which the propriety of an action was determined. Utilitarianism was an immediate answer; right actions are those that promote the greatest happiness for the greatest number. Raphael (1985) points out that Smith was aware of the attractiveness of utilitarianism, and was prepared to accept that moral actions do tend towards promoting general happiness. However, Smith opposed to the notion that utility was the only measure to judge the propriety of an action. Utility to Smith was a subset of sympathy. It arises first from sympathy with the motives of the agent, secondly from the gratitude of the beneficiary, and thirdly from the support of conformity to social norms. Smith believes that, in practice, we don't make moral judgement based on utility, but based on our feeling and sympathy towards others. However, one objection towards Smith is that the moral decision of the "impartial spectator" is of no help because it only tells us whether or not the spectator has the same attitude towards the action as

you.

Smith continues to argue that, these socially approved behaviors become idealized; actions that the "impartial spectator" would deem appropriate. We may progress from a position of calculating our behavior to norms, to behavior that seeks to be praiseworthy. Sympathy can be invoked in scenarios of self-interest, benevolence, and justice so that "virtue", as Smith defines it, is not constrained to fixed rules and situations. Self interest is always mediated by the empathetic properties of human understanding (Heilbroner 1986, p.59). Thus, we can say that morality is not given to us, although Smith says our ability to sympathize is with us from birth (Rima 2009, p.95), but made ourselves. This philosophical contribution by Smith corresponds with the Enlightenment's course of freeing man from the oppressive standards of propriety embodied in church and state. How is it explained that we ascend from seeking praise to seeking to be praiseworthy? Smith does not address this other than referring to a higher standard of judgment than our desire to win sympathy (Heilbroner 1986, p.59).

What does Smith say regarding sympathy towards those we cannot observe? Smith gives us an account of a "man of humanity" in Europe who has just heard news that an earthquake has swallowed the whole Chinese empire? How, Smith asks, might he be affected? He may express sorrow for the tragic misfortune that has occurred and "make many melancholy reflections on the precariousness of human life" (TMS [1759] 1817, p.178-79). He may also ponder on the effect this catastrophe will have on the commerce in Europe. After all this "fine philos-ophy" is over, he would pursue his daily activities as if the calamity had never occurred. However, if he were to lose his finger tomorrow, the greatest travesty has occurred and he would be in a state of anguish and torment. Why would a man, given his choice, choose the greatest misfortune of millions of Chinese dying over the loss of his finger? Smith's astonishingly answers, "Human nature startles with horror at the thought, and the world, in all its depravity and corruption, never produced such a villain as could be capable of entertaining it" (TMS [1759] 1817, p.179). In other words, the loss of a finger directly affects the man, but the loss of millions of people on a different continent has a much less effect. Social distance is the key to this notion; that the "man of humanity" was socially removed from the Chinese people, he is not able to sympathize the same way if he were observing or had social relations with them. The further the social distance, the less sympathy he or she would feel and the less would their approval matter (Young 1985, p.121-123).

We try to close the distance gap by interacting more with people so that our sympathies correspond. However, too much interaction, or closeness can foster improper moral development enabling one to sympathize too much. This excessive sympathy can allow us to indulge too much in our passions, hindering self-command so necessary for moral growth (Paganelli 2010, p.432). Parents, for example, can be too partial and indulgent with their children. "A very young child has no self-command; but, whatever are its emotions, whether fear, or grief, or anger, it endeavors always, by the violence of its outcries, to alarm, as much as it can, the attention of its nurse, or of its parents. While it remains under the custody of such partial protectors, its anger is the first, and perhaps, the only passion which it is taught to moderate." "…[W]hen it is old enough to go to school, or to mix with its equals, it soon finds that they have no such indulgent partiality" (TMS [1759] 1817, p.189-190). Children can develop indifference to their parents, and lack of respect, from too much distance; most likely, says Smith, from children being sent to boarding schools. Thus, an excess or lack of distance can indulge us in the violence of our passions. The proper amount of distance allows us to be more impartial in our judgments and have self-command over our passions enabling us to be the object of approbation (Paganelli 2010, p.433).

Sympathy, according to Smith, allows us to identify with the feelings of others in three distinct ways: the motives of the actor, the gratitude of the beneficiary, and the approbation of others which adjusts our behavior to social norms. We enter into vicarious experiences that allow us to judge the propriety of an action, observed or socially removed, and make a moral judgment. Our behavior is tuned to the pitch of what others would find appropriate and acceptable. Sympathy does not justify action, although it can be a motivating force, such as compassion, it merely explains how we arrive at moral judgments. It applies to issues of morality and not issues of aesthetics or tastes and preferences. Smith's sympathy principle is not without its flaws because it references higher standards of morality from a Deity, an area Smith never indulged.

We now turn to the principle quote which has been in popular textbooks, and heard the world over. In Smith's most popular work, WN, the social benefits of prosperity derive from individuals pursuing their own self-interest through no intention of their own as if led by an "invisible hand". Although Smith only mentions the invisible hand twice in his works, once in TMS and once in WN, the mainstream's interpretation of Smith and his WN has been that it sanctions free market individualism and self-interest. Nothing could be further from the truth. Smith advocated for laissez-faire, but it was in the context of 18th century mercantilism, to which he was vehemently opposed. This topic, however, is outside the scope of this discussion.

Smith wrote the WN in the context of the sympathy principle discussed earlier and established in TMS. Self-interest, according to Smith is the main motivator of human economic activity; it is a motivation for action, not a basis for judgment. Recall that sympathy was the explanation of how humans arrive at moral judgments, and it is not justification for action, although it can influence it. Smith granted us that humans have a continuous drive to improve our material conditions of life, and this self-interest allows the emergence of the division of labor, the most fundamental to the wealth of a nation.

Man by nature cannot foresee, beyond a narrow range, the consequences of his actions. How, then, can he choose the right path when he does not have abilities to anticipate the consequences of his actions; much less the actions of others? We have an acquisitive nature, says Smith, or a searching for immediate satisfaction of pleasures instilled in us from birth. Although we cannot know the consequences of following our instinct for self-interest, we do so regardless of any social benefit. Smith argued that this behavior is not and cannot be limited to such egocentricity. Instead, he argued that other motives were both necessary and important (Newbert 2003, p.255).

Self-interest alone is not adequate enough for a market economy to work. This confusion of self-interest explaining the motivations for trade neglect the broader problem of what is needed for a good society (Sen 2011, p.264). We get our meat, our beer, and our bread from the butcher, the brewer, and the baker because there is a mutual dependency, even though individually each party is pursuing their own self-interest. Thus, we do not receive our goods from the kind heart, but the seld-interest of the butcher, brewer, and baker. However, self-interest is not a claim of the adequacy of self-seeking for the success of a society; it is a motivator to action, influenced and tempered by sympathy. Through competition, the role of the "impartial spectator" is replaced as an enforcer of proper behavior by capitalists (Stabile 1997, p.300). In order for markets to enforce appropriate behavior, however, capitalists could not allow self-interest to act contrary to market forces. In other words, the capitalists, through their own self-interest, can collude and fix prices since it would be in their self-interest to do so. But competition cannot take the place of virtue. In fact, Smith accuses the rapacity of merchants, "[W]hose interest is never exactly the same with the public, who generally have an interest to deceive and even oppress the pub-lic, and who accordingly have, upon many occasions, both deceived and oppressed it" (WN [1776] 1976). The "impartial spectator" has to operate outside the market to ensure that market transactions were undertaken by people who were virtuous and informed through the sympathy of others (Stabile 1997, p.300). It is not self-interest, in the way it is interpreted today, that drives economic growth; it is always tempered by sympathy for others.

Without sympathy, a nation of self-interested individuals may not produce the socially beneficial outcomes that neo-classical economists claim based on their misinterpretation of Smith. Mostly, their mistaken take on the "invisible hand" and "self-interest" stem from a utilitarian and teleological view of capitalism. Without moral duty and the regard for others, self-interested individuals who satisfy their own economic motivations do not contribute to social welfare (Newbert 1997, p.253). Thus, the economic growth of a nation cannot rely solely on individuals pursuing their own self-interest, ignoring the inherent nature of sympathizing with the feelings of others. Self-interest, in the way discussed here, will have a more beneficial context in the way that Adam Smith intended and not the acquiescent way of neo-classical economists and mainstream textbooks.

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