

UBER

The Undergraduate Berkeley Economic Review

**ESSAY: GLOBALIZATION
AND ITS DISCONTENTS**

**PAPER: EFFECTS OF
BOARD GENDER
DIVERSITY ON FIRM
PERFORMANCE
AND DIRECTOR
COMPENSATION IN INDIA**

**INTERVIEW: PROF.
SHACHAR KARIV,
DEPARTMENT CHAIR, ON
ACADEMIC PUBLISHING**



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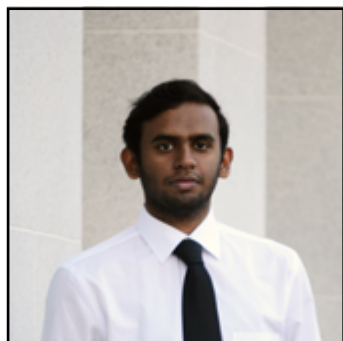
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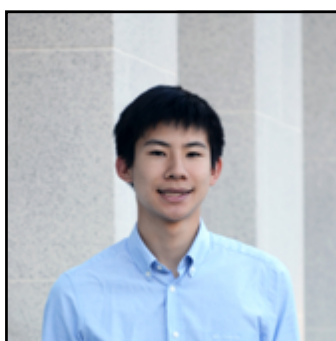
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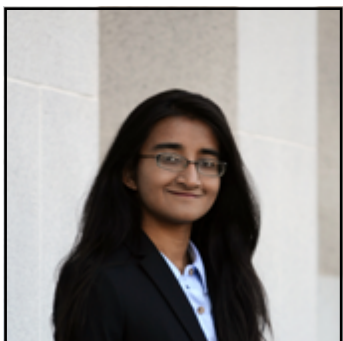
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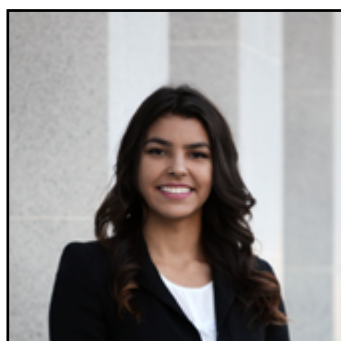
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ESSAY CONTEST

THIS PAST YEAR HAS SEEN THE RISE OF WHAT SOME DEEM TO BE POPULISM IN THE US AND ABROAD, CITING EXAMPLES LIKE THE METEORIC RISE OF DONALD TRUMP IN THE UNITED STATES AND THE HISTORICAL UNITED KINGDOM VOTE TO EXIT THE EUROPEAN UNION.

IN YOUR OPINION, WHAT ARE SOME OF THE UNDERLYING ECONOMIC ISSUES THAT CAUSED A MAJORITY OF BRITISH VOTERS TO CHOOSE TO LEAVE THE EUROPEAN UNION? CONSIDER ALSO SOME OF THE OBSERVED SHORT-TERM AND POTENTIAL LONG-TERM ECONOMIC CONSEQUENCES OF BREXIT.





Globalization and Its Discontents: Explaining Brexit

Since the 1970s, the world has witnessed both a dramatic increase in income and wealth inequality, as documented by Thomas Piketty, Robert Reich and others, and the relentless pursuit of a supra-national economic order – what Dani Rodrik calls “hyper-globalization.” These developments lie at the heart of the rise of populism across the developed world, of which Brexit and Donald Trump are the most glaring symptoms.

It is an essential fact of globalization that it creates both winners and losers. In the post-World War II era, it was understood that governments would compensate their citizens for losses from foreign competition. However, the success of the Bretton Woods paradigm prompted a belief in the value of globalization as an end in itself; subsequently, the scope of government action was reduced to simply maintaining maximum trade openness. The emphasis on reducing market imperfections and transaction costs – essentially minimizing state intervention in markets – led to the decline of collective bargaining, benefits, and provision of extensive public services.

Yet the much-vaunted benefits of trade have not materialized for the vast majority of middle- and working-class households. For the

past thirty years, their wages have stagnated as the costs of healthcare and education have risen. Their children have entered a time of the lowest intergenerational mobility in recent history. To add insult to injury, the top 10% of UK households now own about 45% of privately-held wealth, while the bottom 50% have just under 9% (Hills 2010). In the US the bottom 80% of households hold a little over 10% of available wealth (Wolff 2012). The rising tide of globalization seems to have raised some boats but submerged the rest.

The financial crises of 2008 offered leaders in the developed world the opportunity to repudiate the status quo, which they passed over even if it meant ignoring popular will and imposing egregious austerity on unwilling citizens. This was the final blow to the people’s faith in democratic institutions, which is the key to understanding why Leave proponents paid little heed to the ominous warnings of the Remain campaign.

In the short term, Britain faces a contracting economy, emigration of skilled and unskilled labor, worsening terms of trade and a precipitous drop in investment as foreign capital seeks safer shores. These losses will not be compensated by reduced immigration of low-wage workers or current account improvements

due to sterling depreciation. However, a discussion of purely economic consequences rather misses the point, for Brexit is a rare expression of public will that, because it defies rational analysis, must be understood differently. Brexit should rather be viewed as a revolt of the people against a system that has long lost its claim to legitimacy. This discontent has manifested as the right-wing populism of Donald Trump in the US and UK Independence Party (UKIP) in the UK. To provide a meaningful progressive alternative and reclaim the popular will, it is essential to redeem globalization as a means to a better future and subordinate it to the needs of democracy.

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Brexit and Social Capital

Britain's referendum culminating in a vote to leave the European Union has come to dominate the political discourse in Europe. Unsurprisingly, both the Leave and Remain camps insisted that a vote for their side would be in the country's economic interest. The public's vote to abandon the EU remains a complicated and difficult question to answer for all involved.

Aside from cultural issues, a deeply rooted economic issue which affects not only the UK but other developed countries is also to blame for Brexit. Countries similar to Britain and the United States are experiencing a sharp decline in social capital, a critical measure of productivity and a metric of social connectivity. Although difficult to measure effectively, economists believe that as social capital declines, so too does output potential and economic growth.

I would argue that seriously deteriorating levels of social capital are inextricably bound to the growing levels of populism, nationalism, and partisanship in the West. The vote to leave the EU only reflected this crucial trend. The atrophy of social capital has

manifested itself over the last few decades in growing levels of partisanship, decreasing trust in institutions, distrust in academia, growing xenophobia, and less faith in liberal Christianity. The polarization evident in the American political system receives great attention, but it actually mirrors the trend towards factionalism in countries across Europe and in Australia. Perhaps the most troublesome aspect of social capital's widespread decline has been waning confidence in institutions, whether public, private, or otherwise. Even some liberal-progressive movements over the last year and a half have been predicated on criticism of established systems and trusted institutions (think Bernie Sanders or Jeremy Corbyn). Dwindling religious faith and church attendance have been major factors in the decline of social capital as well. All of these signs and more indicate a broader trend with troubling impacts economically, both in the short and long terms.

The decline of social capital has led to our current situation of stagnant growth. It has left entire regions of developed countries



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with few gains from the changes wrought by globalization in the past few decades. Innovations in technology and transportation have left the world feeling smaller and fragile all while only minimally impacting productivity in the areas that need it most. Even more worryingly, the effects of a loss in social capital can be unpredictable. For Britain, the short run effects of Brexit have been a plummet in the value of the pound since July, permanently increased inflation, and disrupted financial markets. Yet these effects are not even directly related to social capital or even productivity. Rather, they are the result of investor panic and political action taken by people who, thanks to long-term effects like declining wage growth and economic opportunities, voted to leave the European Union in hopes of better deals. Unfortunately, Brexit will likely exacerbate the negative effects of social capital's decline even further.





Brexit: A Political and Economic Analysis

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Britain-EU relations have always encompassed a broad range of economic issues. Leave proponents – from common homeowners to political leaders – have voiced these issues as arguments for Brexit. These concerns are primarily rooted in globalization and labor economics.

Naturally, Brexit would free Britain from the constraints of the EU. For one, the British government can immediately save an estimated 10 billion pounds per year from required budget contribution – an amount by no means small (Kottasova 1). On a larger scale, however, Britain is now free to negotiate its own trade deals with foreign entities in addition to retaining its part in the EU single market. Obama's successor Donald Trump, for instance, has promised UK-US trade deliberations post-Brexit (Sandeman 1). Furthermore, South Korean, Canadian, and Australian officials have already begun pre-negotiating with British trade secretaries (Mason 1). Since EU organs are mandated to conduct current international trade deals, Brexit allows the UK to manage its own economy with other entities – a fact that appeals to Leave supporters. Likewise, since EU trade accounts for 44.6% of all UK exports, retaining that market

in addition to forming new ones overseas could greatly bolster an already-powerful economy (Office for National Statistics 1).

While politicians are concerned with the macroeconomic details, the average citizen seems to be occupied with labor economics and the impact of immigration on their livelihood. To them, leaving the EU exempts Britain from EU immigration laws and refugee mandates, thus allowing the domestic government to control how migrants are allowed into the country. Specifically, a sizeable chunk of the British population view migrants with animosity on the basis that they are “stealing jobs” from UK nationals (Culbertson 1). And while this anti-immigration sentiment has existed for quite some time, the post-2000s explosion in immigration numbers and the ongoing refugee influx have greatly exacerbated these resentments in recent years (Arnett 1). In 2014, the leader of the UKIP (UK Independence Party), Nigel Farage, proposed a discriminatory law against migrant-hiring, arguing that migrants were transferring the money they've earned back to their countries of origin instead of into the British economy (Mason & Watt 1). The veracity of this argument is still up for debate. Regardless, Leave instigators took on Farage's argument as their own in their fight for Brexit.

Admittedly, the argument could be made that Brexit will leave millions without jobs and the UK

without EU-established trade deals, thus decimating the economy. However, according to the Leave advocates, this is simply not the case. Professor Patrick Minford of the Cardiff Business School, for example, predicts a GDP growth of almost 4% by 2020 after Brexit (“Life After Brexit” 1).

Similarly, as fears of a complete economic meltdown continue to dispel, forecasters around the world have been gradually reducing their negative economic predictions (Elliot 1). Again, whether these factors prove accurate is an entirely different subject. Even so, the months leading up to a formal Brexit are a contentious time for all players in the international economy.

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A Skeptical Outlook

Brexit has developed into a major economic and political event which is difficult to successfully dissect. The underlying factors that led the British people to decide to leave the EU represent a culmination of political, economic and demographic tensions in the British Isles. But perhaps the most pressing question now is what the future holds for the UK.

Currently, the UK faces a highly uncertain future. The tumbling of the pound against the dollar following the Brexit vote, as well as the rapid downgrade of the UK's credit rating by agencies like S&P, reflect the speculative economic outlook the UK is facing. The UK must now consider how to position itself relative to the EU and whether there will be backlash from foreign and domestic groups. For example, while the UK may find it desirable to follow Norway's path and maintain free trade with the EU, the EU member nations may decide to take a hardline stance and deny the UK such a position. Their goal would be to ensure that other EU nations do not follow the UK in exiting the union by making an 'example' of the UK. Another source of domestic tension is the fact that both Scotland and Northern Ireland wish to remain part of the EU. The UK's



decision to pursue Brexit may reignite independence movements in Scotland and Ireland, motivated by a desire to regain EU membership.

Another concern is how Copeland, Michael businesses will adjust to the new status of the UK, which may vary depending on negotiations. Currently, large firms, especially those in the financial sector, view the Brexit vote with skepticism. The UK's membership in the EU was essential to this industry, and its exit poses major operational risk considering the dramatic cost increases if the UK is pushed outside of the single European market. In addition, the rapid depreciation of the pound against the dollar and euro has added to the cost of doing business in the short run for these firms. Although the pound's depreciation has spurred some firms, such as Rentokil Initial, which is forecasting £15 million in additional revenue (Hunt 1), it has negatively affected current operations of

the UK financial industry. The short and long term costs financial firms face in the UK, as well as the unstable relationship between the UK and EU, will most likely push companies to relocate to other financial hubs that remain part of the single market, such as Frankfurt and even Dublin.

Overall, the future of the UK is entirely dependent on whether the current leadership of the EU wishes to allow the UK to acquire standing akin to Norway. If the UK is permitted to do so, the worst-case scenario is avoided. However, if member states' political motivations prohibit the UK's inclusion, the result could be a major economic shock in the already weakened UK.

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A New Brexit Strategy



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The recent and relatively surprising Brexit vote is as much, if not more, about the reactions to economic conditions as it is about the economic conditions themselves. With the Brexit vote, a class of previously underrepresented people was able to make its voice heard in the global economy. This class of people is currently gaining power in the democratic world and should be considered in the way that economists make forecasts.

According to data from The Atlantic and the UK Office for National Statistics, this new class of Brexit proponents is made up of under-earners with little or no college education (McGill 1). This is a particularly vulnerable class in the burgeoning white-collar, technology-driven economies of the Western world. Growing global trade and the ease of outsourcing labor has seen this class left out in the cold while Great Britain's economy has plunged into the twenty-first century. It is thus no surprise that this class wants change, reform and protection. Political leaders, in turn, have tapped into this growing unrest and exacerbated it in order to advocate for drastic policy swings. UKIP's Nigel Farage was able to convince this class that the best thing for them was not sensible reform, but a complete separation from the EU. This tactic is not

unlike that of our very own Donald Trump, who was able to convince nearly half of the electorate to support him when his legitimacy as a candidate rested on wall construction.

This presents a problem for economic forecasts. Economically downtrodden people can now be convinced to vote for something drastic, like building a wall or leaving the EU. A problem arises because the developed economy of Great Britain is not a place for drastic policy swings. In an economic environment where the US Federal Reserve's decision to raise the Federal Funds Rate one quarter of a percent sends ripples throughout the developed world, drastic policies like Brexit are going to have erratic effects that economic models will be unable to predict.

The negative effects of Brexit are already evident in Britain, even before any concrete policies have been enacted. A survey from the British Federation of Small Businesses reported that the confidence of small businesses is down significantly for the coming year (FSB 1) and the Organization for Economic Co-operation and Development has cut their expectations for British GDP growth in 2017 in half (OECD 1). If these predictions hold true, the fall in consumer confidence and business investment will lead to a decrease in the growth of employment. Ironically, there

is a real chance that the very individuals most likely to vote to leave the EU will be the most negatively affected by Brexit.

Arguably the most important factor in understanding the Brexit vote is not the economic climate in Britain, but the preferences of this new class of people reacting to that climate. If this class continues to make such drastic decisions, economic models will have to adapt significantly.

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A Dangerous Vote

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On June 23, 2016, voters in the United Kingdom took a previously unthinkable gamble. In doing so, they left a decades-long dream in tatters and a country uncertain of its future. Yet the lead-up to this tragedy was not characterized by widespread social unrest or economic volatility. The country was well along the path of a slow but steady recovery from the recession. The referendum had only been called by conservative Prime Minister David Cameron as a last-minute vote grab ahead of the 2015 parliamentary elections. The fundamental cause of the UK's vote to leave the European Union was not that of deteriorating underlying economic conditions, but rather of a misguided perception among the public that the country was on a downward-sloping path.

The Bank of England, WTO, IMF and countless other reputable institutions warned of the dire consequences of a Leave vote: a massive recession, loss of the single market, increased unemployment, a drop in foreign investment into the country. The EU provided the UK with a massive, barrier-free market for exports and a steady source of financial investment. Yet voters were swayed by exaggerated claims of EU membership fees, falsehoods about the economic impact of immigration, and a flawed view of national sovereignty. Experts agree

that the negative economic impact of Brexit far outweighs any current obligations the United Kingdom currently has, and that the influx of workers due to immigration has helped the British economy grow.

In the end, however, Britons voting leave believed that the issues of national sovereignty (30%) and immigration (49%) were more important than the economy (25%) (Ipsos MORI). An underlying wave of populism and anti-intellectualism had voters changing priorities and improperly weighing the consequences of both sides. A startling 83% of Britons voting leave claimed they would rather trust the wisdom of ordinary people over expert opinion (Economist 1). Such sentiments are a disturbing threat to our style of representative democracy and the faith we put with those in power.

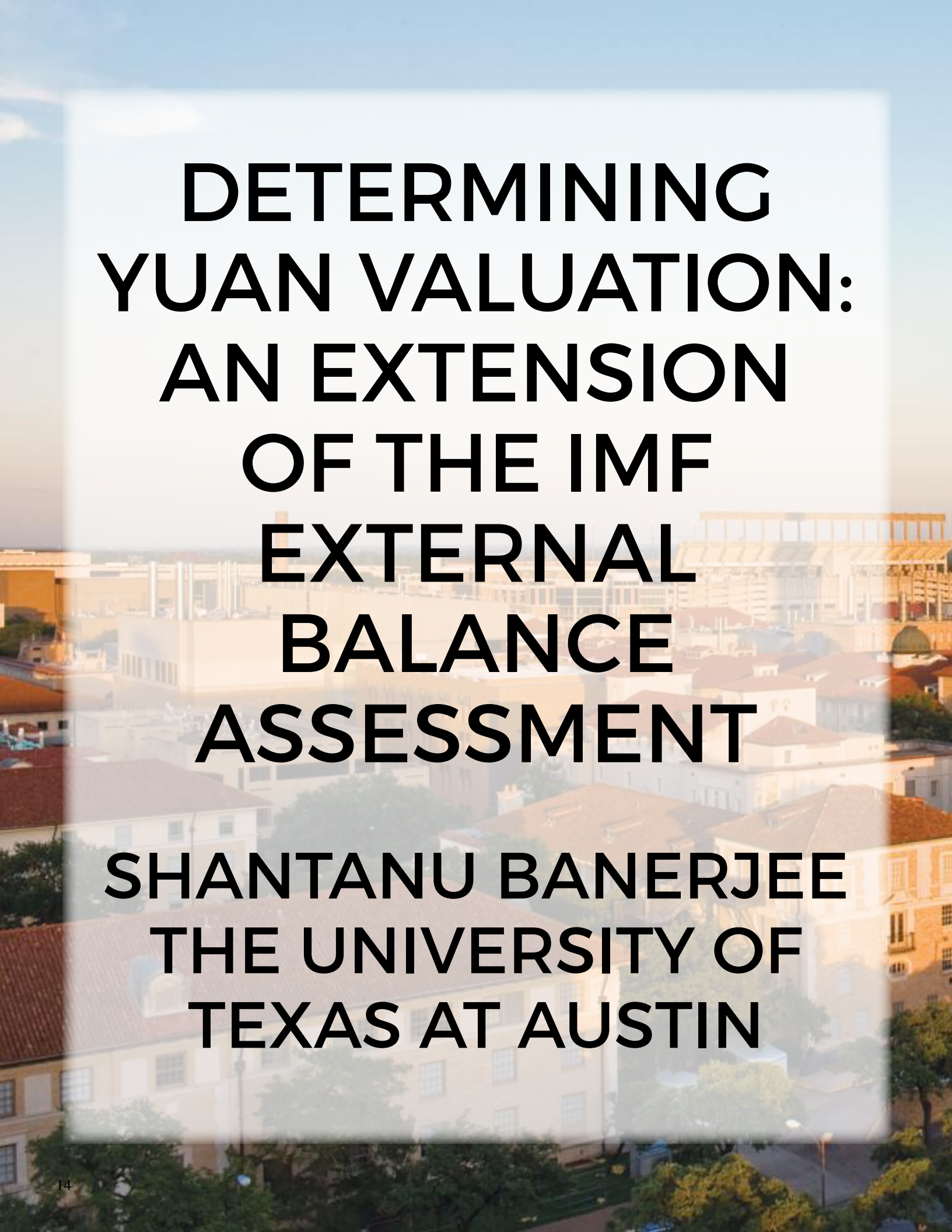
Looking into the future, it is clear that the UK's prospects are grim. The only hope the country has to salvage its economy and maintain some of the benefits of the EU's free exchange of goods is to initiate a "soft" Brexit. Under such a system, the country would remain in the European single market in exchange for stronger controls on immigration. However, current Prime Minister Theresa May has recently proclaimed "Brexit means Brexit" and is signaling that a "hard" Brexit is more likely. This choice would likely cause greater damage to the British economy and indicates that modern populism is here to stay. Scotland may choose

to call for another independence referendum; the UK may attempt new trade negotiations with the United States. A perfect storm of misconceptions and ill-conceived judgement has plunged a country in chaos, and no one can be certain of what lies ahead.

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DETERMINING YUAN VALUATION: AN EXTENSION OF THE IMF EXTERNAL BALANCE ASSESSMENT

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Determining Yuan Valuation: An Extension of the IMF External Balance Assessment Approach

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Undergraduate Honors Thesis
Department of Economics
The University of Texas at Austin
Spring 2016

Advisor: Professor Haiqing Xu
Secondary Reader: Professor Andrew Glover

Abstract

This paper applies the IMF EBA methodology to a China-specific time series analysis, using a 2SLS instrumented regression with Newey-West standard errors to determine the policy gap that results from PBOC intervention. We find the impact of reserve accumulation to be more significant in magnitude than indicated by the EBA, demonstrating a modest improvement in accuracy with the introduction of central bank liquidity swaps as a novel instrument. Evidence of a long term equilibrium relationship is also found between the real effective exchange rate and reserve accumulation, with the presence of medium level capital controls.



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I. Introduction

The past year's debate on the Trans-Pacific Partnership (TPP) and Trade Promotion Authority (TPA) has led to discussion on what is referred to as currency manipulation, the act of devaluing currency in order to increase exports and reduce imports.

Trade rules have obliged countries to refrain from such practices, but enforcement of such obligations depends on certification by the International Monetary Fund (IMF) "that a country's exchange rate policies were contravening IMF obligations as well as distorting trade flows" (Bergsten and Schott 2015).

The Hatch-Wyden amendment to TPP attempted to address the issue of currency manipulation through existing membership obligations in the IMF, with Senator Hatch (R-UT), chairman of the Senate Finance Committee, directly referencing the results of the External Balance Assessment (EBA) in May, 2015 speech on the senate floor. The amendment failed, but it highlights the significance policymakers attach to the conclusions of the IMF methodology.

Recent events have drawn attention to China in particular. The People's Republic has experienced \$158.7 billion in capital outflows in December of 2015 alone, with the 2015 total outflows estimated to be \$1 trillion (*Bloomberg* 2016). In response, new capital controls were introduced in September of 2015. The People's Bank of China



(PBOC) has had to intervene to support the Yuan. As a result, China's foreign exchange (FX) reserves hit a three year low in January of 2016 (Wei 2016), with December 2015 marking the largest single monthly drop (\$107.9 billion) since 2003 (Yap 2016).

The purpose of this paper is to explore the impact of PBOC intervention on China's real effective exchange rate (REER). This paper builds upon the IMF's EBA methodology, with the goal of demonstrating value in country-specific analysis in contrast to the EBA cross-country panel approach.

Forex intervention is when a central bank enters the foreign exchange market to buy or sell currency, typically through FX reserves, to influence exchange rates.

As to the why, various motives are cited in literature. Mohanty and Berger of the Bank for International Settlements (BIS) survey 19 central banks to rank motives for intervention and find the primarily motivation for intervention is to curb excessive exchange rate speculation (Mohanty and Berger 2013, 58). Attempts to control inflation, discourage sudden capital inflows or outflows, ensure financial stability, and build or reduce FX reserves are all found to be motivators for intervention as reported by central banks.

The paper is divided into three sections. Beginning with a literature review that outlines the measures used to proxy for intervention, the recent history of the Yuan and China's exchange rate regime, as well as an explanation of the purpose capital controls



serve for sterilized intervention. This is followed by a data and methodology section, explaining the EBA and characteristics that make this paper distinct from the IMF approach. The final results section covers the instruments used in this study, the impact of intervention, consistency with the EBA results, as well as contributions to literature.

II. Literature Review

2.1 Measures of Intervention & Lack of Transparency

Proxies are used to measure intervention because there is a lack of public intervention data, as only some central banks disclose such data, while others do not. This has acted as a major hindrance on the further study of intervention (Edison 1993).

The PBOC does not disclose intervention and currency composition of FX reserves. It is not uncommon for central banks to keep intervention confidential. One possible reason is Taylor's (1982a and 1982b) explanation, dating back to the fixed exchange rate of the Bretton-Woods era, where any reports of intervention could result in a panic and run on a currency. However, given the lack of transparency which has persisted since the end of Bretton-Woods, literature (Neely 2000, 21) argues central banks may wish to avoid accountability.

Neely also brings up the possibility of secret interventions, or attempts to conceal the size and/or volume of intervention, which can sometimes prove more effective in influencing exchange rates (Bhattacharya and Weller 1997).



2.2 Intervention Proxy

The metric used in this paper is changes in FX reserves from period-to-period, as used by the EBA. Multiple studies have used change in reserves as a proxy for intervention before (C. Neely 2000; Obstfeld 1983; Kearney and MacDonald 1986; Gartner 1987, 1991).

However, one concern over the use of changes in FX reserves as a proxy measure is such reserves can change for a variety of other reasons. This can be due to currency swap agreements, paying back foreign-denominated debt (Neely 2000), swap lines with private firms, and other factors outlined below.

Other measures can be found in the Treasury Department's semi-annual report to congress on exchange rates. The Treasury uses levels of FX reserves to observe reserve accumulation, which can indicate a devalued currency (Powell 2013, 2), as well as two undisclosed measures that, upon inquiry, remain confidential.

A third measure used in literature includes news reports, due a lack of transparent intervention data (Neely 2000; Peiers 1997; Goodhart and Hesse 1993).

2.3 Challenges to Change in Reserves Proxy

The value of FX reserves can change as a result of multiple reasons. The FX value of the currencies held in reserve can shift. One could potentially compensate for



changes in valuation of a currency if one knows the composition of reserves. However, such composition is not disclosed by the PBOC. The other two reasons are interest income/coupon payments as well as changes in value of the underlying asset(s) (Neely 2000, 22) such as Treasuries. There are also other uses of reserves. For example, changes might encompass any government purchase from abroad or payment of debt denominated in a foreign currency (Neely 2000, 6).

Intervention can also be carried out without FX reserves, in order to show no changes in reserves on a central bank's balance sheets. Existing literature (Neely 2000, 22) discusses Taylor's (1982a and 1982b) findings regarding how France, Italy, Spain, and the UK utilized nationalized industries to conduct transactions in the 1970s to hide intervention. There is also evidence of Japan and France intervening using hidden reserves held at commercial banks (Neely 2000, 22). Neely also discusses how a central bank can conduct intervention through forward markets, arguing a central bank can "offset with a spot transaction when the forward contract is executed." (Neely 2000, 22).

Neely further discusses how allocation of special drawing rights (SDRs) from the IMF may alter FX reserves, but this does not prove to be an issue in China's case as SDRs are kept as a separate line item on PBOC balance sheets.



2.4 The Yuan in Review

This brief survey of the Yuan exchange rate begins in 2005, when China broke from the peg to the dollar in July, (Weisenthal 2015) and by Sept. the U.S. Treasury accused the IMF of being “asleep at the wheel” for allowing China to maintain an undervalued currency (“Remarks by Under Secretary... Adams” 2005).

By April 2012 the Yuan trading band went from 0.5 percent to 1 percent (Weisenthal 2015). The trading band is the rate at which the PBOC allows the Yuan to rise or fall from a daily midpoint rate set each day (Sweeney and Jianxin 2014). The larger this band is, the greater a role market forces can play in determining the exchange rate. The set midpoint rate can also be referred to as the central parity rate.

In March 2014 the PBOC widened the Yuan trading band from one to two percent (Sweeney and Jianxin 2014). By June China’s FX reserves peaked at \$3.9 trillion, as the PBOC began to sell dollars to support the Yuan (Weisenthal 2015).

The following April in 2015 Deputy Director of the IMF’s Asia Pacific Department, Markus Rodlauer, said the Yuan was close to a point where it was “no longer being undervalued” (Weisenthal 2015). By Aug. the PBOC set the Yuan central parity down 1.9 percent, further closing the gap between central parity and the spot price. The move was welcomed by the IMF, as it allowed market forces to play a greater role in determining the exchange rate (Weisenthal 2015).



Later that month on Aug. 11 markets saw the single largest devaluation of the Yuan in 20 years, followed by a second devaluation the following day. However, the PBOC attempted to reassure markets it was not looking to embark on a steady depreciation (Inman and Ryan 2015). In November of 2015 the IMF approved the addition of the Yuan to its reserve currency (i.e. SDR) basket.

Finally, this February (2016) marked the lowest FX reserve levels since 2012, with half a trillion dollar decline in FX reserves in 2015, the first ever annual decline seen for China (*Bloomberg* 2016).

2.5 Use of Capital Controls

The use of effective capital controls allows policymakers to influence exchange rates through sterilized intervention (Engel 2011).

For example, say the PBOC sells dollar-denominated assets from its FX reserves. By increasing the supply of dollars in the dollar forex market, the PBOC can appreciate the Yuan against the dollar towards a target exchange rate. However, by definition this sale of dollar-denominated FX decreases China's monetary base. To counteract this effect, the PBOC sells bonds to sterilize the intervention, with capital controls necessary to minimize the impact on the monetary base effectively.

Sterilization by a central bank means “[reversing] the effects of the foreign exchange transaction on the monetary base,”(Neely 2000, 21). As opposed to unsterilized



intervention, which is the equivalent of carrying out domestic monetary policy (Neely 2000, 21) through changing of the monetary base. Neely provides an example; “When a central bank buys (sells) foreign exchange, the monetary base increases (decreases) by the amount of the purchase (sale)” (Neely 2000, 1). To reverse (i.e. sterilize) the effect on the domestic monetary base, a central bank can buy (sell) domestic bonds (Neely 2000; Edison 1993).

However, sterilized intervention has no effect on exchange rates if domestic and foreign bonds are perfect substitutes (i.e. currency denomination of bond does not matter to investor). If investors are indifferent about holding a domestic or foreign bond, then changes in the supply of bonds should not have an impact on the exchange rate (Dominguez 2008), and central banks attempts to issue bonds to sterilize intervention would be theoretically ineffective.

Capital controls provide for limited capital mobility, resulting in foreign and domestic currency denominated assets being imperfect substitutes. As a result, when a central bank issues bonds with capital controls in place, it can effectively lower the price of bonds domestically and absorb the extra liquidity to keep the monetary base unchanged.



2.6 Recent Events

The past decade has seen a gradual liberalization of capital controls in China. However, the capital flight in the third and fourth quarters of 2015 may change this, as China introduced new controls in September of 2015 (Wei and Trivedi). These controls are not perfect. December of 2015 alone saw \$158.7 billion in capital outflows, while the year's outflow stands at \$1 trillion (*Bloomberg* 2016).

Recent events from July 2015 onward are what led us to limit the paper's time horizon to 2015 quarter two, given the recent volatility in FX reserve changes, capital outflows, and the corresponding controls to prevent such outflows.



III. Data and Methodology

3.1 Real Broad Effective Exchange Rate (REER)

The REER index is an average of bilateral real exchange rates between a country (China) and its trading partners; weighted by respective trade shares of each partner. It constitutes the amount of foreign exchange needed to buy RMB. For example, if the REER rises for China the RMB appreciates, as you need more FX to buy RMB. REER indices are provided by the Bank for International Settlements.

3.2 Policy Variables

3.2.1 Foreign Exchange (FX) Intervention

Intervention is proxied for using quarterly changes in FX reserves as listed from the PBOC balance sheets. These changes are scaled to real GDP. Change in FX reserves is interacted with the Quinn capital controls index, where 0 represents no controls, while 1 represents full controls. These two variables are interacted because the use of effective capital controls allow policymakers to influence exchange rates through sterilized intervention (Engel 2011).

The issue of endogeneity arises with the use change in reserves interacted with capital controls. The presence of other control variables as well as instruments are used to correct for this.



M2 (scaled to GDP) is used to account for a crisis prevention motive, while U.S. short term interest rates are used to capture reserve accumulation motives (Phillips et al. 2013).

This paper also introduces a new instrument to control for endogeneity between reserve accumulation and the level of REER, liquidity swap agreements. This is proxied for through the volume of swaps as reported by the Russian Central Bank, as Russia and China have had liquidity swap agreements in place since Oct. 2014 (Ostroukh 2014). This instrument helps account for reserve changes uncorrelated with intervention and the REER.

3.2.2 Monetary Policy

This paper uses short-term real interest rate differentials to proxy for the impact of monetary policy on the REER. The interest rate differential is the difference between Chinese and U.S. short-term real rates. This is interacted with capital account openness, as the EBA suggests the magnitude to which monetary policy explains movements in the REER is influenced by the degree of openness to capital flows (Phillips et al. 2013, 26).



3.2.3 Public Health Expenditure; Lagged

Health expenditure is included to capture the impact on savings rates in a country. National savings rates can be influenced by rises and drops in public spending on health care. The variable is scaled to GDP. The data was obtained through the World Health Organization.

3.3 Non-Policy Variables

3.3.1 Demeaned Private Credit

Meant to serve as an indirect measure for financial excesses, the variable is also intended to capture the failure of policies meant to prevent such excesses. Such excesses can result in shocks to demand, and real appreciation (Phillips et al. 2013). The purpose of this variable is to indicate the impact financial policies have (Phillips et al. 2013) on the REER.

3.3.2 Financial Home Bias

This variable indicates domestic preference for domestic assets (Phillips et al. 2013). It is measured as the share of domestic debt owned by residents of that country. Data is from the Bank of International Settlements.



3.3.3 Productivity Interacted with Capital Account Openness

Measure of output per employed person for China, constructed relative to the U.S. Constructed as an index, baselined at 2000 quarter one. In theory capital flows will move from low to high productivity countries (Gourinchas and Jeanne 2013), to the extent to which countries permit such capital inflows (Phillips et al. 2013); hence the interaction with capital account openness.

3.3.4 VIX/VXO Interacted with Capital Account Openness; Lagged

Demeaned VIX over VXO is used as an indicator of global risk aversion (Phillips et al. 2013). The negative coefficient is linked to the need to generate a current account surplus when global risk aversion increases and access to credit becomes more constrained (Phillips et al. 2013). The EBA finds the more open the capital account, the stronger the effect of risk aversion.

3.3.5 Commodity Terms of Trade

The ratio of real exports to imports prices of commodities. The commodity index is the ratio of a geometric weighted average price of main export categories to commodity import categories, relative to advanced economies manufactured goods prices (Phillips et al. 2013, 45). The weights are given by their share in the countries' exports



to imports. The index is constructed from the prices of six commodity categories (food, fuels, agricultural raw materials, metals, gold, and beverages). These relative commodity prices of six categories are weighted by the time average of export and import shares of each commodity category in total trade (exports and imports of goods and services) (Phillips et al. 2013, 45). This data is obtained through the EBA dataset.

3.3.6 Trade Openness

The sum of exports and imports, scaled to GDP, as a proxy measure for trade liberalization.



3.4 IMF EBA Dataset and Gap Analysis

Data for log commodity terms of trade and financial home bias were obtained through the IMF EBA dataset. The data ends at 2010, with 2013 observations provided. For these two variables we use an autoregressive analysis to forecast the gaps until 2015. Residuals from the AR process are used as a regressor to provide for a more accurate forecast, if the residuals are found to be statistically significant.

The EBA constitutes a cross-country panel regression involving 40 countries, with 769 observations from 1990 to 2010 at an annual frequency, while 2013 observations are used in gap analysis. The methodology utilizes a set of policy and non-policy variables outlined above, as well as additional non-policy variables (e.g. South African apartheid dummy variable, population growth, and GDP growth forecast, own currency's share in world reserves). These additional non-policy variables were not included in this paper due to data availability issues, or they were found to be negligible (i.e. apartheid dummy variable, currency share in world reserves).

The IMF EBA gap analysis can be broken down into the following steps:

$$1. REER = \widehat{REER} + Regression\ Residual$$

$$2. \widehat{REER} = \alpha + X\beta + P\gamma$$

$$3. \widehat{REER} = \alpha + X\beta + P^*\gamma + (P - P^*)\gamma$$

Where X is a vector of non-policy variables and P is a vector comprising of policy



variables. P^* constitutes desirable policy variables, as determined by the IMF. Gamma represents the slope parameter for the policy variable of choice.

$(P - P^*)\gamma$ is considered the policy gap contribution to the deviation from the REER norm. This paper's focus is on the impact of intervention, and as a result focuses on the desirable value assigned to the intervention proxy measure (change in reserves/GDP * K Controls) for China. The desirable value for change in reserves in this case is zero. Gamma's value is the slope parameter for the intervention proxy.

The desirable value of zero is used for countries which are deemed by the IMF to have reserves in excess of what the IMF refers to as the "suggested adequacy range" ("2015 External Sector Report," n.d., 12), determined using a confidential metric for assessing reserve adequacy. The ESR provides a composite metric. Countries with reserves in the range of 100-150 percent of this composite metric are considered to have adequate reserves for precautionary purposes ("Assessing Reserve Adequacy - Further Considerations" 2013). In the IMF 2015 External Sector Report it is found that "China's reserves at end-2014 were 149 percent of the unadjusted metric and 238 percent of the metric adjusted for capital flow management measures. Under either metric, the staff assessment is that further accumulation is unnecessary from a reserves adequacy perspective." ("2015 External Sector Report," n.d., 12).

This study carries out both a levels and log REER instrumented 2SLS regression with heteroskedastic and autocorrelation consistent (robust Newey-West) standard



errors. The prior is used for gap analysis as discussed above, while the latter is used to predict a percent change in the REER, given a percent change in reserves. The 2SLS is carried out twice, using the same instruments as the IMF (i.e. M2/GDP and U.S. interest rates) as well as a new instrument (i.e. volume of Russian Central Bank FX swaps). The time horizon encompasses 2000 quarter one to 2015 quarter two.

IV. Results

4.1 Instruments

The underidentification test rejects the null that the equation is underidentified at the 5% level. The underidentification test is an LM test of whether the equation is identified (i.e. excluded instruments are relevant and correlated with endogenous regressor). It is the test of the rank of a matrix, with the rejection of the null indicating the matrix is full column rank (i.e. model is identified).

In regards to testing for instruments, the first-stage F-test of the crisis prevention motive (m2/GDP) and Russian swaps is significant at the 1% level with an F-statistic of 27.27. The crisis prevention motive and U.S. short term rates results in an F-Statistic of 29.33, and is also significant at the 1% level. Both pairs of instruments exceed the $F > 10$ threshold, rejecting the weak instruments null (Staiger et al. 1997; Stock and Yogo 2005).



Concerning instrument validity, the Hansen-J test indicates the instruments are valid at all levels for both instrument combinations.

4.2 Reserve Accumulation

We find an additional 1% increase in reserve accumulation relative to GDP (with medium level capital controls in place) is predicted to depreciate the REER by 14.9%, *ceteris paribus*. In contrast, EBA Results indicate a 0.75% depreciation of the REER for a 1% increase in reserves.

Using the EBA methodology's gap analysis, we find reserve accumulation results in a -3.1% contribution to the level of REER, in contrast to the -1.3% contribution the EBA finds ("2015 EBA: Individual Country Estimates" 2015, 26).

It is worth noting for the EBA the cross-sectional variation of reserve accumulation is twice the time variation within countries, which makes it difficult to determine the impact (Phillips et al.). In this paper's instance, there is no cross-country variation to be concerned with. What does make finding forex intervention's impact challenging in our paper is determining what observed value should be used for gap analysis. The paper uses the average level of intervention from the last two years as the observed intervention value. Single quarters are volatile, given the heavy intervention by the PBOC over the last year.



4.3 Consistency with EBA

This paper finds while the impact of each variable on the REER (the sign of each coefficient) is consistent with EBA findings, the magnitude of the reserve accumulation proxy measure is not.

Policy variables such as the real interest rate differential and lagged public health expenditure, along with non-policy measures such as productivity, are found to be statistically insignificant. This is unique to the case of China when contrast to EBA findings.

Concerning the accuracy of fitted values, the EBA root MSE is about 8%, in contrast to under 7% with our findings.

4.4 Mean Reversion

Both financial home bias and the real interest rate differential interacted with capital account openness are found to be $I(0)$ (integrated to order 0) stationary, with the augmented Dicky-Fuller test at the 1 percent level, using several different lag lengths. Non-stationary variables' relevance is determined by cointegration testing through the Engle-Granger two-step method.

The non-stationary characteristics seen in some data may be due to a short time horizon or limited observations. In such cases the standard errors are not reliable, and



statistical inferences are not valid as a result (Engle and Granger 1987)

We find \ln REER and change in reserves interacted with capital controls are cointegrated at the 5% level until two or more lags, demonstrating the intervention proxy measure's significance as a non-stationary variable. This suggests a long-run equilibrium relationship between \ln REER and reserve accumulation (Paul, n.d.). Cointegration also implies there exists an error correction data generating mechanism as well (Engle and Granger 1987). Our findings are consistent between both combinations of instruments used.

In regards to the use of lags, literature suggests with too few lags, remaining serial correlation in errors will bias the ADF test (E Zivot, n.d.). However, the power of the test suffers with too many lags (E Zivot, n.d.).

4.5 Implications for Literature

We find reserve accumulation in China's case has far more economically significant impact on the REER than in the cross-country panel EBA results. The novel use of Russian currency swaps proved to be a valid and strong instrument. Swaps have been used before to explain low correlation between reserves changes and intervention, particularly in the case of Germany (Neely 2000). The suggestion to use liquidity swaps to account for changes in reserves in regards to the intervention proxy came from Maurice Obstfeld.



However, the liquidity swaps for another central bank (i.e. Russia) that has a swap agreement with a country of interest's central bank (i.e. PBOC) was not found to be an instrument commonly used in existing literature to deal with the endogeneity issue presented by the of reserve accumulation measure.

There is existing literature on cointegration between nominal exchange rates and reserve accumulation (Adam Elhiraika and Léonce Ndikumana 2007). Specifically in China's case, evidence of cointegration has been found between the log difference in the level of forex reserves and log difference of the REER (Jin 2003). Our finding of cointegration between quarterly changes in FX reserves as a percentage of GDP and the \ln REER for China is unique, and fits into current literature on the long-run relationship between reserve accumulation and the REER.

In regards to the EBA, this paper marks a move towards country-specific analysis. The reason this is of value is due to the fact that the EBA relies on statistical significance for the intervention proxy primarily from two countries in the sample. If China is removed from the EBA REER regression, intervention is no longer significant. If Malaysia is removed, intervention is significant only at the 10 percent level.

In terms of accuracy, our findings have a slightly lower root MSE than that of the EBA, indicating country-specific regressions may make a modest difference in accuracy.



Furthermore, the pooled regression used in the EBA is unbalanced, as there are different numbers of observations for different nations. For example, there are 21 observations for the US, but only 19 for India, 14 for Indonesia, and 12 for Pakistan. Country-specific analysis, as in this paper's case, need not be concerned over unbalanced panels potentially effecting results.

The EBA panel regression offers 21 observations at most for a nation, with the 2014 dataset only going as far as 2010. While it utilizes 2013 observations, it does not take into account 2011-2013 in the regression. In drawing conclusions for 2015 this paper utilizes a dataset that encompasses a time horizon up to the second quarter of 2015, utilizing observations from the time horizon it is drawing a conclusion on.

4.6 Limitations

One limitation to this paper is the short time horizon used, resulting in non-stationary variables that are not always cointegrated with \ln REER (e.g. Demeaned private credit, log commodity terms of trade, demeaned VIX). The model's ability to explain about 75% of the variation seen in the observations does not hold as much weight when taking into consideration the small number of observations (i.e. 59) used.

There is also a higher likelihood of omitted variable bias in this work when contrast to cross-country panel data like that of the EBA. This is due to panel data's advantage in controlling for omitted variables.



4.7 Future Steps

There remain several steps to take to further this paper. A first-differences regression would aid in dealing with non-stationary data, and would go hand-in-hand with investigating for multicointegration in regards to $I(2)$ systems.

We wish to test for nonlinear relationships as well. For example, some literature suggests a nonlinear approach to evaluate the relationship between the real interest rate differential and REER (Nakagawa 2002).

Next, country-specific analysis provides for looking at variables impacted by the level of capital controls in place. Little to moderate levels of capital controls has been found to influence financial home bias (Forslund, Lima, and Panizza 2011), so it would be appropriate to interact with CC as a future step.

Finally, we would like to find the impact of reserve accumulation by currency composition by Dollar reserves, Euro reserves, et cetera. This is currently impossible as the PBOC has not disclosed this publicly.



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VI. Appendices

Exhibit 1

LN(REER) Regression with M2/GDP and U.S. Interest Rates as Instruments

Variables	Coefficient
	P-Value
Delta Reserves/GDP * Capital Controls, Instrumented	-0.149157
	0.00
Real Interest Rate Differential * Capital Account Openness	0.0000369
	0.409
Demeaned Private Credit/GDP	0.7150828
	0.00
Financial Home Bias	0.6203986
	0.033
Log Commodity Terms of Trade	0.0085366
	0.344
Lagged Demeaned VIX * Capital Account Openness	-0.002095
	0.002
Constant	4.486607
	0.00

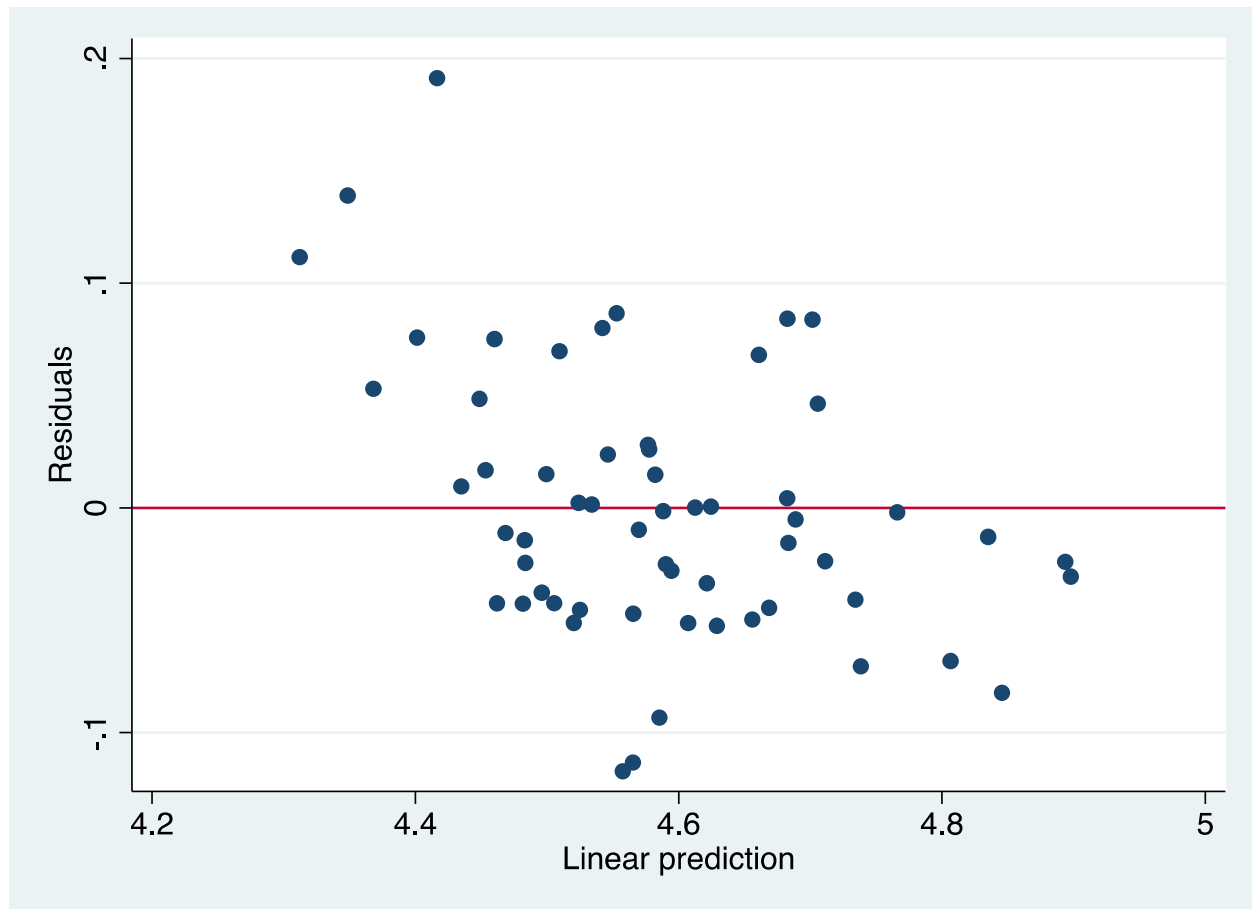
Centered $R^2 = 0.7447$

Lag is 3 quarters

Observations: 59

**Exhibit 2**

Fitted Values Scattered Against Residuals with M2/GDP and U.S. Interest Rates



**Exhibit 3**

Fitted and Observed Values with M2/GDP and U.S. Interest Rates

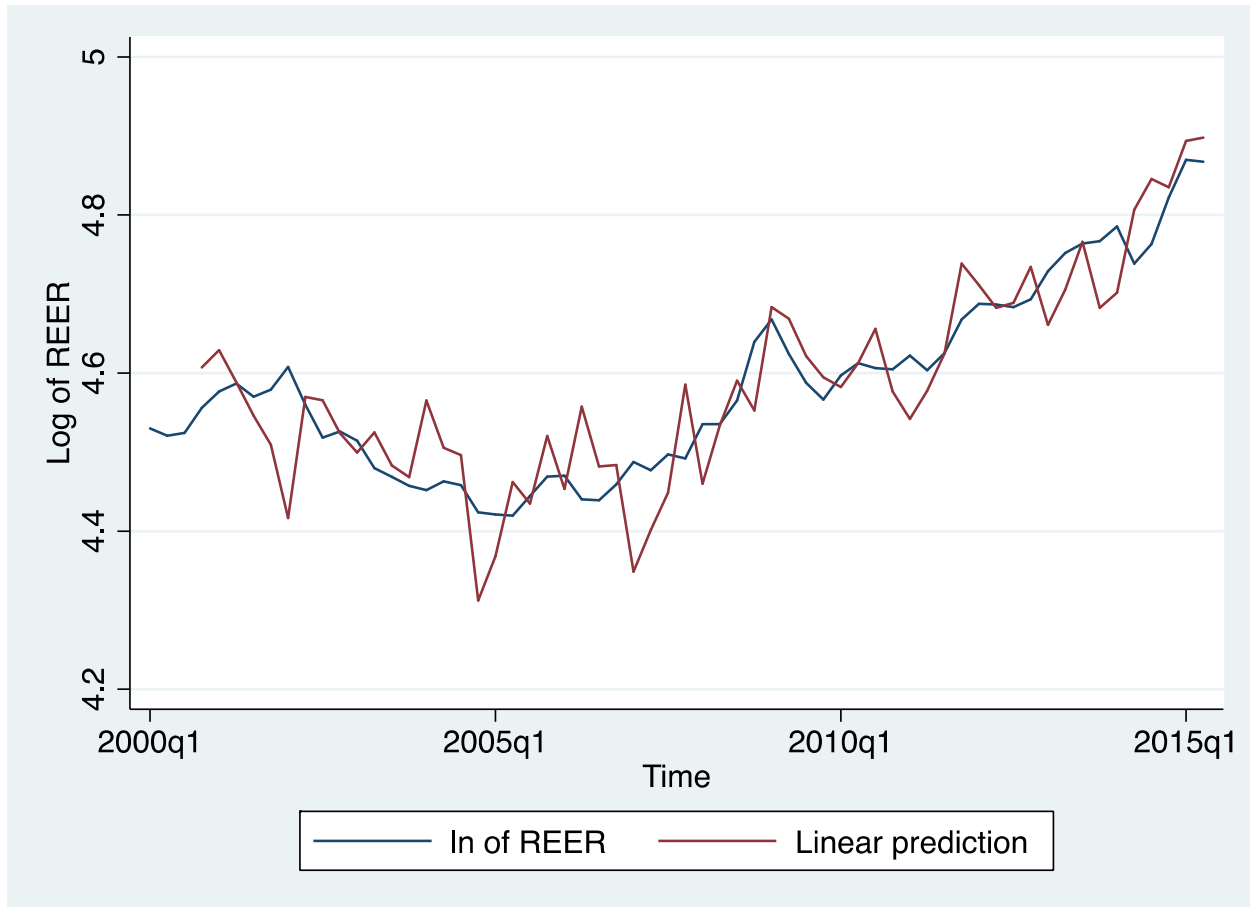




Exhibit 4

LN(REER) Regression with M2/GDP and Russian Swaps as Instruments

Variables	Coefficient
	P-Value
Delta Reserves/GDP * Capital Controls, Instrumented	-0.145326
	0.00
Real Interest Rate Differential * Capital Account Openness	0.0000372
	0.397
Demeaned Private Credit/GDP	0.7254768
	0.00
Financial Home Bias	0.6266451
	0.024
Log Commodity Terms of Trade	0.009378
	0.271
Lagged Demeaned VIX * Capital Account Openness	-0.002103
	0.002
Constant	4.480621
	0.00

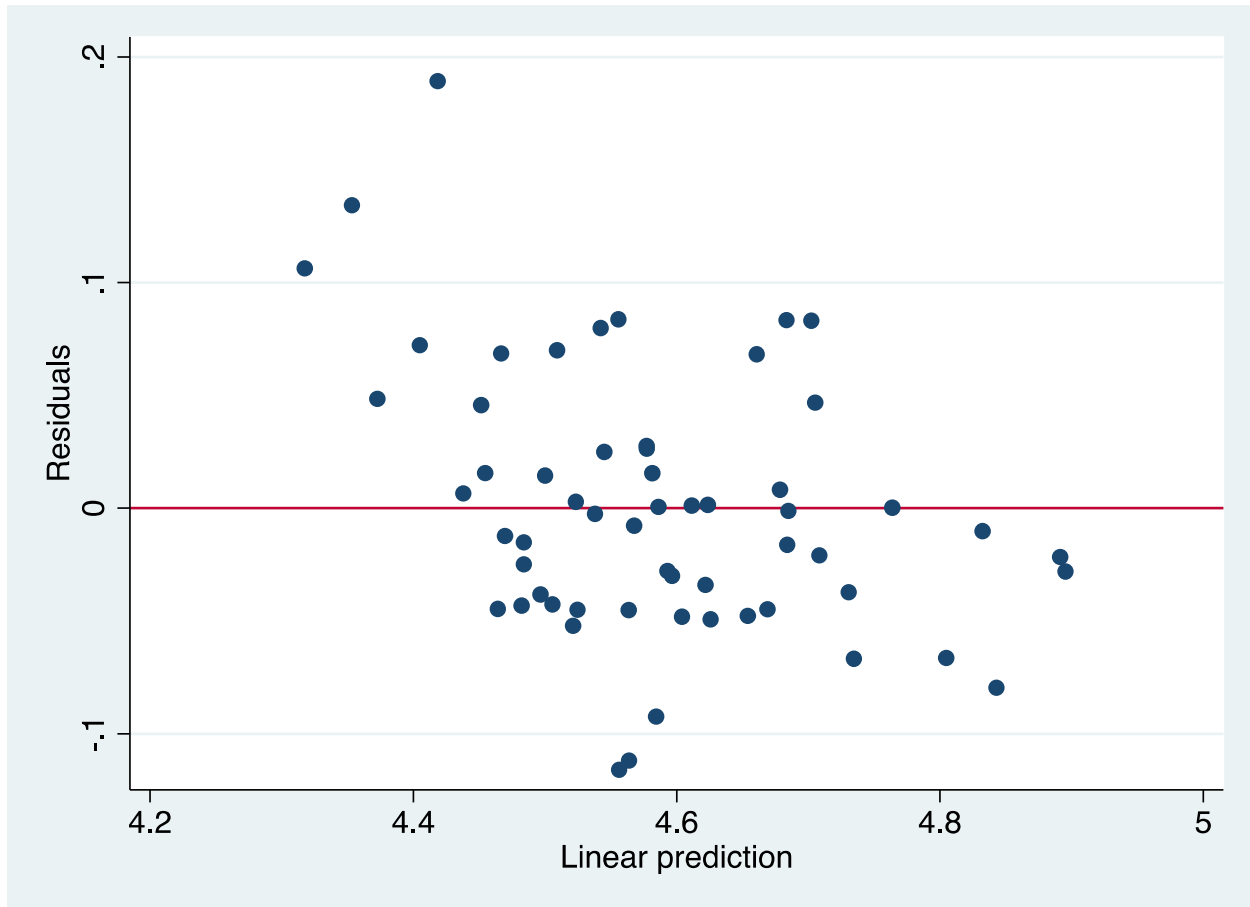
Centered $R^2 = 0.7557$

Lag is 3 quarters

Observations: 59

**Exhibit 5**

Fitted Values Scattered Against Residuals with M2/GDP and Russian Swaps



**Exhibit 6**

Fitted and Observed Values with M2/GDP and Russian Swaps

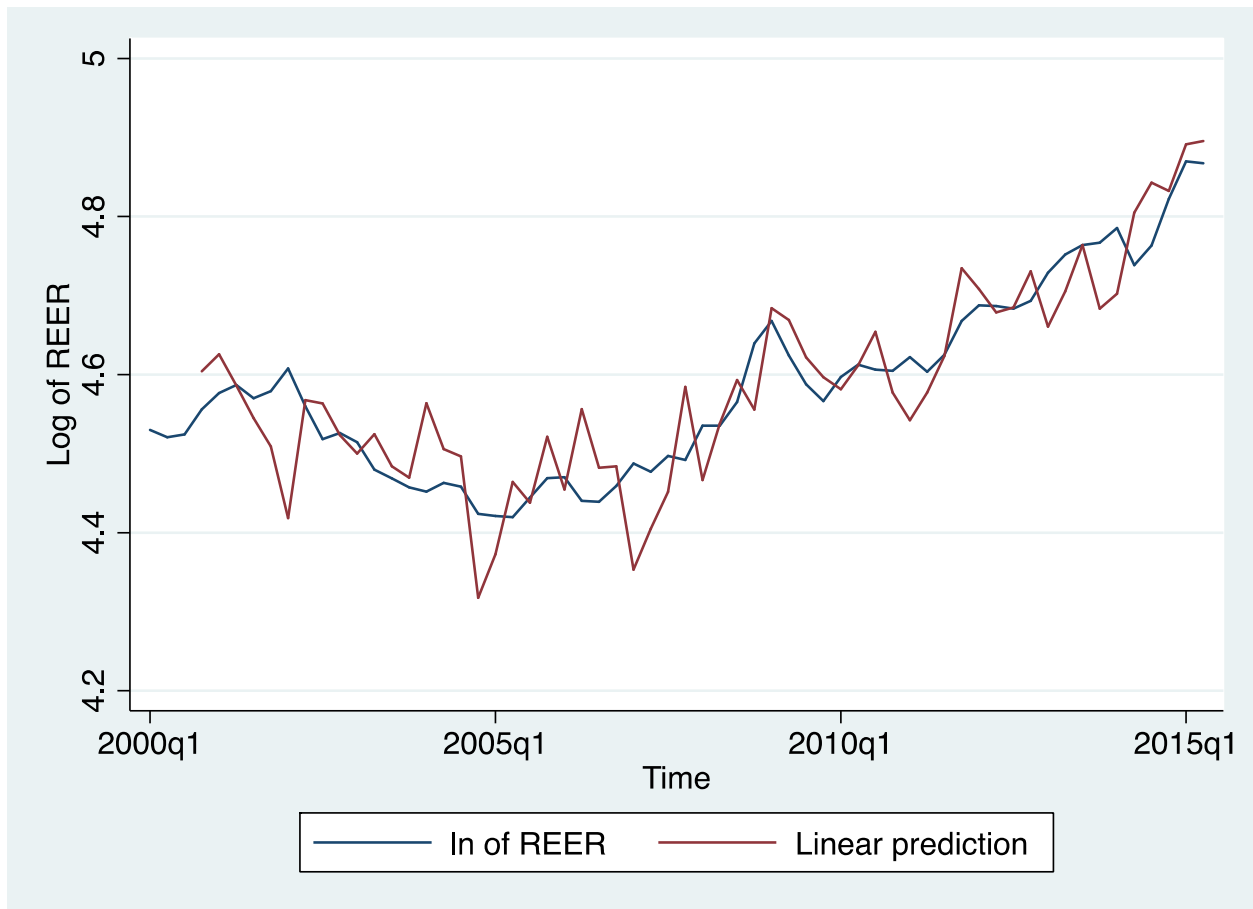
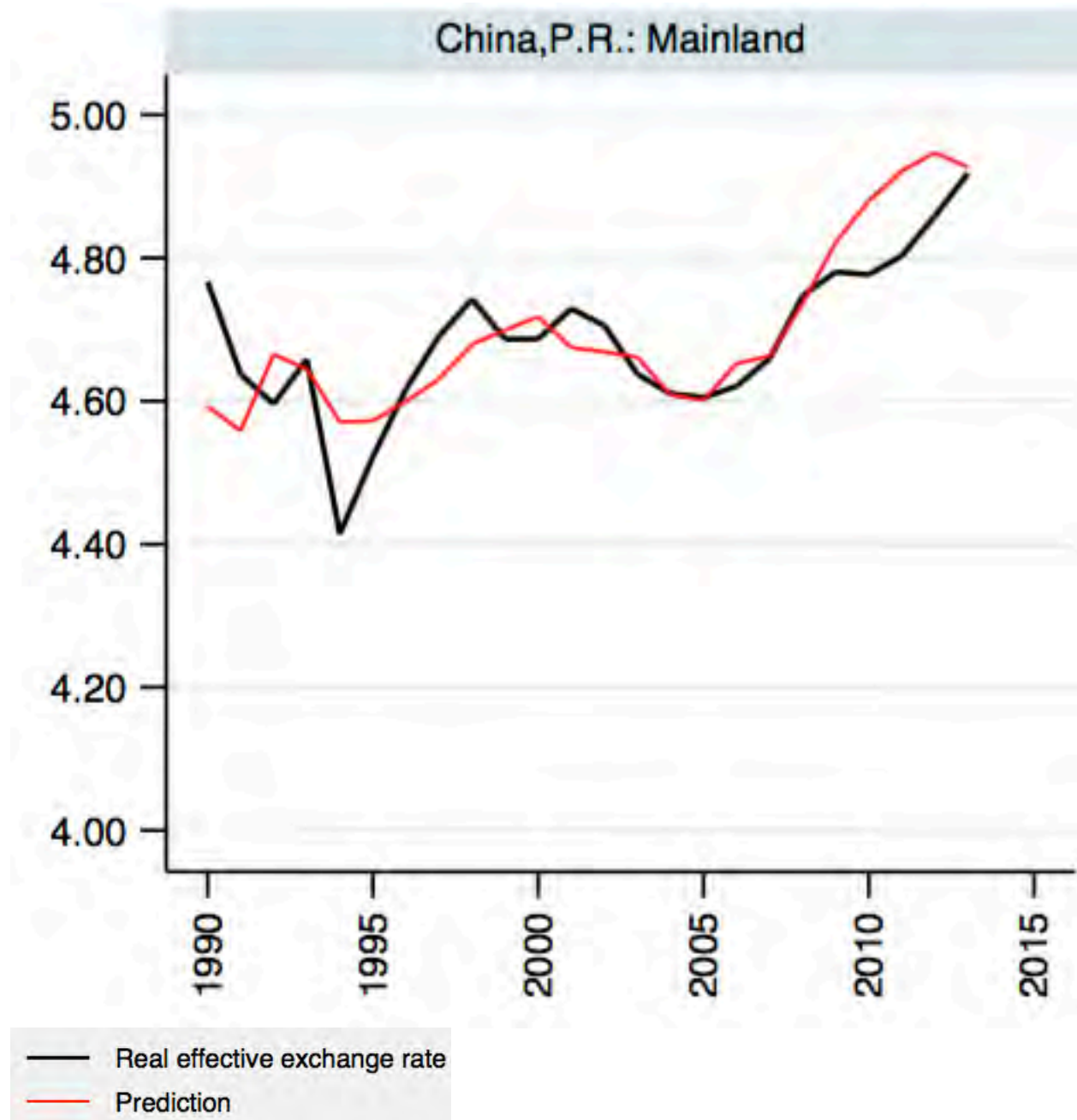


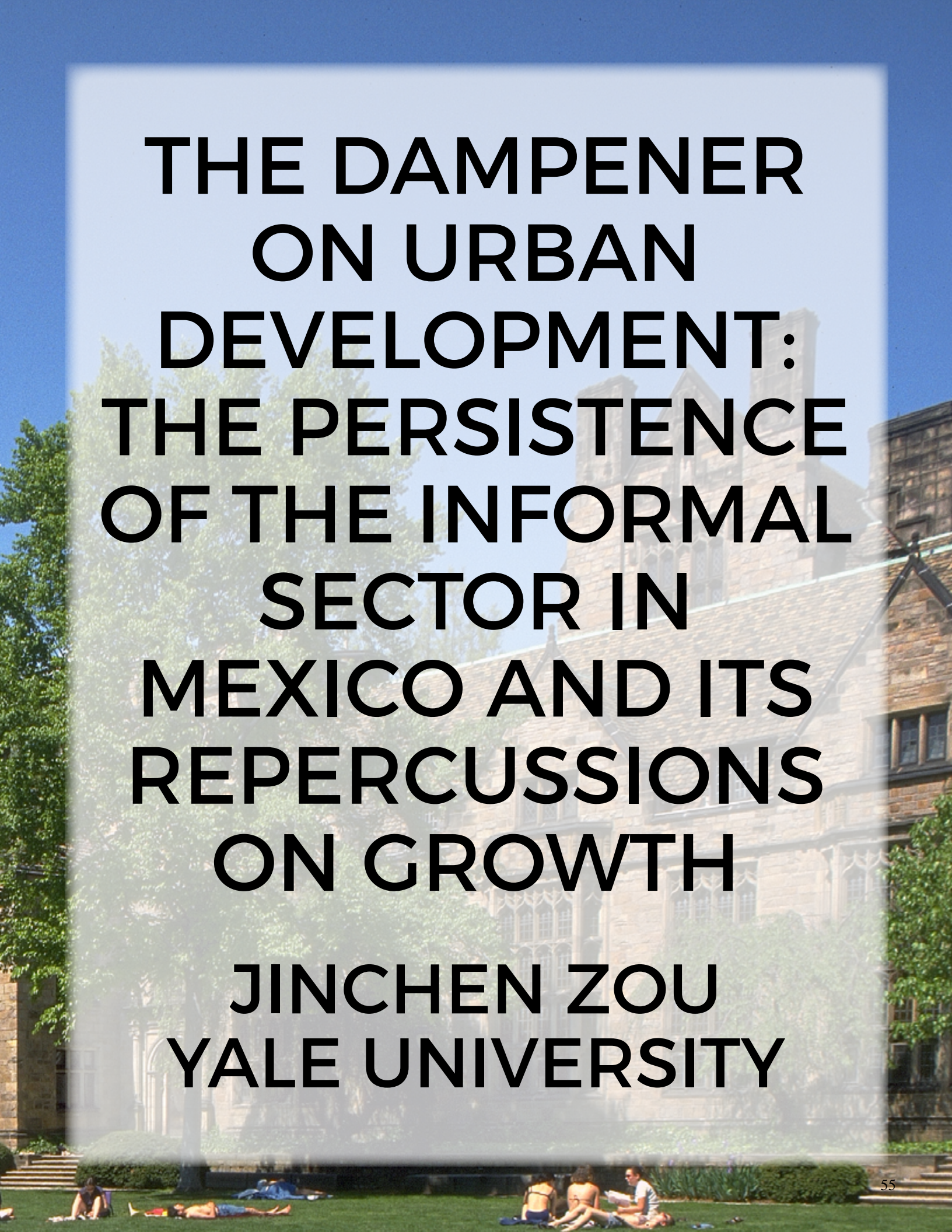


Exhibit 7

Log REER Actual and Fitted Values from EBA





The background of the slide is a photograph of a university campus. In the foreground, there is a green lawn where several people are sitting or lying down. In the background, there is a large, multi-story stone building with many windows and a gabled roof. The sky is blue.

THE DAMPENER ON URBAN DEVELOPMENT: THE PERSISTENCE OF THE INFORMAL SECTOR IN MEXICO AND ITS REPERCUSSIONS ON GROWTH

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The Dampener on Urban Development: The Persistence of the Informal Sector in Mexico and its Repercussions on Growth

Jinchen Zou

Final Paper

ECON 467: Economic Evolution & Challenges of Latin American Countries

Department of Economics

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Abstract

Economists expect that the largest and middleweight cities in Mexico will lead national GDP growth in the coming decades, but the persistence of large informal sectors within urban areas remains puzzling. This paper evaluates the framework presented by Levy (2008), which argues that informality persists as a result of noncontributory social protection policies, by investigating empirical evidence with regard to Seguro Popular, worker mobility, and firm-level barriers to entry. The use of geographic variation in levels of informality across Mexico complements the analysis, and I propose three additional economic mechanisms that contribute to informality.



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I. Introduction

Urban growth is driving economic growth in much of Latin America. With 80% of its population living in cities, Latin American cities have contributed to more than 60% of GDP (Cadena et al., 2011). The 2015 ECLAC Report, *Social Panorama*, claims that rapid demographic changes give rise to opportunities to capture the so-called “demographic dividend,” where the younger population can generate wealth through highly productive jobs if policies maintain a conducive environment in both the largest cities and “middleweight” cities. Mexico especially has plenty of room to grow; Mexico City and Monterrey are two of the biggest cities in the region, but 45 middleweight cities, with populations of 200,000 to 10 million, currently experience rapid urbanization and growth (Cadena et al., 2011).



As cities outpace the rest of the national economy, these urban regions are becoming almost their own economic units. Statistics on growth, productivity, and poverty rates in the large and middleweight cities in recent years diverge from rest of the country (Cadena et al., 2011). To capture the magnitude of this rapid urbanization, projections anticipate that middleweight cities will generate 40% of Latin America's GDP growth by 2025 (Cadena et al., 2011).

Mexico's economy is described as one operating at two separate speeds. Despite the rosy picture of rapidly expanding cities, the McKinsey Global Institute report warns of capacity constraints where cities cannot generate enough productive formal jobs or maintain sound investment and governance decisions to improve social and business conditions (Cadena et al., 2011). Edwards (2010) outlines the stagnation in productivity and growth that followed the heels of liberalizing reforms Mexico implemented after the Latin American debt crisis of the 1980s and the Mexican crisis of 1994; the author points to a lack of sustainable and transformative structural reforms as the culprit of mediocre growth. From far away, one would have expected that Mexico's economy would grow by leaps and bounds in a manner similar Chile's after liberalizing reforms. Upon closer examination, Mexico differs in its reform path on policies involving exchange rate management, regulations, and – the focus of this paper – the failure of modern firms to reallocate resources away from inefficient traditional firms. Bolio et al.



(2014) and ECLAC (2015b) echo this sentiment, stating that while large modern firms have experienced productivity growth of 5.8% a year, traditional firms, typically smaller in size, have actually seen a decline in productivity of 6.5%. In other words, these smaller firms have been 8% as productive as large modern ones in 2009.

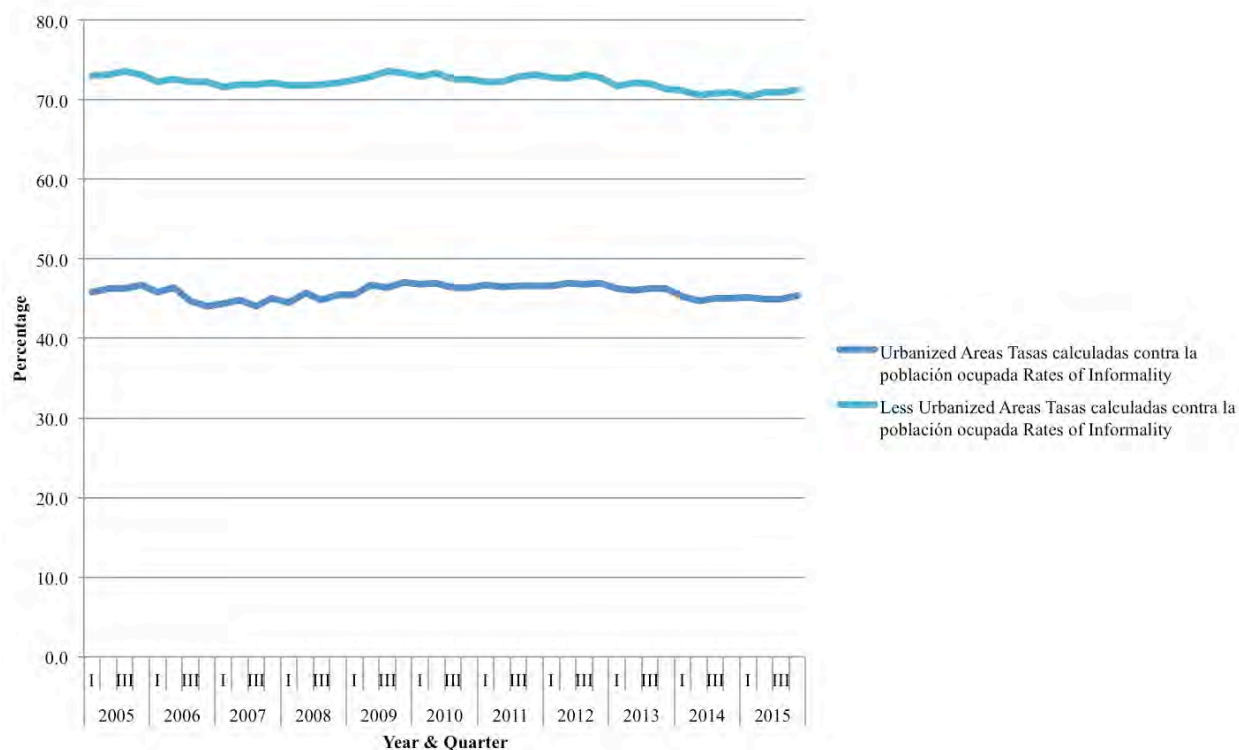
In fact, it is intriguing that high-tech, capital-endowed, modern firms like FEMSA, Grupo Alfa, Grupo Bimbo, Grupo Lala, Mabe, Walmex, and many others have flourished and also coexisted alongside much less efficient enterprises in the informal sector. Outside the looming buildings that house the headquarters of these multinationals are street vendors and car washers who lurk at the fringes of the formal economy. Additionally and perhaps alarmingly, labor in Mexico has migrated from more productive to less productive activities, with most of the losses in manufacturing and most of the gains in the commerce sector, and this reallocation of labor has reduced overall productivity by 13% from 1999 to 2009 (Bolio et al., 2014).

For reasons to be explored in this paper, the informal sector has not only persisted over the past three decades, but also grown in size. According to INEGI's data, the informal economy accounted for almost 25% of total GDP, employing 58.79% of the workforce in Mexico in 2014. Commerce accounted for 32.5% of informal gross output in 2012, followed by services (19.2%), manufacturing (16.5%) and agriculture (12.5%) (Heath, 2014). Focusing on urban informality, INEGI data in Figure 1 shows



that the rate of informality has hovered around 45% of the population in the workforce while, the rate is much higher in less urbanized area.

Figure 1: Rates of Informality in Urban and Less Urban Areas, 2005-2015



Source: INEGI, Encuesta Nacional de Ocupación y Empleo (ENOE)

While the formal sector is easily defined to include firms and workers that are recognized by law, contribute to social security, and exchange salary for work, the informal sector captures a wide range of economic activities. Levy (2008) defines the informal sector by its productivity differential with the formal sector and its nonsalaried



nature, while others define informality by the size and output of the firms. The workers within the informal sector “may or may not own productive assets or access to intangible capital,” but their gross earning ultimately reflect the implicit rent on these assets or intangible capital such as the unofficial rights to a corner of the street (Levy, 2008; De Soto, 1989). Views of the value and functioning of the informal sector vary, but economists evaluate the informal sector with three main models, according to La Porta and Shleifer (2008): romantic, parasitic, and dual. The romantic view, advocated by De Soto in both his seminal work *The Other Path* (1989) and his paper (2000), argues that microenterprises start out in the informal sector, as they lack capital to expand and scale bureaucratic regulations. If the transactions costs to doing business are lower, these informal firms might “fuel growth and development” with their entrepreneurialism (La Porta and Shleifer, 2014). Alternatively, as the statistics on labor reallocation describe, the parasitic view describes informal sector inefficiencies as a drag on the overall economy as workers self-select into informality. The sector becomes not only “extralegal substitutes for established law” but also a flexible safe haven to evade rigid labor regulations, unions, and high transaction costs (Levy, 2008; Davila, 1994; Maloney, 2004). According to Harris and Todaro (1970), the informal sector exists to capture workers that are part of the “residual,” who have lower utility as they wait for a formal job. The urban informal sector thus theoretically absorbs workers that are part



of the urban-rural migration that occurs as a result of urban-rural wage differentials. This dualistic view of informality posits that while informal firms are highly inefficient, they “do not pose much threat to the formal firms, but also do not contribute to economic growth” (La Porta and Shleifer, 2008).

Underlying each view are implicit assumptions about the cause of informality, its consequences, and policy recommendations to reduce the excessive size of the informal sector. In conceptualizing cities as the engine of future growth in Mexico, researchers must critically examine not simply growth and innovation in the formal sector but also stagnation and persistence of the informal sector. Indeed, informality might be one of the main culprits of the sluggish productivity movements and enduring inequality in Mexico. Furthermore, while the informal sector itself holds sobering consequences for economic growth, its size and quality also serve as indicators of much larger problems that plague the Mexican economy, such as market failures, institutional and policy misalignment, and failure of regulation and enforcement.

This paper primarily explores the parasitic and dualistic views of informality to understand why informality has persisted and grown over time. In the next section, I provide an analysis of Levy’s argument presented in *Good Intentions, Bad Outcomes* (2008) that argues empirical evidence of a perverse incentive structure arising from social protection varies according to the mobility of workers and firms. My analysis



exploits geographic variations to point to institutional and regional factors that may contribute to the differential regional growth of informal sector. I conclude by exploring the implications and consequences of this view of informality in terms of productivity, savings, capital allocation, and fiscal sustainability.

II. Causes of Informality

2.1 Noncontributory Social Protection Policies

A worker may retain the choice between formal and informal sector employment, or be forcibly assigned to one of the two, depending on 1) the barriers to entry into the formal sector employment and 2) the incentives that pull the worker into the informal sector. Levy (2008) proposes that in the case of Mexico, the barriers to entry are negligible and unimportant to the broader analysis of the causes of informality. Instead, Levy focuses on the incentives that pull workers into the informal sector in the form of a wedge between the firms' non-wage labor costs and the valuation of benefits that workers receive from social security (Levy and Schady, 2013). The logic of Levy (2008) is presented as follows. First, noncontributory social protection policies, which are universal and unbundled, serve as a tax on salaried work and subsidy on nonsalaried labor; this also implies that whether an employer plays payroll taxes to register the worker with IMSS is the defining characteristic between the two separate labor markets.



Second, the tax on formal work increases the size of the informal sector disproportionately, and this larger-than-optimal size of the informal sector employment lowers aggregate labor productivity. The outcome spills over to capital productivity as investment of capital becomes reallocated to the informal sector. As articulated by Perry et al. (2007), low-wage workers disproportionately select into the informal sector. Coupled with the unbundled nature of social protection programs like Seguro Popular, the incentive structure in place leads to unsustainable practices where informal workers regard social protection measures as free and fail to save for the future or hedge against risks, leading to a lower level of welfare in the future (Levy and Schady, 2013). As a result of both the incentive structure and an inability to properly redistribute income, informal workers depend more heavily on social protection, leaving formal workers to shoulder the burden of financing social security programs.

The theoretical framework, supported by detailed modeling and data, is convincing. One could imagine that workers seek to maximize their utility by choosing the social welfare option that aligns with their preferences and that firms maximize their profits through an evaluation of the probability that they evade enforcement, ignoring the wider social costs of informality. However, the model Levy builds is self-contained. The GDP, wage, and employment data used to calculate static efficiency costs, for example, relies on the logic of the model to arrive at an estimate (Levy, 2008). The



same data could support alternative models as well. To verify the causal link between noncontributory social protection programs and increased informality, I look to empirical literature evaluating the policy outcomes of Seguro Popular. That is, though Levy successfully establishes the existence of a perverse incentive, the empirical link is necessary to understand the extent to which the incentive becomes expressed in Mexico.

The empirical data on Seguro Popular's contribution to informality sends conflicting messages, but the key point revolves around how the individual decision-making process on average becomes affected by the implementation of the program. Thus, despite early studies and a few more recent papers finding either no impact or a small impact on informality, further research is necessary to disentangle the exogenous elements that could prevent this theoretical incentive from manifesting in district or municipal level data (Gallardo-García, 2006; Esquivel and Ordaz, 2008; Barros, 2009; Campos and Knox, 2010; Aguilera, 2011; Azuara and Marinescu, 2010; Duval and Smith, 2011). More recent papers examine the timing of the Seguro Popular roll-out and discover "systematic reallocation effects" of increases in the share of informality between 0.4% and 1% (Aterido et al., 2010; Bosch and Campos, 2010; Bosch and Cobacho, 2011; Pérez-Estrada, 2011).

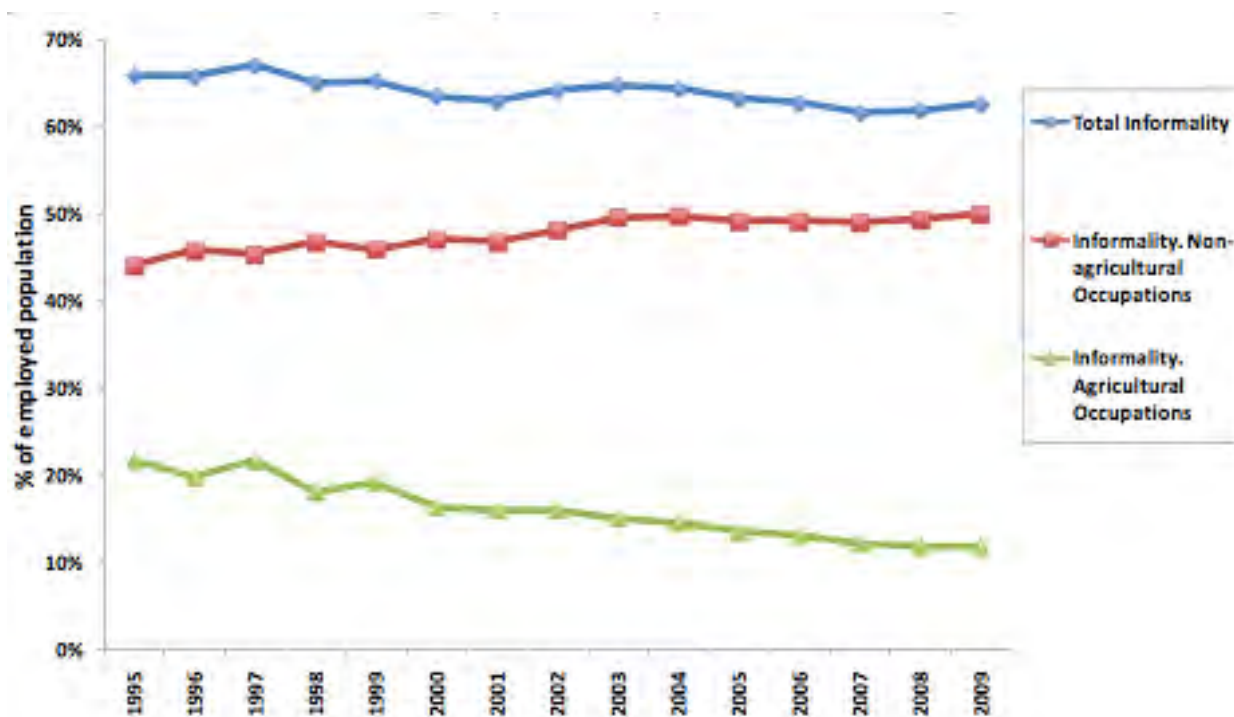
On the other hand, Arias et al. (2010) employ a contrasting approach. According to the researchers, agricultural workers in "rural villages and municipalities have limited



or no access to the bundle of services provided by the formal social security institutions,” which implies that they gain relatively more from access to universal healthcare through Seguro Popular (Arias et al., 2010). Theoretically, the stronger incentives should draw more agricultural workers into the informal sector, but the disaggregated data in Figure 2 shows that informality in the agricultural sector has actually declined between 1995 and 2009. Nevertheless, the collective literature on the effect of Seguro Popular suggests that the extent to which the incentives materialize into actual employment decisions varies.



Figure 2: Informality Split along Agricultural and Non-Agricultural Workers



Source: Arias et al., 2010.

On a higher level, Levy fails to acknowledge that these incentive pulls into the informal sector and barriers to entering the formal sector are not mutually exclusive. It is important to note that pulls into the informal sector do not equate the voluntary choice of entering the informal sector, and evidence on the voluntary nature of the informal sector in Mexico is divisive. Perry et al. (2007) observes “during good times, the number of workers who leave the formal sector to become self-employed or take an informal salaried job is nearly equal to or sometimes even greater than the number of those who transit from the informal to the formal sector,” indicating perhaps that falling



derived demand does not explain the motivation behind who left the formal sector.

However, Bargain and Kwenda (2010), after controlling for self-selection, discover that the median penalty for working informally in urban areas is 9% during 2004-2007 in terms of wages, meaning the same worker would still receive more in return for labor in the formal sector if given the choice between the two markets.

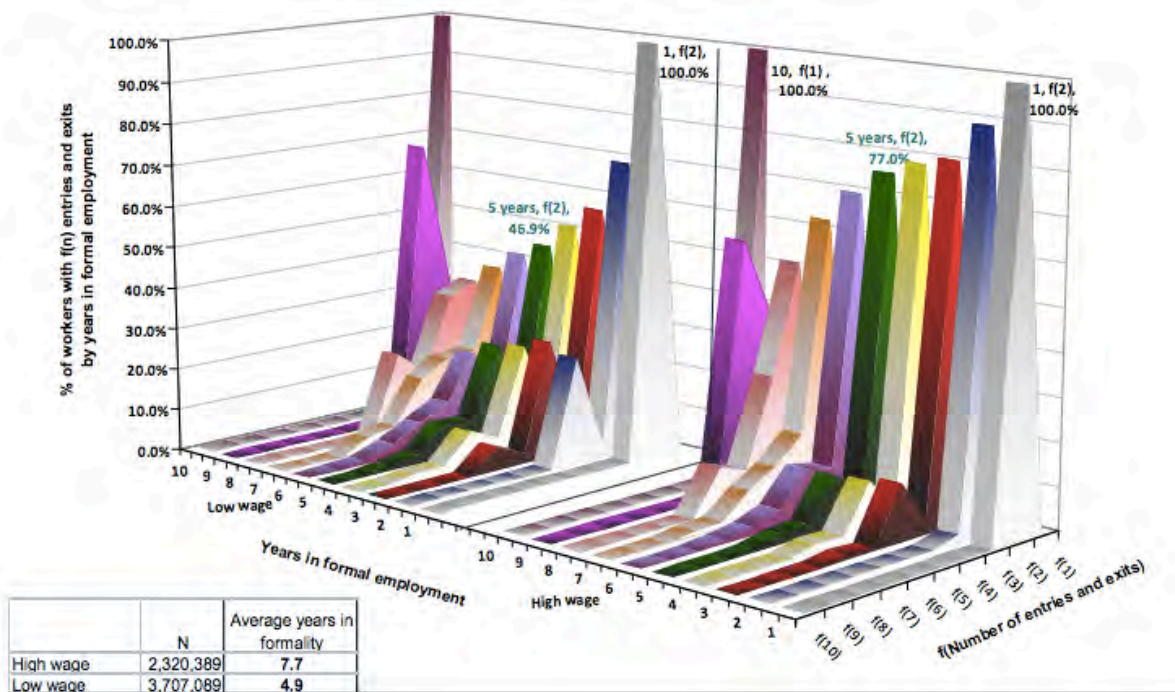
How does this evidence compare with Levy's imposition of absolute mobility between the two sectors? Levy calculates a FM index that displays the relative frequencies with which workers enter and exit the formal sector and then imposes the FM index on the average length of formal employment between high- and low-wage workers to demonstrate that, though the low-wage workers enter the formal market at high frequencies, entering formal employment is not difficult (Levy, 2008). Furthermore, Levy states that over the course of a lifetime, the majority of workers, regardless of wage levels, have entered this sector and exited, implying the ease of entering the formal market. Figure 3 illustrates this data. However, I argue that it is precisely the frequency at which workers enter and exit the formal market that poses a challenge to entering the formal sector. This high frequency of entrance and exit, higher for low-wage workers than high-wage workers, indicates a high rate of separation. Whereas in a healthy economy, a high level of labor market churn indicates desirable dynamism, a high FM index in Mexico indicates that workers frequently separate from their formal



employment and either join the informal sector, become unemployed, or migrate away from the domestic job market (Brittenbach, 2011). The differences between low-wage and high-wage workers further suggest that lower-wage workers have a tougher time staying in formal sector positions. Research examining this aspect of mobility between the informal and formal sectors corroborates the impermanence of formal sector jobs. Maloney (1999) finds “substantial flow across sectors” using ENEU data; Calderon (2000), Rodriguez-Oreggia (2007), and Gong, Soest, and Villagomez (2004) all employ transition matrices and panel data to reach similar conclusions that “four- and six-year retention rates are short relative to OECD countries,” with workers moving out from the formal sector within one quarter of employment.



Figure 3: The Distribution of Workers by Years in Formal Employment and Frequency of Entry and Exit into Formality, 1997-2006



Source: Levy, 2008

Furthermore, the discussion of mobility biases heavily toward the mobility of individual workers, and Levy inadequately addresses the issue of firm mobility.

According to INEGI (2004), 90% of the 3 million firms in Mexico are small firms with five or fewer employees, but only around 533,891 microenterprises in this category show up in the IMSS Registries (Levy, 2008). The remaining enterprises make up the bulk of the informal firms that operate under the radar of the social security administration; this bias toward the microenterprises raises the question of whether firms could be



trapped by constraints brought up by De Soto (1989). Levy argues that firms, even ones in the informal sector, operate efficiently when they engage in profit-maximization and that the defining marker for informal firms lies in “differences in the indivisibilities of capital across activities associated with the nature of the production function” (Levy, 2008). McKenzie and Woodruff (2006) agree: access to startup capital does not regulate the “ultimate” firm size.

Alternatively, a more cynical interpretation of McKenzie and Woodruff (2006)’s finding is that firms that fail exit their analysis prematurely and initial startup capital will facilitate entrepreneurship, thus supporting the romantic view of informality. To go one step further in proposing that informal firms are not as mobile as workers in moving from informal to formal, Gomes and Kuehn (2014) find the level of secondary education attainment positively explains the size of the firm; compared to the US, the concentration of microenterprises in Mexico traces back to lower educational attainment. To mediate between the two opposing views, a firm level study in West Africa shows that heterogeneity among the types of firms in the informal sector triggers varying levels of barrier to entry into the formal sector (Benjamin and Mbaye, 2012). As a consequence, the firms that do face barriers to entering the formal market may feel the push of credit market constraints or registration costs in addition to the pull of social protection incentives; however, it is unclear which force is more dominant.



In summary, Levy (2008) presents a coherent framework to explain changes in individual-level motivations in regards to decision-making between the two labor markets generated by well-intentioned but flawed policy design. I first look to empirical evidence to understand the extent to which the incentives are actualized, and I then supplement his framework with alternative motivating forces that change Levy's assumptions about worker and firm mobility. The conclusions are accompanied often by the caveat that the effects will vary according to the individual characteristics of the firm or worker. The next section rides on these nuanced forces to understand the implications of geographic variation on explanations of informality.

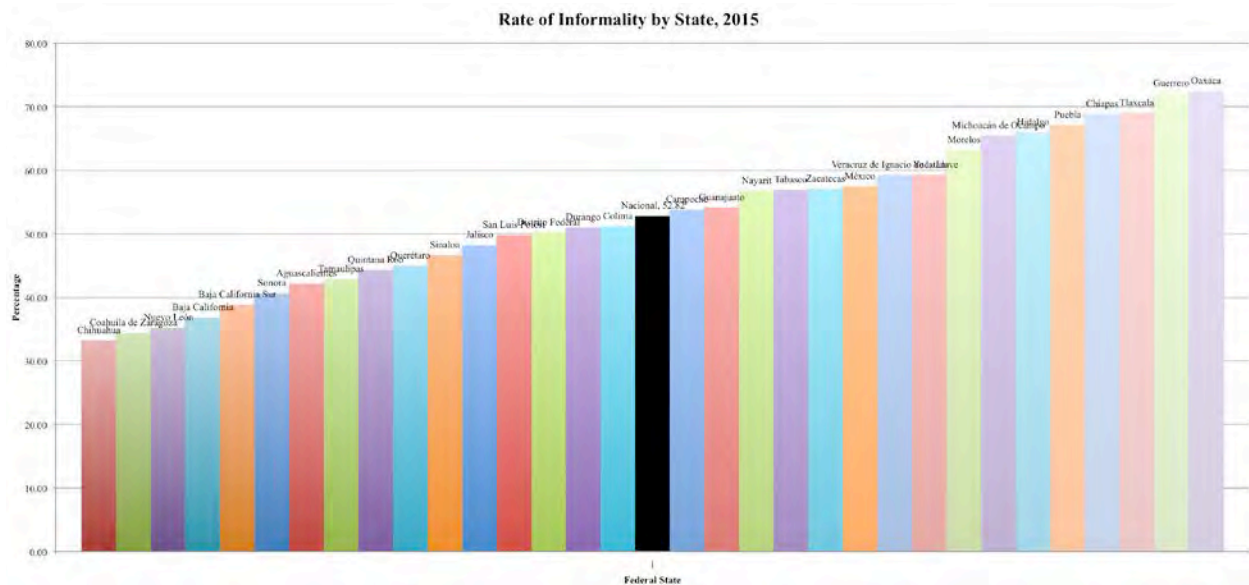
2.2 Geography

Incorporating geographic variation complicates our view of the informal sector. There are benefits and drawbacks: explanations of the phenomenon on the national level no longer seem as valid, but incorporating geographic variation gives the opportunity to pare down and test the broad explanation into nuanced drivers of informality. Looking at the ENEU data, informality is more concentrated in certain states than in others. Heath (2014) points out that the reason Oaxaca has double the rate of informality than Chihuahua may be the “broader historical trends” in poor physical and civil infrastructure that make the formation of a formal business “irrational” given the cost-



benefit analysis. Figure 4 better illustrates this significant variation in regional rates of informality.

Figure 4: Rates of Informality by State, 2015



Source: INEGI, Encuesta Nacional de Ocupación y Empleo (ENOE)

Notes: The black column illustrates the national average at 52.81%. The spread, given by the standard deviation, is 11.37%, showing significant variation between the rates in each state.

Seguro Popular is a federal-level program, and so are other social protection programs included in the analysis conducted by Levy (2008). Thus, with the same incentive structures generated by noncontributory social protection programs binding for workers nationwide, the introduction of regional variations implies that other factors may also influence a worker's decision to join or exit the formal sector. If

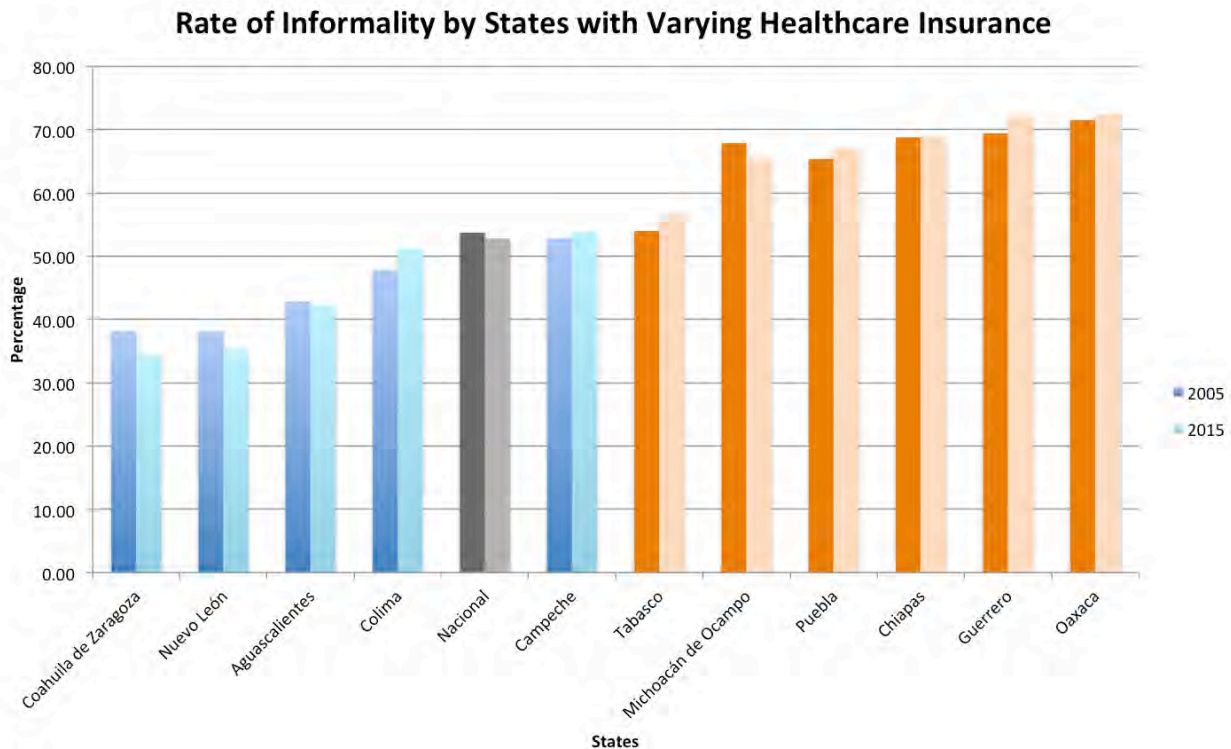


noncontributory social protection is the only explanation for informality, then the level of informality should resemble the national average.

To determine subnational level effects, I map state-level variations in Seguro Popular coverage onto the ENOE informality data, looking to Barros (2009) for methodology guidance. Figure 3 shows the dichotomy in the rates of informality between states that initially had high percentages of people enrolled in private insurance (blue) and states that had the low percentages of people enrolled in private insurance (orange) prior to the implementation of Seguro Popular. The correlation between high coverage under Seguro Popular and high regional rates of informality is striking. Furthermore, while not statistically robust, five out of six states with the highest Seguro Popular coverage saw an increase in informality over time, while three out of the five states with the lowest coverage saw a decline in informality. This observation merits additional research to tease out the direction of the causality and determine factors that gave rise to the differences in initial insurance coverage. Indeed, an issue of endogeneity arises: in the search for factors that gave rise to patterns of initial insurance coverage, one must consider the possibility that not only is high Seguro Popular driving informality, but that prior historical informality might also have led to large percentages of the population without access to formal health insurance.



Figure 3: Rates of Informality in 2005 and 2015 in Variation with Private Insurance Coverage before Seguro Popular



Source: INEGI, Encuesta Nacional de Ocupación y Empleo (ENOE); Gutiérrez, 2014

Notes: Blue signifies states with the highest rates of coverage and orange signifies states with the lowest rates of coverage.

There are three broad historical economic trends that may have plausibly created differential informality rates in addition to differences in institutions and enforcement: north-south polarization, migration patterns, and mixed economic and social characteristics of cities. Bacha and Bonelli (2015) show a diverging trend in capital accumulation, productivity, and mesoeconomic firm-level data that mirrors the



geographic variation in informality. In Mexico post-NAFTA, this economic polarization occurs between the large exporting firms, maquiladoras, in the Northern region and the more informal, non-traded, smaller firms in the Southern region as a result of northern manufacturing being unable to develop linkages to the rest of the economy (Bacha and Bonelli, 2015). On the other hand, the geographic variations could also reflect internal and external migration patterns. Sheehan (2013), through the evaluation of a sample of 56 Mexican urban communities from the Mexican Migration Project (MMP), determined that migrant-sending locations and destinations often see higher levels of informality. Migrants, especially ones returning from work in other cities, possess on average higher levels of experience and entrepreneurship; nevertheless, individuals in his sample faced barriers to enter the formal sector as firms (Sheehan, 2013). The variation in numbers of returning migrations in response to business cycles allow for further testing of this hypothesis. Finally, through the decomposition of formal/informal wage gap in Colombia, Garcia (2013) delineates marked differences in the structures and dynamics of the local labor markets that arise from the economic and geographic nature of the cities themselves. Though the exact characteristics of the Colombian cities analyzed are not transferrable to Mexico (ie. Barranquilla and Cartagena have large tourism sectors and are export-focused, while Bogotá, Cali, Medellín and Bucaramanga feature high population density and dynamic industrial activity), similar analysis could



be applied to Mexico for further research (Garcia, 2013). Understanding these three mechanisms holds further implications in the realm of policymaking, as reforms to reduce informality should tailor to the specificities of each region. The bottom line remains that a policy's generalizability depends on its ability to capture the precise mechanisms that drive informality.



III. Consequences of Informality

When the stance of the parasitic view is taken to inform urban growth policies, informality poses challenges to savings, productivity growth, capital reallocation, and fiscal sustainability. Madero and Mora (2006) indicate that forced savings through social security programs “represent 24% of all financial savings in 2006” with only 14.1 million enrolled in IMSS. More formal enrollment in IMSS will increase the aggregate savings rate in Mexico. Harkening back to the McKinsey Global Institute report (2014), the dampening effects of the informal sector on aggregate productivity and resource allocation have increased as the government, on all levels, struggles to curb growth of the informal sector. Levy (2008) draws on sectoral data to demonstrate the shift to a more “informality prone” mix of products in the economy, another indicator that capital investments become less productive as the informal sector expands. Finally, the drain on fiscal resources comes from two sources— 1) unsustainable current financing of social protection programs from oil rents and diversions from public infrastructure investment, and 2) the evasion of millions of workers in contributing to social security—leading to further fiscal imbalances in the future. Ultimately, poverty and inequality persist with excess informality. As demonstrated by the high frequency with which low-wage workers exit the formal labor market, the disproportionate impact of informality on people in



poverty will become exacerbated by the previous four factors and with the unbundled nature of social protection.

Having discussed reasons for the persistence of the informal market, I conclude by arguing for the need to tailor urban policies with respect to regional variations and assumptions made in regards to the mobility of workers and firms. INEGI estimates that by the next decade, more than ten million people will join the labor force in addition to the eight million people who are currently unemployed (Rodriguez-Oreggia 2007). Coupled with the constant pressures from rural-urban migration, cities shoulder the responsibility to generate productive formal sector jobs. Currently, the Pact for Mexico does not explicitly address informality; its reforms in credit markets, education, and anticorruption could indirectly reduce informality to an optimal level (Heath, 2014). However, one can imagine national reforms of the social protection policies to decrease incentives to exit the formal sector along the lines of the consumption tax-funded universal programs proposed by Levy (2008) alongside municipality-led efforts to decrease the barriers to entry for workers and firms. Combined, policies that address simultaneously the pull and push factors in a tailored and nuanced manner could unleash the potential of major cities in the coming decades.



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**THE MONETARY
POLICY EFFECTS
OF SWEDEN'S
TRANSITION
TOWARDS A
CASHLESS SOCIETY:
AN ECONOMETRIC
ANALYSIS**

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The Monetary Policy Effects of Sweden's Transition Towards a Cashless Society: An Econometric Analysis

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Undergraduate Honors Thesis
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Abstract

Sweden is predicted to become one of the world's first cashless societies. This will affect the Swedish economy in many ways, including the role of the Swedish central bank. The benefits to society are predicted to outweigh the costs, due to increased efficiency in the payment system and reduced transaction costs. Moreover, the ability of the Riksbank to carry out monetary policy will not be negatively affected. In contrast, the power of the Riksbank to control the economy may increase at the zero lower bound with less cash in circulation.



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I. Introduction

Sweden is likely to become one of the first cashless societies in the world. In this paper, I raise the question of how the central bank of Sweden, the Riksbank, will be affected by this transition. More specifically, will their ability to conduct monetary policy change without cash in circulation?

Historically, economists have believed that the growth of the money supply was positively related to the nominal growth of GDP. This idea was represented by the quantity theory of money, which became the foundation for monetary policy decisions. However, most central banks today have adjusted the way they conduct monetary policy by targeting the short-term interest rate rather than the money supply. For this reason, I hypothesize that Sweden's transition towards a cashless society will not decrease the efficiency with which the Riksbank conducts monetary policy.

I will show that the quantity theory of money does not hold using regression analysis, and thus conclude that a transition towards a cashless society will not affect the ability of the Riksbank to conduct monetary policy. In contrast, I introduce the idea that monetary policy may in fact become more efficient in a cashless society operating at the zero lower bound for nominal interest rates.



II. The Riksbank and the Swedish Payment System

Sweden is home to the world's oldest central bank, formally known as "the Riksbank," founded in 1668. The Riksbank was the first regular issuer of bank notes, as well as the first central bank to introduce a price stability target in 1930 after abandoning the gold standard. This strategy turned out to be highly efficient, as it helped Sweden recover from the Great Depression more quickly than other countries.

More recently, the Riksbank has been at the forefront of the negative interest rate movement, together with Japan, the European Central Bank, Denmark, and Switzerland. This unorthodox approach of cutting policy rates to below the zero lower bound in order to fight sluggish growth and reach inflation targets has received a lot of attention across the globe. As a result, economists have closely followed Sweden's experiment of operating in negative territory, regarding it as an indicator of a new era of monetary policy.

The Riksbank has been leading the way in terms of monetary policy for almost 400 years and is now on the verge of writing economic history once again, as Sweden is predicted to become the first country in the world to transition towards a cashless society. While Sweden's first coin was minted in 995 AD, economists estimate that Sweden's very last coin will be minted by 2045. This is because electronic payment



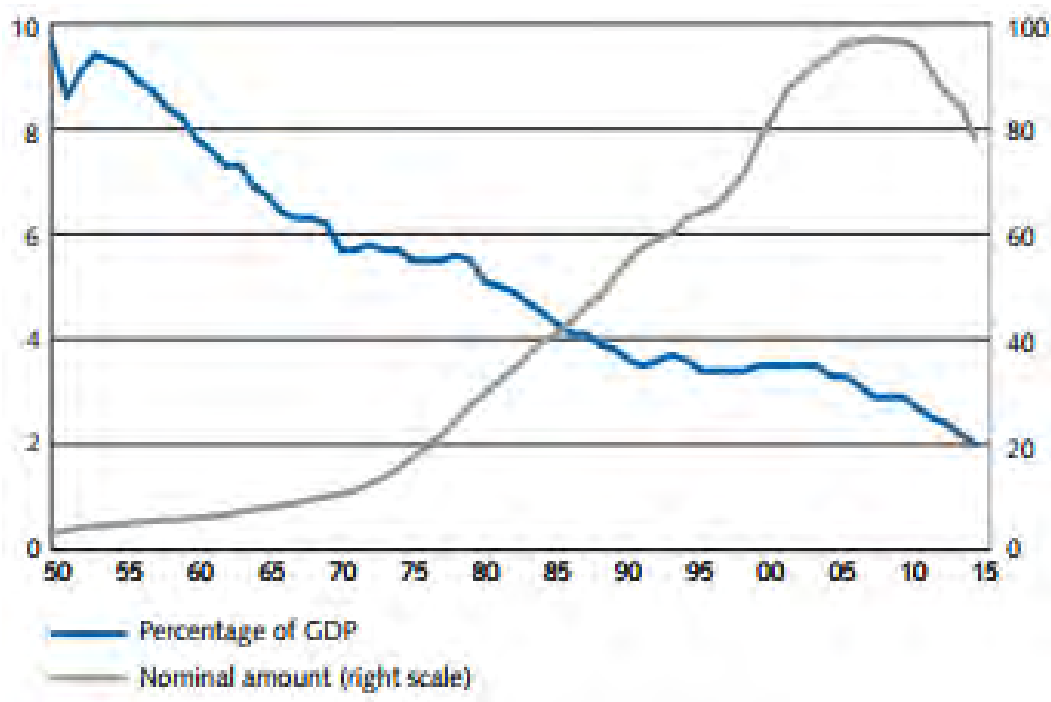
methods, such as debit cards and payment apps, have become the primary form of payment over the last two decades.

Today, the Swedish payment system consists of two major payment methods: cash payments and card payments. Cash payments are carried out by immediately transferring the value of a purchase from the buyer to the seller, whereas banks function as an intermediary to transfer the value of the purchase from buyer to seller for card payments. The most important distinction between the two methods is that cash has its own value, whereas cards function as an instrument to initiate a payment.

According to the Riksbank, approximately one quarter of all payments at points of sale in Sweden are made in cash. However, given the relatively small size of cash payments, they represent only 10% of total payments. Moreover, as a percentage of GDP, the total value of coins and banknotes in circulation have undergone a long-term decline, as seen in Figure 1.



Figure 1: Value of Banknotes and Coins in Circulation, 1950-2014
 (Annual average, bank's holdings excluded)
 Percentage as a proportion of GDP and SEK billion



Source: The Riksbank

As the proportion of non-cash payments has risen in Sweden, the total cash in circulation has fallen significantly during the last two decades. In 1950, the value of notes and coins in circulation was around 10% of GDP, whereas this number was only 2.6% in 2011. In comparison, by the end of 2010 the value of Euro notes and coins in circulation was 9.4% of the total GDP of the Euro region. Moreover, Swedish researcher Niklas Arvidsson states that out of the total cash in circulation, around 40-60% is in *actual* circulation, while the remaining cash is stored in homes, bank deposit boxes, or in



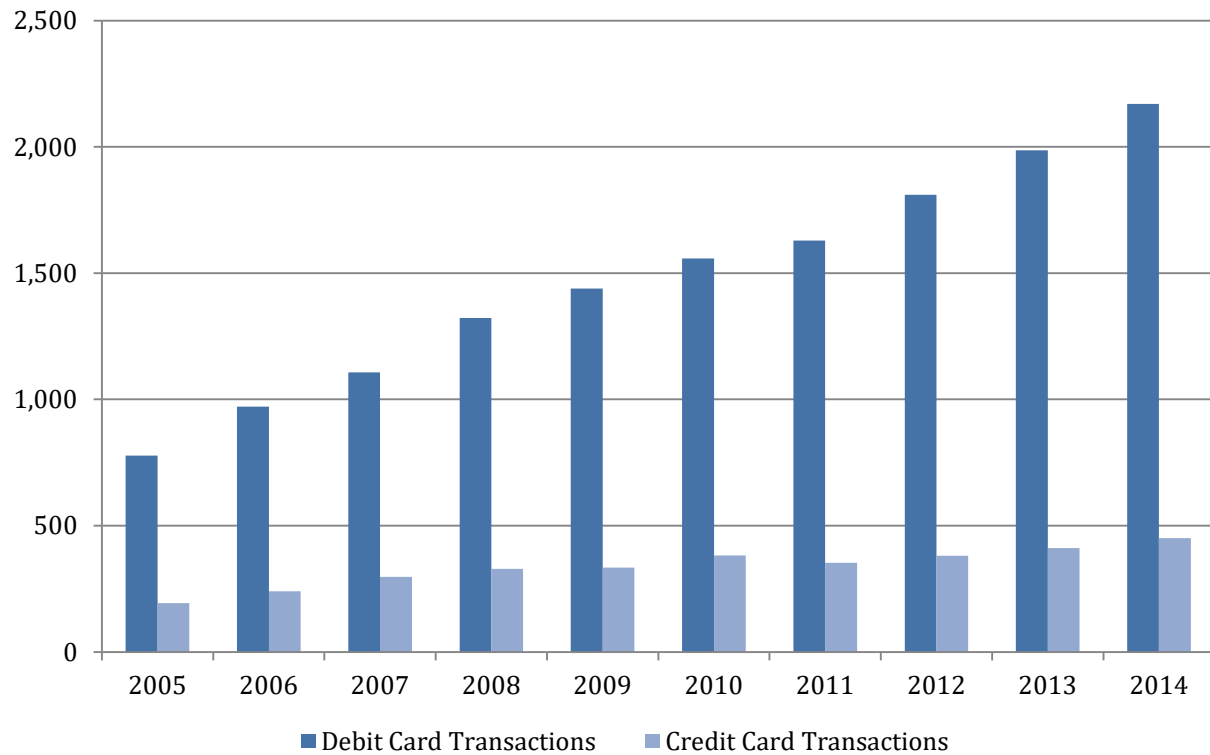
the underground economy.

The Riksbank emphasizes multiple factors to explain why the transition away from cash and toward non-cash payments will continue. These factors include: the establishment of new payment innovations competing with cash; the generational shift toward lower cash usage superseding the older generation's propensity to use cash; the increased use of e-commerce; and the increased reluctance of banks and stores to accept cash as a result of the risks and costs associated with handling cash.

Based on a survey examining consumer payment behavior in 2014, the Riksbank concluded that the most common payment method in Sweden, regardless of transaction size, was debit cards. The Riksbank conducted the same survey in 2010 and 2012, and their results show that 2014 was the first year that debit cards surpassed cash and credit cards as the primary method of payment even for smaller transactions below 100kr (\$12.50). These results indicate that the Swedish payment system is moving quickly away from cash and towards the use of debit cards. In addition, the proportion of non-cash payments in Sweden is rising. According to the Riksbank, 98% of the Swedish population had access to a debit card, 88% to Internet banking, 50% to a credit card, and 22% to the mobile app Swish in 2014.



Figure 2: Debit Card Transactions Are Rising in Sweden
Number of Transactions in SEK million



Source: The Riksbank

Arvidsson and many other economists state that the reason cash still exists is because it still has an important function in the economy. In smaller businesses with low margins, the handling costs of card payments are prohibitive, making cash an important form of payment. Moreover, in some situations cash still has no substitute. Also, some consumers prefer cash as a form of payment. In addition, a study conducted by the Riksbank concluded that cash payments were the least costly option for transactions under 20kr in 2012. However, the same study also concluded that the use of debit cards



in relation to cash should increase further in order to make the Swedish payment system even more efficient (Segendorf & Jansson, 2012.). A more efficient payment system means that each transaction is less costly. As a result, the number of transactions in the economy is likely to rise, which generates higher economic output.

Looking ahead, in *“Det kontantlösa samhället,”* Arvidsson predicts that Sweden is likely to evolve into a cashless society, although this is not likely to happen prior to year 2030. The Riksbank launched new coins and bills in 2016, a signal that a cashless society is still far from a reality.



III. Costs and Benefits of a Cashless Society

Extensive research has evaluated the possible economic effects of a transition towards a cashless society for various countries. Some economists focus on the pure costs and benefits from an economic standpoint, while others focus on the implications on monetary policy and the role of central banks in a cashless society. Some claim the move towards a cashless society will make monetary policy more efficient, while others argue that it would cause central banks to lose their independence, making monetary policy less efficient.

A cashless society is generally defined by three characteristics, as outlined by Storti and De Grauwe (2001) and Dusansky and Koc (2009). First, the central bank does not issue notes and coins. Second, all money is issued by private institutions. Third, central banks do not have a monopoly on the money supply. Money still serves as a unit of account, numeraire, and store of value, but no longer as a physical medium of exchange.

In the podcast *Nordea Market Insights*, released by one of the largest banks in Sweden, Unell and Enlund argue that a cashless society reduces the likelihood of bank runs in the presence of negative interest rates. This type of bank run would differ from the traditional bank run in which consumers withdraw bank deposits due to an expected bank failure. Instead, consumers would withdraw their deposits in order to avoid



interest fees caused by the negative interest rates. Because consumers are no longer able to withdraw their deposits in cash, a cashless society might strengthen the power of the central bank to conduct monetary policy when negative interest rates are in place. However, the deterrence of this type of bank run at the zero lower bound would require capital controls. Without capital controls, a Swedish consumer could simply transfer their account to a foreign bank account, without negative interest rates.

One of the most famous recent cost-benefit analyses focusing on Sweden was conducted by Segendorf & Jansson (2012) on behalf of the Riksbank. In this study, the authors analyzed different cost structures for cash and card payments. They concluded that debit cards are the cheapest payment option compared to credit cards and cash payments. Therefore, increased usage of debit cards relative to cash would increase the efficiency of Sweden's payment system. However, a transition towards a cashless society would only be beneficial if debit cards replace cash, and detrimental if credit cards become the primary payment method. Many other studies have reached similar results, including a study conducted by the Danish central bank, which estimates the costs for payments in stores (POS terminals) at around 0.29-0.72% of GDP, and that the largest share of this cost comes from cash (Danmarks Nationalbank, 2011).

This is due to the different cost structures of cash, credit, and debit cards. Costs for debit cards include transaction handling, information technology and communication, customer service, payment authorization and other controls/checks.



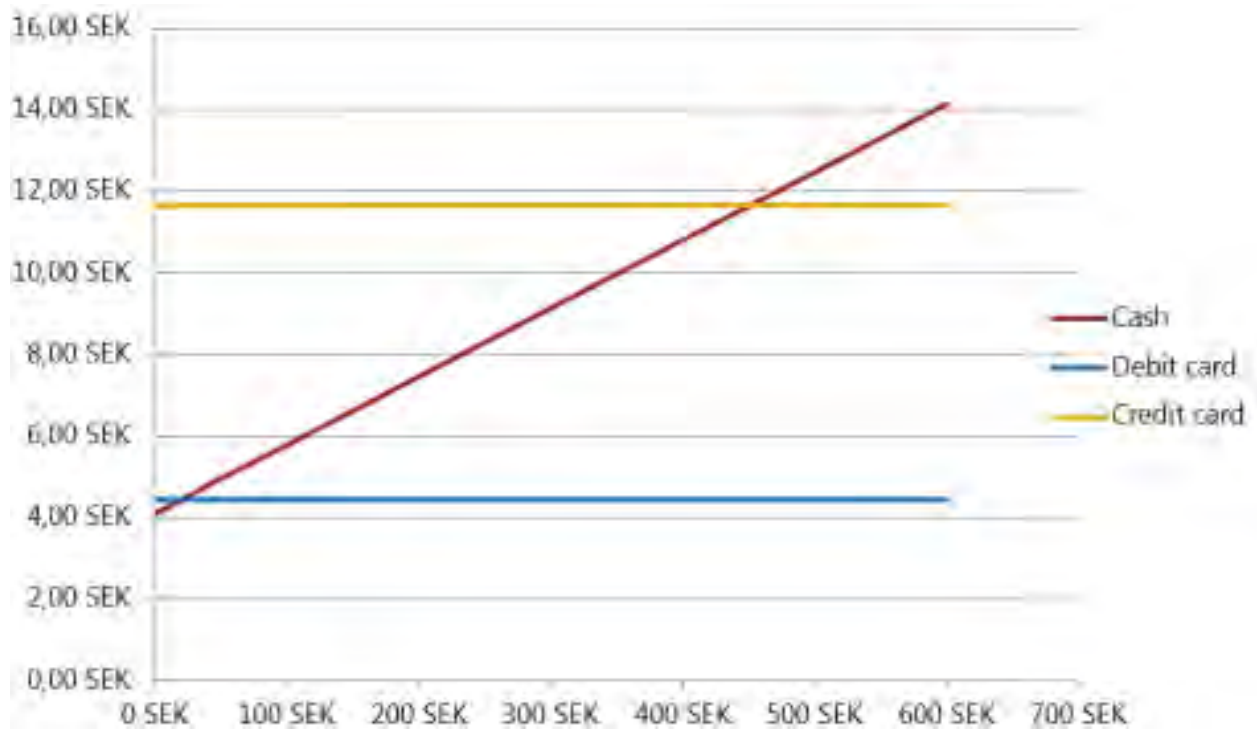
Costs for credit cards include marketing, credit testing, customer service and bonus programs. Costs for cash include printing, transportation, deposits, withdrawals, personnel costs related to counting cash sales at the end of each day, back-office administration, and seigniorage and fees imposed on banks, and the time it takes to perform a cash transaction.

Besides that, cash payments generate other indirect costs such as safety costs, work time, administrative information, and insurances for cash handling, as well as the risk of cash handling system failures and physical robbery. For example, the Swedish Commercial Employee's Union estimates that the direct cost of a robbery is 100,000kr (\$12,427), including the cost of work time spent with police and staff, sick leave, reduced operating hours, and loss of sales due to lost customers.

In turn, the threshold value where the costs of cash and debit cards are equal is 20kr (\$2.5), and for cash and credit cards 450kr (\$56). In other words, it is more efficient to make payments under 20kr with a debit card. Despite this, the estimated average value of a cash payment in Sweden is 252kr (\$31). This indicates that consumers use cash more often than what is economically efficient. Thus the Swedish payment system could achieve higher efficiency by increasing the use of debit card payments and reducing cash payments. Furthermore, the transaction cost of a credit card is always higher than that of a debit card, which means that society would benefit from minimizing credit card usage.



Figure 3: The Social Threshold Transaction Values (SEK) Under Which Cash is Socially Preferable to Debit Cards and Credit Cards



There are multiple other benefits of transitioning towards a cashless society besides reduced transaction costs. These include improved efficiency for businesses, increased tax revenues, and the development of innovative payment companies, which can drive exports and create new jobs. Payment innovations could, for example, develop additional services to map consumer behavior, register bonus points, and direct communication with customers. From an innovational perspective, it would also be beneficial for Sweden to lead cashless development in order to generate business opportunities abroad and thus increase export, GDP, and create more jobs. Criminal



activity would also be more difficult to carry out in a cashless society. According to the Swedish Tax Agency, the black economy comprises 65 billion kr (\$8.08B) annually in lost tax revenues. This revenue loss is likely decrease significantly without cash in circulation.

IV. Monetary Policy Implications of a Cashless Society

The main objective of the Riksbank is to keep inflation low and stable, which can be accomplished in two different ways: 1) controlling the money supply, and 2) adjusting the short-run interest rates on loans between banks according to some variant of the Taylor rule. Since the money supply consists of the Riksbank's liabilities (the sum of currency outstanding plus deposits held with them by commercial banks), a cashless society would, *ceteris paribus*, reduce the money supply. This has raised the question of whether monetary policy will be efficient in a cashless society.

More recently, however, most industrialized countries' central banks, including the Riksbank in Sweden and the Federal Reserve in the United States, have stopped targeting the money supply, and therefore pay little attention to monetary aggregates such as M0, generally defined as currency in circulation. Instead, the Riksbank follows a real interest rate rule in which they manipulate the short-run interest rate on loans between banks, known as the federal funds rate in the U.S. and *reporäntan* in Sweden.



Generally, when inflation rises the Riksbank increases the nominal short-term interest rate in order to force the real interest rate upward, and thus tighten the economy and prevent further inflation (Romer 2000).

This adjustment process is formally known as the Taylor Principle and was formulated by John Taylor in November 1992 at the Carnegie-Rochester Conference on Public Policy. One way central banks use the Taylor Principle is through the Taylor Rule, which includes concerns about economic output or unemployment. This rule suggests that the policy rate should be set normatively and be explained positively by equation (1).

$$r = \pi + 0.5y + 0.5(\pi - \pi_T) + 2 \quad (1)$$

- r : real policy rate set by the central bank
- y : percentage deviation of real GDP from trend
- π : rate of inflation over previous year
- π_T : inflation target set by central bank (the Riksbank's inflation target is 2%)

Assumptions:

- Real GDP is growing at an average rate of 2% annually
- $y = 0$, the real ex post
- $r - \pi = 2$

The Riksbank has officially stated that they follow a variant of the Taylor Rule when setting the short-term interest rate. However, their version differs from the usual



Taylor Rule in three ways. First, the Riksbank uses rules that have been calibrated instead of estimated. Second, the Riksbank includes real-time forecasts of future inflation and real output to inform their monetary policy decisions. Lastly, interest rate smoothing is used to a substantial degree.

This process of adjusting the short-term interest rate to influence economic variables has resulted in multiple country-specific studies concluding that a transition towards a cashless society will not hurt monetary policy (Stix et al. (2014), Odior et al. (2012), Romer (2000)). Moreover, besides targeting the short-term interest rate, there are many other tools a central bank can use in order to control inflation. These include imposing cash reserve requirements, implementing liquidity-ratio open market operations, and moral suasion (Odior et al 2012). However, economists generally agree that in a cashless society, the role of a central bank would focus more specifically on regulatory issues and supervision of private institutions issuing money. Arvidsson (2013) predicts that the Riksbank will have to develop higher regulatory functions, integrity protection, and tax overview in the case of a cashless society.

A recent study on the development of a cashless society in Nigeria by Odior et al. (2012) predicts monetary policy will become more efficient with less cash in circulation. In 2012, Nigeria implemented the “Cash-Less Nigeria Project” as a part of the goal of becoming one of the world’s 20 top performing economies by 2020. The policy introduces cash handling charges to decrease the number of cash payments, which will



in turn prevent revenue leakage, improve efficiency, and reduce transaction costs and the risk for robbery. Other studies by Segendorf, et al. and Arvidsson suggest that implementing similar cash handling fees in Sweden to better reflect the social cost of cash would make the Swedish payment system more efficient as well.

Nigeria also plans to place a greater focus on open market operations and reserve requirements rather than rely on inflation targeting. Moreover, the study predicts that transaction costs will fall in Nigeria as a result of removing the central's bank monopoly on issuing currency. This would allow for competition in the financial sector. In addition, even though seigniorage revenues for the central bank will fall, the cost savings from not printing currency will balance this loss. In turn, cashless banking is estimated to increase the velocity of circulation in the long-run which stimulates trade and commercial activities.

In contrast, Sorti and De Grauwe (2001) argue that central banks and monetary policy will be negatively affected by a transition towards a cashless society. They claim that private institutions will not be able to control for inflation when issuing money and that central banks will lose their independence. They conclude that there will be no mechanism to control for price stability if private institutions begin to print money. This is because of price indeterminacy, which can be illustrated by the equation for money market equilibrium, $M = P(Y, r)$. According to this equation, there are an infinite number of combinations of the money stock (M) and price level (P) in which the money



market is in equilibrium. Both of these are nominal variables, and assuming that private agents are free of money illusion (implying that they only care about relative prices, and not nominal variables), private agents have no incentive to control the nominal variables M and P . Today, central banks take on the responsibility of controlling the money stock in order to prevent inflation. However, in a cashless society central banks will no longer be able to maintain this role.

In contrast, Sorti and De Grauwe argue that if a central bank is able to take on a supervisory role in a cashless society, and control inflation by granting privately issued money legal tender characteristics and imposing legal reserve requirements, they could remain independent in a cashless society and still control inflation.

A central bank could, for example, implement a system that certifies the quality of privately-issued money, both traditional (deposits) and e-money, by printing a “logo” and thus giving the money legal tender characteristics. In addition, a central bank could implement macroeconomic criteria to control the money stock and interest rate by 1) increasing the capital adequacy ratio during a boom or 2) increasing the collateral banks are required to use in extending loans. Legal reserve requirements would still exist, but would include non-traditional types of money, such as e-money. This level of supervision could become an instrument to affect macroeconomic conditions in a counter-cyclical way, stabilizing price levels despite the loss of traditional policy instruments.



In conclusion, the role of the Riksbank will most likely need revision in order to transition to a cashless society. Despite this, the ability of the Riksbank to carry out monetary policy would remain efficient because it would still be able to target the repo rate. In addition, the Riksbank can implement other measures to control inflation, such as reserve requirements, liquidity ratios, and open market operations.

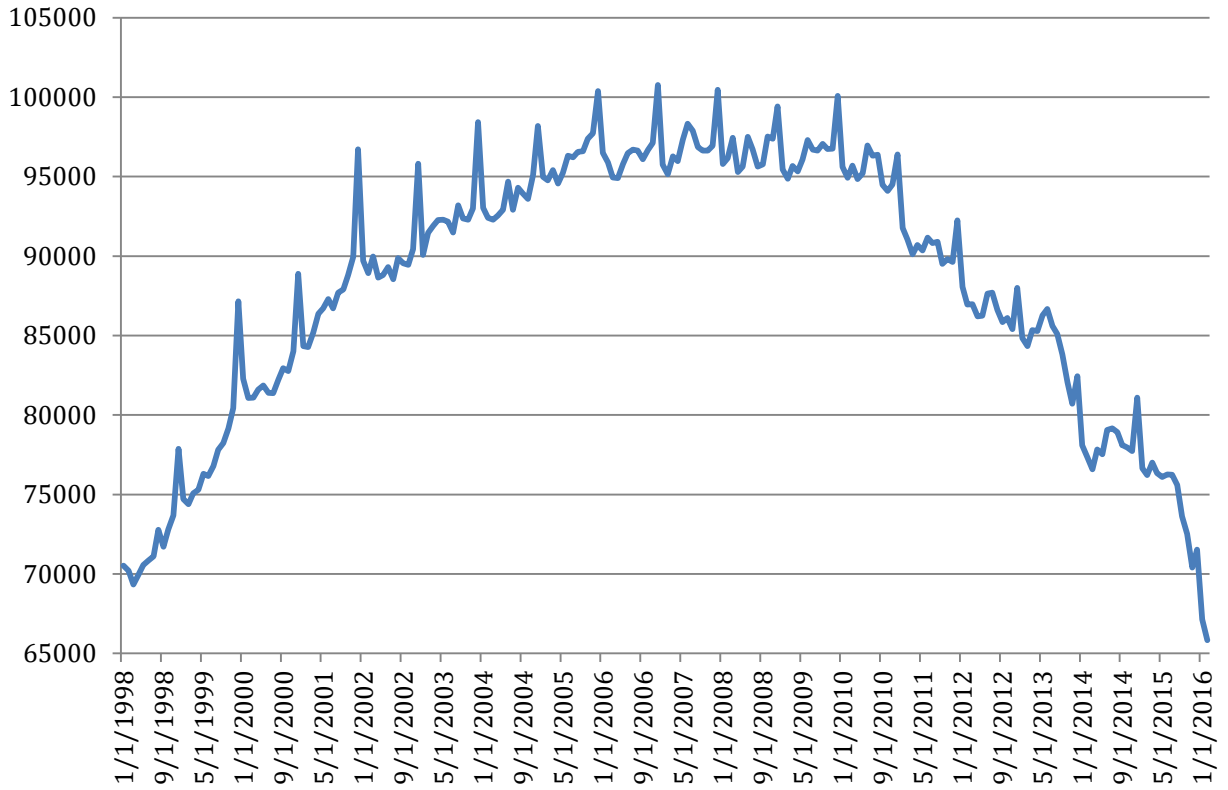
V. Monetary Aggregates and the Quantity Theory of Money

The Riksbank categorizes the total money supply into four categories, known as monetary aggregates, which are differentiated by decreasing levels of liquidity. M0 is the most liquid form of money, whereas M3 is the least liquid. In other words, M0 can more easily be used for payments in comparison to M3, which has to be converted to a more liquid form prior to use. Below is a definition of each category.

- **M0** consists of banknotes and coins in circulation issued by the Riksbank, and is measured as a debt instrument on the Riksbank's balance sheet. Also known as "narrow money" or the "monetary base."
- **M1** includes M0 plus demand deposits, defined as overnight loans and deposits in transaction accounts.
- **M2** includes M1 plus deposits in Swedish Monetary Financial Institutions (MFI) and the Swedish National Debt Office (RGK) by the Swedish public with a maturity of up to two years.
- **M3** includes M2 plus interest bearing securities. Also known as "broad money."



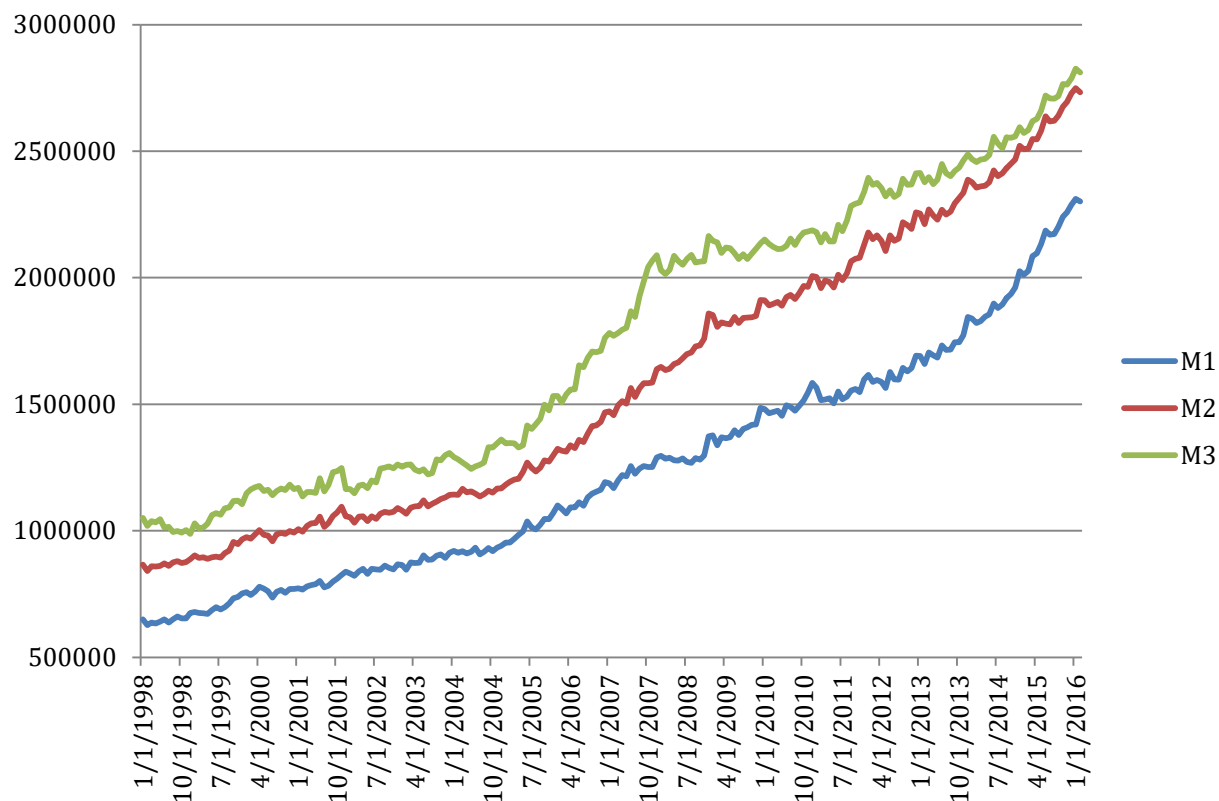
Figure 4: Money Supply M0 in Sweden 1998-2015 (SEK millions)



Source: The Riksbank



Figure 5: Money Supply M1, M2, M3 in Sweden 1998-2015 (SEK millions)



Source: The Riksbank

The quantity theory of money originated in the 18th century and was later reformulated in the 1970s by Milton Friedman. It set the foundation for monetarism and strongly influenced the way central banks conducted monetary policy across the globe.

According to the quantity theory of money, a rise in the stock of money should lead to an proportionate rise in nominal GDP ($P \cdot Y$), assuming velocity, defined as the rate at which money is exchanged to purchase goods and services, is constant. Velocity must be constant because historically, payment mechanisms changed very slowly.



However, after the introduction of debit and credit cards this assumption is no longer true, which I prove graphically in Figures 6 through 9. Equation (2) illustrates the equation of exchange, developed by economist Irvine Fisher, which describes the quantity theory of money.

$$M*V=P*Y \quad (2)$$

- M= Money stock
- V= Velocity of money stock circulation
- P = Price level
- Y = Volume of transactions of goods and services (real GDP)

This equation can be reconstructed into growth rates by transforming the variables into logarithms and time derivatives. This transformation results in equation (3), which ultimately can be simplified into equation (5).

$$\partial(M) * \partial(V) = \partial(P) * \partial(Y) \quad (3)$$

Given that velocity is assumed to be constant, the variable for the growth rate of velocity drops out when taking its derivative ($\partial(V) = 0$). In addition, the growth rate of the price level equals the inflation rate, denoted as π . Thus, $\partial(P) = \pi$. This leaves us with equation (4).



$$\partial(M) = \pi * \partial(Y) \quad (4)$$

Considering that the growth rate of real GDP multiplied by the rate of inflation equals the nominal growth rate of GDP ($\pi * \partial(Y) = \partial(NGDP)$), the equation states that the growth rate in the money stock should equal the growth rate of nominal GDP, as seen in equation (5).

$$\partial(M) = \partial(NGDP) \quad (5)$$

This basic equation shaped the way central banks conducted monetary policy for many years and implies that an increase in the growth rate of the money leads to equal increases in nominal GDP. Thus, central banks focused on targeting the money supply by conducting either expansionary or contractionary monetary policy through open market operations.

However, many economics have called into question the validity of the quantity theory of money following the 2008 financial crisis. More specifically, the theory states that an increase in the money stock should generate a symmetric boost to nominal GDP, holding velocity constant. Yet when the Federal Reserve and other central banks around the world responded to the subprime mortgage crisis by conducting aggressive expansionary monetary policy in the form of quantitative easing, the expected rise in nominal GDP did not materialize (Graff).

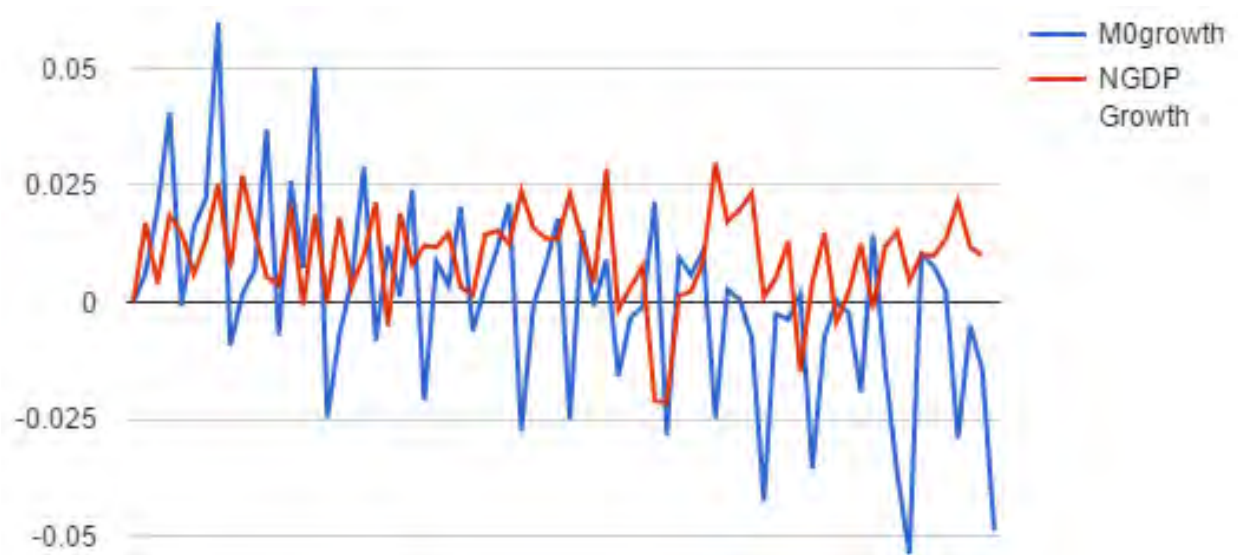


Support for the quantity theory of money, however, started to lose traction long before the global financial crisis in 2007. Starting in the 1980s, most central banks replaced money targeting with inflation targeting. The Riksbank began implementing this new way of conducting monetary policy in 1994 (Mitlid and Vesterlund). The Federal Reserve officially stopped targeting the money supply in 1980, and the European Central Bank downgraded the importance of money targeting versus interest rate targeting more recently in 2003. In other words, most central banks in the modern economy no longer base their monetary policy on the quantity theory of money.

Figures 6 to 9 illustrate that the growth rates of money aggregates in Sweden do not align with the growth rate of nominal GDP. This can also be seen by their low correlation rates: 0.07, 0.12, -0.10, and 0.11, for M0, M1, M2, M3 and Nominal GDP respectively. This finding suggests that the quantity theory does not hold, which I also prove econometrically in section VI.

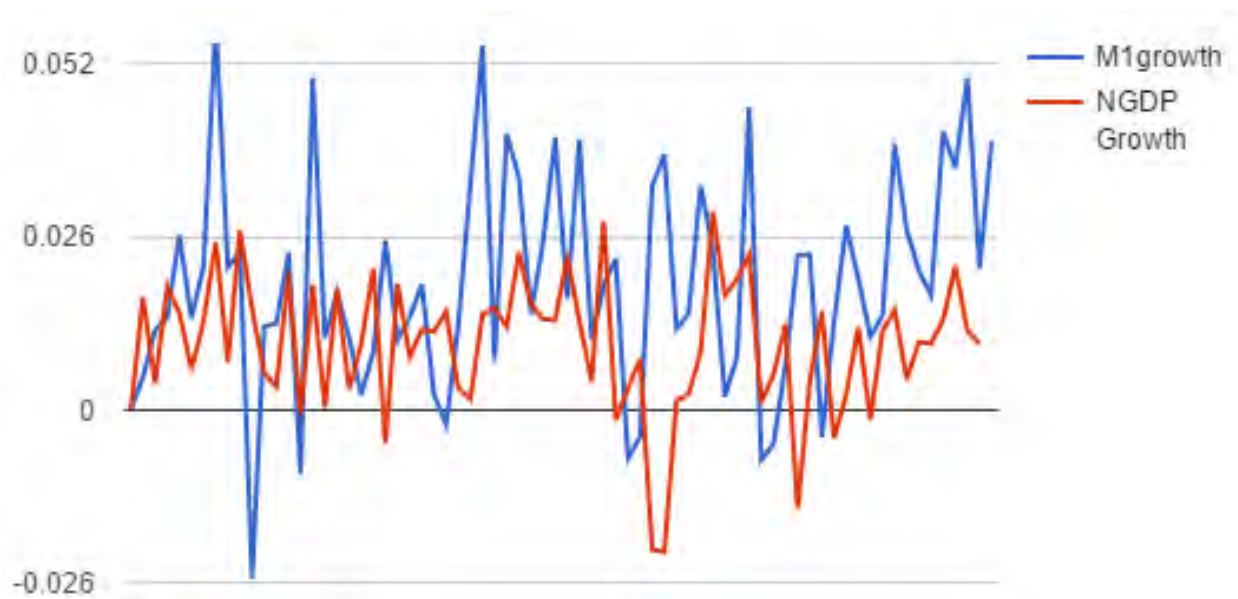


Figure 6: Growth Rates of M0 and Nominal GDP, 1998-2015



Correlation coefficient M0 Growth and NGDP Growth: 0.07

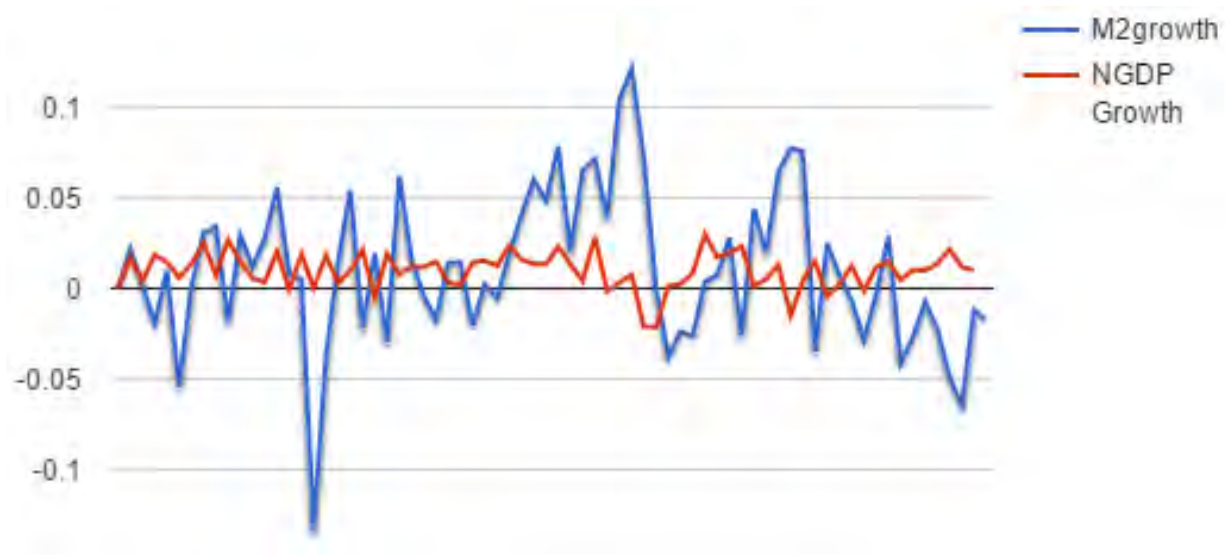
Figure 7: Growth Rates of M1 and Nominal GDP, 1998-2015



Correlation coefficient M1 Growth and NGDP Growth: 0.12

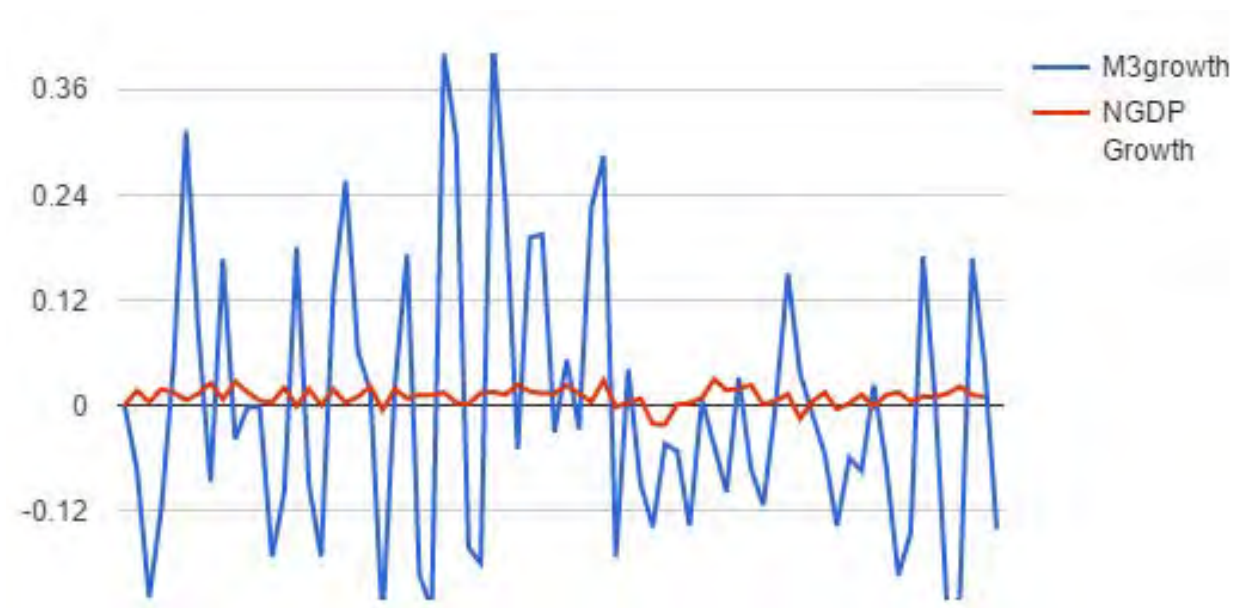


Figure 8: Growth Rates of M2 and Nominal GDP, 1998-2015



Correlation coefficient M2 Growth and NGDP Growth: -0.10

Figure 9: Growth Rates of M3 and Nominal GDP, 1998-2015



Correlation coefficient M3 Growth and NGDP rowth: 0.11



VI. Data

The empirical analysis presented in this paper is based on data measuring the levels of M0, M1, M2, M3, and the Consumer Price Index (CPI) in Sweden on a monthly basis between 1998 and 2015. This data originates from the Riksbank via Trading Economics. In addition, quarterly data for nominal and real GDP (collected from Statistics Sweden via Bloomberg and covering the same time period) have also been used in the regression analysis.

For the purpose of the regression analysis, the monthly data has been transformed into quarters in order to match the available data set on nominal and real GDP. All variables have been transformed from levels into growth rates. In addition, I have subtracted M0 from M1, M1 from M2, and M2 from M3 in order to obtain the incremental money supplies.



VII. Econometric Methodology

To evaluate the causal effect of the growth rates of money aggregates on the growth rates of nominal GDP, real GDP, and inflation respectively, I used a log-log econometric model described below.

$$RGDPgrowth = \beta_0 + \beta_1(M0growth) + \beta_2(M1growth) + \beta_3(Mgrowth2) + \beta_4(M3growth) \quad (1)$$

$$NGDPgrowth = \lambda_0 + \lambda_1(M0growth) + \lambda_2(M1growth) + \lambda_3(Mgrowth2) + \lambda_4(M3growth) \quad (2)$$

$$CPIgrowth = \delta_0 + \delta_1(M0growth) + \delta_2(M1growth) + \delta_3(Mgrowth2) + \delta_4(M3growth) \quad (3)$$

Let $NGDPgrowth$ be the quarterly growth rate of nominal GDP, $RGDPgrowth$ be quarterly growth rate of the real GDP, $CPIgrowth$ be the quarterly growth rate of the Consumer Price Index, and $M0growth$, $M1growth$, $M2growth$, and $M3growth$ be the quarterly growth rate of each money aggregate. All data are based on Sweden throughout the time period 1998 Q1 – 2015 Q4.

Due to strong evidence of heteroskedasticity, as suggested by the changing growth trend of M0 from positive to negative as seen in Figure 4, I have split the full



data set, consisting of 72 observations, in half to avoid offsetting effects in the regression output. The first half covers the period 1998 Q1 – 2006 Q4, and the second half 2007 Q1-2015 Q4. Moreover, I have divided each equation into five different regressions in which I first regress M0 on each of the dependent variables. I then add each variable (M1, M2, M3) sequentially. This is because money can be broken down into the above four categories. Thus by adding each money aggregate sequentially, I will be able to detect if any of these have an impact on nominal GDP.

Let the null be that the coefficients on M0, M1, M2, and M3 respectively are not statistically different from zero at the 5% significance level. Let the alternative be that the coefficients on M0, M1, M2, and M3 respectively are statistically different from zero at the 5% significance level. According to my hypothesis, I expect to find no significant results for the coefficient on M0, and thus fail to reject the null for M0. This is because I hypothesize that the growth rate of cash should not have an effect on nominal GDP. This suggests that a decrease in the growth rate of cash, M0, in Sweden should have no effect on the Riksbank's ability to conduct monetary policy because changes in money aggregates have no effect on economic output.

Moreover, since the money supply can be broken down into multiple money aggregates, i.e. M0, M1, M2, and M3, I will test the significance of each of these sequentially to see if any of these growth rates may have an impact on economic output. However, the velocity of money is no longer constant in Sweden due to the introduction



of debit cards and credit cards, as well as payment innovations. I expect therefore that the quantity theory of money should not hold for any money aggregate.

In addition, I will regress the growth rate of inflation and the growth rate of real GDP on the growth rate of each money aggregate sequentially to test if the quantity theory of money holds for any economic variable. This is because the left hand side of the equation of exchange, describing the quantity theory of money, states that growth rates in the money supply should have a proportionate positive effect on nominal GDP, which can be broken down into $\partial(P)$ (growth rate of inflation), multiplied by $\partial(Y)$ (growth rate of nominal GDP) as seen in equation (5).

$$\partial(M) * (\partial(V) = \partial(P) * \partial(Y) \quad (5)$$

Thus, by testing both the relationship between growth rates of money aggregates and nominal GDP, as well as the two economic variables that comprise nominal GDP (inflation and real GDP), I will be able to detect if the quantity theory of money holds in part, or not at all. I expect to find no significant results for either real GDP or inflation for the same reason that I expect to find no significant results for nominal GDP. That is, the velocity for money in circulation is no longer constant, thus falsifying the quantity theory of money.



VIII. Estimation Results

Regression output nominal GDP, first half of dataset covering time period
1998 Q1 – 2006 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	NGDP Growth Rate	NGDP Growth Rate	NGDP Growth Rate	NGDP Growth Rate
M0 Growth	.0593	.0301	.0257	.0224
<i>t-value</i>	0.77	0.44	0.37	0.31
<i>p-value</i>	0.447	0.666	0.717	0.757
M1 Growth		.1280	.1279	.1382
<i>t-value</i>		1.72*	1.71*	1.76*
<i>p-value</i>		0.095	0.098	0.089
M2 Growth			.0078	.0068
<i>t-value</i>			0.22	0.19
<i>p-value</i>			0.826	0.849
M3 Growth				.00348
<i>t-value</i>				0.47
<i>p-value</i>				0.639
Constant	.0111	.0091	.0091	.0089
R^2	0.0206	0.0934	0.0946	0.1005
N	36	36	36	36
Robust Standard Errors	.00797	.00778	.0079	.008



Regression output nominal GDP, second half of dataset covering time period 2007 Q1-2015 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	NGDP Growth Rate	NGDP Growth Rate	NGDP Growth Rate	NGDP Growth Rate
M0 Growth	3.162	2.951	2.950	2.892
<i>t-value</i>	1.07	1.08	1.07	1.03
<i>p-value</i>	0.292	0.287	0.294	0.312
M1 Growth		-1.8322	-1.772	-1.758
<i>t-value</i>		-1.07	-1.05	1.03
<i>p-value</i>		0.294	0.301	0.312
M2 Growth			.0485	.0357
<i>t-value</i>			0.16	0.12
<i>p-value</i>			0.873	0.909
M3 Growth				.0274
<i>t-value</i>				0.30
<i>p-value</i>				0.763
Constant	.0072	.0423	.0404	.0407
R^2	0.1263	0.1552	0.1554	0.1557
N	36	36	36	36
Robust Standard Errors	.1597	.1594	.1617	.1644

According to the regression output above, I fail to reject the null for M0, M2, and M3 in the first time period, as the coefficients are not statistically significant from zero at the 5% significance level. This supports my hypothesis that the growth rate of money aggregates, in particular M0, have no effect on nominal GDP. However, the coefficient on M1 is statistically significant in the first time period, meaning that I reject the null



at the 5% significance level for the relationship between the growth rate of M1 on the growth rate of nominal GDP.

The coefficient on M1 was 1.72 in regression (2), 1.71 in regression (3), and 1.76 in regression (4). This means that a 1% increase in the growth rate of M1 leads to a 1.72%, 1.71%, and 1.76% average increase in nominal GDP respectively, holding all other variables constant. Thus for M1, the quantity theory of money seems to hold in the first time period, as the theory suggests a positive relationship between the growth rates of the money supply and nominal GDP.

In contrast, I fail to reject the null for all money aggregates, including M1, in the second time period, indicating that the quantity theory of money breaks down in the second time period. In addition, the sign of the coefficient on M1 reverses to negative, which is further proof against the validity of the quantity theory of money. The negative sign indicates that an increase in the growth rate of M1 in fact *decreases* nominal GDP. More specifically, my regression output states that a 1% increase in M1 leads to a 1.83% decrease in nominal GDP in regression (2), and a 1.77%, and 1.76% decrease in nominal GDP in regression (3) and regression (4) on average, holding all other variables constant. However, none of these coefficients are statistically significant.

In contrast, the signs of the coefficients on M0, M2, and M3 remain positive, as the quantity theory of money would suggest. Despite the correct sign, however, the coefficients on M0, M2, and M3 are all statistically insignificant at the 5% significance



level. This indicates that the growth rates of these money aggregates have no effect on nominal GDP, and thus that the quantity theory of money does not hold.

The fact that the quantity theory of money partly holds in the first time period, but breaks down entirely in the second time period, can most likely be explained by the increasing velocity of money in circulation due to payment innovations over the last two decades. Given that the quantity theory of money assumes velocity to be constant, a rise in velocity falsifies the theory, and thus makes the relationship between the growth rates of money supply and nominal GDP insignificant.

Regression output real GDP, first half of dataset covering 1998 Q1– 2006 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	RGDP Growth Rate	RGDP Growth Rate	RGDP Growth Rate	RGDP Growth Rate
M0 Growth	-.0232	-.04118	-.0498	-.0548
<i>t-value</i>	-0.34	-0.68	-0.81	-0.87
<i>p-value</i>	0.500	0.500	0.425	0.393
M1 Growth		.0814	.0812	.0969
<i>t-value</i>		1.55	1.55	1.73*
<i>p-value</i>		0.129	0.131	0.094
M2 Growth			.0142	0.128
<i>t-value</i>			0.47	0.43
<i>p-value</i>			0.644	0.673
M3 Growth				.0053
<i>t-value</i>				0.99
<i>p-value</i>				0.331
Constant	0.0085	.0072	0.0072	.0068
R^2	0.0054	0.0553	0.0621	0.0852
N	36	36	36	36
Robust Standard Errors	.0061	.0061	.0061	.0062



Regression output real GDP, second half of dataset covering 2007 Q1-2015 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	RGDP Growth Rate	RGDP Growth Rate	RGDP Growth Rate	RGDP Growth Rate
M0 Growth	-.1038	-.1074	-.1049	-.1757
<i>t-value</i>	-0.86	-0.84	-0.87	-1.32
<i>p-value</i>	0.396	0.406	0.390	0.197
M1 Growth		-.0311	-.1442	-.1266
<i>t-value</i>		-0.23	-0.88	-0.82
<i>p-value</i>		0.819	0.384	0.420
M2 Growth			-.0917	-.1074
<i>t-value</i>			-1.87*	-2.35*
<i>p-value</i>			0.071	0.026
M3 Growth				.0336
<i>t-value</i>				2.00*
<i>p-value</i>				0.054
Constant	.0029	.0035	.0072	.0075
R^2	0.0271	0.0287	0.1356	0.2329
N	36	36	36	36
Robust Standard errors	.01195	.01212	.01161	.01111

The regression output from regressing the growth rate of real GDP on the growth rate of M0 indicates that there is no significant relationship between the two variables. This further reinforces my hypothesis that a decline in cash should have no effect on economic output, and thus monetary policy. This is proven by the failure to reject the null for the variable M0growth at the 5% significance level for regression (1) through



(4). In the same way, I fail to reject the null for M1growth for the same regressions, proving that changes in M1 also have no impact on economic output.

However, the coefficient on M2growth in regression (3) is significant at the 5% significance level. The results state that a 1% increase in the growth rate of M2 generates on average a 1.87% decline in real GDP, holding all other variables constant. Furthermore, regression (4) indicates that the coefficient on M2growth is significant at the 1% significance level. This means that a 1% increase in the growth rate of M2 generates on average a 2.35% decline in real GDP, holding all other variables constant.

Despite these significant results and rejection of the null, we cannot use these findings to support the quantity theory of money. In fact, since the signs of these coefficients are negative, this actually serves as proof *against* the quantity theory of money. The theory predicts that an increase in the growth rate of the money supply should generate a proportionate *positive* increase in economic output.

The only regression output supporting the quantity theory of money when using real GDP as the dependent variable can be seen in regression (4) in terms of M3growth. The coefficient on growth rate of M3 is significant at the 5% significance level. This suggests that a 1% increase in the growth rate of M3 generates a 2% increase in real GDP on average, holding all other variables constant.



Regression output CPI, first half of dataset covering time period 1998 Q1 – 2006 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	CPI Growth Rate	CPI Growth Rate	CPI Growth Rate	CPI Growth Rate
M0 Growth <i>t-value</i> <i>p-value</i>	.0647 1.74* 0.091	.0603 1.47 0.150	.0617 1.52 0.137	.0603 1.42 0.166
M1 Growth <i>t-value</i> <i>p-value</i>		.0194 0.65 0.523	.01944 0.64 0.525	.0236 0.71 0.481
M2 Growth <i>t-value</i> <i>p-value</i>			-.0024 -0.10 0.922	-.0028 -0.11 0.911
M3 Growth <i>t-value</i> <i>p-value</i>				.0014 0.31 0.760
Constant	.0024	.0021	.0021	0.002
R^2	0.0584	0.0623	0.0626	0.0626
N	36	36	36	36
Robust Standard Errors	.00507	.00514	.00522	.00529



Regression output CPI, second half of dataset covering time period 2007 Q1-2015 Q4

	(1)	(2)	(3)	(4)
Dependent Variable	CPI Growth Rate	CPI Growth Rate	CPI Growth Rate	CPI Growth Rate
M0 Growth	0.1417	.1326	.1318	.1069
<i>t-value</i>	2.85**	2.73**	2.68**	2.07*
<i>p-value</i>	0.007	0.010	0.011	0.047
M1 Growth		-.0790	-.0438	-.0376
<i>t-value</i>		-1.07	-0.56	-0.49
<i>p-value</i>		0.292	0.576	0.625
M2 Growth			.0286	.0231
<i>t-value</i>			1.39	1.25
<i>p-value</i>			0.175	0.219
M3 Growth				.0118
<i>t-value</i>				1.54
<i>p-value</i>				0.134
Constant	.0038	.0053	.0042	.0043
R^2	.0058	0.2182	0.2553	0.2978
N	36	36	36	36
Robust Standard Errors	.00581	.00575	.0057	.00563



When regressing the growth rates of CPI on each money aggregate, I find no significant results in the first time period, except for M0 in regression (1). The coefficient on M0 indicates that a 1% increase in the growth rate of M0 generates a 1.74% increase in CPI on average, holding all other variables constant. However, the significance is eliminated when adding more variables to the regression. This further reinforces my hypothesis, by proving that the growth rate of money aggregates has no effect on the growth rate of inflation.

Interestingly, we find significant and highly significant results between the growth rates of M0 and CPI during the second time period, both at the 1% and 5% significance level. However, I believe that these results can be explained by the financial crisis and the falling growth rate of cash in Sweden during the second half of the data set. More specifically, the second half of the data, which encompasses the time period 2007 Q1-2015 Q4, captures the entire global financial crisis, triggered by the 2007 subprime mortgage crisis in the United States. The financial crisis put downward pressure on inflation rates all over the world. At the same time, Sweden started reducing the growth rate of cash, i.e. M0, as represented by the inflection point in Figure 4. Thus, falling inflation combined with falling growth rates of M0, should generate positive results, as seen in the regression output.

For this reason, I am not surprised to find highly significant results of M0 on CPI growth in the second time period. However, this does *not* suggest that the quantity



theory of money holds, as M0 was in fact falling throughout this time period. On the contrary, if the quantity theory of money in fact holds, we would expect to see a fall in the growth rate of CPI, illustrated by a negative coefficient. This is not the case. Thus even though these results are highly significant, they further reinforce the hypothesis that the quantity theory of money does not hold.

As mentioned earlier, the reason why the quantity theory of money does not hold is because the velocity of money in circulation is not constant for any money aggregate.

Figure 10: M0 Velocity (Nominal GDP/M0 Levels)





Figure 11: M1 Velocity (Nominal GDP/M1 Levels)



Figure 12: M2 Velocity (Nominal GDP/M2 Levels)

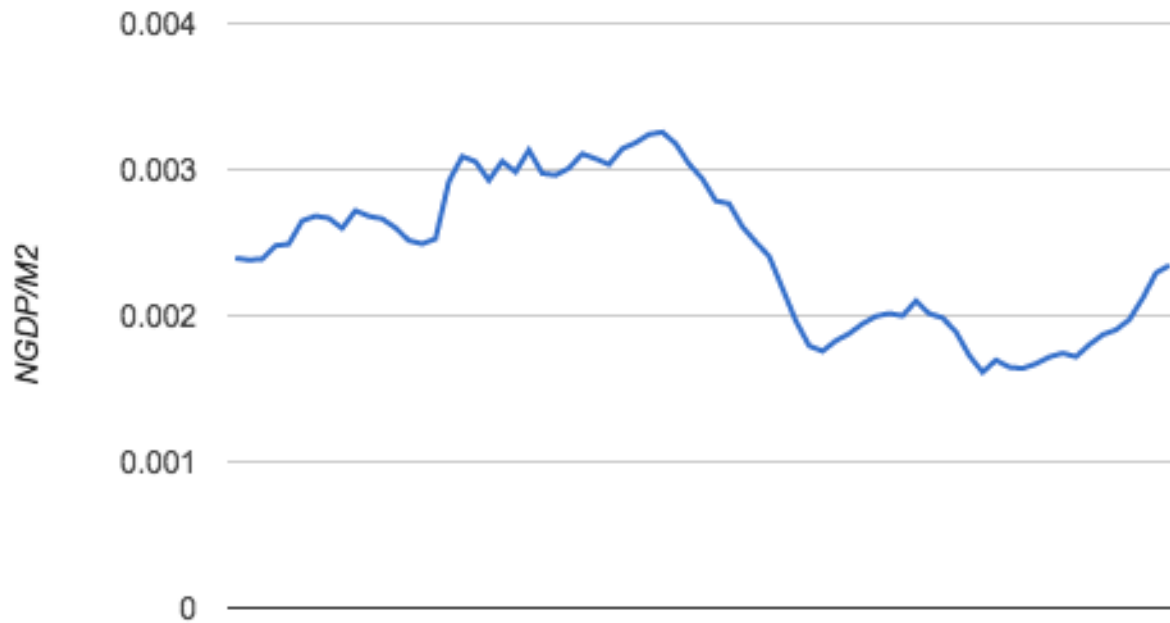




Figure 13: M3 Velocity (Nominal GDP/M3 Levels)



IX. Conclusion

In this paper, I hypothesize that Sweden's transition towards a cashless society will not negatively affect the Riksbank's ability to conduct monetary policy. Further, I argue that this is due to the invalidity of the quantity theory of money. I prove this through econometric analysis by showing that there is no relationship between the growth rates of the money supply and economic output, as suggested by the theory.

In support of my hypothesis, I failed to find significant relationships between the growth rates of nominal GDP, real GDP, and CPI on the growth rates of M0. These



findings indicate that the quantity theory of money does not hold in terms of cash in circulation. This can be explained by the volatility in the velocity of payments, caused by the introduction of debit and credit cards as well as payment innovations over the last decades.

Historically, the quantity theory of money has served as the basis for the monetary policy practice of targeting the money supply. Today, most central banks have officially announced that they have moved away from targeting the money supply, and instead target the short-term interest rate by following some variation of the Taylor Principle. Since the reduction in M0 will have no impact on the Riksbank's ability to control the short-term interest rate, their ability to conduct monetary policy will not be negatively affected by Sweden's transition towards a cashless society.

In fact, there are many benefits to a cashless society. These benefits include a less costly and more efficient payment system, which is likely to generate higher economic activity and output. Moreover, the risk of robbery is expected to decline, as stores would no longer carry cash. Finally, at the zero lower bound, Sweden might be less prone to experience a bank run at the zero lower bound, which would strengthen monetary policy and overall financial stability.



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The background of the slide is a photograph of the Golden Gate Bridge in San Francisco, taken from a low angle looking up at the bridge's towers and suspension cables. The bridge is partially obscured by a large, semi-transparent white rectangular box that contains the title and author information. The sky is a warm, hazy orange, suggesting a sunset or sunrise. In the foreground, there are dark, rocky outcrops in the water.

EFFECTS OF BOARD GENDER DIVERSITY ON FIRM PERFORMANCE AND DIRECTOR COMPENSATION IN INDIA

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Effects of Board Gender Diversity on Firm Performance and Director Compensation in India

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Abstract

This paper attempts to determine if gender diversity in the boardroom has significant effects on firm performance and directors' compensation for firms listed in the National Stock Exchange (NSE) of India. This paper finds that the presence of women on the board has no significant effect on firm outcomes as measured by Return on Assets. This paper also conducts a difference-in-difference analysis using the Companies Act of 2013 as a source of exogenous variation. Other measures of firm performance such as using Tobin's Q and measures of firm risks such as leverage, current, and solvency ratios also yielded insignificant results. This paper also examines pay inequality among directors and finds a clear pay discrepancy between male and female directors. Female directors earn 1.19% less than male directors in monetary compensation, but are compensated with a 0.426% increase in the number of shares received. Limitations to the methodology and results as well as possible extensions to the research are discussed.

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I. Introduction

Corporate governance refers to the ways that financiers to corporations assure themselves of getting a return on their investment (Shleifer and Vishny, 1997). The board of directors facilitates this assurance, through four important functions: (1) monitoring and controlling managers, (2) providing information and counsel to managers, (3) monitoring compliance with applicable laws and regulations, and (4) linking the corporation to the external environment (Mallin, 2004; Monks and Minow, 2004). In addition, the board is actively involved in determining an overall corporate strategy by identifying and prioritizing objectives that are consistent with the vision of the organization. They also balance potential risks involved in maximizing the firm's value (Campbell & Minguez-Vera, 2007).

Because the board of directors plays an important strategic role in chartering a firm's growth path, researchers have turned to investigating board characteristics and diversity due to their potential significance in influencing firm performance and compensation. Many studies have examined the percentage of insiders on the board (Agrawal & Knoeber, 1996), the size of the board (Kini et al, 1995), and more recently director characteristics such as gender and ethnicity (Francoeur et al, 2007).

Understanding how board gender diversity relates to the performance of Indian companies and the compensation of their directors are the main areas of focus for this paper. Unlike past papers on this topic, we use the Companies Act of 2013 as a source



of exogenous variation to determine how gender diversity affects firm performance.

Furthermore, we study whether there is inequality in compensation between male and female directors using panel data with time and entity fixed effects.

1.1 Motivation

India has been reported to have one of the lowest rates of female representation in corporate governance (Corporate Gender Gap Report, 2010). With only 4.7% female directors in 2011 – far less than major economies in Asia (Yi, 2011)¹ – most Indian women face a “glass ceiling” during their careers. This may be due to psychological and societal expectations that men are the sole breadwinners in a traditional Indian family (Nandy et al, 2014). Past literature on developed countries such as the United Kingdom also highlighted that senior women do not easily gain access to the boardroom because an elite group of male directors tend to maintain their power (Singh and Vinnicombe, 2004). Women have also been unfairly subjected to a socially constructed perspective of competence which is typically associated with men and masculinity (Martin, 1996; Abrahamsson, 2002; Tienari et al, 2002).

As a result, women’s roles in Indian firms are predominantly limited to entry- and middle-level positions, with meagre female inclusion at the highest echelons of

¹ The Gender Diversity Benchmark for Asia report concludes that India has the smallest percentage of women in the total workforce among China, Hong Kong, Japan, Malaysia, and Singapore.



management. Indian women hold only one in eight management roles and one in twenty senior executive positions (Haldar et. al, 2014). As a result, the Indian government announced the Companies Act of 2013 in August 2013 (“Companies Act”). The law was designed to enhance self-regulation, strengthen board governance, and improve board gender diversity. The Companies Act required every listed company in India with paid-up capital of Rs 100 crores or more and every public company with turnover of Rs 300 crores or more to have at least one female director on their boards by the end of financial year 2014 (Ministry of Law & Justice, 2013). The law also applies to newly incorporated companies that meet the criteria. In such as case, a female director must be appointed within the first six months of incorporation (India Ministry of Law & Justice, 2013).

This introduction of gender quotas in the boardroom is not exclusive to India. Scandinavian countries such as Norway and Denmark have introduced legislation requiring quotas for the number of female directors. In Norway, 40% of a company’s directors must be female (Carter et al, 2010). Other European countries such as Spain, France and Belgium have also enacted or are currently debating laws for gender quotas in the boardroom (Adams & Funk, 2012; Adams & Ferreira, 2009). Nonetheless, India is one of the first developing countries to impose such a gender quota on private companies. Not only would increasing gender diversity potentially improve levels of corporate accountability, the presence of women on company boards may bring an additional



perspective to board decision making, possibly improving overall firm performance.

Furthermore, having more women in the boardroom allows for further analysis on the possible existence of gender gaps in India, which could be examined by investigating the effects on director compensation.

1.2 Theoretical Foundations and Hypotheses

Theoretical foundations that support increased gender diversity in the boardroom include *Agency Theory* and *Resource Dependence Theory* (Carter et. al, 2010; Low et. al, 2015; Roberts et. al, 2006). These theories, which will be elaborated in further detail in Section 2, argue that improving gender diversity helps the boardroom make better decisions and ultimately leads to improved firm performance. However, some researchers have argued in favor of the *Social Psychological Theory*, which claims that gender diversity may result in increased conflict within the board room. Besides the effect of gender diversity on firm performance, the *Managerial Power* theory of executive compensation also highlights how a potential increase in female directors may provide checks and balances towards an optimal level of executive compensation (Balasubramaniam et al, 2013). This paper thus seeks to empirically test the above mentioned theories with respect to how gender diversity may affect firm performance and director compensation by constructing the following hypotheses.



H1. Will Gender Diversity in the Boardroom Affect Firm Performance?

- *Null Hypothesis:* Board gender diversity has no causal relationship with firm performance in India.
- *Alternative Hypothesis (1):* Board gender diversity improves firm performance in India.
- *Alternative Hypothesis (2):* Board gender diversity decreases firm performance in India.

H2. Does Gender Diversity in the Boardroom Affect Director Compensation?

- *Null Hypothesis:* Board gender diversity has no causal relationship with director's compensation in India.
- *Alternative Hypothesis (1):* Board gender diversity increases director's compensation in India.
- *Alternative Hypothesis (2):* Board gender diversity decreases director's compensation in India.

1.3 Contributions to Existing Literature

This work contributes to the literature on the relationship between gender diversity on firm performance and director compensation, particularly in the context of India. First, it empirically tests existing theories relating board gender diversity to firm performance and director compensation within the context of a developing Asian country. Most articles that examine the effect of board gender diversity on firm



performance and director's compensation use data from developed countries, such as the Nordic countries and the United States. My approach enables better understanding of how gender diversity can affect firm performance and director compensation in different cultural contexts, as cultural differences across countries may affect the significance or even the direction of the relationship.

Second, this is one of the first known studies on boardroom gender diversity conducted on India after the announcement of the Companies Act of 2013. Furthermore, this paper uses a large sample of all publicly listed Indian firms from the National Stock Exchange (NSE) of India. Previous studies focused their research on firm data prior to the announcement of the Companies Act. Moreover, these studies on boardroom characteristics and firm performance in India (Ghosh, 2006; Halar, Shah & Rao, 2014; Dwivedi & Jain, 2005) either focused on firms within one industry or only the largest 100 or 500 firms in the Bombay Stock Exchange (BSE) or the NSE. Because only a small subset of companies had female directors prior to the law, their findings may not be generalizable across all Indian firms. Using data before and after the announcement of the Companies Act potentially provides a more representative view of the effects of gender diversity on firm performance and director compensation in India.

Lastly, this paper uses a relatively new empirical strategy to assess the effect of gender diversity on corporate performance. Previous studies frequently used a multivariate Ordinary Least Squares (OLS) regression to determine the relationship



between gender diversity on board performance and director compensation. This paper improves on previous empirical strategies by using panel data, thereby allowing for unobservable time and entity fixed effects. Furthermore, I conducted a difference-in-differences (DiD) regression specification to use the introduction of the Companies Act as a natural experiment in which companies can be sorted into treatment and control groups. As a result, the average treatment effect on firm performance and risk due to the introduction of a women director in the boardroom can be analyzed accordingly. The merits and limitations of this methodology will be explored in Section 3.

1.4 Findings and Organization of Paper

This paper finds that the presence of one or more women on a corporate board has an insignificant effect on firm performance, as measured by the return on assets (ROA), after adjusting for firm and year fixed effects. Other measures of firm performance, such as estimates of Tobin's Q^2 and measures of risks like leverage, current ratios, and solvency ratios, also yielded insignificant results. Using the Companies Act of 2013 as an exogenous random assignment of treatment and control groups and conducting a difference-in-differences analysis, this paper also finds that boardroom gender diversity has no significant effect on the various measures of firm performance

² Defined as the sum of the market value of stock and the book value of debt divided by the book value of total assets



described above.

Furthermore, this paper finds no significant relationship between the proportion of female directors in the boardroom and overall director compensation. However, we find that female directors earned approximately 1.19% less in monetary compensation than their male counterparts. This is sizeable because it amounts to approximately 130,000 rupees, or about 1.3 times the 2015 Indian GDP per capita (World Bank, 2015). On the other hand, this difference was compensated by a significant increase in the number of company shares that female directors receive.

The remainder of this paper is organized as follows. Section 2 reviews theories that explain why board gender diversity may have an effect on firm performance and compensation for directors. It also reviews the empirical findings of previous studies. Section 3 articulates the data generation and selection process and the empirical strategy used to determine the relationship between board gender diversity and firm performance in India. The results and the limitations of these findings will also be covered in Section 3. Section 4 articulates my empirical strategy and the key results of the relationship between board gender diversity and director compensation. Section 4 also evaluates the results of the relationship between board gender diversity and director compensation. Section 5 provides a discussion of the limitations of the overall findings and considers future research opportunities to better understand the research questions detailed in this paper. Section 6 concludes this paper.



II. Literature Review

2.1 Gender Diversity in the Boardroom and Firm Value

With changing social norms, women will constitute a larger proportion of the workforce. As a result, gender diversity in the boardroom has attracted attention from scholars, corporations, and governments in recent years (Erhardt et al, 2003).

Understanding gender diversity in corporate governance has important implications for both public policy and corporate governance (Carter et.al, 2010).

If gender diversity is positively related to firm profits, the economic implications of gender diversity are powerful. However, if gender diversity is not positively related to firm profits, the issue becomes a question of public policy – ensuring equal representation and eliminating the “glass ceiling effect” on women in the workforce (Farrell and Hersch, 2001). The next section articulates the key economic arguments for greater gender diversity in the boardroom.

2.1.1 Economic Arguments and Greater Gender Diversity

Three major theories, *Agency Theory*, *Resource Dependence Theory* and *Social Psychological Theory*, relate boardroom gender diversity and corporate governance. However, the cumulative effects of these three arguments are still ambiguous. For example, while *Agency Theory* supports gender diversity and firm performance, *Social*



Psychological Theory argues otherwise. Hence, these effects must be tested empirically in order to determine the effect board gender diversity has on firm performance.

2.1.2 Agency Theory and Empirical Evidence

Agency Theory argues that female boardroom members tend to bring a fresh perspective on complex issues which can help correct informational biases in strategy formulation and problem solving (Dewatripont et. al, 1999 and Westphal and Milton, 2000). Gender diversity can also resolve problems caused by agency costs arising from management's private pursuits (Finegold et al, 2007). Women also tend to take their roles more seriously, leading to more civilized behavior in the boardroom and improved corporate governance (Singh and Vinicombe, 2004). All of these conjectures point toward a lessening of the principal-agent problem, better assuring shareholders of a positive return on their investment through the firm's improved performance.

The fact that women's presence in the boardroom reduces the principle-agent problem has been shown empirically in multiple research papers across different developed countries. Research conducted by Adams and Ferreira (2009) highlighted improved attendance and behavior among male directors as a result of having more women in the boardroom. Carter et. al. (2003) found significant positive relationships between board gender diversity and firm performance in the United States using Tobin's Q as the key measure. Campbell and Minguez-Vera (2008) found that board gender



diversity had a positive effect on firm performance in Spain using a similar analysis. Finally, Julizaerma and Sori (2012) demonstrate a positive relationship between women in the boardroom and firm performance in Malaysian companies.

2.1.3 Resource Dependence Theory and Empirical Evidence

Pfeffer and Salanick (1978) argue that boards play multiple roles that link the corporation to other external organizations, fulfilling its environmental dependencies. The introduction of women in the boardroom may allow for a better understanding of the firm's market because the board better reflects the diversity of its employees and customers (Campbell & Minguez-Vera, 2007). Consequently, companies with gender diverse boards are able to penetrate markets more effectively.

Evidence in support of the *Resource Dependence Theory* includes a survey by McKinsey, which notes that gender diversity helps firms maintain good relationships with female clients and gain female insight into consumer buying patterns (Sussmuth-Dyckerho et. al, 2012). Others have found that female directors have close ties with female directors in other companies (Hillman et al, 2007).

2.1.4 Social Psychology Theory and Empirical Evidence

While the previous two theories argue in favor of gender diversity, *Social Psychological Theory* postulates that greater gender diversity may reduce firm



performance. Earley and Mosakowski (2000) suggest that members of homogeneous groups tend to communicate more frequently, as they are likely to share the same opinions. Other research has also shown that more homogeneous groups are more cooperative and tend to experience fewer emotional conflicts (Williams & O'Reilly, 1998). Finally, Lau and Murnighan (1998) argue that decision-making becomes more time-consuming and potentially less effective with more gender diversity.

However, *Social Psychological Theory* also argues that a homogeneous boardroom is more likely to conform to groupthink (Miller and Del Carmen Triana, 2009), which may exacerbate the principal-agent problem. Hence, proponents of board gender diversity argue that heterogeneous boardrooms bring forth wider perspectives that lead to more innovative ideas (Hoffman, 1959) and result in improved firm performance.

In any case, Smith, Smith, and Verner (2006) found a negative relationship between gender diversity and gross profits to sales for a sample of Danish firms. Farrell and Hersch (2005) conducted an event study to investigate the effect of additional female directors on U.S. boards, but also found no evidence that it affects returns on assets to shareholders. Another study in Norway reported a significantly negative relationship between the proportion of women on the boards of Norwegian firms and Tobin's Q (Bohren & Strom, 2005). Finally, Adams and Ferreira (2009) suggested that female presence on corporate boards may lead to over-monitoring in companies that already have strong governance in place.



2.2 Gender Diversity in the Boardroom and Director Remuneration

An important role of the board of directors is to set and oversee firm policies for compensating management. Traditionally, directors are compensated with an annual retainer and a separate fee for attending board and committee meetings. As director compensation increases, compensation has trended toward a greater focus on equity compensation, which is thought to reduce the principle-agent problem (Pakela & Sinkular, 2015). In general, there are two different approaches to executive compensation, namely the *Optimal Contracting Approach* and *Managerial Power Approach* (Balasubramaniam et. al, 2013).

2.2.1 Optimal Contracting Approach and Empirical Evidence

The Optimate Contracting Approach is based on the agency theory of corporate governance, where the board's objective is to maximize shareholder wealth (Balasubramaniam et. al, 2013). To align the incentives of directors and shareholders, directors are offered stocks and options in addition to cash compensation (Jensen & Meckling, 1976).

One implication of this approach is that directors should be compensated for their executive ability, i.e. the capacity to generate profits (Fagernas, 2006). If greater gender diversity enables the directors to perform their roles better due to the theories



mentioned above, then all else equal, we would expect that directors in boardrooms with higher gender diversity should be paid better. Furthermore, there should be no pay gap between male and female directors if they are paid based on individual abilities. However, in a study by Bertrand et. al. in 2014 highlighted that women directors earned about 38% less than their male counterparts in Norway after accounting for board fixed effects.

2.2.2 Managerial Power Approach and Empirical Evidence

The *Managerial Power Approach* argues that outstanding talent at top management levels is scarce and thus commands a compensation premium in a competitive market (Balasubramaniam et. al, 2013). This suggests that the greater a manager's power, the more substantial influence they have on their pay, and hence presents a form of agency problem itself (Bebchuk & Fried, 2003). As a result, greater gender diversity could possibly lead a more optimal level of compensation from the viewpoint of shareholder value maximization (Bebchuk et. al, 2002).

Research conducted by Adams and Ferreira (2009) suggests that the effect of gender diversity on director pay is positive and significant at the 10% level after accounting for firm fixed effects. Adams and Ferreira (2009) also argue that a higher proportion of female directors is associated with more equity-based pay for directors. This suggests a board more aligned with shareholder interests.



2.3 Review of Arguments Applied to India's Context

Consolidating the various insights from previous literature, empirical evidence does not provide clear support on the direction of the relationship between gender diversity, firm profits, and director compensation. The inconclusive nature of the empirical evidence may be explained in the following possible ways.

First, the empirical evidence above spans different countries with significant differences in cultural characteristics and time periods. In other words, the effect on board gender diversity and firm performance may be highly localized. Second, researchers have been using different empirical methods to estimate the relationship between gender diversity and firm performance. In some studies, key control variables such as firm size and firm age were not included. There could be problems of omitted variable bias in these studies, which could possibly explain the varying nature of the results found. Third, the relationship between firm performance and director compensation based on the characteristics of the board of directors is complex because of large variations and unobserved variables.

2.3.1 Understanding Gender Diversity and Firm Performance in India

Taking these insights into consideration, this paper conducts a separate study to understand the relationship between board gender diversity and firm performance specifically in India. As mentioned earlier, previous studies on this topic in India focused



on firms within one industry sector or only the largest 100 or 500 firms in the Bombay Stock Exchange (BSE) or the NSE. However, the low percentage of Indian firms with women on the boardrooms (about 4.00% of total Indian directorships) in India could indicate that their results may not be representative of all Indian companies in general. Hence, besides using a multivariate regression to compare the difference in performance of a small sample of firms with gender-diverse boards to that of firms with less gender-diverse boards, this paper introduces year and firm fixed effects as well as utilizes the introduction of the Companies Act 2013 as an exogenous shock to conduct a DiD analysis. Detailed explanations of the empirical strategy and the data collection process are articulated in Section 3.

2.3.2 Understanding Gender Diversity and Director Compensation in India

While no prior literature has surveyed the effects of gender diversity on director compensation in India, other determinants of executive payment have been studied. In particular, studies have raised the question of whether family ties affect director compensation. In fact, directors who are related to other directors or are part of the founding family are paid more than those who are not (Fagernas, 2006; Jaiswall, 2009). The introduction of independent directors seems to have a disciplinary effect in lowering pay that aligns more to firm performance (Fagernas, 2006). Taking these insights into



consideration, this paper considers whether gender diversity has an effect on directors pay through a fixed effects regression on a panel sample of director-level data. Detailed explanations of the empirical strategy and data collection process are articulated in Section 5.

III. Gender Diversity and Firm Performance

3.1 Data Sources and Construction of Dataset

The sample for this paper consists of an unbalanced panel of financial information for all of the firms listed in the NSE for the period from 2006 to 2015. The sample was obtained from the Osiris database managed by Bureau Van Dijk, a major worldwide publisher of business information. Specifically, financial information and the Standard Industry Classification (SIC) of each firm were collected.

Data on the number of board directors with their respective genders was also collected for all firms listed in the NSE. This data was obtained from the PRIME Database Group³, which collects data directly from the stock exchange itself. Director data is updated daily within the database. Table 1 articulates the list of variables collected from these two data sources.

³ Subscribers of the database include globally renowned financial institutions such as Goldman Sachs, consulting companies such as McKinsey & Company, and many large institutions in India.

**Table 1: Summary of Variables**

Variable Name	Definition
<i>Boardroom</i>	Size of the boardroom for a company; total number of directors in the boardroom.
<i>PercentWD</i>	Proportion of women directors in the boardroom, calculated by dividing the number of women directors by the total number of directors in the boardroom
<i>ROA</i>	Return on assets for a company, calculated by dividing a company's annual earnings by its total assets.
<i>CurrentRatio</i>	A liquidity and efficiency ratio that measures a firm's ability to pay off its short-term liabilities with its current assets. Calculated by dividing current assets by current liabilities.
<i>Solvent</i>	Denotes the solvency ratio of the firm
<i>Leverage</i>	Denotes a firm's financial leverage, which is defined as the degree to which a company uses fixed-income securities, such as debt and preferred equity.
<i>TobinsQ</i>	Ratio of the firm's market value to its book value of assets.
<i>Firmage</i>	Denotes the firm's age in years
<i>Ln(AssetUSD)</i>	Natural logarithm of the firm's total assets (in USD) in the stated year
<i>PercentIndep</i>	Proportion of independent directors in the boardroom. Data is available only for years 2014 and 2015.

3.2 Overall Descriptive Statistics for Company Performance

The subsample for which complete financial data was available was used to determine the level of female representation in publicly listed companies in the NSE.

The subsample contained data for 804 firms over 10 years. Table 2 below displays the key statistics on variables measuring firm performance.

**Table 2: Descriptive Statistics of Firm Performance (2006 - 2015)**

Variable	N	Mean	SD	Min	Max
Boardroom	8040	8.272139	2.643389	1	21
PercentWD	8040	.0575043	.0829161	0	1
ROA	8040	6.309514	11.28141	-92.24	98.84
Current Ratio	8040	2.627332	4.538678	.02	90.8
Solvent	8040	43.72537	24.00035	-95.78	99.99
Leverage	8040	96.79007	150.5679	-993.59	998.2
TobinsQ	8040	1.015014	3.003443	0	152.299
Ln(AssetUSD)	8040	12.06963	1.635973	4.489609	18.20502
Ln(AssetLCU)	8040	15.98698	1.643962	8.626227	22.34164
Firmage	8040	38.24117	22.27499	5	152
PercentIndep ^a	1608	0.5214634	0.1372202	0	1

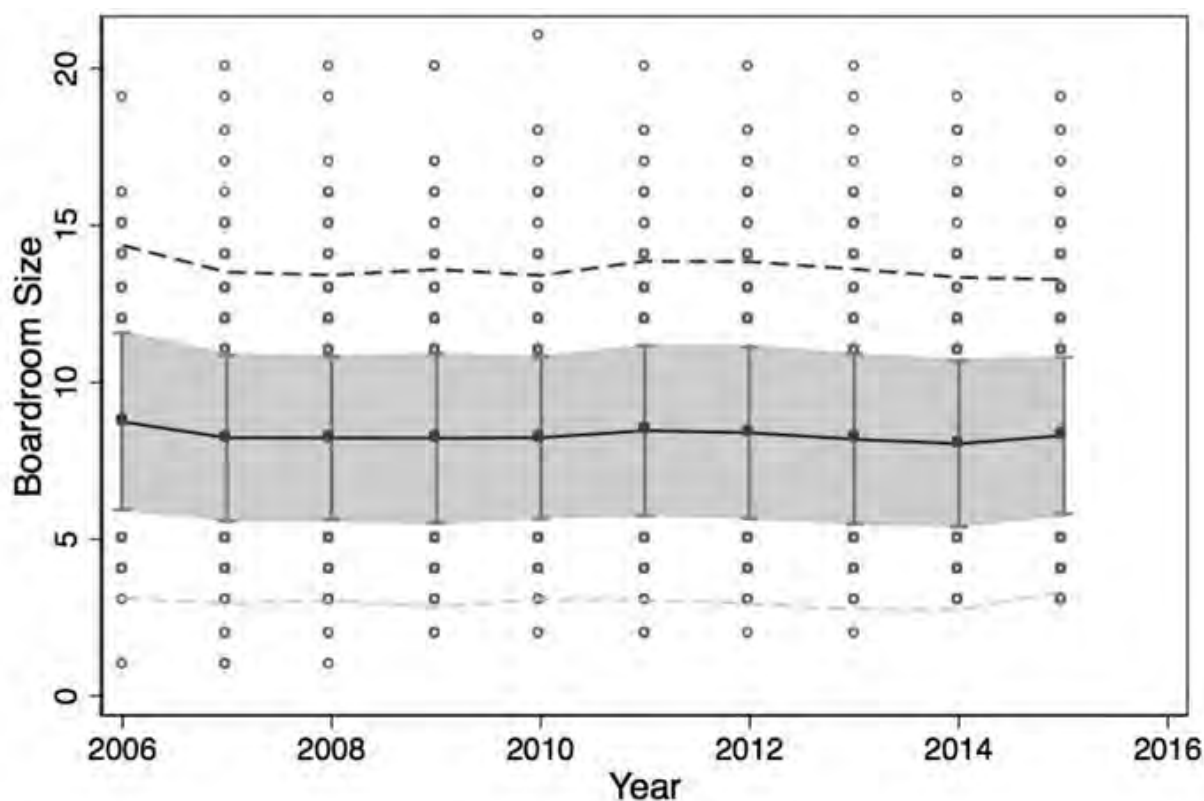
The average boardroom size was 8.27 directors, with a standard deviation of 2.64.

The average board size has been fairly consistent from 2006 to 2015. This is highlighted in Figure 1 below. Grey bands denote the standard errors of the boardroom size.

^a Observations available only for years 2014 and 2015



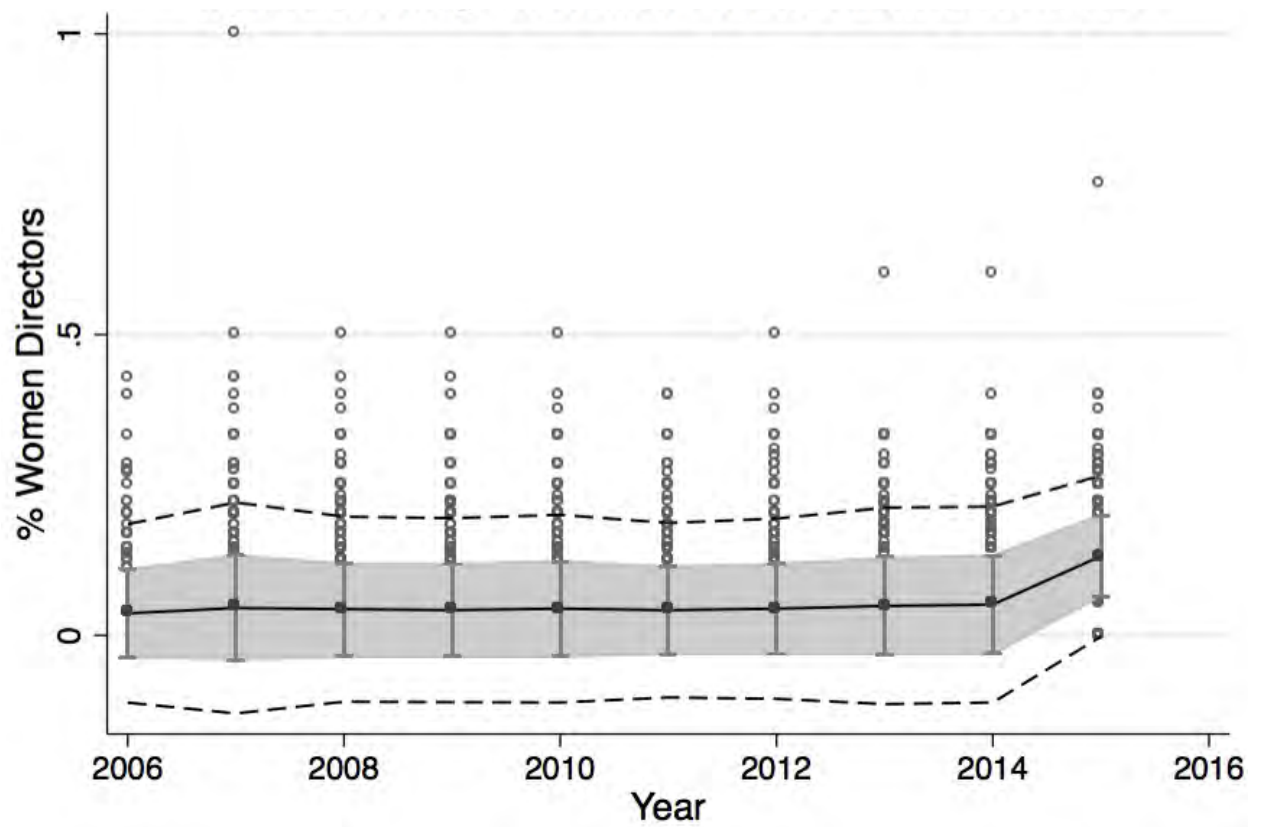
Figure 1: Mean Boardroom Size from 2006 - 2015



From the sample, women directors constitute approximately 5.7% of all directors with a standard deviation of 8.29%. This is consistent with the findings from a paper written by Banerji and Mahtani in 2010. The percentage of women directors ranged from 4.0% to 4.5% on average from 2006 to 2014, before a significant increase to about 13% in 2015 after the implementation of the Companies Act of 2013. This surge in the percentage of women directors is also shown in Figure 2 below, with the grey bands displaying the corresponding standard errors.



Figure 2: Percentage of Women Directors from 2006 – 2015





3.3 Comparison of Firm Performance with and without Female Directors

Table 3 provides a comparison of firm performance for observations that had involvement of female directors against observations without the involvement of female directors⁵. In the ten-year period, there were 3,153 observations of firm performance that had the involvement of a female director, constituting approximately 39.2% of all observations. Consequently, there are 4,887 observations of firm performance (approximately 60.8% of all observations) that did not have the involvement of a female director.

Table 3: Descriptive Statistics of Firm Performance by Female Directors

Variable	Mean HasFemale = 1	Mean HasFemale = 0	Difference	T-stat
No. Firms in Sample	3153 (39.2%)	4887 (60.8%)	-1734 (21.6%)	N/A
Boardroom	8.880431	7.879681	1.000751	16.8633***
Firmage	38.1405	38.30612	-0.1656172	-0.3255
ROA	6.473565	6.203671	.2698939	1.0473
CurrentRatio	2.489083	2.716528	-2.716528	2.1943**
Solvent	44.46034	43.25117	1.209165	2.2061**
Leverage	96.89736	96.72085	0.1765068	-0.0513
Tobin's Q	1.177038	0.9104794	0.2665589	3.8888***
Ln(AssetUSD)	12.22158	11.97159	0.2499972	6.7081***
Ln(AssetLCU)	16.19377	15.85356	0.3402098	9.1057***

** indicates significance at 5% level and *** indicates significance at 1% level

⁵ For example, the observation for Company A when it had no female directors will be grouped in HasFemale = 0 and another observation for Company A when it appoints a female director will be grouped in HasFemale = 1. This provides a “macro-view” of how all firms in the sample perform with and without female directors.



Table 3 also reports the means of the various firm performance measures in each of the two groups. A t-test of the difference between the means of the performance measures within the two groups was conducted, with the corresponding t-statistics articulated in the rightmost column. From the t-tests, measures of the Current Ratio and Solvency Ratio showed a significant and positive difference at the 5% level of significance, while other variables, such as the Tobin's Q, $\text{Ln}(\text{AssetUSD})$ and $\text{Ln}(\text{AssetLCU})$, showed a significant and positive difference at the 1% level of significance.

From a macro-perspective, it might seem that the influence of a female director has significant and positive impacts on the various performance measures shown. However, this analysis is inconclusive because it does not address how the introduction of a female director affects each performance measure at the individual firm level. Furthermore, the co-variation across different variables must be evaluated. As a result, this paper extends the analysis through a multivariate regression with fixed effects as well as a difference-in-differences regression, which will be elaborated further in the next section.



3.4 Empirical Strategy

In order to ascertain the effects of gender diversity in the boardroom on firm performance, this paper uses a multivariate ordinary least squares (OLS) regression specification, as shown in equation (1) below.

$$ROA_{i,t} = \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 Percent\ WD_{i,t} + \beta_3 Firmage_{i,t} + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \quad (1)$$

$ROA_{i,t}$ denotes the dependent variable and $PercentWD_{i,t}$ represents the independent variable of interest. Control variables such as the firm's age and the natural logarithm of the firm's assets measured in US dollars are also included in the regression. The error term of the regression is denoted by $u_{i,t}$.



3.4.1 Dependent Variables

A previous study by Haldar et. al (2014) on gender diversity and firm performance in India used Economic Value Add (EVA)⁶ and Market Value Add (MVA)⁷ as measures of firm performance. This paper, however, uses a different accounting measure of firm performance, namely the Return on Assets (ROA), which parallels the dependent variables used in other key studies on gender diversity and firm performance for other countries. ROA, which is calculated by taking the Net Income and dividing by the firm's average Total Assets, indicates how profitable a company is relative to its assets (Investopedia, 2016). The ratio illustrates how the firm's total assets have been utilized to make a profit. The higher the ROA, the more efficient the management is at utilizing the firm's assets (Campbell and Minguez-Vera, 2007).

This paper also includes an approximation of the Tobin's Q, defined as the sum of the market value of stock and the book value of debt divided by the book value of total assets (Campbell and Minguez-Vera, 2007). In other words, the ratio is measured by the market value of its outstanding stock and debt to the replacement cost of the firm's assets (Investopedia, 2016). If a firm is worth more than its value based on what

⁶ EVA is a measure of true economic profit or the amount by which earnings exceed or fall short of the required rate of return by investors while investing in risky assets (Haldar, Shah and Rao, 2014).

⁷ Estimated by subtracting the market value of capital invested in a firm from the total market value of the firm's equity and debt (Haldar, Shah and Rao, 2014)



it would cost to rebuild it, it is earning excess profits. Tobin's Q is distinct from accounting measures which offer performance insights based on events that have already occurred because it reflects the market's expectations of future earnings. It is therefore a good proxy for a firm's competitive advantage (Montgomery and Wernerfelt, 1988). The regression specification with Tobin's Q as the dependent variable is shown in equation (2) below.

$$\begin{aligned} TobinsQ_{i,t} = & \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 PercentWD_{i,t} + \beta_3 Firmage_{i,t} \\ & + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \end{aligned} \quad (2)$$

3.4.2 Independent Variable

The independent variable of interest in this case is PercentWD, which represents the proportion of female directors in a boardroom. It is calculated by taking the total number of female directors in each firm and dividing it by the total number of directors within the same firm.

3.4.3 Control Variables

The control variables for the regression include *Boardroom*, *Firmage*, and *Ln(AssetUSD)*. *Boardroom* is the total number of directors in a given firm. It has been included as a control variable in previous empirical research on gender diversity and



firm performance (Adams & Ferreira, 2009). Past empirical evidence has also shown that the size of a boardroom has a direct inverse effect on firm performance in India (Garg, 2007).

Firmage measures the number of years since the firm's incorporation. It has been included as a control variable in light of increasing empirical research on firm age and performance (Low et. al, 2015). While older firms may have more experience, which enhances firm performance, it may also encounter organizational rigidities that would diminish firm performance (Majumdar, 1997).

$\ln(AssetUSD)$ is the natural logarithm of the firm's assets, measured in USD. This accounts for the growth of the assets of the firm, which is directly related to the dependent variable ROA. It has also been included as a control variable in order to better ascertain the effect of board gender diversity on firm performance.

3.5 Other Measures of Performance: Variables to Measure Risk

We also investigate the effect of board gender diversity on measures of risk. This is because return and risk can be seen as two sides of the same coin, with firms engaging in more risky projects with positive net present value in order to generate higher returns for shareholders (Sila et al, 2015). This paper includes three measures of risk, namely solvency ratio, financial leverage, and the current ratio.



The solvency ratio (*Solvent*) is a key metric used to measure an enterprise's ability to meet its debt and other obligations. The solvency ratio indicates whether a company's cash flow is sufficient to meet its short- and long-term liabilities. The lower the company's solvency ratio, the greater the probability that the company will default on its debt (Investopedia, 2016). A mathematical representation of the regression model with *Solvent* as the dependent variable is expressed in equation (3) below.

$$\begin{aligned} Solvent_{i,t} = & \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 Percent\ WD_{i,t} + \beta_3 Firmage_{i,t} \\ & + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \end{aligned} \quad (3)$$

Financial leverage (*Leverage*) is defined as the degree to which a company uses fixed-income securities, such as debt and preferred equity. A high degree of financial leverage would necessarily result in high interest payments. This in turn affects bottom-line earnings per share negatively, increasing risk to stockholder return (Investopedia, 2016). The regression specification with *Leverage* as the dependent variable is expressed in equation (4) below.

$$\begin{aligned} Leverage_{i,t} = & \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 Percent\ WD_{i,t} + \beta_3 Firmage_{i,t} \\ & + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \end{aligned} \quad (4)$$



The current ratio (*CurrentRatio*) is a liquidity and efficiency ratio that measures a firm's ability to pay off its short-term liabilities with its current assets. As such, the current ratio can be used to take a rough measurement of a company's financial health (Investopedia, 2016). The higher the current ratio, the more capable the company is of paying its obligations, as it has a larger proportion of asset value relative to the value of its liabilities. A current ratio of less than 1 indicates that the company will be unable to pay off its debt obligations if they were due at that point (Investopedia, 2016). The regression specification with *CurrentRatio* as the dependent variable is expressed in equation (5) below.

$$\begin{aligned} CurrentRatio_{i,t} = & \beta_0 + \beta_1 Boardroom_{i,t} + \beta_2 Percent\ WD_{i,t} + \beta_3 Firmage_{i,t} \\ & + \beta_4 Ln(AssetUSD)_{i,t} + u_{i,t} \end{aligned} \quad (5)$$

Analyzing how gender diversity affects different dependent variables enables a better understanding of the contributions of having a higher proportion of women directors on the boardroom, especially given ambiguous cumulative theoretical effects highlighted in Section 2 of this paper.



3.6 Empirical Results and Key Findings

Table 4 below reports the regression results of a multivariate OLS regression for the regression models with the different variables of interest specified in Sections 3.4 and 3.5. Standard errors were clustered for each firm. This clustering of standard errors assumes that the standard errors are correlated within each firm but are uncorrelated across different firms, which is reasonable for the data in our sample.

Table 4: OLS Regression of Gender Diversity and Firm Performance

	(1)	(2)	(3)	(4)	(5)	(6)
	ROA	ROAW	SolventW	CurrentRatioW	LeverageW	TobinQW
PercentWD	-3.133 (2.450)	-3.413 (2.317)	13.93* (5.563)	-0.161 (0.799)	-39.50 (25.57)	0.814** (0.274)
Boardroom	0.601*** (0.0847)	0.576*** (0.0804)	0.387 (0.210)	-0.0540* (0.0254)	-1.539 (1.150)	0.0348** (0.0121)
Firmage	0.0484*** (0.0119)	0.0429*** (0.0112)	0.0133 (0.0243)	-0.00491* (0.00231)	-0.314* (0.134)	0.00477** (0.00174)
Ln(AssetUSD)	0.0596 (0.153)	0.0310 (0.143)	-3.170*** (0.403)	-0.265*** (0.0480)	18.79*** (2.070)	0.0123 (0.0199)
Constant	-1.051 (1.876)	-0.242 (1.717)	77.73*** (4.536)	6.336*** (0.554)	-101.7*** (21.92)	0.258 (0.248)
Firm Fixed Effects	No	No	No	No	No	No
Year Fixed Effects	No	No	No	No	No	No
<i>N</i>	8040	8040	8040	8040	8040	8040
<i>R</i> ²	0.035	0.037	0.047	0.033	0.050	0.017
Adjusted <i>R</i> ²	0.034	0.037	0.047	0.033	0.049	0.016

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of the preliminary regression (i.e. with ROA as the dependent variable) are displayed as Model (1) in Table 4. The coefficient of the independent variable of interest, *PercentWD*, in Model (1) is -3.133 with a standard error of 2.450,



making it statistically insignificant at the 95% level. This means that under this regression method, a higher proportion of female directors did not result in a significant improvement in firm ROA, holding all other factors constant. In other words, the preliminary results from Model (1) show that although there seems to be a negative correlation between board gender diversity and firm performance, there is no statistical indication that the relationship is causal and significantly different from zero.

3.6.1 Robustness Check 1: Winsorizing Variables

Results for Winsorized ROA

From the descriptive statistics articulated in Table 3, ROA data contained large outliers; the lowest ROA was -92.24% and the highest was 98.84% over the period from 2006 to 2015. To account for possibility that these outliers may have led to a biased regression coefficient on the *PercentWD* variable from Model (1), the ROA was winsorized at the 99% level.

Specifically, all observations of ROA below the 1st percentile will be set to the value of the 1st percentile and ROA above the 99th percentile will be set to the value of the 99th percentile. The winsorized ROA is indicated by the variable *ROAW* and is the dependent variable for Model (2) in Table 4.

The new coefficient of the interaction variable decreased to -3.413 with a standard error of 2.317. Furthermore, the t-statistic of the coefficient showed a



reduction from -1.278 in Model (1) to -1.47 in Model (2), but is still insignificant at the 95% level. This indicates that the lack of statistical significance is not related to the presence of outliers. The coefficient of the *PercentWD* variable is negative, possibly indicating a negative correlation between the percentage of women directors on the board and firm performance. However, there is still no evidence that the proportion of female board directors led to a significant change in firm performance at the 95% significance level.

Results for Other Winsorized Dependent Variables

The other dependent variables were similarly winsorized at the 99% level to account for any potential outliers. Table 4 reports the OLS regression of these winsorized dependent variables.

Results for Solvency Ratio and Tobin's Q

From Table 4, we see that the coefficient on the independent variable *PercentWD* in Model (3) is 13.93 with a standard error of 5.563, and that it is significant at the 95% level. From the same table, we see that the coefficient on *PercentWD* in Model (6) is 0.814 with a standard error of 0.274, and that it is significant at the 95% level. This potentially implies that a unit increase in *PercentWD*



may lead to a corresponding 13.93 unit increase in the company's solvency ratio, as well as a 0.814 unit increase in the company's Tobin's Q.

In other words, the significant and positive effect of *PercentWD* on the solvency ratio potentially implies that companies with a higher proportion of women directors are less risky because they have a higher cash flow to pay off their short and long term debt liabilities. This means that the firm has a lower probability of defaulting on its debt obligations. Correspondingly, the positive and significant coefficient of *PercentWD* on Tobin's Q also indicates a potentially positive relationship between the market's reflection of future firm earnings and a higher proportion of woman directors.

However, these preliminary findings are not conclusive because there may be other omitted variables or endogenous factors that could contribute to the above findings. In particular, the Adjusted R² for Model (3) and (6) are very low, indicating that only a small fraction of the variation in the solvency ratio and the Tobin's Q is explained by the regression specified in those two models.

Results for Leverage Ratio and Current Ratio

Table 4 also reports the effect of *PercentWD* on the current ratio and leverage ratio for a company. We see that the coefficient of *PercentWD* in Model (4) is -0.161 with a standard error of 0.799, indicating that the proportion of women directors is not significantly related to current ratio of a firm at the 95% significance level. Similarly,



the coefficient of *PercentWD* in Model (5) is -39.50 with a standard error of 25.57, also showing no significant relationship between the proportion of female directors and the leverage ratio of a firm at the 95% significance level.

Overall, the findings given by the multivariate OLS regression not been conclusive due to potential omitted variables, endogenous factors, or the statistical insignificance of the coefficient on *PercentWD* at the 95% level.



3.6.2 Robustness Check 2: Fixed Effects Regression

As a result of the potential omitted variable bias highlighted in the previous section, year and firm fixed effects were included in the regressions shown in Table 5 to account for any unobserved endogenous factors or variation across different firms and years.

Table 5: Fixed Effects Regression of Gender Diversity and Firm Performance

	(1)	(2)	(3)	(4)	(5)
	ROAW	SolventW	CurrentRatioW	LeverageW	TobinQW
PercentWD	-3.112 (2.765)	1.596 (5.198)	0.546 (1.040)	30.69 (37.91)	-0.276 (0.289)
Boardroom	0.444*** (0.102)	0.642** (0.196)	0.00511 (0.0272)	-1.725 (1.476)	0.0307** (0.0102)
Ln(AssetUSD)	-0.833 (0.442)	-5.213*** (1.122)	-0.0480 (0.125)	60.77*** (7.033)	-0.430*** (0.0712)
Constant	14.92** (4.937)	100.7*** (12.79)	3.647** (1.345)	-591.9*** (80.09)	6.230*** (0.820)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
<i>N</i>	8040	8040	8040	8040	8040
<i>R</i> ²	0.645	0.807	0.626	0.642	0.758
Adjusted <i>R</i> ²	0.576	0.770	0.553	0.573	0.711

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



Results of Fixed Effects Regression

Table 5 reports the results of the regression models specified in Section 3.4 and 3.5, but with firm and year fixed effects. We see that the coefficients on *PercentWD* for all of the models are not significant at the 95% level. The adjusted R² of Models (1) to (5) have increased significantly after including firm and year fixed effects and in general do a better job at explaining the variation in the dependent variables than the models examined in Table 4. On the whole, there may be a negative correlation between the proportion of female directors with ROA and Tobin's Q, and a positive correlation between the proportion of female directors with the solvency, current and leverage ratios. However, there still seems to be no statistically significant relationship between the proportion of women directors on these variables to measure firm performance and risk.

3.6.3 Robustness Check 3: Difference-in-Differences Model

This paper also uses a difference-in-differences (DiD) analysis to measure the effect of gender diversity on firm performance. This research methodology is appropriate in identifying the effects of a specific intervention, in this case the Companies Act of 2013. I further conduct a comparison between the outcomes before and after the intervention for groups affected by the intervention to the same difference for the unaffected groups (Bertrand, Duflo & Mullainathan, 2003).



The DiD methodology may be able to circumvent some of the endogeneity problems that underlie measurement of the relationship between gender diversity and firm performance. One potential endogeneity problem is that better-performing firms may have a higher willingness and ability to hire female directors (Adams and Ferreira, 2009), since firms are now “forced” to comply and hire a new woman director regardless of firm characteristics.

Treatment and Control Groups

The Companies Act of 2013 serves as an exogenous shock on firms. We can assign a treatment and a control group among the listed Indian firms.

- **Treatment Group:** Firms who did not have a woman director at the time of the announcement of the Companies Act.
- **Control Group:** Firms who already had at least one woman director during the announcement of the Companies Act.

We can construct a DiD model for the treated and control group across two time periods before and after the announcement of the Companies Act, i.e. financial year 2014 (FY2014) and financial year 2015 (FY2015).⁸ Using the return on assets (ROA) as the main dependent variable to measure firm performance, the mathematical equation

⁸ The financial year in India runs from 1 April to 31 March. Hence, the announcement of the Companies Act falls within FY2014.



relating the relationship between board gender diversity and firm performance can be expressed as that in equation (6) below.

$$ROA_{i,t} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 Treatment_i \times Post_t + u_{i,t} \quad (6)$$

The coefficient of interest, i.e. β_3 , will be the DiD estimate:

$$\hat{\beta}_3 = (\Delta \overline{ROA}^{Treated}) - (\Delta \overline{ROA}^{Control}) \quad (7)$$

If the DiD estimate is positive and statistically significant, it indicates a positive relationship between board gender diversity and firm performance in India. Conversely, if the DiD estimate is negative and statistically significant, it indicates a negative relationship between board gender diversity and firm performance in India. Lastly, if the DiD estimate is not statistically significant, it indicates that board gender diversity has no effect on firm performance in India.

Descriptive Statistics: Exogeneity of Policy

An important condition for using the government policy to construct a natural experiment situation hinges on the fact that the policy must create an exogenous shock to the firms in the sample. Table 6 reports the descriptive statistics of the treated group of firms before and after the Companies Act of 2013.

**Table 6: Treated Firms Before and After Policy**

Variable	N	Mean	SD	Min	Max
FY2014, Pre-Policy					
Boardroom	543	7.515654	2.414446	3	19
PercentWD	543	0	0	0	0
ROA	543	3.784162	11.67989	-79.27	59.73
CurrentRatio	543	1.895341	3.142657	.02	51.6
Solvent	543	41.6147	25.94108	-81.13	99.85
Leverage	543	101.1656	170.6327	-905	941.25
TobinsQ	543	.743512	1.581529	0	18.802
Ln(AssetUSD)	543	11.87227	1.611973	7.236536	17.80564
Ln(AssetLCU)	543	15.96914	1.611874	11.33254	21.90165
Firmage	543	36.39042	22.62429	6	132
FY2015, Post-Policy					
Boardroom	543	8.055249	2.443586	3	19
PercentWD	543	.1216948	.0585393	0	.4
ROA	543	2.99628	11.91825	-70.05	50.63
CurrentRatio	543	1.980479	4.386874	.02	89.2
Solvent	543	41.01735	29.54092	-95.39	99.89
Leverage	543	98.8953	194.5614	-868.25	995.51
TobinsQ	543	1.268387	4.024292	.003	81.604
Ln(AssetUSD)	543	11.87589	1.625041	7.250177	17.80358
Ln(AssetLCU)	543	16.01307	1.625152	11.3868	21.9402
Firmage	543	36.39042	22.62429	6	132

For this analysis, I used a subsample of 832 firms listed in the NSE with complete data for FY2014 and FY2015. I obtained this data from Osiris and the PRIME Database Group as explained in Section 3.1 of this paper. Table 6 above shows that there are 543 firms in FY2014 that did not have a female director, which constitutes approximately 65% of all of the firms in the sample.

We see that there is a stark increase in the proportion of woman directors before



and after the implementation of the Companies Act of 2013. In FY 2014, before the policy was implemented, the mean percentage of woman directors for firms in this treated group was zero. However, one year after the policy was implemented, the mean proportion of woman directors in the boardroom increased to 12.16%, signaling that the Companies Act of 2013 served as an exogenous shock for these firms to hire additional women directors in the boardroom. Descriptive statistics of other firm performance measures for firms in the treated group are also articulated in Table 6 above.

Empirical Results and Key Findings of DiD Regression

Table 7 reports the regression results for the DiD model. Standard errors were clustered by individual firms to account for possible standard errors that are independent across firms but correlated within each firm across the 2-year period.

Results for ROA

The result of the preliminary and baseline DiD regression (i.e. without control variables) coefficients are displayed as Model (1) in Table 7. As stated in Section 3.6.3.1, our variable of interest is the interaction variable Treatment Post. We can see that the coefficient of the interaction variable in Model (1) is 0.399 with a standard error of 0.600, which means it is insignificantly different from zero at the 95% confidence level. This regression method therefore suggests that the introduction of female directors in



the treated firms did not result in a significant improvement in firm ROA. In other words, the preliminary results from Model (1) show that although there seem to be a positive correlation between boardroom gender diversity and firm performance, there is no statistical indication that the relationship is causal and significantly different from zero.

Table 7: DiD Regression for ROA

	(1) ROA	(2) ROAW	(3) ROAW	(4) ROAW
Treatment	-3.034*** (0.795)	-2.711*** (0.721)	-1.398 (0.737)	0 (.)
Post	-1.187** (0.448)	-1.076** (0.342)	-0.810* (0.354)	-0.997* (0.491)
Post \times Treatment = 1	0.399 (0.600)	0.358 (0.454)	-0.317 (0.475)	0.105 (0.718)
Boardroom			0.754*** (0.134)	0.295 (0.292)
Firmage			0.0363* (0.0178)	
Ln(AssetUSD)			-0.0273 (0.211)	4.185 (2.263)
PercentIndep			0.715 (2.523)	-0.198 (2.625)
Constant	6.818*** (0.617)	6.613*** (0.564)	-1.744 (3.023)	-48.03 (27.72)
Year Fixed Effects	No	No	No	Yes
Firm Fixed Effects	No	No	No	Yes
N	1664	1664	1664	1664
R^2	0.015	0.015	0.058	0.904
Adjusted R^2	0.013	0.013	0.054	0.808

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Treatment variable in Model (4) is absorbed by the firm fixed effects.



Results for Winsorized ROA

After winsorizing the new coefficient of the interaction variable, the ROA decreased to 0.358 with a standard error of 0.454. However, the t-statistic of the coefficient showed a slight increase from 0.665 Model (1) to 0.788 in Model (2). The coefficient of the interaction variable is positive and possibly indicates a beneficial effect of introducing female directors. However, the effect is still not statistically significant at the 95% level. In summary, there is still no evidence that the introduction of female board directors led to an improvement in firm performance even using the DiD regression method.

Results of Adding Control Variables

Additional control variables that could account for the variation in ROA were included in Models (3). Firm and year fixed effects were also included in Model (4). This resulted in an overall increase in the \bar{R}^2 of the regression models. However, even after accounting for these control variables, the coefficient of the interaction variable is still statistically insignificant at the 95% level. As such, the regression results fail to definitively conclude that there is a significant relationship between board gender diversity and firm performance.



Results for Other Dependent Variables

Table 8 reports the results of DiD regressions with fixed effects for the other dependent variables that measured firm performance and risk.

Table 8: DiD Regression for Other Dependent Variables

	(1)	(2)	(3)	(4)
	SolventW	CurrentRatioW	LeverageW	TobinQW
Treatment	0 (.)	0 (.)	0 (.)	0 (.)
Post	0.521 (0.713)	-0.0324 (0.0672)	1.253 (5.869)	0.373*** (0.0613)
Post × Treatment = 1	-0.853 (0.905)	0.0596 (0.0872)	-3.108 (10.87)	-0.0213 (0.0837)
Boardroom	0.469 (0.377)	-0.0190 (0.0399)	-0.0733 (4.753)	0.00149 (0.0291)
Ln(AssetUSD)	-3.178 (4.456)	-0.0599 (0.315)	29.70 (33.65)	-0.131 (0.332)
PercentIndep	-1.948 (3.646)	-0.0320 (0.297)	-49.01 (50.10)	0.107 (0.343)
Constant	79.13 (53.61)	2.760 (3.812)	-233.5 (410.0)	2.295 (4.036)
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
<i>N</i>	1664	1664	1664	1664
<i>R</i> ²	0.974	0.967	0.887	0.938
Adjusted <i>R</i> ²	0.948	0.934	0.772	0.875

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: The treatment variable in each Model is absorbed by the firm fixed effects.



The variables were winsorized at the 99% level. I also included control variables to obtain a DiD model that resulted in a higher \bar{R}^2 . Similar to the analysis conducted in Table 7, standard errors were clustered by individual firms.

Effect on Solvency Ratio and Current Ratio

We see from Table 8 that the coefficient on the interaction variable of interest for solvency ratio (Model 1) is -0.853 with a standard error of 0.905, indicating that having a woman on the board of directors has no significant effect on reducing the level of risk for the average firm. Similarly, the coefficient of the interaction variable of interest on the current ratio (Model 2) is 0.0596 with a standard error of 0.0872, also indicating that there is no significant relationship between having an additional female director with the current ratio at the 95% level.

Effect on Leverage Ratio and Tobin's Q

Table 8 also reports that the coefficient on the interaction variable of interest for the leverage ratio (Model 3) is -3.108 with a standard error of 10.87. This indicates that having an additional woman on the board has no significant effect on reducing the leverage ratio for the average firm at the 95% level. Finally, the coefficient of the interaction variable of interest on the Tobin's Q (Model 4) is -0.0213 with a standard error of 0.0837. This also indicates that there is no significant relationship between



having an additional female director and the market's reflection of future firm earnings at the 95% level.

While these findings may show conflicting directions of correlation with the addition of a female director, they are all not statistically significant at the 95% level. This could be because the sample contains financial information for only two periods, which means that the effect of having an additional woman on the board may not have been realized yet. In order to ascertain the true causal effect of having an additional female director to the level of firm risk, we will need to obtain data with financial information for a longer period before and after the Companies Act of 2013.

IV. Gender Diversity and Director Compensation

4.1 Data Sources and Construction of Dataset

In this section, we attempt to evaluate whether and to what extent gender diversity in the boardroom affects remuneration for directors in terms of both monetary compensation and stocks. We will also evaluate if there is a significant pay gap between male and female directors. A director-level dataset was compiled for all firms listed in the NSE from 2010 to 2015. This data comes from the Osiris database and the dataset obtained from the PRIME Database Group as articulated in Section 3.1. Director characteristics such as their gender (*Female*), the number of years of education (*Educ*), length of appointment in current board position (*Tenure*) as well as a breakdown on the



sources of remuneration that these directors received were collected. A list of all variables measuring director characteristics is given in Table 9 below.

Table 9: Summary of Variables Measuring Director Characteristics

Variable	Definition
<i>Educ</i> ^α	Total number of years of education that a director has completed.
<i>Age</i>	Denotes the age of the director.
<i>Tenure</i>	Number of years the director has been appointed in his/her current position on the board
<i>SalaryLCU</i>	Salary obtained by a boardroom director in local currency units (Indian Rupees).
<i>SittingFeeLCU</i>	Sitting Fee obtained by a boardroom director measured in Indian rupees.
<i>CommissionLCU</i>	Commission obtained by a boardroom director measured in Indian rupees.
<i>OtherLCU</i>	Other forms of monetary payments obtained by a director and measured in Indian Rupees.
<i>Shares</i>	Number of company's shares a director obtains.
<i>ESOP</i>	Number of company's shares held in an employee stock ownership
<i>Ln(TotalPay)</i>	Natural logarithm of a director's total monetary compensation in LCU. TotalPay is the sum of a director's Salary, Sitting Fee, Commission and Other payments obtained by a director.
<i>Ln(TotalShares)</i>	Natural logarithm of a director's total shares in the company. Total-Shares is the sum of the number of Shares and ESOP belonging to a director.

^α The number of years of education obtained by someone with a completed undergraduate degree will be 16 years. Number of years of education for a Masters and a PhD are recorded as 18 and 22 years, respectively.



4.2 Descriptive Statistics

Table 10 below reports a summary of director characteristics collected from the sample. We see that female directors only make up approximately 6.8% of all directorships in India, which is similar to the findings of Halder et. al (2014). Furthermore, the average education level of a director is 16.9 years, indicating that most of the directors have obtained some type of postgraduate degree. The table also shows that the average tenure for a director is 12.76 years, indicating that directors do not change often from year to year. Lastly, the Companies Act of 2013 mandated that at least one-third of directors in a boardroom must be independent. Companies have generally abided by the law; approximately 50% of all directors are independent.

Table 10: Descriptive Statistics; Director's Characteristics

Variable	N	Mean	SD	Min	Max
Female	39396	.0688649	.2532274	0	1
Educ	39396	16.91999	2.300222	0	22
Age	39396	61.59752	12.30191	23	95
Tenure	39396	12.76	9.463485	1	67
Independent	39396	.5053305	.4999779	0	1
SalaryLCU	39396	1.09e+07	1.51e+09	0	3.00e+11
SittingFeeLCU	39396	67179.58	134382	0	8400000
CommissionLCU	39396	2207654	1.52e+08	0	3.00e+10
OtherLCU	39396	65816.41	2667645	0	1.95e+08
Shares	39396	1351114	9601063	0	3.77e+08
ESOP	39396	13001.55	489165.8	0	7.04e+07
TotalPay	39396	1.33e+07	1.52e+09	0	3.00e+11
TotalShares	39396	1364116	9612186	0	3.77e+08
Ln(TotalPay)	39396	10.25623	5.935553	0	26.42705
Ln(TotalShares)	39396	4.129808	5.881477	0	19.74744



In Table 11, we compare the differences in characteristics of male and female directors in order to assess whether there is a general difference between the male and female directors that have been appointed to the board room. Interestingly, we see that female directors on average have a significantly higher level of education at the 1% level. The fact that the educational criteria for women is higher than that for men highlights a possible “glass ceiling” effect in which women find it more difficult to be promoted from senior or middle management into the board of directors. This of course assumes similar competencies and gender distribution in the labor force on average. In addition, women directors in the sample are significantly younger than male directors at the 1% level. This makes intuitive sense, given the Indian government’s recent emphasis on including more women in the board room. As a result, the average tenure for woman directors is also significantly less than male directors at the 1% level. Interestingly, the proportion of female independent directors was significantly less than that of men, also at the 1% level. This may mean that in addition to introducing women to the boardroom, the Companies Act of 2013 may have also enabled women directors to have a closer involvement with the transactions and decision-making process of each firm.

**Table 11: Director Characteristics Grouped by Gender**

Variable	Mean Female = 1	Mean Female = 0	Difference	T-stat
No. of Directors	2713 (0.0689%)	36683 (99.93%)	-33970	N/A
Educ	17.28824	16.89276	0.3954849	8.6496***
Age	55.46849	62.05081	-6.582329	-27.1429***
Tenure	9.155179	13.02661	-3.871428	-20.6723***
Independent	.4131957	.5121446	-0.0989489	-9.9594***
SalaryLCU	3547474	1.15e+07	-7923308	-0.2635
SittingFeeLCU	60357.29	67684.15	-7326.861	-2.7406*
CommissionLCU	900658	2304316	-1403658	-0.4656
OtherLCU	15599.63	69530.34	-53930.71	-1.0161
Shares	1445183	1344157	101026	0.5289
ESOP	1709.48	13836.68	-12127.2	-1.2461
Ln(TotalPay)	9.678041	10.29899	-0.6209479	-5.2598***
Ln(TotalShares)	4.778965	4.081797	0.6971672	5.9604***

** indicates significance at 5% level and *** indicates significance at 1% level

Table 11 also highlights the difference in director remuneration between male and female directors. The difference may not be at the 95% level because director compensation varies widely across different firms and individuals, giving rise to extremely high standard errors. For example, female directors make on average Rs 7,923,308 less than male directors, while the t-statistic is non-significant. However, after computing the natural logarithm of director's total monetary compensation (Ln(TotalPay)) and the shares and stock options for each director (Ln(TotalShares)), we see a significant difference between male and female directors. In particular, female directors receive a significantly less amount of monetary compensation compared to



their male counterparts at the 1% level. On the other hand, they are “compensated” by a significantly higher amount of company shares and stock options.

4.3 Empirical Strategy

From the insights obtained in Table 10 and Table 11, this paper empirically tests whether and to what extent the proportion of woman directors *PercentWD* in a boardroom and a director's gender affects his or her pay. The following empirical strategies were constructed.

a. Multivariate OLS Regression of Directors' Monetary Compensation

$$\begin{aligned} LN(TotalPay)_{i,t} = & \gamma_0 + \gamma_1 Female_i + \gamma_2 Boardroom_{i,t} + \gamma_3 PercentWD_{i,t} \\ & + \gamma_4 Educ_i + \gamma_5 Tenure_{i,t} + \gamma_6 Independent_{i,t} + \gamma_7 ROA_i + \gamma_8 TobinQ_i \\ & + \gamma_9 LN(TurnoverLCU)_{i,t} + \xi_{i,t} \end{aligned}$$

b. Multivariate OLS Regression of Directors' Stock Compensation

$$\begin{aligned} LN(TotalShares)_{i,t} = & \pi_0 + \pi_1 Female_i + \pi_2 Boardroom_{i,t} + \pi_3 PercentWD_{i,t} \\ & + \pi_4 Educ_i + \pi_5 Tenure_{i,t} + \pi_6 Independent_{i,t} + \pi_7 ROA_i + \pi_8 TobinQ_i \\ & + \pi_9 LN(TurnoverLCU)_{i,t} + \eta_{i,t} \end{aligned}$$



4.4 Key Findings and Results

4.4.1 Results for Monetary Compensation

Table 12 displays regression results of how gender diversity affects director compensation. In Model (1), we see that the *PercentWD* has a significant and positive impact on director salaries at the 95% level. In particular, for every unit increase in *PercentWD*, we see that a director's total salary increases by approximately 4.328% on average, ceteris paribus. However, we also see from Model (1) that female directors are paid significantly less than their male counterparts at the 95% level. In particular, female directors earn approximately 1% less than male directors in terms of monetary compensation, holding all other variables constant. In the same model, we also see that a director's education level, tenure, and director status (independent versus not independent) contribute significantly in determining his or her total monetary compensation at the 95% level. This makes intuitive sense since we would expect a director with a higher level of education, more experience, and active involvement in company decision-making to be paid more. We also see that measures of firm performance have significant and positive effects on director's salary at the 95% level.



Table 12: Regression of Gender Diversity and Director Compensation

	(1)	(2)	(3)	(4)
	Ln(TotalPay)	Ln(TotalPay)	Ln(TotalShares)	Ln(TotalShares)
Female	-1.004*** (0.122)	-1.190*** (0.161)	0.470*** (0.114)	0.426* (0.176)
Boardroom	0.157*** (0.0112)	0.0283 (0.0294)	0.0130 (0.0106)	0.0111 (0.0248)
PercentWD	4.328*** (0.377)	-0.744 (0.737)	4.947*** (0.357)	-0.440 (0.663)
Educ	0.168*** (0.0123)	0.0546** (0.0196)	-0.0210 (0.0110)	-0.0230 (0.0212)
Tenure	0.0659*** (0.00328)	0.0692*** (0.00515)	0.145*** (0.00335)	0.144*** (0.00634)
Independent	-0.773*** (0.0606)	-1.022*** (0.0896)	-3.583*** (0.0555)	-3.816*** (0.0990)
ROA	0.0298*** (0.00317)	0.00680 (0.00392)	0.000362 (0.00260)	-0.00471 (0.00343)
TobinsQ	0.151*** (0.0223)	-0.0244 (0.0181)	-0.00213 (0.0144)	-0.0560 (0.0305)
Ln(TurnoverLCU)	0.570*** (0.0167)	0.182** (0.0580)	0.123*** (0.0139)	0.0689 (0.0634)
Constant	-3.984*** (0.317)	4.483*** (0.992)	2.041*** (0.273)	2.908** (1.066)
Year Fixed Effects	No	Yes	No	Yes
Director Fixed Effects	No	Yes	No	Yes
<i>N</i>	39396	39396	39396	39396
<i>R</i> ²	0.090	0.389	0.192	0.396
adj. <i>R</i> ²	0.090	0.368	0.192	0.375

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$



Effects on Monetary Compensation after Fixed Effects

However, after incorporating year and director fixed effects into the regressions on Table 12, we see that the coefficient on the *PercentWD* variable becomes insignificant at the 95% level. This indicates that the gender diversity of the boardroom has no significant impact on a director's salary. Yet it is interesting to note that after accounting for these fixed effects, the coefficient on the *Female* variable is still significant at the 95% level. In fact, we see a further decrease in the coefficient of *Female* to -1.190 with a standard error of 0.161. This demonstrates that female directors receive about 1.19% less than their male counterparts in terms of monetary compensation even after including the fixed effects. This equates to approximately 130,000 rupees on average, which is 1.3 times the 2015 Indian GDP per capita (World Bank, 2015). In other words, while gender diversity in the boardroom may not have a significant relationship with a director's compensation, gender pay gaps exist for directors in India.

4.4.2 Results for Stock Compensation

Now we analyze how gender diversity affects a director's compensation in terms of company shares received. We see that in both Model (3) and (4) of Table 12, the coefficient of *PercentWD* is not significant at the 95% level. This implies that gender diversity in the boardroom does not affect a director's compensation. Interestingly, the



coefficient of *Female* is positive and significant at the 95% level. In particular, after accounting for year and director fixed effects, a female director receives approximately 0.426% more than male directors in terms of company shares.

Consolidating the findings from Table 12, a female director earns about 1.19% less cash than a male counterpart but is “compensated” by a 0.426% increase in the number of company shares they receive. In order to draw precise conclusions about the relative value of director compensation, we must obtain data on the value of stock options provided to female directors. If the value of shares obtained by the female directors is equal in magnitude to the difference in monetary compensation between male and female directors, there is no compelling evidence for a gender pay gap in director compensation.

4.4.3 Structure of Directors’ Compensation

We also need to understand why women are compensated more in shares. One possible explanation is the lower percentage of independent female directors. The difference in compensation structure between males and females could then be attributed to the fact that independent directors are paid in equity in order to align incentivizes.

**Table 13: Regression of Non-Independent Director Compensation**

	(1)	(2)	(3)	(4)
	Ln(TotalPay)	Ln(TotalPay)	Ln(TotalShares)	Ln(TotalShares)
Female	-1.773*** (0.176)	-2.099*** (0.236)	0.555** (0.183)	0.172 (0.264)
Boardroom	0.179*** (0.0176)	0.0725 (0.0464)	0.00485 (0.0186)	0.0475 (0.0419)
PercentWD	5.774*** (0.619)	0.349 (1.191)	7.872*** (0.643)	0.351 (1.132)
Educ	0.124*** (0.0216)	0.0372 (0.0367)	-0.0275 (0.0214)	0.0493 (0.0358)
Tenure	0.0810*** (0.00439)	0.0668*** (0.00750)	0.166*** (0.00465)	0.162*** (0.00915)
ROA	0.0306*** (0.00492)	0.00347 (0.00626)	-0.00408 (0.00457)	-0.00706 (0.00629)
TobinsQ	0.0687* (0.0291)	-0.0219 (0.0278)	-0.0103 (0.0242)	-0.0552 (0.0540)
Ln(TurnoverLCU)	0.547*** (0.0267)	0.321*** (0.0877)	0.121*** (0.0253)	0.0806 (0.117)
Constant	-3.287*** (0.534)	1.917 (1.536)	1.771*** (0.513)	0.166 (1.925)
Year Fixed Effects	No	Yes	No	Yes
Director Fixed Effects	No	Yes	No	Yes
<i>N</i>	19488	19488	19488	19488
<i>R</i> ²	0.068	0.434	0.074	0.477
Adjusted <i>R</i> ²	0.067	0.395	0.073	0.441

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

To remove this potential variation, we obtained and further analyzed a subsample of all non-independent directors. The same regression specifications stated in Section 4.3 were conducted and the results of the analyses are reported in Table 13. It shows that within the subsample of non-independent directors, gender diversity in the



boardroom has no significant effect on director monetary compensation or total number of shares.

Similar to the results found on Table 12, female directors still earn significantly less in monetary compensation than male directors at the 95% level after accounting for year and director fixed effects, as shown by the coefficient of the Female variable of Model (2). Specifically, female directors earn approximately 2.1% less than their male counterparts in monetary remuneration. This is about Rs 240,000, about 2.45 times the 2015 Indian GDP per capita.

However, the *Female* variable's coefficient in Model (4) is not significant at the 95% level, indicating that female non-independent directors do not earn a significantly higher number of shares than their male counterparts. Therefore, female directors who are equally involved in the firm's decision-making process do not receive more shares to compensate for the gap in monetary compensation.



V. Discussion and Further Areas of Research

The results of this paper seem to provide empirical evidence that the theories explaining how gender diversity in the boardroom affects firm performance may not apply in the context of India. Furthermore, the results contradict a previous study done by Haldar et. al (2014). Instead of finding a positive relationship between board diversity and firm value, this paper finds no significant effects between gender diversity and firm performance when using an alternative measure.

Extreme care was taken to ensure that the empirical strategies used in this paper were robust in order to obtain the true causal impact of having female directors in the boardroom on firm performance. However, potential limitations to the findings of this study exist because of possible unobservable factors and limited data that impede a clearer interpretation of the regression results.

5.1 Better Understanding of Dynamics of Boardrooms

One possible unobservable factor is boardroom dynamics. For example, “seasoned” directors in the boardroom may not readily accept fresh opinions provided by newly appointed female directors. If that were the case, the appointment of a new woman director would not have much impact on firm performance, as we have seen throughout the regression results.

Furthermore, most firms have only appointed their first female director. It is



plausible that one female director may not be influential enough to single-handedly channel an improvement in firm performance, especially in a short space of a year. To circumvent these potential limitations, future research should explore the relationship between board gender diversity and firm performance when more company data becomes available a few years down the road. This will also enable clearer interpretations of the results obtained using the DiD regression method.

5.2 Further Research on Determinants of Compensation Structure

Additional research should also examine the determinants of director's compensation structure. From the results discussed in section 4.4.3, further data on the value of the shares awarded to directors is needed to evaluate whether a gender pay gap exists. For example, we could use the Black-Scholes formula to estimate the value of the shares and stock options. In order to do so, we will need to collect information or estimate parameters such as the risk-free interest rate and option strike prices and expiration dates.

Future research should also consider Indian attitudes toward paying directors in shares versus monetary compensation. This provides a valuable insight on possible factors that may have led to women being paid more in shares and less in cash. For example, if cash is the generally preferred form of remuneration in India, then paying women directors more in shares could constitute in itself a form of gender pay gap



between directors. If a gender pay gap truly exists, addressing it is critical in order to motivate more female middle managers to step up and become senior managers within the firm. Furthermore, past papers have also shown that female leadership raises the aspirations and educational attainment of girls in India (Duflo et al, 2011) which has important public policy implications for the Indian government.

VI. Conclusion

On the whole, this paper has found that the relationship between board gender diversity and firm performance measures (ROA & Tobin's Q) is statistically insignificant. Similarly, gender diversity in the boardroom also shows no significant relationship with firm risk measures such as the current, leverage and solvency ratio. The robustness of these results was verified by utilizing the Companies Act of 2013 as an exogenous shock and conducting a DiD analysis on the above mentioned measures – although limitations persist due to limited data. This paper's results indicate that the effects of boardroom gender diversity as highlighted by *Agency Theory* and *Resource Dependence Theory* are uncertain and may not be applicable to the Indian context.

This paper also conducted a multivariate OLS regression with fixed effects to determine the relationship between gender diversity and director compensation. While gender diversity does not have a significant impact on director compensation, female directors were found to earn 1.19% less than their male counterparts in monetary



compensation at the 95% level. This is sizeable because it amounts to approximately 130,000 rupees, or about 1.3 times the 2015 Indian GDP per capita (World Bank, 2015). We also find that female directors are compensated with 0.426% more shares when compared to male directors.

There are several obvious limitations to the empirical strategy and sample data. Unobservable factors such as board room dynamics made it difficult to ascertain an average treatment effect of increased board gender diversity on firm performance in India. Furthermore, the potential effects of gender diversity on firm performance may only be realized in the long term or with greater woman representation in the board.

Finally, the performance of the firms in the sample should be tracked across the years. The announcement of the Companies Act provides opportunities to research how board gender diversity may lead to improvements in other aspects of corporate governance, such as corporate philanthropy (Williams, 2003). Future research must consider a holistic view on how gender diversity can affect corporate governance in India, which is important in sustaining India's continued economic progress.



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THE IMPACT OF THE AFFORDABLE CARE ACT ON RACIAL DISPARITIES IN HEALTH CARE FOR WORKING-AGED ADULTS IN THE UNITED STATES

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The Impact of the Affordable Care Act on Racial
Disparities in Health Care for Working-aged Adults in the
United States

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Abstract

Using data from the National Health Interview Surveys in 2004 and 2014, I examine the impact of the Affordable Care Act (ACA) on racial disparities in health care for working-age adults in the United States. This study builds on previous research and focuses on analyzing how Hispanics, non-Hispanic Blacks, non-Hispanic Asians and non-Hispanic Whites benefit differently under the Affordable Care Act in terms of health insurance coverage and regular access to medical care. The results suggest that the Affordable Care Act has significant effects in reducing the likelihood of being uninsured for Hispanics and Blacks, the two racial groups which have much higher uninsured rates in the U.S. compared to Asians and non-Hispanic Whites. The impacts are conducive to reducing the racial gaps in health care.

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I. Introduction

The Affordable Care Act, passed in March 2010, is landmark legislation in the U.S. healthcare reform. It significantly expanded public healthcare assistance to a larger population, especially to low-income working-aged adults. More specifically, there are three critical provisions which address pressing issues in the non-employer insurance market: outlawing the exclusion of individuals with pre-existing conditions; the individual mandate; and expansion of Medicaid.

The non-group insurance market allows individuals without insurance coverage from either the government or their employer to purchase their own health insurance. Before the Affordable Care Act, it was not uncommon for insurance companies in the non-group insurance market to charge buyers with pre-existing conditions higher prices or deny them coverage outright. The Affordable Care Act protects these individuals from discrimination and imposes “minimum benefits” that insurance companies must provide to all customers. The second important provision in the ACA is the individual mandate, requiring most individuals to have minimum health coverage each year. In order to make the individual mandate effective, the third important provision expands Medicaid program to millions of low-income individuals and families who earn below 138 percent of the Federal Poverty Line. For families with income below 400 percent of Federal Poverty Line, governments provide subsidies or tax credits to people who purchase their health insurance from the non-group insurance markets (Gruber, 2011).



Thus far, one of the significant effects of the ACA is the substantial reduction of the uninsured population. Evidence shows that after the first enrollment period in October 2013, approximately ten million people acquired health insurance coverage (Carman, Eibner and Paddock, 2015). Moreover, studies have documented the systemic health disparities that exist between different racial groups (Durben, 2006). Some of the contributing factors to these gaps include lack of access to health insurance or affordable, quality health care services. Furthermore, African Americans and Hispanics have experienced higher uninsured rates than non-Hispanic whites. As the proportion of ethnic minorities in America has steadily increased, it is important to address the disparities in health care these individuals face. The purpose of this research is to examine the effectiveness of Affordable Care Act in reducing the racial disparities in health care with specific emphasis on differences in health insurance coverage and access to health care for working-age population between Hispanics, non-Hispanic African Americans, non-Hispanic Asians, and non-Hispanic whites.



II. Literature Review

Health disparities in racial and ethnic minorities have existed for more than two centuries (Baldwin, 2003). These persistent inequalities are reflected by high morbidity and mortality rates among African Americans, Hispanics, Native Americans, and Asian Pacific Islanders. For example, Hispanics are more likely to have hypertension and obesity compared to non-Hispanic whites. Hispanics with diabetes also experienced higher mortality rates (Baldwin, 2003). Many factors contribute to these disparities, including socioeconomic status, poverty, poor education, and environments (U.S. Department of Health and Human Services, 2000).

In the U.S., lack of health insurance coverage directly affects access to health care services, especially for low-income individuals. The uninsured are more likely to receive irregular and lower quality health care, and thus suffer worse health outcomes compared to those who are insured (Kirby and Kaneda, 2010). From the 1970s to the 1990s, Hispanics were three times as likely to have no insurance (Kirby and Kaneda, 2010). Between 1997 and 2002, the uninsured rate among Hispanics increased by four percentage points to 40.7 percent. Among the 6.6 million nonelderly uninsured individuals who were also in fair or poor health status, approximately 44 percent of them were Hispanics in 2002. Even with the expansion of Medicaid between 1997 and 2002, the uninsured rates for Hispanic adults remained unchanged largely simply



because they were not eligible for the public coverage (Wherry and Finegold, 2004). Thus, expanding public health coverage does not necessarily reduce racial disparities in health care.

Milestone legislation enacted in 1997, the State Children's Health Insurance Program (CHIP), had enrolled more than 3 million children, greatly decreasing the number of uninsured children in America. But CHIP did not reach these children's parents, who were often the working poor. It was estimated that about 31 million working-age adults were not reached by the expansion of Medicaid in 1997 (Hoffman, 2001). Although many states have attempted to expand Medicaid to provide health coverage for more low-income individuals prior to the Affordable Care Act (Wherry and Finegold, 2004), employer-sponsored insurance was still the primary source of insurance for nonelderly Americans in the U.S. (Durben, 2006). In 2006, about 62 percent of Americans had their health insurance coverage through their employers. However, employer-sponsored insurance began to decline in the early 1990s. Individually-purchased insurance from the private insurance market provides care for those who are neither covered by employer-sponsored insurance nor by public health programs such as Medicaid and Medicare. Yet private insurance is usually too expensive for low-income individuals to afford (Hoffman 2001). African Americans are a particularly disadvantaged group when it comes to being uninsured, because they are disproportionately employed in jobs which do not provide health insurance (Kirby and Kaneda, 2010).



The Affordable Care Act in 2010 was an important step toward making public health insurance programs attainable for low-income working-age adults. McMorro et al. (2015) found that racial disparities in health insurance coverage narrowed under the Affordable Care Act. Overall, the Act has decreased the uninsured rate among Hispanic adults from 40.1% to 31.8% since the first open enrollment period in October 2013. The percentage of uninsured African Americans fell from 25.5 percent to 17.2 percent by the fourth quarter of 2014. Non-Hispanic whites have also experienced decline in uninsured rates, from 14.8% to 10.5%. However, the uninsured rates among non-Hispanic whites were still much lower than those of Hispanics and African Americans. Overall, the Affordable Care Act has been effective in reducing the uninsured rates across racial groups in the absolute term, but the impact on disparities varied across racial groups and states (McMorro, 2015).

It is important to address disparities in health care coverage because those with health insurance are significantly more likely to have regular access to medical care. Angel et al. (2002) found that people without health insurance reported fewer medical-care visits and that they were less likely to have a usual source of health care. The literature, in sum, has found that Hispanics are more likely to be uninsured and less likely to have a usual source of medical care after controlling for immigrant status and socioeconomic status (Durben, 2006). In theory, increasing health insurance coverage by expanding public health assistance and making health care more affordable should



increase access to care for minorities. However, skeptics assert that the supply side might not be able to catch up with the expansion of access to care. In fact, increasing coverage and access to care might worsen the shortage of primary care physicians in the U.S. According to the Massachusetts Medical Society (Gruber, 2011), the average waiting time for patients has remained flat in Massachusetts after a health reform law similar to the ACA launched in 2006. This trend may persist under the ACA (Gruber, 2011), but it is out of the scope of this paper.

My research contributes to the study of the effectiveness of Affordable Care Act in reducing the disparities in health care across racial and ethnic groups, particularly among Hispanics, African Americans and Asian Americans.¹ This paper analyzes the changes in health coverage and access to care among non-Hispanic whites and racial minorities before and after the implementation of the Affordable Care Act.

III. Data and Methods

The data I use in the analysis is drawn from the Integrated Health Interview Series, a harmonized set of data and documentation deriving from the public use files of the U.S. National Health Interview Survey (NHIS). Since 1957, the NHIS has collected

¹ Relatively little research has been done to measure the impact of the Affordable Care Act on Asian Americans, largely because Asian Americans still make up a small percentage of the U.S population (although this population has experienced significant growth in recent years).



annual data by conducting household interviews through trained interviewers from the U.S Census Bureau. The data, comprised of micro-level information on the civilian noninstitutionalized population in the U.S, enables researchers to study a variety of health-related subjects at the individual level. The complex sample design involves stratification, clustering, and multistage sampling and assures that the sample is representative of the U.S. population. In particular, the oversampling of Hispanics and Blacks since 1997 is useful for studying health-related topics for the growing population of minorities.

I selected year 2004 and year 2014 as the two survey years for comparison because the most recent data available after the Affordable Care Act took effect was collected in 2014. In the paper, I refer to 2004 as the pre-ACA period and 2014 as the post-ACA period. The total number of observations combining the two samples is 104,605 after restricting the sample to include only working-aged adults from 25 to 64 years old. This yields a sample of 21,891 Hispanics, 14,726 Blacks, 6,116 Asians and 83,763 non-Hispanic Whites. For the same reasons articulated by Durben (2016), excluding young adults below 25 and older adults above 64 minimizes complicating factors that affect the examination. Young adults below 25 years old often face instability in health insurance coverage because of life changes such as graduating from colleges. Medicare is provided to the majority of the population over 64 years old and thus reduces racial disparities in health care (Durben, 2006). Therefore, I limit the study to the working-age



population between 25 and 64 years old.

To analyze the impact of the Affordable Care Act on racial disparities in regards to uninsured rates and access to health care, I first present the summary statistics in Table 1 to illustrate the raw changes in the variables of interest. I distinguish four racial groups: Hispanics, non-Hispanic Blacks, non-Hispanic Asians, and non-Hispanic Whites. Year 2014 is identified as the treatment of the Affordable Care Act. My two binary dependent variables – uninsured and usual place for medical care – serve as indicators of the effectiveness of the Affordable Care Act in reducing the gap in health care between minorities and whites. Health insurance coverage is highly correlated with access to medical care, but they are not necessarily equal. I use the survey question “Is there a place that you usually go to when you’re sick or need advice about your health?” as a proxy for the measure of access to health care. While the response does not need to be a doctor’s office or clinic, emergency departments are not included as a usual place for medical care. I then analyze the results from two main dprobit regression models. Since my two dependent variables are binary, dprobit regression is appropriate and the coefficients are interpreted as marginal effects. The first dprobit regression model is to measure the marginal probability of uninsured across races:

$$\frac{\partial Y_i}{\partial X_i} = \beta_j \emptyset (\beta_0 + \beta_1 H_i + \beta_2 B_i + \beta_3 A_i + \beta_4 PACA_i + \beta_5 (PACA_i \times H_i) + \beta_6 (PACA_i \times B_i) + \beta_7 (PACA_i \times A_i) + \beta V_i) \quad (1)$$



where X_i denotes all the explanatory variables; Y_i represents the dichotomous outcomes of health coverage status (1=uninsured, 0=insured); H_i , B_i , and A_i are three dummies for Hispanics, Blacks and Asians; PACA is a dummy for the post-Affordable Care Act period in 2014; and V_i represents the matrix for each individual that includes demographic, geographic, citizenship, and socioeconomic controls. In addition, I interact PACA with three racial groups in the regression to investigate how the Affordable Care Act affects ethnic groups differently.

The second dprobit regression model measures the marginal probability of having usual access to health care:

$$\begin{aligned} \frac{\partial W_i}{\partial X_i} = & \delta_j \phi(\delta_0 + \delta_1 H_i + \delta_2 B_i + \delta_3 A_i + \delta_4 U_i + \delta_5 PACA_i + \delta_6 (PACA_i \times H_i) + \\ & \delta_7 (PACA_i \times B_i) + \delta_8 (PACA_i \times A_i) + \delta Z_i) \end{aligned} \quad (2)$$

where W is the dichotomous outcome for having usual access to health care (1=Yes, 0=No usual access); the race variables, treatment variable, and the interaction terms are identical to equation (1). Z_i is the matrix representing an individual's demographic, geographic, citizenship, and socioeconomic characteristics. The only difference in equation (2) is the extra term U_i (1=uninsured, 0=insured) indicating the dichotomous outcomes of health insurance coverage. This takes into account that people can report whether they have usual place for medical care regardless of their health insurance coverage status.



IV. Summary Statistics

Table 1 presents the summary statistics for the working-age adults in 2004 and 2014. Overall, the uninsured rate decreases by 3.13 percentage points in 2014 compared to 2004 in the full sample. The uninsured rates across all four racial groups are consistent on the decreasing trend. Hispanics maintained the highest percentage of uninsured individuals, although the uninsured rate, about 35 percent in 2014, is 6.49 percentage points lower compared to 2004.

African Americans had the second highest uninsured rates among the four racial groups in the sample, but also experienced a decline in the uninsured rate by 4 percentage points in 2014. Asian Americans had the lowest uninsured rates among the three minority groups in both 2004 and 2014. In 2014, the Asian American uninsured rate was only one percentage point higher than that of non-Hispanic whites. Under the Affordable Care Act, Hispanics experienced the largest reduction in the share of the uninsured, followed by Asian, Black and white populations.

However, the share of Hispanics who were covered by Medicaid in both years is lower compared to African Americans, largely due to Hispanics' immigration status. According to the Pew Research Center, about half of the Hispanic population in the U.S. are non-citizens (Krogstad and Passel, 2015). Citizenship status has an important influence on health coverage in particular in the public assistance for insurance coverage



such as Medicaid, tax credits and subsidies. However, it is worth noting legal immigrants under certain circumstances are also qualified for public assistant programs including health insurance coverage. Additionally, unauthorized immigrants are most likely to lack health insurance coverage due to the high cost of health insurance and medical care. As reflected at Table 1, Hispanics and Blacks are more likely to be below the poverty threshold compared to Asians and Whites. However, over 90 percent of the Blacks in the sample are U.S. citizens, which would be advantageous when applying for Medicaid or public assistance to afford health care.

In general, the percentages of Medicaid beneficiaries in each of the four racial groups experienced an average increase of 5 percentage points in 2014 under the provision of Medicaid expansion. The increases in Medicaid coverage is also accompanied by a decline in uninsurance rates across the four racial groups in 2014. Moreover, the increase in Medicaid coverage is compensated by a decline of 3 percentage point on average in the share of private insurance coverage across the four racial groups. While it is reasonable to project an overall increase in access to health care with a decline in uninsurance rates, the percentages of people in the full sample who reported having a usual place for medical care has not changed much. However, by looking at individual race group, the share of Hispanics who reported having a usual place for medical care in 2014 is 4.79 percentage points higher. African Americans are also slightly more likely to report having a usual place for medical care in 2014, though the increase



is less than half of a percentage point. Changes in reporting ‘no usual place’ for medical care are also unclear, except for Hispanics. The second dprobit regression in the next section will provide analytic results to further assess how access to health care varies across races under the Affordable Care Act.

Table 1 also presents the summary statistics for my explanatory variables consisting of basic demography, geography, citizenship and socioeconomic status. Under citizenship, I list both U.S born and U.S citizen, despite the fact that U.S born is included in U.S citizen. Due to the limitation of the data in identifying legal immigrants, naturalized citizens and unauthorized immigrants, I include the U.S-born to compare with the foreign-born, and the U.S. citizen to compare with non-U.S. citizen. They are also included in my two dprobit regression models to control for citizenship status.

Under the geographic variables, it is worth noting that majority of the Hispanics and Asians in the sample reside in the West region, and majority of the Blacks reside in the South region. The racial distribution by region in the sample properly reflects the true distribution in the United States. Region is a crucial factor in determining the impact of the Affordable Care Act on minorities because states have the flexibility to adopt the Act or not. Currently, there are nineteen states that have opted out the Affordable Care Act. Moreover, ten out of the nineteen states are concentrated in the South, where most of the Black population in the U.S resides.



Lastly, socioeconomic status plays an indispensable role in health coverage and access to health care. Those with low educational attainment and income are disproportionately likely to have less health insurance coverage and access to health care. Hispanics are more likely to have lower educational attainment. There has been an increase of about 6 percentage points in the share of Hispanics in the sample with at least a college degree in 2014. However, Hispanics still have the lowest college education rate (35.84 percent) compared to the other three racial groups. Educational attainment is highly correlated with income levels, which is illustrated by the last two rows in Table 1. Hispanics and Blacks are more likely to be below the U.S. Census Bureau's poverty thresholds compared to Asians and Whites.

It is also worth noting that health disparities are persistent between Hispanics, Blacks and Whites, which is evident from the Health Status in Table 1. Asians and whites have better health statuses compared to Hispanics and Blacks, reflected by the share of sample adults who reported 'Excellent/Very Good' and 'Fair/Poor.' Health disparities and health care disparities are highly correlated; to some extent, larger health care disparities exacerbate health disparities. Health insurance coverage and regular access to health care might not be the sufficient condition to reduce health disparities among minorities, but they do serve as necessary conditions.



Table 1: Summary Statistics for Working-Aged Adults in the U.S. in 2004 and 2014 (percent)

	Full Sample		Hispanic		Black		Asian		Non-Hispanic White	
Year	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014
Insurance										
Uninsured	20.29	17.16	41.83	35.34	21.16	16.97	18.15	12.64	12.74	11.46
Medicaid	6.13	11.03	9.88	15.37	11.43	20.37	4.89	10.19	5.30	9.43
Private	69.23	66.00	45.07	45.15	60.02	53.18	72.77	72.61	70.61	67.66
Access to healthcare										
Usual access to care	83.79	83.48	70.83	75.62	85.84	86.28	82.46	80.71	83.08	83.90
No usual access to care	16.21	16.52	29.17	24.38	14.16	13.72	17.54	19.29	16.92	16.10
Health Status										
Excellent/Very Good	62.09	61.05	55.11	55.09	53.65	50.45	66.40	64.22	66.08	62.06
Good	26.56	27.08	31.64	31.27	29.48	31.30	24.97	28.91	24.26	24.48
Fair/Poor	10.96	11.79	13.13	13.51	16.36	18.18	7.84	6.87	9.22	10.38
Unknown	0.39	0.08	0.12	0.13	0.51	0.07	0.79	0	0.44	3.08
Immigration Status										
U.S. Born	77.67	76.00	32.81	34.76	88.11	86.38	12.57	18.38	94.95	94.89
U.S. Citizen	86.42	87.18	53.83	57.96	94.43	94.80	59.19	67.08	97.67	98.03
Demographic Variables										
Sex										
Male	47.96	47.58	48.82	47.67	43.21	42.93	46.06	46.84	48.81	48.86
Female	52.04	52.42	51.18	52.33	56.79	57.07	53.94	53.16	51.19	51.14
Marital Status										
Married	66.56	61.31	66.46	60.15	45.53	41.85	75.27	70.59	69.66	63.94
Region										
Northeast	17.18	16.61	11.99	12.35	15.75	14.18	18.60	17.70	19.21	18.49
Midwest	21.92	20.01	7.36	8.45	18.35	15.03	12.80	10.78	28.31	26.21
South	36.19	35.16	35.77	35.00	56.46	61.76	18.09	21.66	33.04	30.97
West	24.71	28.22	44.88	44.20	9.44	9.03	50.51	49.85	19.44	24.32
Socioeconomic Variables										
Education Level										
Less than High School	14.73	11.84	41.23	33.82	12.53	11.84	9.75	8.97	15.32	12.12
High School degree	31.56	28.08	29.43	30.34	38.04	35.18	21.76	19.50	30.92	27.61
At least college degree	53.71	60.08	29.34	35.84	49.43	52.98	68.49	71.53	53.76	60.27
Income level										
Below poverty threshold	10.63	13.97	21.57	23.82	16.93	24.61	7.82	11.16	9.76	12.34
At/above poverty threshold	89.37	86.03	78.43	76.18	83.07	75.39	92.18	88.84	90.24	87.66
N	48,007	56,598	10,267	11,624	6,690	8,036	1,876	4,240	39,441	44,322

Note: Each percentage is based on the total number of individuals who actually answer the given question; therefore, the individuals in the 'NIU (not in universe)' who were not deemed to answer the given question and the individuals who answered 'unknown' to the given question are not included in the denominator when calculating the percentage. Except for Health Status, I include the percentage for 'unknown' for complete information on this question. Determining one's own health status can be subjective. Under Insurance, I only present two types of insurance, Medicaid and Private. Insured individuals can also have other types of insurance besides the two presented here (for example, Medicare). The poverty status was determined by comparing total family income to the U.S. Census Bureau poverty thresholds for the year in question.

V. Empirical Results

Table 2 presents the results from the first dprobit regression model estimating the marginal probability of uninsured rates across races. The first column controls for only basic demographic and geographic variables to estimate the raw differences in the likelihood of being uninsured across races. Compared to non-Hispanic whites, the results from column 1 in Table 2 shows that Hispanics are about 25 percent more likely to be uninsured; Blacks are about 4 percent more likely to be uninsured; and Asians are about 3.7 percent more likely to be uninsured. The results for Hispanics and Blacks are consistent with the previous literature that they are more likely to be uninsured (Durben, 2006). The coefficient on Post-ACA demonstrates that the Affordable Care Act, on average, reduced the uninsured rate by 1.15 percent. Furthermore, the interaction terms between the post-ACA period and race show that minorities experience greater reductions of uninsured rates under the Affordable Care Act: Hispanics are 1.74 percent less likely to be uninsured; Blacks are 2.76 percent less likely to be uninsured; and Asians are 2.49 percent less likely to be uninsured.

The second column of Table 2 introduces the citizenship status into the regression. The coefficients on Hispanics, Blacks and Asians change considerably from column 1 but remain statistically significant: their marginal probabilities of being uninsured compared to non-Hispanic whites decrease after controlling for citizenship status. Hispanics become 12.28 percent more likely to be uninsured; Blacks are about



3.34 percent more likely to be uninsured compared to non-Hispanic Whites. Interestingly, the coefficients on Asians becomes negative in column 2, meaning that Asians are 5.19 percent less likely to be uninsured compared to non-Hispanic whites after controlling for citizenship status. The results from column 2 illustrates that citizenship has a significant impact on racial disparities in uninsured rates. As discussion on the summary statistics shows, a large share of Hispanics in the sample are not U.S. citizens, which explains parts of the differentials in uninsured between Hispanics and non-Hispanic Whites. The coefficient on Post-ACA has shown an increase by about 2 percentage point from column 1. The Affordable Care Act remains effective in reducing the overall likelihood of being uninsured. The interaction terms indicate Hispanics, Blacks and Asians still benefit more than non-Hispanic whites from the reduction in uninsured rates under the Affordable Care Act. In fact, the effects of the Affordable Care Act in reducing the uninsured rates among Hispanics and Blacks increase slightly, but the benefit for Asians becomes insignificant.

The third column in Table 2 introduces two socioeconomic variables into the regression. Individuals with only a high school diploma are 4 percent more likely to be uninsured. Income below the poverty threshold increases the likelihood of being uninsured by 13 percent. Education and income explain some of the racial differentials in uninsured rates but Hispanics and Blacks are still more likely to be uninsured, and Asians are less likely to be uninsured compared to non-Hispanic whites. The effect of the

Affordable Care Act in reducing uninsured rates increases by 1.6 percentage points to 14.9 percent. Minorities still see greater reductions in uninsured rates under the ACA even with the complete set of characteristic controls: Hispanics remain about 2 percent less likely to be uninsured; Blacks are about 3 percent less likely to be uninsured; and Asians do not seem to benefit more compared to non-Hispanic Whites. Overall, the Affordable Care Act demonstrates a positive impact in reducing uninsurance in the United States. In particular, Hispanics and Blacks experience greater increases in insurance rates.

Table 3 presents the results for the second dprobit regression examining the effects of the Affordable Care Act on access to health care. With only basic demographic and geographic controls in column 4, Hispanics are less likely to report having a usual place for medical care when they are sick or need medical advice. Surprisingly, Blacks are more likely to report having a usual place for medical care compared to non-Hispanic Whites. Durben (2006) also found a similar result for Blacks, which she explained is because non-Hispanic Blacks are more likely to rely on clinics and emergency rooms as their usual places for health care. Although the coefficient on Post-ACA does not show any significant impact of the Affordable Care Act on access to health care, Hispanics are two percentage points more likely to report having a usual place for medical care under the Act. After adding citizenship status and socioeconomic factors to the regression, the impact of the Act on access to medical care for Hispanics remains positive: about a two percentage point increase in the likelihood of having usual place for medical care. The coefficients on Hispanics lose significance in column 5 and 6, meaning that citizenship



and socioeconomic status explain the differential in access to health care between Hispanics and non-Hispanic Whites. It is important to note that the regressions in column 4, 5 and 6 all include the indicator for insurance coverage. Therefore, the coefficients on races, treatment and the interaction terms throughout the three regressions in Table 3 all take the influence of insurance coverage into account. Interestingly, the results from all three columns in Table 3 show that under the Affordable Care Act, Asians in the post-ACA period are less likely than non-Hispanic whites to report having a usual place for medical care. But the difference is small and only weakly significant. Blacks with insurance are as likely as non-Hispanic whites to report having a usual place for medical care under the Affordable Care Act. Overall, Hispanics gain more under the Affordable Care Act in terms of the increase in usual access to medical care.

Table 2: The Likelihood of Being Uninsured Across Races by the ACA

	(1)	(2)	(3)
Race/ethnicity(ref: non-Hispanic white)			
Hispanic	0.2474*** (0.007)	0.1228*** (0.007)	0.1012*** (0.006)
Black	0.0440*** (0.007)	0.0334*** (0.006)	0.0200*** (0.006)
Asian	0.0367** (0.012)	-0.0519*** (0.009)	-0.0451*** (0.009)
Post-ACA	-0.0115** (0.004)	-0.0133*** (0.004)	-0.0149*** (0.003)
Post-ACA x Hispanic	-0.0174** (0.006)	-0.0197*** (0.006)	-0.0190*** (0.005)
Post-ACA x Black	-0.0276*** (0.007)	-0.0267*** (0.007)	-0.0327*** (0.006)
Post-ACA x Asian	-0.0249* (0.011)	-0.0132 (0.012)	-0.0158 (0.012)
Individual-level controls			
Female	-0.0343*** (0.003)	-0.0324*** (0.003)	-0.0342*** (0.003)
Age	-0.0030*** (0.000)	-0.0026*** (0.000)	-0.0027*** (0.000)
Married	-0.1045*** (0.003)	-0.1188*** (0.003)	-0.1034*** (0.003)
Region(ref: Northeast)			
Midwest	0.0289*** (0.005)	0.0335*** (0.005)	0.0322*** (0.005)
South	0.0887*** (0.004)	0.0939*** (0.004)	0.0912*** (0.004)
West	0.0367*** (0.005)	0.0397*** (0.005)	0.0415*** (0.005)
Citizenship			
U.S-born		-0.0283*** (0.005)	-0.0306*** (0.005)
U.S citizen		-0.2357*** (0.008)	-0.2051*** (0.008)
Education (ref: less than high school diploma)			
High School Diploma			0.0415*** (0.004)
College degree and above			-0.0299*** (0.003)
Below poverty threshold			0.1309*** (0.005)
<i>N</i>	84034	84034	84034

*Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
The number of observation drops from the original size of the sample because the regressions exclude the sample adults who were not given the question or answer the question with 'unknown.'*



Table 3: The Likelihood of Having A Usual Place for Healthcare Across Races by the ACA

	(4)	(5)	(6)
Race/ethnicity(ref: non-Hispanic white)			
Hispanic	-0.0358*** (0.007)	-0.0041 (0.007)	-0.0008 (0.007)
Black	0.0339*** (0.007)	0.0357*** (0.007)	0.0370*** (0.007)
Asian	-0.0037 (0.015)	0.0274 (0.013)	0.0264 (0.013)
Post-ACA	-0.0075 (0.004)	-0.0068 (0.004)	-0.0069 (0.004)
Post-ACA x Hispanic	0.0207** (0.008)	0.0214** (0.008)	0.0213** (0.008)
Post-ACA x Black	-0.0040 (0.010)	-0.0033 (0.010)	-0.0021 (0.010)
Post ACA x Asian	-0.0387* (0.021)	-0.0416* (0.021)	-0.0404* (0.021)
Insurance coverage			
Uninsured	-0.3284*** (0.007)	-0.3147*** (0.007)	-0.3093*** (0.007)
Individual-level controls			
Female	0.0920*** (0.004)	0.0915*** (0.004)	0.0916*** (0.004)
Age	0.0037*** (0.000)	0.0036*** (0.000)	0.0037*** (0.000)
Married	0.0460*** (0.004)	0.0506*** (0.004)	0.0496*** (0.004)
Region(ref: Northeast)			
Midwest	-0.0386*** (0.007)	-0.0408*** (0.007)	-0.0413*** (0.007)
South	-0.0545*** (0.006)	-0.0566*** (0.006)	-0.0567*** (0.006)
West	-0.0580*** (0.007)	-0.0598*** (0.007)	-0.0610*** (0.007)
Citizenship			
U.S-Born		0.0230** (0.008)	0.0234** (0.008)
U.S citizen		0.0480*** (0.009)	0.0432*** (0.009)
Education(ref: Less than high school diploma)			
High school diploma			-0.0027 (0.005)
College degree and above			0.0145** (0.004)
Below poverty threshold			-0.0110* (0.005)
N	38923	38923	38923

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
The number of observation drops from the original size of the sample because the regressions exclude the sample adults who were not given the question or answer the question with ‘unknown.’

VI. Conclusion

The Affordable Care Act passed by Congress in 2010 was projected to decrease the number of the uninsured and provide affordable and quality health care for all Americans. While there are many provisions that tackle different aspects of the health care system in the United States, addressing the racial disparities in health insurance coverage and access to health care accounts for one of them. Early research shows that the Affordable Care Act has been effective in reducing the number of uninsured across different racial groups. This study builds on previous research and analyzes how Hispanics, non-Hispanic Blacks, non-Hispanic Asians and non-Hispanic whites benefit differently under the Act in terms of health insurance coverage and usual access to medical care. In other words, I examine the question of whether the Affordable Care Act reduced racial disparities in health care by examining the likelihood of being uninsured and access to health care before and after the Affordable Care Act.

The descriptive and empirical results from dprobit regression models are based on analysis of data drawn from National Health Interview Surveys in 2004 and 2014. I focus my analysis of the Affordable Care Act on working-age adults in the sample aged 25-64 years old. The summary statistics show that the absolute difference in outcome variables across races in 2004 and 2014. The decline in uninsured rates across four racial groups demonstrates the effectiveness of the ACA. The uninsured rate for Hispanics in 2014 was about six percentage points lower compared to a decade ago. However,



Hispanics still had the highest uninsured rate in 2014 (about 35 percent) followed by Blacks. In contrast, the uninsured rate for Asians in 2014 was less than one percentage point higher than non-Hispanic whites.

The regression results illustrate that the Affordable Care Act has been effective in reducing the likelihood of being uninsured across all four racial groups; in particular, it has had greater impact on Hispanics and Blacks. After taking the influence of citizenship and socioeconomic status into account, there is no significant difference on the impact of the Affordable Care Act in reducing uninsured between Asians and non-Hispanic Whites.

Health insurance coverage is closely related to access to health care. Individuals without insurance coverage are about 30 percent less likely to report having a usual place for medical care. After taking insurance coverage and a complete set of demographic, geographic and socioeconomic factors into account, the Affordable Care Act does not seem to have had a significant impact on these reports. However, Hispanics are more likely than non-Hispanic whites to report having a usual place for medical care under the Affordable Care Act.

Overall, the results demonstrate the important achievement of the Affordable Care Act in reducing the racial disparities in health insurance coverage and access to medical care for Hispanics and Blacks. The greater effects of the Act in reducing the likelihood of being uninsured for Hispanics and Blacks, the two racial groups that have

much higher shares of the uninsured in the U.S. compared to Asians and non-Hispanic Whites, are conducive to reducing the racial gaps in health care. The results also suggest that we would see much a larger impact on minorities, especially Blacks in the South, if more states in the U.S. adopted the Affordable Care Act.

There are several limitations involved in the study: the inability to separate Medicaid expansion and non-expansion states due to the limited information on an individual's residency; inaccurate measures of access to health care (there may be various reasons why an individual has no usual place for medical care); and a relatively small sample size for Asians. Furthermore, since the implementation of different provisions of the Affordable Care Act is still ongoing, this paper only describes the early effects of this policy on racial disparities. It is important for further research to keep track of the impact of the Act on different aspects of health care, such as affordability and quality.



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Fall 2016

Interviewed
by
Ashwin Ananthakrishnan

Scripted and Edited
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Ashwin Ananthakrishnan
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Professor Interview

S hachar
K ariv



" Did you have any formative experiences early on in life? "

Um, yes. Like all of us. But I don't think that there was an experience in life that made me become an economist. I think like many of us – or maybe most of us – there was a lot of chance involved in ending up doing what I'm doing.

I was born in 1970 and I grew up in Israel. I was in Israel all my life, until I went to do a Ph.D. in the United States. The Israel that I grew up in – I think it's quite different from the Israel of today. I'm many years out of Israel, so I don't know. But the Israel that I grew up in the 1970s was a country of three million people. It was very homogeneous in terms of political opinions. The Israel of today I think is a country of 8 million people and very, very heterogeneous. Like an individual can be under trauma, the Israel of the 1970s, and maybe even today, was a country under trauma. And the trauma was the Holocaust. There are a lot of things that, in my opinion, might explain why Israel behaves the way Israel behaves. It is actually going back to the Holocaust. When I grew up in Israel in the 1970s, it was a different era. My political opinions were always kind of to the left, or even the extreme left. But I went into the army and I was six years in the army. At least in my generation, we believed, maybe wrongly, that we were right, and we were moral, and we were doing everything to achieve peace.

I think that nowadays it would be harder to maintain these views, but this was definitely the views that I had when I grew up. And so to your question – I think that was the biggest memory – or the first memory – of my childhood was the 1973 war – the Yom Kippur War. It was a major event. I was only three, but I remember.

So to your question, when I graduated from high school, I went into the army. I was in the army for six years, and I started my undergraduate [education] when I was 24 years old. I knew I wanted to do something with math. I was always intrigued by mathematics. I thought it was beautiful, that the language was beautiful. And the first course I took in university – I didn't even take a course; I only audited a course, because I was in the army – but the course was on game theory. I said to myself, "Ah, this is interesting," and this is what attracted me to economics. Then I did my undergraduate and part of my master's in Tel Aviv University, and then I was accepted into a Ph.D. [program] in the United States. I looked at the Ph.D. more as consumption, not as an investment– which I actually think is the right way to look at graduate our studies. But I always thought that I would find myself in back in Israel after the Ph.D.

" And did that end up happening? "

No! [I suppose] it ended up happening in some sense. My wife is also Israeli. I started my Ph.D. in 1998 and in 2003, when I graduated, I came to Berkeley. I was one year on sabbatical at Princeton and we did also one year on sabbatical in Israel, mostly for the kids to be close to family. When you live on one end of the world and your entire family is on the other end of the world, it is an interesting experience. But I definitely now identify myself more with the United States.

" So the first economics course that you took was a game theory course?"

Yes. It was actually an advanced elective in the math department in Tel Aviv University. Actually, I took two courses. Now I remember. I took two courses in the math department. It was game theory in the math department. Now you can find game theory courses in computer science – you can find them in many places. Game theory is not only in economics, of course. I think I said that in class. I think economics is a field of game theory, not game theory is a field of economics. [Anyway], I remember the instructor was a new immigrant from Russia. In the early 1990s, many Russian immigrants came to Israel. It was a very small class, and I think most of the other students were also immigrants from Russia. So very quickly he moved to speak in Russian. I was sitting there and not understanding anything.

“ Being the chair of the economics department at BERKELEY is like playing football, but only defense. You never get the ball. If you’re the chair at STANFORD , you get the ball many times. ”

" That's an interesting experience! "

When I did my undergraduate in economics – I majored in economics, and an undergraduate [program] is three years [in Israel] – I think two-thirds of the student credit hours that you had to do were in economics and one-third were not in economics. Here if you major in economics, it may be almost reverse – only one-third [of courses] will be in your major and two-thirds of courses will be completely other things.

So you have a lot of freedom to choose. Now some people get lost because of this, but like anything else in life, you need to choose courses such that you take risks. You try to do something new. And for me, [taking that course] was an eye-opening event. I was lucky. I picked the right course, by chance. It was my first course in university, before I was even a student! And I liked it a lot. Some people go through their undergraduate education and they don't find this life changing course. It's a pity. It's terrible.

" So in terms of advice for an undergraduate, you would say, 'Really seek out those courses that you think are going to make a difference in your life.' "

Take risks. You have to take risks somehow. It's hard to know in advance what course will have an impact.

" As the department chair, what does your average day look like? "

This is a terrible job. This is a bad job. I don't like it at all. [I'm joking]. We have good lives, academics. We do. The department chair has to do two things. A department chair has to negotiate with the other faculty. The macro people might want something and the micro people might want another thing. And the department chair has to negotiate with campus for resources. So it's negotiations [and] bargaining all the time. Now compared to other department chairs, I must say that I have a very good life within this department. This is a wonderful department. Throughout my time as chair – and it's a three year term; in June I am stepping down – thank goodness – [but in that time]

I didn't have even one tough conversation with any faculty member. This is a wonderful, wonderful department. And there are reasons why this is a wonderful department. I really think that the Berkeley economics department is very different from peer institutions – Stanford, Yale – for a variety of reasons. I had times in my career that I could go elsewhere, but I would say that Berkeley is different and it fits with what I think is important in life.

And a large part of it too is teaching undergraduates. This university – it is no secret, when you have a provost who has to step down, a chancellor who has to step down – but the budget situation of this university is partly a problem because of the state and it's partly a problem because of the UC system, but it's partly also our problem as well. We made a fair share of mistakes that got us into this mess. These are not happy times. The big advantage of money is that by throwing money you can solve a lot of many problems. If you don't have enough money to solve problems, you actually need to deal with them.



[In any case] I'm happy to say that I [inherited] an excellent department from my predecessor as chair, and I will pass it on to my successor after a very difficult time for the department, and we didn't lose any ground. Let me put it this way: being the chair of the economics department at Berkeley is like playing football, but only defense. You never get the ball. If you're the chair at Stanford, you get the ball many times.

" We've talked about your role in academia, but you also are very prominent within the academic publishing [world]. Can you tell us about some of your experiences at academic journals? "

My kids are older now – they're 14, 12, and 10 – but when they were younger, they were in the university preschools. I would drop them off in the morning every day. They would go to their playground, and I would go to my playground. This is really a privileged life, that you can choose what you want to do, as long as you do it well. Being able to do research and especially share this research with other people that are interested, and with graduate students and undergraduate students, this is a wonderful privilege.

The reason there are all these scientific journals – years ago, we used scientific journals to spread knowledge. People actually took the journal and read the journal. But you see the journals now –

(laughing, pointing to bookshelf full of volumes of journals) – no one is looking at them. This is not the way that we spread knowledge [anymore]. So the journals came to be – the journals became trophies. If you publish a paper in some scientific journal, it's a trophy. [If you're a] tennis player, sometimes you win and sometimes you lose. [If you're an academic], sometimes you publish in this journal and sometimes you publish in that journal.

“ Years ago, we used scientific journals to spread knowledge. People actually took the journal and read the journal. But you see the journals now - no one is looking at them. This is not the way that we spread knowledge. So the journals became trophies. ”

If you write a paper and you only put it on your website, it will get less attention at the end of the day if you write a paper and you work hard and get it published in one of the leading scientific journals. Leading scientific journals provide a validation that the paper is good. The process of publishing in these journals is many times very, very tedious and time consuming. Actually, you waste time on getting old ideas published instead of working on new ideas, but these are the rules of the game. And this is the game that you have to play. So we're all playing this game!

And sometimes you are more successful, sometimes you are less successful. But the papers that I think are important are not necessarily the papers that are the best published.

Different fields also have different rules regarding academic publishing. Some publish very short papers in conference journals. For example, publishing in computer science is very different than economics. In other fields, you need to publish books.

Thank God we don't need to publish books! That is really tedious. It's always fun to get the paper published – again, because it's a trophy! It's nice to get the trophy. But this is not the central issue. The issue is the work itself.

I don't think it's a joke, [of course]. Who should get tenure at a place like Berkeley, and when? People should get tenure at Berkeley when it's clear that their work will have fingerprint on the profession as a whole. This is our method. Take an econometrician. Even if the econometrician is great, if he's not going to make an impact on economics outside of



econometrics, then to be honest, he might be very good econometrician, but not good enough for Berkeley. The second thing is when should you get tenure? You should get tenure when we know you are addicted. You cannot stop any more. And if you are only driven by the trophies – publishing in this journal or that journal, this medal or that award, being invited to this talk or that talk – it won't work. In this life, you sacrifice a lot.

"What do you do for fun?"

Ah! First my work is fun. Not the chair role. That's administration. My work is fun. I have three kids and my wife, of course. But whenever I'm alone, I can work 16 hours a day on my research, and I wouldn't feel that I'm working. It would be perfectly fine. I had this period in my life when my family was here and I was there. I spent some time at Oxford. It's like in the movies. I would take dinner like Harry Potter. Very, very pretty. In any case, they gave me an office, and the office had a bed, so it was also my bedroom! I was there for three weeks.

" They really didn't want you to leave. "

And I didn't want to leave! I never left and I was perfectly happy. But I really think that my only problem in life is that my kids are growing too fast. I want to spend time [with them]. I have a daughter – she's 14 – and two boys that are now 10 and 12. They are all enthusiastic

snowboarders, but the boys are also the ones that take risks. My daughter is a normal human being. My two boys – in order to snowboard with them, I'm taking risks. Taking big risks.

" Recently you published a paper about how macroeconomic conditions affect redistribution preferences and the preferences of the elite. I wanted to see if you see a relationship between the research findings and what's happening today politically, in terms of the [American presidential] campaign. "

This is such a good question that actually we are trying to answer it right now. To answer your question specifically, I don't know. This is why I need to do more research. Distributional preferences are the preferences with which you make trade-offs between your own well-being and the well-being of other people. These preferences determine your views about taxation and redistribution. I would actually say that all [debates] in our society are somehow about taxation and redistribution – public health insurance, unemployment benefits, Social Security. So these are all about distributional preferences.

We used game theory experiments to understand these preferences in the general population in the United States and also in [certain] subgroups.

We call them the elite because – what can we do? These are the groups that later on make decisions. I didn't decide that half of the presidents in the last century should be graduates of Harvard and Yale. But they are! What can I do? I didn't decide that 50 percent of Congress should be graduates of Harvard, Yale, and Princeton. But they are! I didn't decide that all eight or nine Supreme Court justices should be graduates of Harvard Law School or Yale Law School. Sonia Sotomayor went to Princeton, to Yale Law School. So she penetrated the elite. You can penetrate the elite, of course. Distributional preferences of the elite have a lot of influence on public order. Because they're the elite! Now I know that in a perfect world, the decisions [made by the people] we elect reflect the preferences of the constituencies. But there is always more.

How people make decisions has to do with the distribution of preferences. So we tested all this, and the important thing that we found is, first, that there are significantly big differences. And what is more important is that the differences we find are correlated very strongly with political decisions. So our experimental results have significant explanatory power with [respect to whether someone is a] Democrat or Republican. We had these experiments in 2011, 2012, and 2013. We're running it again now, because what is happening in this country is – I'm stunned. People are talking about the Trump phenomenon.

I actually think that we will be able to explain the Trump phenomenon in terms of distributional preferences.

" So the currents of populism and right-wing rhetoric which are occurring around the world, like in the Philippines, Austria – "

Yes. But also, political opinions are becoming more extreme. We are becoming more extreme. Phenomena like Sanders and Trump – [despite] their extreme differences, I think both of them can be explained by changes in these distributional preferences.

" What are the laboratory conditions that you're doing the experiment under? "

I'll show you. So first, it's an experiment, not a survey. For us economists, actions speak louder than words. Words change. They don't mean anything. I don't think you lied to me in any way, but what's important to me are the preferences that affect your choices.

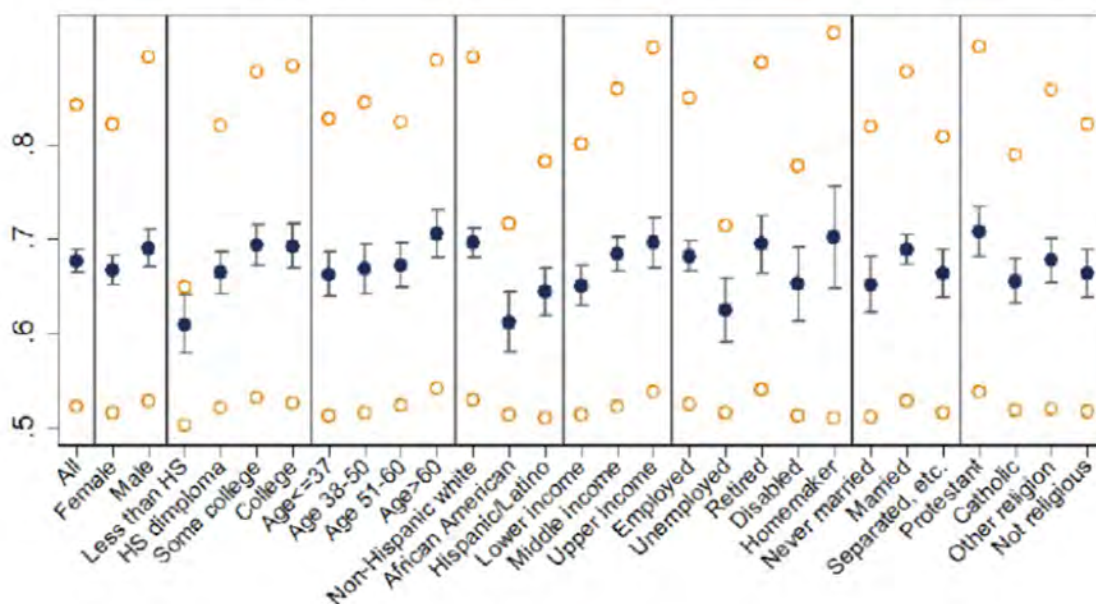
We don't ask people what they believe, what they see, what they should do. We had thousands of Americans [participate in the study]. [They saw on] their computer screen a line like this. And we told them that they could choose any point on the line. How do you do this? You move your finger on the computer screen. Now what does the point on the line mean? A point on the line [represents] an allocation of money.

The money that you allocate to the vertical axis – let's call it "self." And the money you allocate on the horizontal axis – let's call it "other."

We ask you to choose allocations of money between you and a completely random American.

We are going to give you fifty lines like this. The lines will have different slopes and shapes. This is very important. Why? The bigger lines [represent] more money, and the slope is what we would call the relative price of redistribution. If the slope is exactly minus one, moving one dollar from the other person to you would be exactly the same. But here, look what happens because the line is flat. Starting from here, every dollar

The mean estimated fair-mindedness by sub-group





“ The important message here is this: you cannot explain altruism in term of race, gender, education, identity. There is something else. We always like to look at people and classify them. Ah! This group is more altruistic than that group. Yes, it can be true, but only on average. ”

that you take from yourself [means] the other person will get more than a dollar. The line is flat. If the line was steep, if you wanted to give a dollar, you would need to give up more than a dollar. Here, giving someone a dollar is easier. So people make fifty decisions like this, and eventually the computer will flip a coin and will choose one of these fifty.

Suppose that I’m giving you this line. At most you can pay yourself to \$10, and you can give to a completely random stranger \$100. Some people will say, “Tough shit.” Some people don’t. So this is how we measure distributional preferences. Because you see it [measures] how you trade off your money for a complete other.

What you see here (points to the screen) is some measure of how selfish you are. The higher it is, the more selfish you are. The measure [is defined] between 0.5 to 1. If you are 1, you are perfectly selfish. If you are 0.5, we are going to call you “impartial.” You treat yourself and the other person exactly the same. This is the notion of impartiality.



So what you see here (points to the screen) are all sorts of demographics. You see the average altruism [scores] – and remember, lower means more altruistic; higher means more selfish. This is the average in the subgroup. These are 95 percent confidence intervals around the average. And what you see here is the 25th percentile and 75 percentile of the distribution.

Now, here is the message. [Let's say you're looking] at males and females. Because [the average altruism score] is [statistically significantly] lower for females, you would say that females are more altruistic than men. But what's the problem in saying this? This is the problem with a lot of data in the real world. You are comparing means, but there is a large distribution around the means. Take a man at random and take a woman at random. What's the probability that the man is going to be more selfish? It's tiny. Because there is indeed – and that's the key – there is more heterogeneity within socio-demographics than across socio-demographics. Many times when you hear research on NPR, they're telling you, "Asians are more whatever than whites," [and so on]. They always compare the averages. But the average is only one moment of the distribution, and it tells us very little. And the important message here is this: you cannot explain altruism in term of race, gender, education, identity. There is something else. We always like to look at people and classify them. Ah! This group is more altruistic than that group.

Yes, it can be true, [but only] on average. That's the message.

" Another paper you published used a new data infrastructure for measuring economic activity. "

Yes. Let's suppose Bank of America gives you all their data. So you will get data on millions and millions of Americans. [But suppose] my checking accounts are with Bank of America, but my credit cards are not. So what's the problem? We are always talking about big data, big data, big data. Big doesn't necessarily mean good data. The problem with this data is that you are going to see my income in my checking account, but you're not going to see my spending, because my credit cards are with Chase.

The problem with this data is that you are going to see my income in my checking account, but you're not going to see my spending, because my credit cards are with Chase. In order to understand economic activity, you need to see all the money going in and all the money going out.

Now there is an app called Mint. It's an app on your phone, and you link all your banks and utility bills and everything. Instead of checking the Bank of America website for your balance and [checking] different credit cards, you just check one place. This is what is called a financial aggregation app. But in the process of presenting [this information] to you, [the app is]

collecting information [as well]. Actually the company that we worked with was acquired by another company after a couple years, but when we started working with them, they were a very small startup. And they didn't even save their data; they didn't have the infrastructure. Even if they wanted to, they didn't know how to do it. So we built the infrastructure with them. And this is where the data came from.

What is important about this data is that it's comprehensive. You can see on paper the money going in and the money going out. This is really a new way to look at macroeconomic data at the micro level. We have a couple of papers on this and a couple of them in the pipeline. The newest one considers a fundamental question: gas prices went down. So what people are doing with the money they are saving at the pump? Are they saving it? Are they spending it on other things? What they are spending it?

Why this is very important? When the government wants to stimulate the economy, they will pass tax refunds and things like this. They will give you money in your pocket, but it will stimulate the economy only if you use it. Where do you use it? And how? There is the multiplier to consider. So let's suppose the government gave you money, and you bought a product from India or China. Let's say you bought something on eBay from China. [Your purchase] will have [an effect on] economic growth – in China.



But if I buy it here? If I buy it from your store – and you buy from their store, and she buys again from my store, it will create a multiplier.

" And so this new data infrastructure is helping you understand that multiplier effect. "

Yes. People living in the United States file their taxes [every year], and then many of us get refunds. The refunds are very large, relative to income. It can be [up to] five percent of household income. And then you ask yourself, "Why the hell people are doing this? Why didn't they get their withholdings right [in the first place]?" Because this is basically giving an interest-free loan to the government! Why don't you get the money in your paycheck and save it?

And there are a variety of explanations. One of them is false savings. I'm leaving it there to prevent myself from spending it. Another explanation for this is called household economics. If the money [appeared on my paycheck] every month, my wife would spend it. If it arrives only once, I can buy my flat screen TV instead. We studied this in game theory. Many times, you and I, we are in a partnership. We can agree on many things, but how we agree on the margin is what is important. The question is how we agree on what to do with the marginal dollar that we get. [In this case], the wife wants to spend it here, and the husband wants to spend it here.

If the husband wants to buy a flat screen TV, it's actually better for him to hide it with the government and get the refund. So there are many explanations for this behavior. But now we have a few years of tax refund data, and the question is, why are people taking tax refunds and what they are doing when they get that money? So we will be able to answer this. It has been a big puzzle.

" Last question: we recently hosted an essay contest for undergrads, and it's asking about the economic effects or causes of Brexit. Do you have any comments on this? And is there a game theory approach to the Brexit question? "

Everything has a game theory approach, because at the end of the day, [everything] is a game.

[But] I wouldn't say anything about it, because – [I'll give you an example]. I just tried to fix [something] and it didn't go very well. I almost lost my finger. When I was injured in my finger, they sent me to see the finger doctor. This guy, he's a finger doctor! He's only doing surgeries in the finger! He's a finger doctor. When you ask me about Brexit, you're asking me about a nose. But I only know about the finger! Part of the problem [is] that we are becoming so specialized. Some people have no problem talking about your ear even though they are the finger doctor. But I know what I know about Brexit is what I don't know.

And actually, knowing what you don't know is a large part of knowing. And because I don't know a lot, and I know that I don't know a lot, I will not say anything. But what I can do is say this is a very interesting question. You need to go up one floor and two rooms to the side, and you can get the best person in the world to speak about Brexit.

" Who's that? "

Barry Eichengreen.

" Of course. "

He's very knowledgeable. And I think [this is happening throughout the] economic profession, for better or for worse. This is what the world has become, that we are becoming specialists in a narrower field. Two hundred years ago, the best economists were also the best philosophers and the best mathematicians. We don't have people like this anymore. And I don't think the people are becoming less smart. There's [just] more work to do! Once I got myself in trouble. An Israeli newspaper interviewed me and asked me something about the Israeli economy. All I said was, "This is a very difficult problem in the sense that I don't know; don't ask me." The headline was, "Professor Kariv, Israeli economy, a very difficult problem." [The article went on to present] a bunch of things from other people saying why the Israeli economy is in deep shit. But I didn't say that I think it's in deep shit! No! This is not what I said!



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