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A MODERN INTERPRETATION OF KEYNES' ANALYSIS OF SPECULATION IN THE PROFESSIONAL FINANCIAL MARKETS AND THE IMPACT ON THE ALLOCATION OF TALENT

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ABSTRACT

This paper explores the role of secondary financial markets and the proliferation of speculation. In *The General Theory*, Keynes identifies speculation as a social bad that can increase volatility. This paper extends Keynes' analysis to comment on two additional possible consequences of increased speculation. The first consequence is a redistribution of income. This change in the income distribution is shown to have long run employment effects in a Post-Keynesian model. The second consequence is a possible externality caused by increased speculation, a misallocation of human capital. Using the Integrated Postsecondary Education Data System's Survey of Institutional Characteristics and Survey of Degree completions, some suggestive empirical evidence is presented. The primary finding is that US states that have a high proportion of college graduates with finance related degrees grew more slowly on average between 1990 and 2012.

Keywords: Keynes, Speculation, Rent seeking, Human capital, Financial markets.
JEL codes: E02, E12, D84.

Introduction

In chapter 12 of *The General Theory,* Keynes brought the state of long-term expectation to the forefront of his analysis of the tension between investment carried out by entrepreneurs and professional speculators who participate in organized investment markets. The former can be thought of as new investment, the use of one's wealth to create new wealth. The latter should be thought of as old investment, the use of wealth to purchase

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already existing wealth. Entrepreneurs create while speculators rearrange (Brockway 1983: 515-516).

In Keynes' analysis, he critiques the role secondary markets play in shortening the time horizon upon which assets are held due to investment markets pursuit of the "fetish of liquidity (1936: 155)". He argues under these conditions that,

> This battle of wits to anticipate the basis of conventional valuation a few months hence […] does not even require gulls amongst the public to feed the maws of the professional; – it can be played by professionals amongst themselves. Nor is it necessary that anyone should keep his simple faith in the conventional basis of valuation having any genuine long-term validity. For it is, so to speak, a game of Snap, of Old Maid, of Musical Chairs – a pastime in which he is victor […] who passes the Old Maid to his neighbour before the game is over (Keynes 1936: 155-156).

This investors' game of musical chairs is rent-seeking as the activity procures private returns for the individuals participating but it does not directly lead to the creation of wealth (Murphy *et al*. 1990: 505). This fetish of liquidity leads to a specific type of speculation motivated by investors' objective to "beat the gun (Keynes 1936: 155)." In the financial markets, this has led to an arms race of sorts, where firms hire highly skilled speculators to organize, program, and operate automated trading systems in hopes of passing the "Old Maid" not months, or weeks, or days before their competitors catch on; but microseconds.

One of the shortcomings of Keynes' analysis is that he all but ignores the impact speculation has on the allocation of talent. The lure of high private returns found in financial markets where compensation contracts can be closely tied to short-run individual performance, while failing to internalize negative externalities, make financial institutions an attractive place for talented individuals motivated by private returns. Using data constructed from the Integrated Postsecondary Education Data System between 1990 and 2014, this paper provides some suggestive evidence that increased opportunities for rent-seeking in the financial markets have influenced the composition of postsecondary degree completions among college graduates of four year public postsecondary institutions in the United States.

It is clear that; "There is no clear evidence from experience that the investment policy which is socially advantageous coincides with that which is most profitable (Keynes 1936: 157)." Indeed, this paper looks to show that although these types of activities may be immensely profitable there is both theoretical and suggestive empirical evidence that not only are these types of activities wasteful in terms of the allocation of resources but that their distributional effects can also lead to a reduction in growth.

The remainder of this paper is organized as follows. Section 1 outlines some developments in financial markets with a focus on the increased prevalence of sophisticated speculators in financial markets. Section 2 outlines a mechanism by which speculation can alter the income distribution and, therefore, influence investment and saving behavior. Section 3 comments on the effect of speculation on the distribution of human capital. Section 4 outlines the data used and some suggestive analysis. Section 5 concludes.

1. Modern Finance: Speed, Sophistication, and Certainty

Keynes' analysis of speculation in secondary financial markets provides interesting insights into the tension between their usefulness in the creation of new wealth through investment and their ability to redistribute wealth through the purchase and sale of equity on the Stock Exchange. Financial markets provide a functional role in that they provide liquidity to investors and a constant re-evaluation of investment decisions that, without a well functioning financial market, would be non-existent. This constant re-evaluation of businesses can increase the level of investment by making investments revocable for the individual entrepreneur and decreasing risk (Keynes 1936: 151). In this way, secondary financial markets operate as something akin to an insurance market (Tirole 1982: 1163). Afraid of the riskiness of new investment, more risk averse entrepreneurs use financial markets to reduce their long term risk in the face of uncertainty as secondary financial markets make their otherwise illiquid investment liquid. Without a secondary financial market the entrepreneur is forced to make investments of "the old-fashioned type (Keynes 1936: 150)".

Conversely, the existence of well-functioning secondary financial markets may reduce the level of investment. If a pre-established company can be purchased at a lower price, it may diminish the incentives for new investment. In addition, secondary financial markets may lure workers with business acumen away from starting their own business if they can instead buy and sell assets on financial markets for immediate profit. Finally, and perhaps most importantly, even though secondary financial markets make an investment revocable for the individual, the investment is not socially revocable, as the resources used to make it have already been used up. (Keynes 1936).

However, there are two developments within financial markets that Keynes could not have anticipated. First, Keynes did not foresee is just how short the time horizon speculators concern themselves with would become. Second, Keynes did not make mention of increasingly sophisticated, and therefore hard to price, financial instruments.

In his analysis, Keynes takes particular care in distinguishing between speculators, those who forecast the psychology of the market, and investors who forecast the value of assets over their entire life. An increase in the prevalence of professional speculators has transformed the role of financial markets. Instead of applying their efforts to correctly evaluate the long-term viability of investment projects, speculators look to foresee "changes in the conventional basis of valuation a short time ahead of the general public" (Keynes 1936: 154).

One aspect of modern financial markets is that instead of focusing their attention on the state of "mass psychology, three months or a year hence" (Keynes 1936: 155), some highly sophisticated speculators have reduced the time horizon they hold assets to fractions of a millisecond. To do so, financial firms have invested heavily in technology that allows them to obtain and process information far faster than the general public.

The obsession with speed likely stems from the increased volatility caused by speculators and unsophisticated investors. As Keynes points out, when asset prices are based on "the mass psychology of a large number of ignorant individuals" (Keynes, 1936: 154) they are more likely to fluctuate wildly due to changes in investor sentiment. With sufficient volatility, professional investors are more likely to partake in speculation. Volatility increases the amount of profits available to speculators who predict short-run changes in the conventional valuation that may have little bearing on the long run yield of the investment. If the conventional valuation changes rapidly due to financial reports, news stories, or other available information, there are incentives for speculators to be the fastest at taking advantage of that information.

Using speed for the purpose of increasing liquidity draws to our attention the absurdity of the role of professional speculators. Instead of facilitating the goals of clients to generate future returns and manage risk, professional speculators look to exploit their comparative advantage by reducing their latency, or the amount of time it takes to execute an electronic operation. Latency occurs as a result of a computer needing time to process data and execute commands, and the amount of time it takes data or commands to travel between computers and data centers at different locations. When stocks are poised to fall, they use speed to ensure that they can dump assets before the general public. When stocks are poised to rise, they use their superior technology to purchase assets before the general public.

The aggregate costs of pursuing zero latency are largely unknown, but the pursuit of zero latency has become big business for firms participating in financial markets. There are a large number of firms in the United States that provide financial companies with low latency services, includ-

ing Spread Networks, Ciena, Lightower, and TNS. High frequency trading firms do indeed pay for the ability to compete on the basis of speed by co-locating their servers at different exchanges. The reason why firms are willing to pay a fee is that trading on speed is a winner take all competition. If a trader is second in line, they will not be able to take advantage of the arbitrage opportunities available (Baron *et al*. 2016).

The consequences of this type of speculation can be demonstrated by a simple arms race game. Assume that there is a trading opportunity that exists with a value a available to two speculators. The speculator that can execute the trade the fastest receives the entirety of the prize, a, while the slower speculator receives nothing. An outside firm provides a subscription service to access the fastest trading technology at an average cost per trade, c, which the speculators can choose to pay or not to pay. If they do not pay for access, they incur no technology costs and use an inferior technology, which is the default technology for both firms. If both firms use the same technology, they have an equal chance to win the prize, a. This game can be represented as follows:

	Buy	*Don't*
Buy	$\frac{1}{2}a - c, \frac{1}{2}a - c$	$a - c, 0$
Don't	$0, a - c$	$\frac{1}{2}a, \frac{1}{2}$

It can be shown that (Buy, Buy) is the unique pure strategy Nash Equilibrium of the game if c is less than $\frac{1}{2}a$. This outcome is Pareto inferior to the outcome where both speculators do not invest in the technology. In this stylized game, the total cost to the players of playing the Nash Equilibrium strategy is $2c$.

As a result of the game modeled above, there is not an increase in real investment and no new wealth is created as a result of using the superior trading technology. If both firms purchase the superior technology, there is no transfer of wealth between the two traders and they pay the firm providing the technology a fee. However, the total cost to society is not known from this game and depends on the opportunity cost of the resources that are needed to use the technology, which is likely to include highly skilled workers.

High frequency trading firms use technology to try to take advantage of changes in the conventional valuation of an asset. To do this, they use latency to process news and order flow (Baron et al, 2016). This type of competition through speed results in adverse selection as some market par-

ticipants have information about an asset that others do not (Biais, et al, 2015). In effect, highly sophisticated speculators are indeed playing a game of Snap.

Processing information faster than the rest of the market can be thought of as "foreknowledge" and is examined by Hirshleifer (1971) and Fama and Laffer (1971). In these papers, it is clearly shown that the production of information about future states for the purposes of trading before that information becomes public leads to incentives for private agents to speculate based on that information or to re-sell the information. Firms and individuals with private information about the future use that information to increase individual profits. However, the private returns from this foreknowledge do not increase social welfare. Instead, if there are costs associated with producing the private information, the result is a reduction in public welfare compared to when that information is disseminated publicly.

The speed advantage of the speculator corresponds to foreknowledge relative to the general public. They know what happened to the true price of the asset before the rest of the market as a result of their superior technology. The speculator, keeping that information private, executes the trade and earns a profit by redistributing wealth from the general public to himself or herself.

The existence of the possibility of obtaining and processing information before the rest of the market encourages rent seeking. If the speculator continues to use resources to try to produce private information, the outcome is not socially optimal as those resources used to rent seek are social waste. The potential costs of such strategies include the costs of physical capital, the networks and computers used, and the opportunity cost of human capital.

In Keynes' analysis, he ignores the potential opportunity costs of human capital and perhaps rightfully so. Up until far more recently, speculators in financial markets were often boisterous, gruff, and often uneducated traders and it's not clear that Keynes should have been able to predict the amount of skill demanded by modern financial firms (Levine 2013). However, with the increased importance of technology, the rise of sophisticated speculators has led to an influx of highly educated individuals to participate as speculators. This change in the average skill level of finance workers is well documented by Philippon and Reshef (2012). In their study, they track human capital intensity and wage premiums in finance between 1909 and 2006. They find that high wages, skill intensity and complexity are not permanent features and that finance has not always been a high-skill intensive industry.

As an illustrative example of the potential human capital opportunity costs, consider Renaissance Technologies LLC, an investment manage-

ment company that handles over $15 billion in assets. Its founder, Jim Simons, was not a savvy 'businessman' or experienced trader, but a former code breaker for the Department of Defense and a former Mathematics professor at MIT and Harvard. According to their website, the company hires much in the same vein with roughly half of their 150 Long Island employees possessing a PhD in scientific disciplines.

And Renaissance Technologies is not alone, the Prediction Company, founded by James Farmer and Norman Packard, who left their jobs at Los Alamos National Laboratory and a tenured position as a professor of physics at the University of Illinois respectively, requires their employees to have their masters or equivalent in fields like mathematics, statistics, physics, financial engineering, etc. to be considered for a job as a quantitative research analyst. Want to write code for the Prediction Company? A degree in computer science is compulsory (Prediction Company). Want to work as a quantitative researcher at Citadel? You better pack your PhD, be ABD, or a junior faculty member in economics, engineering, finance, mathematics, or physics (Citadel).

Along with innovations in speed, increased sophistication of financial assets has increased the possibility of a divergence between financial trends and real ones. This was no more apparent than during the housing bubble and subsequent housing crisis. Speculators in the financial and insurance industries, fueled by perverse incentives inherent in the originate and distribute model, created and sold complex securities comprised of thousands of mortgages.

Crotty (2009) provides an extensive overview of what he refers to as the New Financial Architecture (NFA). In this framework, Crotty argues that extensive deregulation of financial markets and repeated bailouts prompted increased risk taking by financial institutions. This incentivized strategies that maximize short term profits, through the collection of fees, and, as a result, increased medium run and long run risk. This risk taking was not only fueled by increased leverage, but it was also fueled by increased asset sophistication.

Financial innovation can reap incredible rewards for the innovator. During the run-up to the financial crisis, highly educated people created increasingly complex financial assets. These assets included not only mortgage-backed securities (MBS) but also their derivatives. Often times the riskier components of the MBS were repackaged and sold to investors. However, as Kashyap *et al*. (2008) point out, traders are incentivized to take risks if those risks are not easily detectable by the financial system, including its regulators. In the case of financial innovation, the traders can sometimes capitalize on increased risk taking that is not properly accounted for and capture the risk premium as a return on their superior ability.

As was the case during the financial crisis, over a longer period of time complex assets with poorly understood riskiness can become volatile and increasingly difficult to price as the assets' original pricing model becomes obsolete (Diamond and Rajan 2009). In the case of highly leveraged financial institutions, decreasing asset values coupled with investor panic can amplify downward pressure on prices as banks must sell their distressed assets in order to cover their liabilities up until the point when the government bails them out in order to stave off a complete collapse of the financial system.

Making matters worse, the majority of complex financial assets are traded over the counter (OTC) and are therefore marked-to-model as opposed to marked-to-market as there is no deep and transparent market for these types of assets. This allows not only for the possibility but the probability that these assets are priced incorrectly as a competitive capital market that prices risk optimally does not exist (Crotty 2008). Furthermore, if something were to go wrong with a non-transparent asset, liquidity can dry up quickly as there is not a market, never mind a deep market, for OTC assets.

The result of this 'NFA' is an increasingly complex and risky financial sector the produces and sells increasingly opaque assets for non-refundable fees to investors that do not have the ability to accurately asses their risk. This type of system requires a group of highly educated workers not just to create the assets, but also to regulate them. If the risk is improperly measured, the result is a financial system that pays above average wages, as the risk premium is mistaken for superior talent, and can potentially lead to a misallocation of talent.

Modern financial markets are faster, more complex, and more skill intensive than the financial markets of the 1930's. If, however, they provided services that facilitated the real sector of the economy through the financing of real investment there would be no need to take objection to the high returns to skill. However, as Keynes correctly pointed out, when financial markets become more interested in pure speculation their social benefit is called into question. What he could not have predicted is the extent to which the complexity of financial markets would impact the distribution of highly skilled workers, taking them away from the real sector of the economy and placing them firmly into speculative activities. The next section demonstrates one channel through which an economy with a large amount of speculation may be worse off.

2. Saving and Investment Behavior with Speculation Income

With the aforementioned examples as motivation, this section builds a highly stylized Post-Keynesian model that includes a speculators' share of income. As was outlined in section 2, financial markets have become more sophisticated and have attracted more high-skilled workers. In an economy that requires both high-skill workers (managers, engineers, etc) and low-skill workers for the production of output, an increase in the speculators' share of income that attracts high-skill workers away from the production of physical output reduces the efficiency of the economy by drawing high-skill workers toward speculative activities.

To see the logic of this argument, assume that the level of output in the economy is determined by the following Leontief production function:

$$Y = \text{MIN}(L,\phi H,K) \tag{1}$$

Where, L is the number of low-skill workers employed in the production of output, ϕ is the percentage of high-skill workers employed in the production of output, H is the stock of high-skill workers, and K is the size of the capital stock. Assuming a mature economy without labor hoarding, the level of output is determined by:

$$Y = uK = \phi H = L \tag{2}$$

Where u is the rate of capacity utilization Y/K.

Following Dutt and Veneziani (2015), high-skill workers and low-skill workers are qualitatively different in that they possess different roles in the production process. They are distinguished from one another in that high-skill workers have obtained a postsecondary degree while low-skill workers have not. By obtaining a degree, Dutt and Veneziani argue that high-skill workers are qualitatively different than low-skill workers in that they are inputs into the production of a single good but that they can also induce technological progress and "education as family members, educators and mentors."

This paper follows their paper by asserting that high-skill workers and low-skill workers both contribute to the production of a single good and that high-skill workers and low-skill workers are qualitatively different. However, instead of assuming that high-skill workers contribute to technological progress as innovators, this paper assumes that they are distinguished from low-skill workers in that they can be employed as speculators. Finally, as a simplifying assumption it is assumed that high-skill workers are fully employed and that the stock of high-skill labor grows at

the rate of the force. Therefore, the total labor force, *N*, of the economy is given by:

$$N = L + \phi H + (1 - \phi)H + U \tag{3}$$

and the low-skill employment rate is:

$$e = \frac{L}{L + U} \tag{4}$$

Following the Post-Keynesian tradition including Rowthorn (1981), Dutt (1984), Marglin and Bhaduri (1990), and Robinson (1962) investment is a function of the rate of capacity utilization and the profit share. Following Flaschel and Skott (2006), Ryoo and Skott (2008), and Skott and Zipperer (2012) the mature economy investment function is extended to include the employment rate as an additional parameter. Therefore, a mature economy Post-Keynesian investment function can be written as,

$$\frac{I}{K} = f(u,\sigma_\pi e) \qquad f_u>0, f_{\sigma\pi}>0, f_e\leq 0 \tag{5}$$

Where u is the rate of capacity utilization, σ_π is the profit share and e is the employment rate of low-skill workers. Increases in the rate of capacity utilization increase investment as it encourages the purchase of new capital equipment. An increase in the profit share also increases investment as higher profit shares indicate a strong business climate. Finally, increases in the rate of employment are assumed to have a negative effect on investment as it could result in an increase in the bargaining power of workers or in the costs associated with hiring workers.

The inclusion of speculators in the analysis introduces an income share that is not associated with the creation of new output. Instead, speculation causes the shuffling of existing wealth that results in income being paid to the speculators in the form of fees for their services from the general public or by firms who hire them in hopes of increasing the value of their assets. Regardless of where the income originates, the introduction of speculator income allows for the income share to be re-written as:

$$\sigma_\pi + \sigma_w + \eta = 1 \tag{6}$$

Where η is the speculators' share of income and σ_w is the labor share of income paid to workers employed in the production of output.

Using equation 6 it is possible to re-write equation 5 as:

$$\frac{I}{K} = f(u, \eta,\sigma_w,e) \qquad f_u>0, f_{\sigma w}<0, f_\eta<?>0, f_e<0 \tag{7}$$

Increases in the labor share of income reduce investment as it represents a decline in the business climate through a reduction in the markup. Changes in the speculators share of income have an ambiguous sign. Increases in the level of speculation can reduce the profit share if speculators are considered a cost to firms. Alternatively, speculation income could come from the labor share and have no impact on the profit share.

The saving rate depends on the saving behavior of capitalists, labor, and speculators. If speculators save a portion of their income, the saving rate can be written as:

$$\frac{S}{K} = s(u,\eta,\sigma_w) \qquad s_u, s_\eta <?>0, s_{\sigma w}<0 \tag{8}$$

The important assumptions about the saving function revolve around the relative saving rates of the different economic agents. A fairly standard assumption is that capitalists have a higher saving rate than workers. Therefore, an increase in the labor share of income will reduce the aggregate saving rate. However, the effect of an increase in speculators' share of income depends on what their saving rate is relative to capitalists and whether or not their income is paid as a cost to firms or a transfer of income from the general public.[1]

For the purposes of this paper, speculators will be assumed to save a portion of their income but they will have a lower saving rate than capitalists. In addition, firms pay speculators for their services. This means that an increase in their income can be interpreted as a cost to firms and result in a reduction in the profit share. However, the wage share is assumed constant as the markup is assumed fixed. The result of this specification is that an increase in the speculators share of income causes a reduction of the aggregate saving rate.

To close the model, the equilibrium condition that the saving rate is equal to the rate of investment and the maturity condition that the rate of accumulation is equal to the growth rate of the labor force is imposed.

$$\frac{S}{K} = s(u,\eta,\sigma_w) = g = \frac{I}{K} \tag{9}$$

$$g = n \tag{10}$$

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[1] As it turns out, this assumption is crucial to the findings of the model. However, the approach taken in this paper is the most conservative for finding a negative effect caused by an increase in speculation. If instead it were assumed that increases negatively impacted the labor share of income, the result that follows would be stronger.

It is now possible to solve for the equilibrium capacity utilization rate and employment rate. To do this, first set equation 8 equal to equation 10 to find:

$$\frac{S}{K} = s(u,\eta,\sigma_w) = n \tag{11}$$

Since n, η, and σ_w are all exogenous variables, equation 11 determines a unique equilibrium value of the utilization rate:

$$u^\star = u(\eta,\sigma_w) \qquad u_\eta > 0,\ u_{\sigma w} > 0 \tag{12}$$

Increases in the speculators share of income and the wage share increase the rate of capacity utilization through an increase in aggregate demand as speculators are assumed to have lower saving rates than capitalists.

Using equations 7, 10, and 12, it is possible to write the rate of investment as:

$$\frac{I}{K} f(u(\eta,\sigma_\pi),\ \eta,\sigma_\pi,e) = n \tag{13}$$

Again, since n, η, and are σ_w all exogenous variables, equation 13 determines a unique low-skill employment rate:

$$e^\star = e(u(\eta,\sigma_w),\ \eta,\sigma_w) \tag{14}$$

The equilibrium low-skill employment rate is increasing in the rate of capacity utilization and the profit share. Therefore, the effect on the low-skill employment rate of an increase in speculation depends on whether or not increased speculation reduces the profit share and if the effect of a reduction in the profit share is large enough to offset the increase in the rate of capacity utilization.

Even though the effect on the rate of employment of low-skill workers cannot be unambiguously determined, something can be said about the likelihood an increase in speculation will have a negative impact on the low-skill employment rate. If capitalists and speculators have similar saving rates the aggregate demand effect of an increase in speculation will be relatively small making it more likely that increases in speculation will reduce low-skill employment.

3. The Distribution of Human Capital and the Level of Output

The decomposition of the labor share of income raises important distributional questions that extend beyond the distribution of income be-

tween workers and capitalists. Once high-skill workers are included as speculators, there are additional potential conflicts between high-skill and low-skill workers and between high-skill workers who produce output and high-skill workers employed as speculators. As a result of this, changes in the distribution of income can have an effect on the distribution of high-skill workers between production activities and speculative activities.

To demonstrate this possibility, assume that the total wage bill, W, paid to workers producing output is:

$$W = W_O + W_L \tag{15}$$

Where W_O is the total wage bill paid to high-skill workers involved in the production of output, and W_L is the total wage bill paid to low-skill workers. The average wage paid to high-skill workers is defined as:

$$\frac{W_O}{\phi H} = w_O \tag{16}$$

The average wage paid to low skilled workers is:

$$\frac{W_L}{L} = w_L \tag{17}$$

Therefore, the total wage bill paid to workers involved in the production of output is:

$$w_O \phi H + w_L L = \sigma_w Y \tag{18}$$

High-skill workers are paid a premium over low-skilled workers given by:

$$\frac{w_O}{w_L} = \tau > 1 \tag{19}$$

Speculators are paid out of the speculators share of income so the average wage paid to speculators is:

$$w_S = \frac{\eta Y}{(1 - \phi)H} \tag{20}$$

Assuming that there are no barriers to high-skill workers switching between producing output and speculating, equilibrium requires that:

$$w_S = w_O \tag{21}$$

Using equations 2, 18, and 19 it is possible to write the wage paid to high-skill workers employed in the production of output as:

$$w_o = \frac{\tau}{1+\tau}\sigma_w \tag{22}$$

Using equations 2, 20, 21 and 22, the equilibrium distribution of high-skill workers is given by:

$$\phi^\star = \frac{\frac{\tau}{1+\tau}\sigma_w}{\eta + \frac{\tau}{1+\tau}\sigma_w} \tag{23}$$

If the premium paid to high-skill workers and the markup are fixed, equation 23 suggests that increases in the speculators share of income, reduces the percentage of high-skill workers employed in the production of output. Given the assumption that high-skill workers and low-skill workers are not substitutes, an increase in the speculator's share of income results in a reduction in the level of output. So not only does an increase in the speculator's share of income reduce low-skill employment, it also reduces the efficiency of the economy as a larger number of high-skill workers would be required to produce the same level of output.

4. Suggestive Analysis

The model presented in sections 3 and 4 has suggested that the distribution of high-skill workers matters for both growth and the level of output. As was mentioned previously, Keynes did not concern his analysis with the opportunity cost of human capital as a result of an increase in the sophistication of speculation. In fact, if postsecondary students select their field of study based on employment opportunities, the composition of degree completions may be a reasonable proxy for the distribution of high-skill workers. It follows that an economy that is graduating a high proportion of students studying fields related to speculation should grow more slowly than economies that do not. This section is very humble in its goals. First, it looks to establish that there is a correlation between the composition of college graduates and employment opportunities in finance. Second, it provides some evidence that there is a correlation between the composition of college graduates and growth.

In an ideal setting, this paper would be able to use a data set that directly observes students over the course of their postsecondary careers, observes students' career aspirations, their choice of major, preferred job upon graduation, actual job upon graduation, and where they live post graduation. Unfortunately, in The United States, no such microdata exists. To get around this lack of data, one place to look for the effect of a rise in

speculation is at the correlation of employment in finance and the composition of undergraduate students majoring in degrees that are related to finance.

To identify degrees that are related to finance, Georgetown University's Center on Education and the Workforce's analysis of American Community Survey (ACS) data is used (Carnevale et al, 2013). Starting in 2009, if the respondent to the ACS had obtained a postsecondary degree they were also asked what their field of degree was in. Using this information, the Center on Education and the Workforce at Georgetown University constructed a table that shows what occupations degree recipients were most likely to work in by field of study. As can be seen in the Appendix, the only two fields of study that list finance as one of the top 5 occupations for degree recipients are business and social science. Therefore, business and social science degrees are classified as finance related degrees.

The Integrated Postsecondary Education Data System (IPEDS) is used to construct the data on degree completions in The United States. This data set includes a vast amount of US higher education data including, institutional characteristics, enrollment, degree completions, and postsecondary school finances. Using the IPEDS Survey of Institutional Characteristics and Survey of Degree Completions it is possible to track the number of postsecondary degree completions at the institution major level. However, for the purposes of this paper, tracking degree completions at the state and national level by major is sufficient.

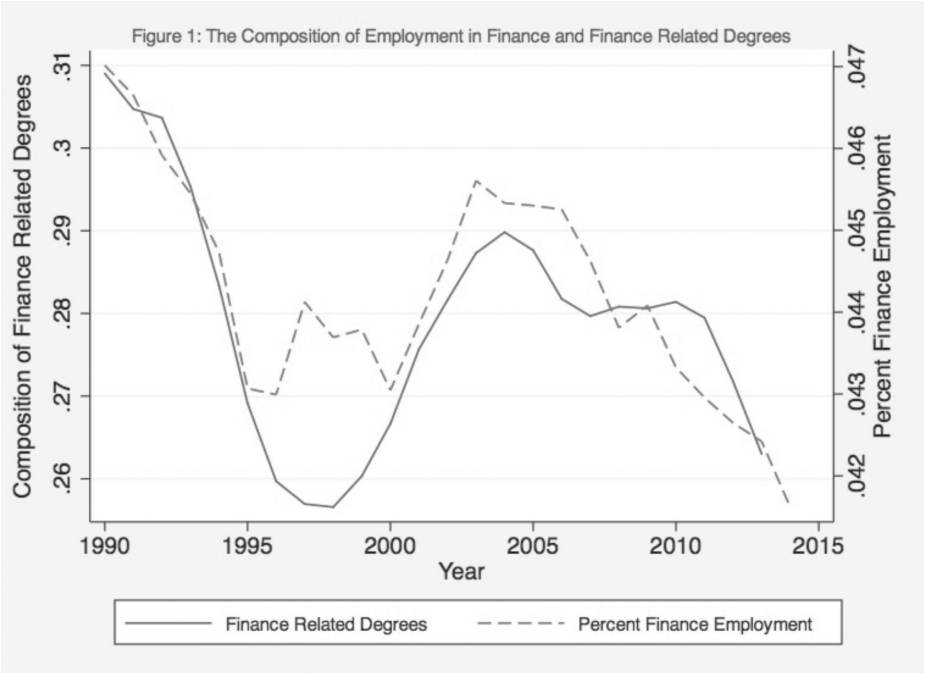
From the Survey of Institutional Characteristics the school's unique ID code, the state in which it is located, and whether or not it is private or public is collected. From the Survey of Degree Completions, the school's unique ID code, the total number of degree completions, and the number of degree completions by field of study is collected. Using the school's unique ID code it is possible to construct the total number of degree completions by state and field of study. From this, the variable of interest, the composition of finance related bachelors degrees awarded at public postsecondary schools is created. Finance related degrees include the total number of degree completions in business and social science divided by the total number of degree completions at public postsecondary institutions.

This paper focuses on the number of degrees awarded at state schools for two reasons. First, the IPEDS data system does not track individual students. This makes it impossible to observe whether or not students remain in the state post graduation. To help ease, but not completely eliminate, concerns that labor mobility might be driving the results, the sample is constrained to only public postsecondary institutions. Second, the goal of the empirical exercise is to get at the underlying structure of a state's economy. Since public schools tend to have a much larger percentage of in

state students than private schools, the examination of degree completions at public postsecondary schools better captures incentives within the state.

Employment data comes from the United States Bureau of Labor Statistics Quarterly Census of Employment and Wages. The percentage of finance employment variable is constructed by dividing the number of workers employed in the North American Industry Classification System's Finance and Insurance sector by total employment in The United States. Finally, the average growth rate between 1990 and 2012 is calculated using real personal income per capita from the Bureau of Economic Analysis.

Figure one shows the relationship between the percent of individuals employed in finance and the composition of finance related degree completions in The United States. Somewhat remarkably, the trend in the composition of finance related degree completions and the composition of finance employment are very similar. Both series experience a decline between 1990 and 1995 and a subsequent rebound between 1998 and roughly 2004. Since 2008 both series have declined significantly.

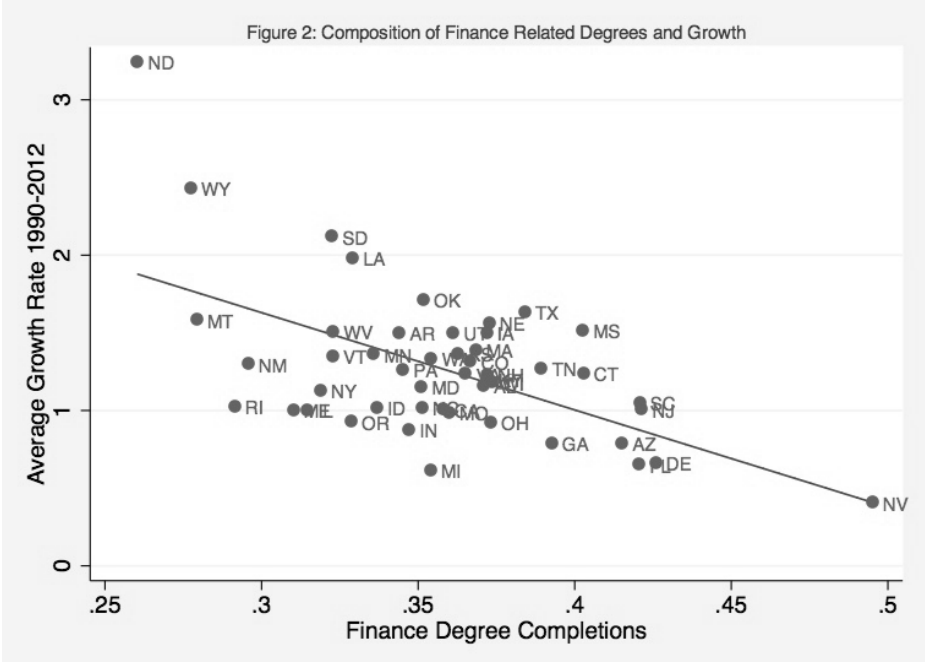


Although this is a very rough visual analysis of the data, the correlation between the two time series suggest that college student's selection of major is influenced by their employment opportunities post graduation. In an economy that has a booming financial sector, students appear to be more

likely to major in finance related fields. When finance related employment is decreasing, students look to major in fields that are not related to finance.

This striking relationship between employment and major selection sheds some light on the dangers of increased speculation as defined by Keynes. If professional investors have indeed become more interested in predicting short term fluctuations in stock prices and the development of increasing complex financial assets, and less concerned with reducing long run risk and volatility, we might become concerned of the effects of the allocation of talent on economic outcomes. Keynes suggests that increases in the amount of financial speculation may lead to a reduction in investment and presumably growth.

Figure 2 shows the relationship between the average growth rate of real personal income per capita between 1990 and 2012 and the composition of finance related degrees for the 48 contiguous states in 1990. What is clear from the figure is that there is a negative relationship between the percentage of degree completions in finance related fields of study and the growth rate. What is not entirely clear is the cause of that negative relationship.



One possible interpretation is that the composition of degree completions is an indicator of the level of speculation within that state. In states that have high levels of speculation, there are lower levels of capital invest-

ment and growth. Of course, this is not the only possible interpretation of the data. One other possible interpretation is that a high composition of degree completions in finance might lead to a larger percentage of a state's graduates to leave the state for employment in financial centers like New York City, Chicago, or San Francisco. Unfortunately, the IPEDS data set does not have information on individual students[2] and this cannot be explicitly ruled out. Restricting the sample to graduates to only those graduating from public post-secondary institutions alleviates, but does not eliminate, concerns about migration as students who attend college in the state in which they live are less likely to leave the state upon graduation (Kodrzycki 2001).

Alternatively, figure 2 could be interpreted as demonstrating the importance of the allocation of talent. As high-skill individuals are funneled towards finance and away from other activities, such as entrepreneurship, research and development, and engineering, states grow more slowly. Figure 3 examines this hypothesis more closely by plotting the percentage of graduates receiving STEM (science, technology, engineering, and mathematics) related degrees[3] in 1990 and the average annual growth rate in real personal income per capital between 1990 and 2012. There is a positive relationship between the percentage of degree completions in STEM related majors and the average growth rate. One possible reason for this is that states that graduate a high percentage of STEM students have an economic and educational structure that emphasizes growth through entrepreneurship, innovation and the production of physical output.

Another interpretation of figure 3 is that states with a higher percentage of graduates in STEM related fields of study were more resilient to the financial crisis. Although this is almost certainly true, states with a large financial system are more likely to feel the impacts of the financial crisis, it may also be that states which graduate a high number of finance related degrees are more prone to experiencing crisis due to the speculative nature of their economies. In other words, increases in the share of income going to speculators leads to an increase in the volatility of the state's economy.

It should be noted that the positive relationship between the composition of STEM related degree completions and the average growth rate of

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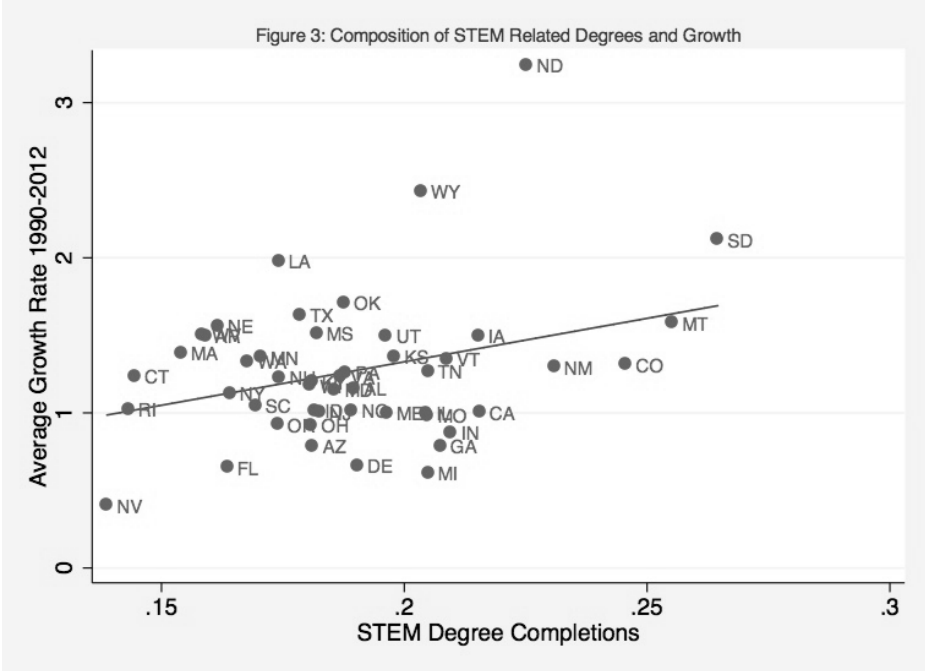
[2] Fortunately, there is some empirical evidence that migration may not a large issue. Kodrzycki (2001) finds that one year after graduation only 15% of students live in a state different than where they attended college. In year nine, that number increases to 39%. However, it should be noted that these statistics include individuals who attend private postsecondary institutions.

[3] This paper defines STEM related degrees as degrees awarded in agriculture, natural resources, computer science, engineering, engineering technology, mathematics, physical science, and science technology.



the state is not as strong as the negative relationship between the composition of finance related degree completions and the state's average growth rate. One possible reason for the lack of a strong relationship is that financial firms are poaching STEM graduates. As the technology required to compete in modern financial markets becomes more and more complex, financial firms have begun hiring more and more workers with the hard skills developed in STEM programs even if they have little knowledge of, or experience in, finance. Regardless of the particular cause, this analysis suggests that there are potentially negative consequences of increased speculation beyond those outlined by Keynes in *The General Theory*.

5. Conclusions

Keynes' analysis in chapter 12 of *The General Theory* highlights some important consequences of an increase in the level of speculation within an economy. In particular, he focuses on the tension between the potential positive impact on investment through a reduction in uncertainty for the investor and the impact on investment through negative externalities, specifically increased volatility. However, Keynes' analysis ignores the potential impacts that increased speculation has on the allocation of talent.

The Post-Keynesian model developed in this paper suggests that in a developed economy an increase in speculation can have distribution effects that may reduce the long run rate of employment. The empirical analysis suggests that postsecondary students respond strongly to employment opportunities and that a rise in the level of speculation could influence a student's choice of major. Although no controls are included, there appears to be a negative relationship between a state's composition of finance related degree completions and growth.

From the empirical analysis there are two possible channels through which the composition of degree completions may cause a reduction in the average growth rate. The first is through a traditional human capital channel. As a larger proportion of students obtain degrees related to finance a lower proportion of students are left to obtain degrees in the mechanical arts. This can have a negative effect on the growth rate through a possible reduction in innovation. The second channel is structural. The allocation of undergraduates may be indicative of the underlying structure of an economy and economies that are speculation heavy may grow more slowly than economies that are enterprise heavy.

One concern that is not included in this analysis is the rapid rise in higher education debt. If students are enticed to work in occupations that may lead to slower growth and lower employment, a debt bubble is likely to follow. The consequences of an education debt bubble may be even more catastrophic for the economy than a housing bubble as, unlike mortgages, education loans are made without any collateral whatsoever.

In sum, Keynes was exactly right that we should be concerned with an economy that focuses on speculation over enterprise. However, it would have been impossible for him to predict the sophistication and speed of modern day speculation. In addition, his analysis falls short in that he does not consider the consequences of the allocation of talent on the economy. Policy makers should act to re-align incentives for professional investors to "defeat the dark forces of time and ignorance which envelop our future (Keynes 1936: 155)".

Appendix

Where Majors End Up By Occupation from "What's it Worth"							
Degree	Occ. 1 (%)	Occ. 2 (%)	Occ. (3) (%)	Occ. 4 (%)	Occ. 5 (%)	Total %	% STEM
Agricultural and Natural Resources	MGMT (24)	SALES (15)	LS (8)	OFF (7)	BLDG (4)	58%	8%
Arts	ARTS (25)	MGMT (14)	OFF (12)	SALES (12)	EDU (8)	71%	0%
Biology and Life Science	MGMT (16)	HLTH PROF (15)	LS (12)	SALES (11)	OFF (8)	62%	12%
Business	MGMT (25)	SALES (18)	FIN (18)	OFF (12)	BUS (6)	79%	0%
Communica-tions and Journalism	MGMT (21)	SALES (17)	ARTS (14)	OFF (14)	EDU (7)	73%	0%
Computers and Mathematics	COMP (46)	MGMT (16)	OFF (7)	SALES (6)	BUS (4)	79%	46%
Education	EDU (54)	MGMT (9)	OFF (9)	SALES (6)	BUS (3)	81%	0%
Engineering	ENGR (32)	MGMT (22)	COMP (9)	SALES (7)	ARCH (4)	74%	45%
Health	HLTH PROF (69)	MGMT (8)	OFF (4)	SALES (3)	HLTH SUP (3)	87%	0%
Humanities and Liberal Arts	MGMT (18)	OFF (15)	SALES (14)	EDU (11)	ARTS (6)	64%	0%
Industrial Arts and Consumer Services	MGMT (22)	SALES (12)	EDU (9)	TRAN (8)	OFF (7)	58%	0%
Law and Public Policy	PROT (32)	MGMT (11)	OFF (11)	COMM (9)	SALES (8)	71%	0%
Physical Sciences	MGMT (18)	SALES (11)	LS (10)	HLTH PROF (10)	OFF (8)	57%	10%
Psychology and Social Work	COMM (18)	MGMT (16)	OFF (15)	SALES (11)	EDU (8)	68%	0%
Social Science	MGMT (22)	SALES (16)	OFF (13)	FIN (7)	BUS (6)	64%	0%

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