Welcome to Volume XI, Issue II of the Michigan Journal of Business. Founded in 2007, the Michigan Journal of Business is an undergraduate-run peer-reviewed publication affiliated with the Ross School of Business at the University of Michigan. Though the publication remains committed to its original goal of recognizing outstanding undergraduate research, this year our organization was elevated to the next level with the redesign of our website and a new method of running the publication focused on individual interest.

Each semester, our team of students focuses on soliciting research papers from undergraduate students attending universities all across the world, promoting both the current issue and upcoming issue around our campus, and advertising our publication to our audience. With the mission of showcasing the original research topics of our peers on a wide range of business and economics-related topics, we seek to empower the undergraduate research community.

For our Winter 2019 publication, we are pleased to publish academic research papers by Mark Jones and Anirudh Viswanathan. Congratulations to our selected authors and their advisors for completing this outstanding research, and thank you to all the other commendable authors for their submissions this semester.

Finally, thank you to the rest of the editorial board for making this publication possible. Everyone demonstrated hard work and diligence this semester. The publication and website would not be where it is today without the assistance of Joseph Rickert and Caitlin Ju; thank you for keeping things running efficiently during a turbulent transition.

We hope you enjoy this issue,

Matthew Jacobs
Editor-in-Chief

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Characteristics of Neighborhood Revitalization in Detroit

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**Author biography**

Mark Jones graduated from Wayne State University in April 2019 with an undergraduate degree in economics. Mark pursued an economics degree in order to learn more about statistical models, demographic forecasting, and transportation planning. Currently, Mark is a GIS analyst at the Southeast Michigan Council of Governments. He became interested in land economics while observing rising home prices in his neighborhood of Woodbridge, Detroit. In addition to work and school, he is an active member of the Woodbridge Citizen Council, an Airbnb Superhost, and contributor to the mapping website DETROITography.com. Mark can be contacted at mark.davis.jones@gmail.com.

1. Introduction

Similar to population and economic output, housing values in Detroit peaked in the 1950s. At its greatest value, city-wide real estate was estimated at $45.2 billion; by 2012 it had fallen to $9.6 billion (both adjusted to 2013 dollars) – a decline of approximately 78% in 50 years (Bomey, & Gallagher, 2013). By 2013, the loss of property tax along with a plethora of other reasons, Detroit filed for bankruptcy.

Filing for bankruptcy disposed about $7 billion of Detroit’s $18 billion of debt and obligations (Reuters, 2018). The debt relief enabled the city to invest in much needed quality-of-life services for its residents, such as installing 65,000 LED streetlights, hiring 150 police officers, purchasing 50 buses, implementing crime-fighting technology such as Project Green Light, and maintaining/improving parks (Burns, 2018). In addition, philanthropy efforts and private investments have helped stabilize and increase the value of real estate in Detroit.

Median sales price shows a bottoming out in Detroit’s market in July 2012 at approximately $30,000; however, six years later the median sales price doubled to $60,000. Revitalization is
occurring in the neighborhoods in Detroit, but it is increasingly uneven (Reese & Sands, 2017). At the same time, residents are worried about displacement and gentrification.

Gentrification and revitalization are sometimes used interchangeably; however, revitalization can occur without gentrification. Generally speaking, gentrification is the process by which a formally lower-income neighborhood draws a growing number of more affluent residents, eventually reaching a critical mass that changes the character of the neighborhood in fundamental way (Mallach, 2018). Revitalization is the process of investing in a neighborhood and can result in neighborhood stabilization and equity building for current residents. If a neighborhood revitalizes without displacement, it can increase the quality of life for its residents (Reece, 2004). Gentrification requires neighborhood revitalization, but neighborhood revitalization does not necessarily lead to gentrification.


First: location. Revitalization does not jump from one area to another; it moves incrementally from areas that are already strong or from major nodes of activity. These Major Activity Nodes are commonly central business districts (CBDs), hospitals, and universities. These nodes are attractive for residents and offer quality of life amenities that people want to live near.
Second: urban fabric. Houses, small apartment buildings, and storefronts woven together create the built environment and revitalization will occur in areas where these are still standing and not where demolitions have occurred. Demolitions erode the urban fabric and ultimately discourage investment. These mixed-use, walkable neighborhoods were generally built before World War II, before cities were redesigned for the automobile (Mallach, 2018).

Third: race. Predominately African American neighborhoods are less likely to be revitalized. While large percentages of America’s inner cities became majority African American after World War II, the portions that remained majority white have consistently been the first to draw outside residents which increases demand and property prices (Mallach, 2018).

When looking at which neighborhoods in Detroit are currently under revitalization, Mallach’s three characteristics of revitalization are further defined and applied to the current state of Detroit’s neighborhoods. This paper aims to explore the characteristics of reviving neighborhoods and investigate how much of a factor the characteristics have in the increased property value in Detroit.

2. Characteristics of Reviving Neighborhoods
2.1 Major Activity Nodes

Nationally, downtowns have shown an increased investment and an influx of new residents with higher socioeconomic status, especially in big city downtowns since 2000 (Hwang and Lin, 2016). Additionally, neighborhoods close to CBDs offer a range of amenities that increase demand for nearby housing subsequently increasing property costs (Jaffe, 2016). This phenomenon has spilled over to nearby neighborhoods as Kolko (2009) found that nationally from 1992 to 2000 census tracts within two miles from CBDs increased in income faster than all other tracts and only in large metropolitan areas. Similarly, in Detroit an analysis of land sales showed that land values are relatively high near the CBD, but the values drop precipitously two miles away (Hodge, et al., 2017).

American urban universities play two significant roles, both as a driver of economic development and as a real estate developer. After World War II, the G.I. Bill increased enrollment, and urban universities responded by expanding outwards. This outward expansion led to universities
partnering with community organizations and focusing on issues such as public safety, homeownership, affordable housing, and public education reform (Etienne, 2012). This is exemplified by the Detroit-based Wayne State University expanding their police presence into the Midtown and Woodbridge neighborhoods. These partnerships lead to increase in quality of life around the universities.

Similarly to universities, hospitals maintained their presence in inner cities throughout the century, but they have had to adjust during times of disinvestment. Hospitals are usually surrounded by other medical facilities, so without the anchor hospital the other medical services would vaporize and appear in other areas with a major hospital (Siegfried, et al., 2008). The clustering of medical facilities often leads to the main hospital purchasing land and demolishing blight in order to make room for additional facilities. In Detroit, Henry Ford Health Systems on W. Grand Boulevard is in the process of implementing its neighborhood master plan which calls for medical, educational, and research facilities as well as housing, neighborhood-serving businesses, and light industrial development (HUD, n.d.). The first step has already begun as the Brigette Harris Cancer Pavilion broke ground in 2017.

In Detroit, the riverfront is a major activity node. Since its founding, major commerce has existed along the river as it connects Lake Erie to Lake St. Clair and further north to Lake Huron. More recently, the Detroit River has been redeveloped as a place for tourists and residents. The Detroit RiverWalk stretches from the former site of the Joe Louis Arena to Gabriel Richard Park. Current expansions include rehabilitating the Uniroyal Superfund site and West Riverfront Park to complete the 3.5-mile walkway from the Ambassador Bridge (to Canada) to the MacArthur Bridge (to Belle Isle) (Detroit Riverfront Conservancy, n.d.). In addition, developments such as Orleans Landing, DNR Adventure Center, and DuCharme Place have been completed since 2014. Other developments such as Meijer on E. Jefferson, Stone Soap Building, West Riverfront Park, and new mixed-use builds next to Orleans Landing have been announced (Runyan, 2018). This is also consistent with other research that considers a waterfront to be a major activity center (Owens et. al., 2018; Hwang & Sampson, 2014; Heidkamp & Lucas, 2006).
2.2 Intact Urban Fabric

Many cities, including Detroit, had a mismatch of housing demand and housing stock. The oversupply of housing resulted in the abandonment of the least desired houses in the least desired locations. The lack of demand keeps rehabilitation economically infeasible, when the cost of restoring the structure is greater than the final market cost (Mallach, 2012). In response, cities demolished structures. Between 1960 and 2000 Detroit removed 178,000 dwelling units, or approximately 32 percent of its 1960 housing (Mallach, 2012). Since 2014, the City of Detroit has demolished an additional 16,552 structures (Detroit Building Authority, 2019).

Research shows that neighborhood revitalization rarely starts in the most distressed areas, ones in which houses are demolished and vacant lots are predominating (Mallach, 2018). In fact, vacant lots have been shown to reduce home values. Analysis found vacant parcels decreased property values 6.5 percent in Philadelphia and vacant and abandoned lots decreased property values by 3.5 percent within 250 ft in Columbus, OH (Econsult Corporation & Penn Institute for Urban Research, 2010; Mikelbank, 2008).

Neighborhoods near the borders were developed later and are fuller. The city growth model explains that a city expands outward and dwellings near the city’s center age and deteriorate leaving the poorer residents. As time progresses, the buildings are replaced and second-generation city dwellings move in, often with higher economic status (Brueckner & Rosenthal, 2009). This process of removing the structure for future development is a teardown and is different than a demolition. Both processes involve removing a structure, but a demolition typically leaves the lot vacant for much longer than a teardown (Paredes & Skidmore, 2017).

Similarly, census tracts founded before 1930 are most vacant in Detroit (Owens et al., 2018). The City of Detroit has identified these neighborhoods for strategic investment. Instead of land banking the land, in Greater Downtown neighborhoods such as North Corktown and Woodbridge vacant lots can be purchased for $25,000-$30,000 to build a single- or multi-family home. The property sale description stipulates:
The seller is the Detroit Land Bank Authority. Buyer must submit an application to purchase, including construction plans or precedent architectural images of proposed development and financing plan with proof of funds or a pre-approval letter on a new-construction loan.

This shows a dichotomy of vacant land, one in which demolitions of abandoned structures are plentiful in outlying neighborhoods and there is not enough demand to return the lots to the market, and another in which lots are purchased near downtown neighborhoods in order to rebuild where a structure once stood.

2.3 Race

There is a cap in the amount of non-white populace in neighborhoods that gentrify. Hwang and Sampson (2014) looked at the relationship between racial composition and gentrification in Chicago. Gentrification in this paper was defined as the social process of neighborhood renewal as it unfolds over time. Hawak and Sampson discovered a nonlinear pattern between proportion of African-American residents and gentrification observations, with gentrification scores becoming negative at a faster rate in neighborhoods with greater than 40 percent African-American. Gentrification observations sharply increased in neighborhoods with a population of white residents greater than 35 percent.

Similarly, races are less inclined to move into neighborhoods of a majority race that is not their own. Data from New York and Chicago shows that census tracts that increased socio-economic status (SES) between 1980 and 2010 remained the same racially. White neighborhoods remained white as they increased SES just as African American neighborhoods remained African American (Timberlake & Johns-Wolfe, 2016). That’s not to say there are no diverse neighborhoods. Freeman (2009) found that gentrifying neighborhoods – those that experience a reversal, reinvestment, and in-migration of well off – start more diverse and remain so through the process. Synthesizing the research, revitalization does not require displacement or racial turnover, and the current racial makeup will likely remain through revitalization.

As a prelude to the analysis, we estimate that the three characteristics of revitalization are positively significant with the amount of revitalization a neighborhood has experienced. Properties closer to a Major Activity Node have experienced greater amount of revitalization than those
further away. Also, the higher percentage of white population, the higher the amount of revitalization. Finally, the more intact the urban fabric, the more revitalization has occurred.

3. Methods

3.1 Data

The goal of defining the characteristics of reviving neighborhoods is to measure their influence on the current state of Detroit neighborhoods; therefore, each must be defined with information that is available.

Race will be defined as the percentage of white non-Hispanic in a census block group utilizing 2009-2016 American Community Survey. Therefore, census block groups will serve as neighborhood boundaries. Major Activity Nodes are defined as hospitals, universities, job centers, and waterfront access. Hospitals include Henry Ford Hospital, Detroit Medical Center, Sinai-Grace Hospital, and Beaumont Hospital Grosse Pointe. Universities include Wayne State University, University of Detroit, and Marygrove College. All access points to the Detroit River are the waterfront activity nodes. Employment centers were determined by jobs per acre. The Southeast Michigan Council of Governments (SEMCOG) tracks employment by Transportation Analysis Zone. According to SEMCOG’s research, the main employment centers – those with an employment density greater than 15 jobs per acre - in Detroit are the CBD, Henry Ford Hospital, Detroit Medical Center, New Center Neighborhood, University of Detroit, Wayne State University, and the Riverfront from CBD to Belle Isle. The hospitals, universities, and waterfront are already included as major activity nodes, so employment centers are defined as the CBD and New Center neighborhood. Census block groups that contain or are adjacent to the activity nodes are assigned a value of 1, and other block groups within 2 miles are given a value of 0.5.
*Intact Urban Fabric* was defined two ways. First, as the percent of intact structures from 1940 and before per census block group. The SEMCOG Open Data Portal contains building footprints along with the building type and year built. All buildings, except accessory buildings, built 1940 or earlier were utilized. Each building footprint was assigned to a parcel and the percent of parcels containing a pre-WWII building was calculated. Second, structures per acre. Using SEMCOG building footprint data the amount of structures per acre was calculated.

Reviving neighborhoods were measured by the mean change in single-family and condominiums sales in 2014 and 2017. The City of Detroit Open Data Portal has property sales history dating back to 1968. The first full year out of bankruptcy was used as the starting point, 2014, and the last full year of real estate sales is 2017, so the study comparison years are 2014 and 2017. There were 43,467 properties sold in 2014 and there were 31,524 in 2017, according to the City of Detroit. Properties that were government transfers (i.e. Wayne County Treasurer to Detroit Land Bank), multi-parcel sales, vacant land, apartment complexes, duplicates, and sales under $1,000 were excluded from this analysis. In the end, there were 23,338 and 16,850 single-family houses and condominiums sold in 2014 and 2017, respectively. The mean sale value was calculated for 2014 and 2017 and then the 2014 mean was subtracted from the 2017 mean. The resulting value is the mean amount the properties changed in value. This change in value is the working definition of the amount of revitalization a neighborhood has experienced.
Those block groups without any property sales in 2014 or 2017 were eliminated leaving 825 block groups, or n = 825. Defining the characteristics outlined in this paper, the following is Model 1:

$$REV_{2014-2017} = \beta_0 + \beta_1 AN_N + \beta_2 W_N + \beta_3 IUF_N$$

Where $REV_{2014-2017}$ is defined as the amount of revitalization a neighborhood has experienced from 2014 to 2017, which is defined as the change in mean home sales; $\beta_0$ is the intercept; $AN_N$ is the neighborhood’s location compared to major activity centers; $W_N$ is the percent of white population; $IUF_N$ is the percent of intact urban fabric pre-World War II. Model 2 changes the definition of intact urban fabric to structures per acre.

4. Results

The models serve as a way to determine if the identified characteristics of revitalization are present in the neighborhoods gaining the most real estate value. Table 1 has the results of city-wide models which look at all 825 census block groups studied. Model 1 has two variables - adjacent activity centers and white population - significant at a 99% confidence level. Houses in neighborhoods near major activity nodes gained nearly $55,000 in value from 2014 to 2017. Houses not adjacent but within 2 miles gained almost $27,500. In addition, for every 1% non-Hispanic white population in a neighborhood, houses gained $750 in value.
The change in how to measure intact urban fabric increases the adjusted $R^2$ score slightly, from 0.250 to 0.277, also making all three variables significant at the 99% confidence level (Model 2). The value gained by being close to a major activity node is virtually the same in both models. The change in how to measure intact urban fabric slightly reduces the value gained from white population while the negative value for structure density remains but is reduced. Model 2 will be used for the remainder of the paper and will be referred to as the “city-wide model.”

The city-wide model attempts to cover the full spectrum of developed areas. To determine if the characteristics of revitalization have affected neighborhoods differently, the next section will break the neighborhoods into four groups defined by their mean increase in value.
4.1 Sales Quartiles

The revitalization of Detroit has been decidedly uneven to this point. Out of the 825 census blocks examined, 25 gained more than $100,000 in average value, while 212 lost value. The mean loss value between all 212 census blocks was $7,980, so it may be depressed properties continuing their slow slide. In order to determine the characteristics of revitalization level of variability, census blocks are divided into quartiles by the difference in mean property price change from 2014-2017, with the top 25% quartile representing the neighborhoods that gained the most value.

Table 2. Sales Quartiles Models

<table>
<thead>
<tr>
<th></th>
<th>Top 25%</th>
<th>26-50%</th>
<th>51-75%</th>
<th>75%+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Change 2014-2017</td>
<td>50,079</td>
<td>8,239</td>
<td>2,313</td>
<td>-6,658</td>
</tr>
<tr>
<td>Intercept</td>
<td>45,188***</td>
<td>8,628***</td>
<td>2,570***</td>
<td>-5,869***</td>
</tr>
<tr>
<td></td>
<td>(13,599)</td>
<td>(602)</td>
<td>(369)</td>
<td>(1,974)</td>
</tr>
<tr>
<td>Distance to Major Activity Nodes</td>
<td>58,885***</td>
<td>-160</td>
<td>113</td>
<td>-3,042</td>
</tr>
<tr>
<td>(1 – adjacent; 0.5 within 2 miles)</td>
<td>(10,716)</td>
<td>(528)</td>
<td>(391)</td>
<td>(2,302)</td>
</tr>
<tr>
<td>Percent White</td>
<td>162,806***</td>
<td>1,280</td>
<td>1,403*</td>
<td>1,873</td>
</tr>
<tr>
<td></td>
<td>(29,284)</td>
<td>(1,360)</td>
<td>(785)</td>
<td>(4,391)</td>
</tr>
<tr>
<td>Structures per Acre</td>
<td>-7,922***</td>
<td>-80</td>
<td>-66</td>
<td>-110</td>
</tr>
<tr>
<td></td>
<td>(2,318)</td>
<td>(104)</td>
<td>(61)</td>
<td>(337)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.356</td>
<td>-0.006</td>
<td>0.011</td>
<td>-0.005</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>206</td>
<td>206</td>
<td>207</td>
<td>206</td>
</tr>
</tbody>
</table>

Coefficient with standard error in parentheses.

* Statistical significance in the 90% confidence interval  ** at the 95% interval  *** at the 99% interval

The final model shows that the characteristics of revitalization only help explain the change in real estate value for the neighborhoods that gained the most (Table 2). All three characteristics were significant at the 99% level for the top 25% neighborhoods, while no characteristics were
significant at the 95% or above for any other quartile. The r-squares are also very telling, as the characteristics of revitalization help explain a fair amount of the variability (35%) in the top gaining neighborhoods, while all the other quartiles have an r-square value closer to 0. The characteristics of revitalization explain as much about the change in real estate values in these neighborhoods as random variables picked out of air. Next, each of the characteristics of revitalization will be examined within the top real estate gainer group.

Figure 3. Sales Quartiles Map

4.2 Intact Urban Fabric

The operating hypothesis was that the three characteristics were positively influencing revitalization; however, intact urban fabric has a negative sign in all models. There are a few reasons why this is the case. One possible explanation is that high density requirements have put constraints on the size of houses and lot sizes, resulting in smaller houses and smaller prices (Wassmer & Baass, 2006). Larger older houses have historically been the first renovated in early stages of gentrification (Hwang and Lin, 2016). Neighborhoods such as Indian Village, Palmer
Woods, Boston-Edison, etc., are increasing in value faster than the smaller houses on smaller lots in other neighborhoods. In the top 25% mean change category, the “sweet spot” for structures per acre is less than 3 (See Figure 4). Local examples include Corktown (2.4 structures per acre), eastern Boston-Edison (2.6), and Cultural Center (1.4).

Another thing to consider is the equilibrium between vacant land and developer entry. A developer will only invest in residential land if the density of residents, which determines residential prices, is large enough relative to fixed costs (Owes, et al., 2018). Therefore, there must be enough residents to spur demand, but not too many residents to price out prospective developers. Looking at the residential building permits issued since the bankruptcy, there have been only 72 building permits issued for a single-family house from 2014 to 2017 – the lowest 4-year total since late 1980s/early 1990s. In contrast, total residential building permits, those that include two-family, apartments, and condominiums, are at their highest levels since 2004.

Another possibility is that the city’s demolition process is working. Empirical evidence shows a link between abandoned structures and lowering of real estate value, and in Detroit, there are an estimated 70,000 abandoned structures (Binelli, 2012). Other researchers have found evidence that demolishing buildings in Detroit raises the value of the houses in the immediate surrounding area by 13% (The Blight Authority, 2018). Model 2, the city-wide model presented here, estimates that for every one house removed per acre, the mean value of houses sold increased by $4,385, significant at the 99% confidence level. Similarly, the top real estate gainer group shows that for every one house removed per acre, the mean value increased by $7,922.
Finally, the operating hypothesis that vacant lots decrease home values can still be true while the evidence shows that demolitions raise property values. Paredes and Skidmore (2017) analyzed demolishing dilapidated buildings in Detroit and found that one additional increase in dilapidated buildings decreases average home sale value by 8.7% within a ring of 0.05 miles. In addition, an increase in one vacant lot reduces sale price by 4.9%. This shows that vacant lots do decrease property sale value; however, it decreases less than a dilapidated building. Therefore, both can be true at the same time: demolitions increase property value and vacant lots decrease value.

4.3 Race

Race was consistently significant through the analyses, but the value considerably gained as the top real estate gainers were isolated. In the city-wide models, the value added was $680-$750 for every 1% gain in white population; however, the largest real estate gainers saw the value increase to $1,628 for every 1% increase.

Figure 5. Percent White and Mean Change Value

Previous research had the rate of gentrification, and therefore revitalization, increase dramatically in neighborhoods with 35% white population or greater. Figure 5 illustrates that the dramatic increase was found in areas with white population greater than 20%, as the mean value of real estate went from gaining $40,000 to gaining $100,000. This trend continued until neighborhoods had over 50% white population, but there were only 3 block groups in this category, so the results may not actually be indicative if there were more data points.
4.4 Major Activity Nodes

In the city-wide models, the value added for being adjacent to a major activity node was between $51,000 and $54,000. When the model was divided into quartiles, it became apparent that the value was strictly caused by the high real estate gainers. In the top 25% gain in real estate value group, the value added was $58,000 and statistically significant at the 99% level, while all the other groups had coefficients closer to 0 and were not significant at any level.

Out of the 81 census blocks that were coded as adjacent to major activity nodes, 19 did not have sales in both 2014 and 2017, so they were eliminated in the analysis. Out of the remaining 62 census block groups, 44 were in the top quartile for increase in real estate value. This follows other research that cited neighborhoods adjacent to major activity nodes getting revitalized first and the interest extending to a maximum of 2 miles from the node.

Figure 6 has all the distances from the center of each census block group to a major activity node and the difference in mean value. At the 2-mile distance there is a large increase in neighborhoods that gained over $50,000 in value, suggesting that Detroit follows a similar path as previous research.

Figure 6. Distance to Major Activity Nodes and Mean Change Value
5. Conclusion

Neighborhood revitalization in Detroit shows a pattern similar to an inverted T – north and south along Woodward Ave and east to west along the waterfront. This pattern also holds true for efforts to lure investors into neighborhoods including Opportunity Zones created by the Tax Cuts and Jobs Act of 2017, City of Detroit Empowerment Zones created in 1997, and Local Historic Districts. This paper does not examine the success of these programs, but these programs do reflect past efforts to strengthen targeted areas and encourage developers to invest. As Owens et al., (2018) stated “[E]nough developers have to expect that others will also invest, and that sufficiently many residents will populate the neighborhood. This in turn requires that enough residents expect other residents to want to live in the developed neighborhood.” Detroit can encourage development, but it cannot create demand solely on its own.

Large-scale developments that have recently been announced, such as the Ford Motor Company Autonomous Campus, Former Hudson Site Development, and Henry Ford Hospital Cancer Institute, have the potential to expand revitalization to other neighborhoods, but the development themselves are in neighborhoods already experiencing large gains in real estate price. The real potential for spillover revitalization with regard to activity nodes is in redeveloping abandoned structures in outlying areas, such as the old American Motors headquarters on the westside, the soon to be idled Detroit-Hamtramck General Motors assembly plant, or the former DTE Conner Creek plant on the eastside. If any of these become major job centers, neighborhood revitalization will follow into areas of the city most in need of help.

Another way to capitalize on the premium to real estate demand near major activity nodes is to encourage developers to develop the 19 census blocks adjacent to an activity node that had no sales in both 2014 and 2017. Some of this is already occurring as large developments in Brush Park, skyscrapers in downtown are being rehabilitated into residences, and Eastern Market is redeveloping into a residential and commercial hub. Many opportunities still exist, such as redeveloping Southwest Industrial and adding owner-occupied housing around both Wayne State University and the Forest Park Neighborhood.

Detroit is the largest majority-African American city in the United States, so it follows that revitalization needs to happen in majority African American neighborhoods. If, as the research has shown, neighborhood revitalization is limited to neighborhoods with over 35 percent white
population, only 42 out of 825 studied census block groups would see revitalization and that is not acceptable. Deep racial tensions need to be addressed in order to make sure revitalization reaches all neighborhoods in the city.

Lastly, the City of Detroit has taken steps to keep the urban fabric intact. As the Detroit Land Bank collects properties formally foreclosed upon, they are reselling them through an online auction (buildingdetroit.com). Additionally, programs such as Motor City Re-store and Detroit 0% interest Home Loan Program are designed to give developers and residents an opportunity to rehabilitate storefronsts and houses before they become dilapidated.

Select neighborhoods in Detroit are increasing in value, but many others are still declining. Identifying education, transportation, health, crime, and affordable housing solutions, among many other urgent issues, is even more important to raising property prices for current Detroiters than attracting new residents. Long-term revitalization will need to include answers to these complicated questions, but the City can be optimistic, considering how far it has come in the last few years.
References


Detroit City Council approves $55 million bond repurchase plan.


Official Dollarization: Its Effects in the Latin American Region
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Author biography
Anirudh Viswanathan is a recent UC Berkeley graduate, where he majored in Economics and minored in Math. He will soon be pursuing his PhD studies. This paper was written as a part of an undergraduate research class. Comments and questions are welcome at anirudhsv@gmail.com

Abstract
The purpose of this paper is to juxtapose the performance of different Latin American financial regimes: floating exchange rates, fixed exchange rates, and dollarization. Dollarization is the financial system adopted by a country, where the country does not have any currency of its own, and solely uses the currency of a larger, more developed nation. Ecuador, El Salvador and Panama are all countries that have dollarized. The findings of this research paper (through a difference-in-differences regression and an events study) illustrate that the dollarized countries did fare better than fixed exchange rate regimes. Dollarized nations exhibited a lower inflation rate, higher and steadier growth, and a perceptible drop in sovereign debt.

I. Introduction
For many developing and emerging economies, monetary regimes play a crucial role in economic growth. Most countries are under a financial regime known as floating exchange rates, where their currency valuation is based on supply and demand along with other currencies on the foreign currency market. There is also another regime option, specifically, where countries decide to fix (or peg) their currency rates. Developing nations will peg their exchange rate to that of another, more developed country in an effort to stabilize their own currency. This is done in order to both revamp consumer and international confidence in that country, and as a means to promote/make trade easier amongst its trading partners. Fixed exchange rates do come with their vices though; central banks are effectively at the whim of the country that the currency is pegged to. In the event that a country establishes a peg at the wrong time (i.e. the currency it is pegged to, is overvalued
or under speculative attacks), the developing country will see a subsequent fall in indicators like trade and investments. Typically, the central bank for these nations must actively buy or sell domestic currency in order to keep their currency valuation at constant or near constant level in relation to that of the foreign currency. Latin America is a region that is predominantly comprised of developing nations, and several countries employed a fixed exchange rate regime in times of crisis, such that they can negate the insidious effects of high inflation. The region was “unable to service their debt” (Sims & Romero 2013) in 1980s and fell into a period known as the “Latin American Debt Crisis,” the pernicious effects of which still lasted into the 1990s. Many of the Latin American countries experienced stunted growth, high unemployment, and astronomical inflation (refer to Figure 1 and 2 in the Appendix).

There is another option, however, that is rarely used, but has made tremendous ripples in financial regimes: dollarization. Dollarization is a sort of special fixed exchange rate, in that, the country has no currency of its own. Rather, it solely uses the currency of another country. In Latin America, three countries have dollarized so far, Ecuador (dollarized in 2000), El Salvador (dollarized in 2001), and Panama (dollarized in 1904). The history of dollarization is still being debated amongst economists, and there is not a large amount of empirical evidence to back up its merits, or its drawbacks (Schuler 2005). Consequently, delving into the economic indicators, and their respective performances under countries that dollarized is of great interest to several macroeconomists and governments. The IMF has noted that “dollarization is nearly permanent, and some of its benefits can be gained only in the long run.” Understanding and conducting further research into this topic is of massive importance, particularly for developing nations that would desire a potentially safer and long-term solution to develop. This paper’s main focus is exactly that; to understand the effects of dollarization on major economic indicators, such as GDP, inflation, sovereign debt, and foreign direct investments (FDI), as compared to when countries use either fixed or floating exchange rates.

This paper illustrates that there are indeed tangible and perceptible positive effects that dollarization brings, mostly in abating hyperinflation, increasing GDP growth, lowering central debt, and boosting FDI. The method used was a panel regression (with random effects), using the statistical technique of difference-in-differences. By using two dummy variables, one for
dollarized countries and the other for countries using fixed exchange rates, a comparison between floating, fixed, and dollarized regimes was produced. The three variables mentioned above displayed statistical significance. Furthermore, several other outcome variables were tested, and their results will be discussed later. An event study was run for inflation and central debt, to buttress the positive effects that dollarization had for those countries. Overall, dollarization has proven to help countries, more so than fixed exchange rates, but it too, is not without its disadvantages, mostly owing to a lack of seigniorage and the absence of a central bank that can dictate monetary policy.

The rest of the paper will cover the following content: relevant literature to further elucidate dollarization and the reasons for its use, a more detailed look into the data and methodology used, analysis of the aforementioned data, and lastly, concluding remarks and directions for future research.

II. Literature Review
As the implementation of dollarization has not been widely done through history, the literature on the subject is sparse, yet very insightful. This following section will attempt to illustrate the fundamentals of dollarization, juxtapose dollarization with fixed exchange rate regimes, and address some empirical work done by institutions and academics. Unfortunately, not much theoretical work has been done in the subject, but, more details and theory are provided in the ‘Results & Data Analysis’ section, along with discussion of further literature.

In the works of Slivinski (2008), Alesina & Barro (2001), and Berg (2000), they note that over the past several decades the number of countries around the globe has more than doubled, and as each autonomous entity has sprouted, we see an increase in “currency unions”. Often times this is seen when smaller countries peg their currency to the currency of a larger, more established country. Fixing an exchange rate typically happens during times of economic turmoil (especially in Latin America). The main purposes behind having an independent currency (whether pegged or not) is that country’s ability to dictate monetary policy, a power that they abdicate if they pursue dollarization. One imperative idea that Alesina's & Barro’s paper points out, is that, “The cost from losing an independent monetary policy will be higher the less correlated the business cycle of the
client country is with that of the anchor.” This illustrates that the dollarized countries should be very careful as to whose currency they choose to adopt, as their parent country could pull the dollarized country down with it, during a time of recession. Another flaw of dollarization is the sudden lack of seigniorage revenue that governments are used to. Since the country no longer has a currency of their own, they will not profit off the printing of that currency. Slivinski issues an argument that there are other options that are stronger than simply fixing an exchange rate but not as permanent as dollarization, such as that of a currency board because the “board would be responsible only for maintaining a specific exchange rate between the domestic currency and the foreign currency of choice.” There are issues, especially speculative attacks when a country employs a currency board. As such, all these authors offer both the pros and the cons of dollarization, in contrast with fixed exchange rates.

The next major paper, written by Sebastian Edwards (2001), looks into the “historical records” of countries that have undergone dollarization, indicating that these countries have expressed lower inflation and grown at a slower rate, amongst other economic changes. Using the Kruskal-Wallis chi-squared test on panel data of dollarized nations vs non-dollarized nations (he looks at the time period of 1970-1997), the author finds that dollarized countries have expressed lower inflation and GDP growth is lower for the dollarized nations. However, the standard deviation for these indicators is much higher than countries that have not dollarized. It is important to note that Edwards uses all dollarized nations around the globe as one group and does not segregate based on region and also that his study is a bit old, which could skew results. However, the main focus of this paper is solely on the performance of Latin American countries to ensure that regional differences are not present, as many of the major issues the region faces are also experienced by the majority of the countries. Edwards’s paper though, serves as an excellent blueprint from where to start dollarization research, as well as provide some valuable empirical findings.

In relation to the Edwards literature, Swiston (2011) analyzes the effects of dollarization on El Salvador, one of the countries that this paper looks into. One of the major findings of this paper is the fact that currency risk premium greatly decreased subsequent to dollarization, saving El Salvador much money. Additionally, this paper looks at the effects of dollarization on interest rates. As it turns out, through US monetary policy, there is a stability in inflation and prices,
helping mitigate volatility especially during times of recession or economic downturn. They also do a comparison of Ecuador and Panama with the US serving as a benchmark, which was very useful in understanding how to analyze panel data. Moreover, the differences between commercial bank interest rates of the two countries is easily explained by “by market views of fiscal sustainability.” Evidently, according to the IMF’s research, dollarization has greatly helped the country, and they conclude by adding that more research needs to be conducted for cross-country analysis in economic activity and trade, which this paper does.

Bearing all this in mind, the main motivation for this paper is to provide a juxtaposition of dollarization and other financial regimes that are restricted to a singular area and that look at cross-country performance. While providing very useful framework and background, none of the above literature has done this, and given the time that this paper has been written, almost two full decades have passed since Ecuador’s and El Salvador’s regime change. As such, the results of this paper aim to further elucidate the effects of dollarization.

III. Methodology & Data Collection

Overview of Data and Data Collection

The paper focuses on the years of 1980-2012, where 1980 was selected as it is the first year of the tumultuous decade for Latin America. This was done because it will allow for a greater understanding for how fixed exchange rates work during times of crisis, as well as giving a long enough timeline to observe the effects of dollarization. All the data was gathered yearly, as quarterly data was not available in the detail that was needed. Additionally, finding enough data before the 1980s would be tough, as it is not publicly available. All the data used in this paper was from the database of the World Bank.

Fifteen countries in the Latin American region were observed: Argentina, Brazil, Bolivia, Colombia, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, Peru, Panama, and Uruguay. The only notable country omitted was Venezuela, but that was due to their recent hyperinflation and political instability, since their current situation might have skewed the results with too many outliers. Out of these 15 countries, three of them are dollarized:
Ecuador, El Salvador, and Panama. The rest of these nations have flitted between fixed and floating exchange rates, depending on the needs of that respective area, normally during a financial crisis.

There are instances where some countries do not have data for the outcome variable that was tested or are missing years for that outcome variable. Some of the more prominent examples are: Chile has no data for Interest Payments on Debt, El Salvador does not have values for the Total Central Debt as a Percent of GDP for 1980-1996, Paraguay has no data for the Total Central Debt as a Percent of GDP, and finally Uruguay has no data for Short Term Debt as a Percentage of Total Reserves. Unfortunately, this data was not available on any of the major international organizations like the OECD, IMF, or UN. These lapses should not have an adverse effect on the data results, as they are far and few in between. The main outcome of interest are the dollarized nations and their behavior after they decided to dollarize. The data was sorted into a panel structure, as time and the individuals were all imperative to conducting proper data analysis.

**Difference-in-Differences Regression Model & Random Effects (Robustness)**

As mentioned in the introduction, the main statistical method of analysis is a difference-in-differences (DD or DID) test. A DD test aims to emulate a research experiment by calculating and comparing the difference between one group, that underwent a certain treatment/change, and another group (which serves as the control). It averages the change over time between both groups, and that result is indicative of the difference between the groups (Wooldridge 2007). Refer to Figure 3 for a more graphical representation of DD.

The general regression equation for this model, according to Pichke (2016), is as follows:

\[ y_{st} = \alpha_s + \beta_0 + \lambda t + \partial D_s \cdot dt + \epsilon_{st} \] (diff-in-diff equation)

Here, the \( y \)-variable is the outcome variable that an individual is regressing on (GDP, Inflation, etc.). The \( \alpha_s \) and \( \lambda t \) are to capture the random and fixed effects, respectively—typically only one is used. Lastly, and perhaps more importantly, is the \( \partial D_s \cdot dt \) term. This \( \partial \) is the coefficient that will illustrate the difference between the treatment group and the control group. The \( D_s \) represents the dummy for that individual country (if they were subject to the treatment or not), and the \( dt \)
variable represents the years that countries dollarized. Taking the product of these dummy variables will give which countries were dollarized during which exact years.

\[ y_{st} = \beta_0 + \alpha_s + \delta_1 Dst(dollarized) + \delta_2 Dst(fixed \ exchange \ rate) + \epsilon_{st} \ (Version \ used \ for \ this \ paper) \]

In the data analysis for this research, a more general version is used as the difference-in-differences estimator, as the treatment and time were conflated into a singular dummy variable. Another similar dummy variable was created, this time matching countries that employed fixed exchange rates as opposed to floating exchange rates. Obviously, the difference between \( \delta_1 \) and \( \delta_2 \) is the difference between countries that dollarized and countries that used fixed exchange rate for that specific outcome variable, and is perhaps the most important result, as it gives insight into the performance of countries that dollarized versus countries that used a fixed exchange rate regime.

To create the dummy variables, once the panel data has been constructed, create a column wherein, a “0” is put in the spot if that country has not dollarized in that year, for Dst(dollarized) and a “1” if the country has both dollarized and is dollarized during that specific year. Similarly, for Dst(fixed) a “0” is placed into the area where a country has not used fixed exchange rates during that time, and a “1” is used to indicate that a specific country is pegging their currency to another at that year.

One of the caveats of panel data regression is to choose between random effects and fixed effects, as the main method of a robustness check. Random effects are used in this model, as the dummy variables (the inputs) are not correlated with each other, at least not to a very large extent. As in, a country’s choice to dollarize does not depend on any other country or have any correlation to fixed exchange rates. Ecuador dollarized to negate their hyperinflation, El Salvador mostly dollarized because 2/3 of their GDP involved the US (Swiston 2011), and Panama has been dollarized since the early 1900s. Dollarization is an act independent of other countries in the region, and consequently, it would be wise to include random effects, instead of fixed effects. Furthermore, a majority of major Latin American countries have many large trading partners outside of the region (Argentina, Chile, Brazil, etc.), so there will not be much fixed exchange rate regimes for the sake of its neighboring countries, rather for countries outside of Latin America, if at all.
Offering a more statistically sound reason, a Hausman test was applied to the fixed effects and random effects versions of three main indicator variables: GDP, inflation, and central debt. In all three cases, the p-value for the Hausman test came back much larger than 0.05. The Hausman test works such that the null hypothesis would be to use random effects, and since the p-value returned was much greater than 0.05, random effects should be used, in accordance with failing to reject the null hypothesis.

Further Analytical Methods

An event study with leading and lagging variables was conducted for the countries that dollarized in 2000/2001 (so Ecuador and El Salvador), in order to truly cement the positive effects that dollarization had on inflation and on sovereign debt. Once again, dummy variables were used, such that with a one-year lag 2001 would correspond to 2000, for a two-year lag, 2002 to 2000, etc. The same methodology was done (except in opposite years) with the leading dummy variables.

Lastly, a quick standard deviation for countries pre and post dollarization was conducted for inflation, GDP, central debt, and FDI, as a measure of the volatility of these indicators. Dollarization should have lowered such volatility because one of the reasons countries dollarize is to introduce economic stability into their country.

IV. Results & Data Analysis

Main Findings from Difference-in-Differences Regression

As mentioned in the prior section, the main data analysis technique was by the difference-in-differences regression, the results of which, are captured in Table 1. In all instances, the panel regression was run with random effects as a robustness check, to ensure that the statistical significance was accurate and the measured effects, true. $\partial_1$ captures the difference between dollarized countries and countries using floating exchange rates, and $\partial_2$ depicts the difference between the fixed exchange rate countries. The difference of the two variables gives the comparison between dollarized and fixed exchange rates. Nine variables were tested, and of those nine, four are of particular interest for lengthy discussion and analysis (the rest of the results are in Table 1): Inflation, sovereign/central government debt, GDP, and GDP per capita.
To start, inflation is perhaps the most important of the economic indicators, since the “main attraction of full dollarization is the elimination of the risk of a sudden, sharp devaluation of the country's exchange rate,” (Berg 2000). The coefficient for $\partial_1$ is -292.397, which again means that the dollarized countries have a lower inflation rate by -292.397% than the floating exchange rate countries. For $\partial_2$, it was -285.046%, meaning they displayed -285.046% lower inflation rates than floating exchange rate countries. Taking the difference of the two $\partial$ coefficients, gives us that dollarized nations have, on average, a -7.382% lower inflation rate than countries that peg their exchange rate to the US Dollar. The results were statically significant at the 90% and 99% level, respectively. Figure 4 portrays a time series, showing the inflation rate of dollarized nations from 1980-2012, displaying the trend detailed above. Bear in mind, as well, for inflation, only Ecuador dollarized to combat hyperinflation; El Salvador was at a safe inflation rate, and Panama was always dollarized. Several prior literature corroborates that inflation drastically reduces under dollarization. As such, it should be noted that for the purposes of the rest of this study, 90% should qualify as statistical significance (despite typical convention) due to the small sample size of dollarized nations (three). Again, economically, this is precisely what we would expect. Countries only peg to another county’s currency (or totally dollarize) to combat rampant hyperinflation and to reinstall citizen and foreign confidence in their county’s currency and economy, due to the central bank being able to prevent the domestic currency supply from rising too rapidly. By dollarizing, there is neither a chance of a currency devaluation, nor a necessity to reaffirm the strength of one’s own currency leading up to the peg being broken. Indeed, there is a rather strong form of pegged exchange rates, called currency boards, where they “issue notes…fully convertible at a fixed exchange rate into an anchor currency, and backed by net reserves, held in foreign assets only;” (Schuler 2005), which does a phenomenal job at keeping inflation at bay. However, the greatest drawback for these quasi-central banks is that the few times it has been done in the past, mainly Argentina and Hong Kong, both regions fell prey to massive speculative attacks on the appreciation of their respective currencies (Spiegel 2002). Dollarization does not encounter these issues due to the total abandonment of any local currency.

Central (or sovereign) debt is another imperative indicator at overall economic robustness, especially for developing nations. Central debt is best described as domestic and foreign liabilities that the government owes to either its own citizens or to foreign investors. The variable used in
this study is the total central debt as a percentage of GDP, to better delineate how the country is leveraging and/or paying back their debt within the context of their growth. As it turns out, the coefficient for $\partial_1$ is -73.7389, which again means that the dollarized countries have a lower central debt by -73.7389% than the floating exchange rate countries. For $\partial_2$, it was -2.7461%, illustrating that they displayed 2.7461% higher central debt rates than floating exchange rate countries. Taking the difference of the two $\partial$ coefficients, gives us that dollarized nations have, on average, a 76.485% lower central debt rate than countries that have used fixed exchange rates. The results were statically significant at the 99% level for dollarized nations, but showed no statistical significance for the fixed exchange rate countries. Nevertheless, when taking into account the standard errors, the difference between the dollarized and non-dollarized nations is stark. Refer to Figure 5 for a time series of this trend over years for the dollarized nations. One vital caveat about the dollarized nations is that their debt is now in US Dollars or whichever currency they have adopted. According to similar work done by Arellano and Heathcote (2007), “dollarization may be attractive precisely because eliminating the monetary instrument can strengthen incentives to repay debts, and thereby increase access to international credit.” This validates everything previously mentioned, as the exchange-rate uncertainties do not exist, and meeting foreign debt payments is much easier.

The next indicator that shall be discussed is GDP growth and GDP per capita growth. For GDP growth, the DD regression gave $\partial_1$ at 1.36457%, which means that the dollarized countries experienced a 1.325% higher growth than countries that were using floating exchange rates. A similar extrapolation can be made for $\partial_2$ for fixed exchange rates and floating. What is more interesting is $\partial_1-\partial_2$ which gives us the difference between countries that have dollarized and countries that use fixed exchange rate, which is estimated to be 0.863%, a rather sizable amount. Dollarization to floating was significant at the 90% level, and the fixed to floating was not statistically significant, indicative of a lower growth for both versus dollarization. Figure 6 shows a time series of GDP growth for dollarized nations. Surprisingly, this is in direct contrast with prior literature, where Edwards (2001) and Levy-Yeyati (2004) note that dollarized nations grow at a much lower rate than non-dollarized nations. However, the research done by Edwards (and Levy-Yeyati) was done in 2001 (2004), long before the effects of dollarization were clear in Ecuador, and before El Salvador even dollarized. Edward’s study also looked at all dollarized nations of the
world, and did not control for the region, which most likely skewed results. Remember, one of the most important points about dollarization is the time frame that it takes to act, as these effects do not simply happen overnight. Countries dollarize (other than combating hyperinflation), to “increase foreign investment, improve financial conditions, and decrease transaction costs in international trade, thereby further accelerating economic growth and stability,” (Quispe-Agnoli and Whisler, 2006). Similarly, GDP per Capita displays a similar trend, where it was significantly higher (at the 95% level for dollarization), which again, falls in line with the end goals of dollarization. After dollarization, there is more income per person. As the GDP is increasing, simultaneously, there is an increase in their purchasing power since their income is now paid in dollars.

Unfortunately, there were some variables that did not show significance, even though they theoretically were expected to. One of the economic indicators, of a lowered interest rate both commercial and on foreign debt was not found to be significant, in part due to a lack of proper data. Many countries and years were missing, and thus, no intelligible conclusions could be drawn. A multitude of prior literature, especially Arellano and Heathcote (2007), has found that these interest rates are indeed lower, and this is one of the main benefits of dollarization; an established currency gives credence to foreign investors, thus driving down the interest rate on debts. Since interest rates tend to move together, there is a drop in the interest rate of commercial banks, as well, fostering more economic growth as citizens (and businesses) are then more likely to borrow money. In addition, running an analysis on the futures, or index funds of these countries would also have been very valuable, in order to truly display consumer and foreign faith in a country once it has dollarized (again, finding this data proved to be too difficult to collect, as there were no records online).

Event Study Findings

The purpose of the event study is to display the effects of the treatment, in this case dollarization, before and after its implementation, as an extra check for its efficacy. The two event studies conducted were for inflation and for central debt, the two main outcome variables of interest. There were 5 lead variables, and 5 lag variables, and the main effect of the dollarization is captured at the 1-year lag and beyond (thus looking at the immediate effects of inflation 5 years leading up to
and subsequent to dollarization). Once the dummy variables of the leads and lags are set up, a panel regression, similar to the ones above, gives the coefficients for each of the variables. These event studies only take into account Ecuador and El Salvador, as Panama has been dollarized since in the early 1990s. An intuitive way to analyze these results is the percentage change in this outcome variable for each year.

For inflation, there was a blatant drop in inflation rates, as at the 2-year lag, inflation had dropped to -72.63%. Inflation was actually on its way down, but as shown by Figure 7, dollarization acted as a major catalyst in the process. Furthermore, bear in mind that only Ecuador dollarized for the sake of combating hyperinflation.

Central debt displays a similar trend, where, leading up to dollarization, there was a sharp increase in the amount of central debt relative to GDP, and again, a massive drop (almost 105%) as soon as dollarization took effect. Figure 8 contains the graph for this event study. Overall, the event studies verified the veracity of the regression findings, as dollarization had an obvious and tangible difference on the inflation rates and the central debt of Ecuador and El Salvador.

**Standard Deviation Findings**

Lastly, as a measure of volatility pre and post dollarization, standard deviations for the major outcome variables were calculated. Dollarization is pursued in order to introduce stability into a nation. Refer to Figure 9 for the graph on the changes for GDP, inflation, and central debt. As it turns out, there is significantly less volatility in inflation and central debt post-dollarization, as one would expect. However, there is a marginal increase in the spread for GDP growth. This is rather odd but could potentially be explained by either a lack of time or the inception of the Great Recession starting in 2008. The volatility finding of GDP actually does fall in line with Edwards (2001).

**V. Concluding Remarks & Further Work**

The main purpose of this paper was to detail the performance of dollarized nations versus non-dollarized nations. Overall, dollarized nations have performed better in most of the key economic variables, but it, too, is not without its downsides. The roadblocks that exist for dollarization are
typically an aversion of countries to lose a part of their autonomy, as they can no longer pride
themselves on using their own currency. Short of political motivations though, economically, a
country forsakes their central bank, and are entirely at the whim of the monetary policy of their
parent country, which, typically will not be looking at the dollarized country’s interests when
making decisions. More than anything else, is the fact that dollarization is permanent, as dictated
by Thiers’ law (opposite of Gresham’s Law), where, this “good money” (that is, money that is
valued higher) will drive out any “bad money.” In line with that, after accepting the dollar as legal
tender, reverting back to a domestic currency might only create further turmoil, and undermine
any of the positive long-term effects that dollarization has to offer. Thus, it is not a decision that
should be embarked upon lightly.

Nevertheless, according to the research of this paper, it has indeed proven to be very beneficial to
the countries that have adopted it, especially juxtaposed with fixed exchange rates. Through the
method of difference-in-difference regression with random effects, inflation, sovereign debt, and
GDP have proven to react quite positively to dollarization. Panama has employed dollarization for
more than a century, and has maintained relatively low inflation and interest rates, steady growth,
and low central debt since its initial adoption. Many of the benefits of dollarization are experienced
over long periods of time and maintaining the policy for many years is essential to reaping
maximum benefit.

As dollarization is still an up-and-coming policy, there are still many future questions and
necessary research that must be conducted. Primarily, looking at the effects of dollarization on
consumer spending and on income, to notice how the citizens of the country do under dollarization.
Many of the responses to dollarization will manifest themselves over time and should be studied
with very careful attention. In the meantime, introducing rigid theoretical backing of dollarization
will only aid the subsequent study of this growing financial regime.
VI. References


World Development Indicators, The World Bank.
VII. Table and Figures

Table 1:

<table>
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<tr>
<th></th>
<th>GDP Growth (1)</th>
<th>Inflation Percent (2)</th>
<th>GDP Per Capita (3)</th>
<th>Short Term Debt (4)</th>
<th>FDI % of GDP (5)</th>
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<tr>
<td>Dollarized Regimes</td>
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<td>-292.397**</td>
<td>1.421**</td>
<td>28.703</td>
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|                                            |                |                       |                    |                     |                  |
| Observations                               | 490            | 489                   | 490                | 421                 | 490              |
| R²                                         | 0.009          | 0.020                 | 0.008              | 0.001               | 0.027            |
| Adjusted R²                                | 0.004          | 0.016                 | 0.004              | -0.004              | 0.023            |
| F Statistic                                | 2.092 (df = 2; 487) | 4.945*** (df = 2; 486) | 2.056 (df = 2; 487) | 0.165 (df = 2; 418) | 6.757*** (df = 2; 487) |

<table>
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<tr>
<th></th>
<th>Interest Payments on Debt (6)</th>
<th>Average Interest Rate New Debt (7)</th>
<th>Total Central Debt as % of GDP (8)</th>
<th>Exports Growth (9)</th>
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<td>(0.347)</td>
<td>(25.9721)</td>
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| Observations                               | 409                          | 424                               | 411                              | 478                |
| R²                                         | 0.030                        | 0.053                             | 0.021                            | 0.008              |
| Adjusted R²                                | 0.026                        | 0.049                             | 0.016                            | 0.003              |
| F Statistic                                | 6.340*** (df = 2; 406)       | 11.856*** (df = 2; 421)           | 4.349** (df = 2; 408)            | 1.797 (df = 2; 475) |

Note: *p<0.1; **p<0.05; ***p<0.01
*Note: For these time series, a smoothing was applied to the lines, in order to show an obvious trend.*
Figure 3:

Figure 4:

Inflation Percentage of Dollarized Countries

Country Name
- Ecuador
- El Salvador
- Panama

Inflation Annual Percentage (Consumer Prices)

Year

1980 1990 2000 2010
Figure 5:

![Central Debt as a Percentage of GDP](image)

Figure 6:

![GDP Growth Percentage of Dollarized Countries](image)
Figure 7:

[Graph showing lead and lag event study for inflation]

Figure 8:

[Graph showing lead and lag event study for central debt]
Figure 9:

Standard Deviation of Outcome Variables Pre & Post Dollarization

Outcome Variables

GDP
Inflation
Sovereign Debt

Standard Deviation

Treatment
- Post
- Pre

Pre
Post