PROMOTING EXPORTS OR FOSTERING DISPARITY?
THE EFFECTS OF EXCHANGE RATE UNDERRATEVALUATION ON INCOME INEQUALITY

A Thesis
submitted to the Faculty of the
Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
degree of
Master of Public Policy

By

Shiladitya Chakrabarti, B.S.

Washington, DC
April 15, 2014
PROMOTING EXPORTS OR FOSTERING DISPARITY?
THE EFFECTS OF EXCHANGE RATE UNDervaluation ON INCOME INEQUALITY

Shiladitya Chakrabarti, B.S.

Thesis Advisor: Andreas T. Kern, Ph.D.

ABSTRACT

Income inequality finds a prominent place in contemporary political and economic debates. I demonstrate that sustained exchange rate undervaluation increases inequality, building on research linking undervaluation with growth (Rodrik, 2008). I offer evidence that sustained undervaluation increases income inequality levels using fixed effects and dynamic panel estimators with country-level data. The relationship is robust to the inclusion of controls such as the political regime type, nature of the banking system, trade, and education levels. The adverse effects of inequality due to undervalued exchange rates imply that governments pursuing undervaluation-based strategies for spurring economic growth should consider the socioeconomic effects of such policies and the potential threat to political stability posed by rising societal disparities. The existence of a relationship between these variables also offers insights about the behavior of autocratic governments that undergo a sustained period of export-driven economic growth.

Keywords: income inequality, exchange rates, currency undervaluation
I would like to acknowledge everybody who assisted in the writing of this thesis, in particular friends, family members, faculty and staff at the McCourt School of Public Policy. A special note of appreciation is owed to my thesis advisor Dr. Andreas T. Kern for his vital inputs and assistance during the entire process of researching and writing this document.

Shiladitya Chakrabarti
# TABLE OF CONTENTS

INTRODUCTION .................................................................................................................. 1

LITERATURE REVIEW ........................................................................................................ 2

THEORETICAL CONSIDERATIONS .................................................................................. 10

DATA DESCRIPTION ........................................................................................................... 14

ANALYSIS .......................................................................................................................... 18

POLICY IMPLICATIONS ..................................................................................................... 26

APPENDIX .......................................................................................................................... 32

BIBLIOGRAPHY .................................................................................................................. 37
INTRODUCTION

Inequality has been a topic of fierce debate in recent years. Phenomena as diverse as the Arab Spring revolts of 2011 and the Occupy Wall Street movement have been attributed in part to the increasing gap between the rich and poor in societies around the world.

The post-war economic order was characterized by substantial growth in the United States, Western Europe and Japan, rapid productivity increases, fixed exchange rates underpinned by Bretton-Woods institutions, and restricted capital flows. Beginning in the 1970s, various developments including the oil shocks, introduction of floating currencies, and high inflation in advanced economies led to its unraveling in favor of the “Washington Consensus” that emphasized trade liberalization, low taxation and deregulation of industry as a way of increasing living standards. While the effects of such policies on growth rates has at best been mixed, most of the advanced economies have witnessed a simultaneous rise in the income gap between the richer and poorer sections of society.

At the same time, the past several decades have been a period of rapid economic growth for a number of economies that have attempted a rapid transition to developed-country status. A select group of these countries, particularly in the East Asia region, have managed to combine rising prosperity with changes in their political systems enabling greater democratic representation. For instance, South Korea has epitomized this type of transformation in the past 60 years. A closer look at forces in their political economy suggests that the rising power of economic elites during a period of high growth and financial liberalization paved the way to democratic transition. It is also of interest that many of these economies relied on a development strategy that emphasized competitiveness of their national currencies to boost manufacturing exports, which found lucrative markets in advanced economies.

In the contemporary era, the People’s Republic of China seems to be following a similar trajectory
of exports-fueled economic development and financial liberalization along with gradual opening up of the political system. It might well be the case that such economic and political developments cannot be replicated outside of East Asia due to the unique historical experiences and cultural circumstances of that particular region. Nevertheless, the relationship between currency undervaluation (a key factor in the East Asian development story) and income inequality (a plausible result of policies focused on promoting selected economic sectors) merits investigation.

This paper is intended as an investigation into the determinants of income inequality, specifically the role of currency exchange rate undervaluation that may be pursued by countries in search of economic development and rapid rise in living standards for their impoverished populations, in exacerbating the income gap between the poorest and richest segments of society. I hypothesize that sustained periods of undervaluation result in greater earnings gap between the upper and lower halves of the income distribution. To validate this theory empirically, I shall analyze the effect of exchange rate undervaluation on income inequality in various regression specifications, including cross-sectional, fixed effects, and dynamic panel GMM models. Evidence of this type of relationship between undervaluation and income inequality would signify that the strategy of emphasizing exports to generate GDP growth might impose a cost on the wider society, and in turn generate social and political instability.

LITERATURE REVIEW

In this section I analyze the literature on income inequality and how my research question fits into the body of work on this topic. A number of broad trends have shaped the extent and direction of income inequality across the world over time. Here I shall point to some of the key channels influencing inequality levels.

Macroeconomic Channel

In his classic contribution to the literature, Kuznets (1955) surveyed the income inequality landscape
by observing the advanced economies of United States, Great Britain, and Germany through their periods of industrialization in the 19th and early 20th centuries, including two world wars and the Great Depression. Although Kuznets concedes a lack of empirical rigor in this rather descriptive work, the author theorizes a long-term trend for the “secular income structure: widening in the early phases of economic growth when the transition from the pre-industrial to the industrial civilization was most rapid; becoming stabilized for a while; and then narrowing.” While he gives legislative measures (e.g. inheritance taxes and other limits on capital accumulation) their due in restricting the wealth of those at the top of the income distribution, the major role in offsetting widening inequality is attributed to “a rise in the income share of the lower groups within the nonagricultural sector of the population.”

Following a period of increasing rural-urban earnings gaps as the population migrates from low-productivity agricultural settings to higher-earning industrial sectors, the lower income groups within those urban populations adapt to “the possibilities of the city life” and their participation in the political system ensured that the benefits of industrialization accrued to people at the bottom of the income distribution at a faster rate than those at the top. Kuznets also speculates on the relationship between the long-term inequality trends and patterns “in other important components of the growth process,” including population growth rates, changes in savings and capital formation rates, and proportion of foreign trade in terms of overall economic activity. Although this paper serves as a useful starting point in terms of an investigation into determinants of income inequality, the lack of robust empirical evidence calls into question the applicability of the authors’ assertions spelled out in his paper. Rather, one should deem Kuznets’ contribution as a thoughtful piece of literature hypothesizing different avenues through which long-term macroeconomic processes can affect the income distribution, particularly in societies that have witnessed a significant amount of urbanization and industrial activity.

In their study of twentieth-century income inequality patterns in the United States, Piketty and
Saez (2003) argue that the twin shocks of the Great Depression and the Second World War had an adverse long-term impact on incomes at the top of the distribution. This conclusion would suggest that exogenous events (such as wars requiring large-scale resource mobilization and steep recessions induced by financial crises) might play a role in reducing inequality by compressing incomes at the very top of the distribution. Moreover, the authors also claim that highly progressive income and inheritance tax structures likely contributed to maintaining the cap on earnings for those at the top rung of the income ladder. This would imply that fiscal policy, having to do with personal or corporate tax rates and government spending on redistributive social programs, might also play a role in reducing (or exacerbating) income inequality. The empirical analysis performed in this paper lends robustness to Piketty-Saez’s assertions regarding the relationship between macroeconomic policies and overall income distribution. However, one must be skeptical about drawing conclusions from studying a single country and extrapolating those results towards other nations. Nevertheless, both Piketty-Saez (2003) and Kuznets (1955) demonstrate the relevance of macroeconomic factors such as gross domestic product and social expenditures when considering factors contributing to income inequality.

Stiglitz (2012) offers a provocative argument linking volatility in economic growth and increased inequality levels. While the author claims that causality could potentially run in either direction, he hypothesizes a number of mechanisms through which fluctuation in growth can adversely impact inequality, be it through downward pressure on nominal wages, cuts in social safety net programs that affect poorer sections of society disproportionately, or the loss in skills following prolonged spells of unemployment, in turn negatively impacts the long-term earnings potential of the jobless. Stiglitz makes a number of other arguments in this paper that are tangentially related to the issue at hand. Nevertheless, volatility of economy, as measured by either GDP growth or deviations from long-term growth trends, finds its place among the determinants of income inequality.
Dollar and Kraay (2002) advance a contrarian view about the effects of growth on inequality. The authors cite the lack of cross-country data on the effects of growth on the incomes of the poor, and themselves estimate regression models using country-year observations. Their empirical analysis allows them to infer that “(changes in) income and (changes in) inequality are unrelated.” Dollar-Kraay use an unconventional approach of measuring income inequality by looking at income share of the poorest quintile in the population, rather than traditional approaches that deal with Gini coefficients. However, it is questionable whether not finding evidence of growth’s effects on inequality should lead them to conclude that there is indeed no causal relationship between the two variables. Perhaps this leaves the door open for further analysis on how different mechanisms of growth, rather than growth itself, affect income distribution.

Trade channel

Numerous papers have addressed the relationship between trade and income inequality. In a survey of arguments made by both trade-boosters and skeptics, Richardson (1995) concluded that “trade is a moderate contributing source of income inequality trends,” though he did concede its role in fostering growth and increasing incomes for those at the top and bottom of the income distribution. Following a similar appraisal of the literature and their own analytical work, Milanovic and Squire (2007) determined that tariff reductions are associated with increasing wage differentials between different industries and within workers at different skill levels. The authors do moderate their claims by upholding the variation of income inequality by average national incomes, suggesting that the deleterious effect on openness to trade are likely to be felt more acutely in the case of poorer nations rather than those with middle and upper-income status. Meanwhile, in his investigation of the relationship between trade openness and income distribution, Edwards (1997) asserted, “for the developing countries, there is no evidence linking openness or trade liberalization to increases in inequality,” though he acknowledges that cross-country comparisons can be affected by
unstipulated “measurement problems”\textsuperscript{13} that may have unwittingly biased the author’s observations. Dollar and Kraay (2001) also seem to share a similar outlook on the effects on inequality of trade liberalization that began during the 1980s.

In a discussion on the expansion of the state’s role in aggregate economic activity, Cameron (1978) declared a country’s degree of openness to international markets is a chief determinant of the amount of state intervention. Cameron claims that governments intervene vigorously in economies exposed to foreign trade “to protect national objectives of internal stability, employment of workers, and undisturbed domestic production and consumption in a world of more chaotic economic relations.”\textsuperscript{14} This is suggestive of a disruptive effect of foreign trade on the income distribution, especially in the absence of aforementioned interventions by governments through spending on safety net programs.

Rodrik (2008) in a seminal piece on trade sheds some light on a plausible mechanism through which trade might impact income inequality. Commenting on the undesirability of overvalued currencies for the development process, Rodrik extends this argument further by linking undervaluation to higher growth, particularly for low and middle-income economies. Notably, the previously imprecise concept of currency undervaluation is formalized with an index derived from data on nominal exchange rates and relative price levels. This allows for direct comparisons of undervaluation in a cross-national context, of great importance to my research question. Moreover, Rodrik contends that the operative channel for increased economic growth is the size of the tradables sector, which increases in relation to nontradables during periods of undervaluation. This is consistent with my argument of increased inequality in the wake of currency undervaluation owing to a stimulated export sector. The implicit subsidy offered to owners and financiers of export industries as a consequence of undervaluation seems a credible explanation for increasing earnings gaps between the rich (i.e. exporters) and the rest of the economy.
A corollary arising from the above discussion on Rodrik (2008) and currency exchange rates is the motivation of governments that undervalue currencies for extended periods. Steinberg (2011) maintains that although the tradables sector is biased towards undervaluation, exchange rate policy is also determined by the political regime’s control over the banking system. The ability of governments to set favorable interest rates for export producers and channel investments into tradables sector allow the exporters to maximize profits. This “financial repression” argument helps us comprehend as to why policies of currency undervaluation have not been adopted universally, since their implementation may be contingent upon state exercising control over credit and banking channels. Control over the banking system might in turn be determined by the nature of the political regime, thereby explaining why authoritarian governments find it easier to turn to financial repression, and by extension, undervaluation strategies. Hipolit (2013) lends support to this explanation, arguing that the types of governments pursuing sustained periods of undervaluation are likely to be autocratic regimes, since their greater ability to suppress domestic consumption results in “substantial friction in the nominal exchange rate adjustment channel,” thereby artificially sustaining the undervaluation. Furlan et al. (2012) reach similar conclusions through their empirical assessment of reduced currency undervaluation and appreciating real exchange rates in democratic regimes. Steinberg and Malhotra (2014, forthcoming) present a more nuanced view of the argument linking regime type and exchange rate policies. Here, the authors offer evidence that civilian autocratic regimes are inclined to persistently undervalue currencies, as opposed to military dictatorships characterized by fixed exchange rates. They offer examples such as China and Saudi Arabia as civilian autocracies that have amassed massive trade surpluses through persistently undervalued currencies. Arguments such as these necessitate introduction of control variables measuring a country’s control of the banking system (e.g. a composite index representing financial repression, or a similar indicator for government control of banks) as well as a numerical measure of
the political system (e.g. Polity scores) into the empirical model for estimating the impact on income inequality.

**Financial markets channel**

Demirgüç-Kunt and Levine (2009) argue that economists have traditionally overlooked the important role of financial markets in determining income inequality. The authors survey a body of theoretical and empirical analysis at the individual, firm and country units, confirming that development of financial markets has a disproportionately positive impact on the incomes and well-being of those at the bottom of the distribution, thereby significantly reducing inequality levels. The reduction occurs through a number of mechanisms, including lowering of transaction costs for essential services such as healthcare and education, financing of small-scale entrepreneurial ventures by reducing collaterals and income requirements, and easier access to insurance leading to consumption-smoothing. Financial development also creates greater labor-market opportunities and raises incomes of the poor as a result. Admittedly, the authors also call for more empirical grounding of theoretical observations that link financial development with inequality.

Ang (2010) presents a quite different picture regarding the relationship between financial markets and income inequality. The author concentrates on India and the role of finance development as a determinant of the nation’s Gini coefficients over a period of time. Empirical analysis lets Ang conclude that although development of the financial system, such as improvements in banking processes and density of banking facilities, aids the poor and reduces income disparities, financial deregulation has little or no effect on reducing unequal access to financial activities. Rather, increasing financial liberalization has an adverse impact on inequality levels.

The above arguments on the relationship between finance and inequality point us in the direction of a proxy variable (e.g. a composite measure of financial liberalization, or an indicator of credit to the general population) that could be used as a control variable for the regression model.
Having surveyed the literature on how macroeconomics, trade, and financial markets may affect inequality, we should also consider whether a certain level of inequality might be determined by factors of human development.

Factors channel

Acemoglu (2003) offers a comparative look at inequality trends in the United States and Western Europe, concluding that the nature of labor market institutions (e.g. collective bargaining arrangements) can lead to differences in inequality. Acemoglu also finds evidence of skill-biased technological change impacting income differentials, implying the role of human capital levels in determining income inequality. Topel (1997) generally agrees with this assessment. Focusing exclusively on inequality trends within the United States and its various determinants, Topel pinpoints increased demand for skilled workers as the driving force for the increasing divergence in incomes between those at the top and the ones at the bottom. Topel also speculates on supply side changes in the workforce, including increased female participation and greater immigration levels from low-wage nations such as Asia and Latin America, as contributors to inequality through the channel of displacement of native-born citizens in the labor market. However, the author does not substantiate such assertions with robust evidence.

Although both papers are significant contributions to the factors literature on inequality, they have limitations that prevent us from applying their conclusions to a wider population of nations. The data is restricted to a subset of developed economies and thus does not permit generalization of conclusions on factors affecting income inequality in other regions, or ones at other stages of development. Data on wage levels is hard to obtain outside of OECD nations, while educational attainment varies significantly across countries and thus may bias our inferences. Nevertheless, the literature does tell us the importance of including variables in our regression models that allow us to control for human capital levels.
THEORETICAL CONSIDERATIONS

In order to comprehend the relationship between undervaluation and income inequality, we need to explore the role of exchange rates in the development process itself. Below, I provide some insights into how the pricing of currencies can have a significant effect on growth and under certain conditions act as de facto industrial policy. I extend this argument further and propose a mechanism whereby persistent currency undervaluation leads to increases in income inequality levels.

Exchange Rates as Industrial Policy: The Undervaluation Temptation

It should be obvious to all but the most casual observer of history that different regions of the world have experienced divergent trajectories of growth and economic development over time. Numerous models that have dealt with the dynamics of growth have stressed the importance of “factor accumulation, human capital, institutions, and policy” in determining per-capita income levels at any given point. Some of these frameworks have shed light on the concept of “catch up growth,” namely the process by which incomes in developing countries grow at a faster rate in comparison to developed economies, owing to the ease of transferring existing technologies and comparatively lower labor costs in developing markets.

However, not all underdeveloped economies have experienced catch-up growth phases to the same extent. While East Asian economies such as Japan, South Korea, and Taiwan posted rapid growth rates in postwar decades and have successfully managed the transition to developed country status, others in Asia, Africa, and Latin America have languished in low-income status, despite ostensibly having many of the same advantages such as surplus labor supply. Yet others have fallen into the “middle-income trap,” unable to sustain the growth momentum that had enabled their rise above the low-income group.

While there may be institutional, cultural and geographical factors that have led to different economic outcomes among the nations of the world, development policy has also had an impact in
shaping growth trajectories. Given the lack of well-developed financial systems that can allocate credit in an effective manner, or domestic markets that can sustain increased consumption levels, developing nations have often turned to export-oriented growth as a means of boosting GDP in the short and medium-run. The East Asia region in particular has followed this development model with a degree of success. However, such a strategy requires activist government policies, epitomized by agencies such as Japan’s Ministry for International Trade and Industry (MITI) that has been often been credited with a key contribution to the nation’s “growth miracle.” Other countries that have followed Japan’s example have also employed a mix of export-friendly government policies with the aim of boosting their current account surpluses, including favorable tax policies, export subsidies, and special economic zones (SEZ) facilities which enable manufacturers to bypass stringent regulations.

While aforementioned industrial policies do play a central role in boosting production of tradable goods and services, exporters need to ensure that such products are priced competitively in international markets in order to maximize profits. Undervaluation of the domestic currency can play a useful role in this context, given the relative inflexibility of wages and other domestic production costs. The politically treacherous “internal devaluation” process undertaken in Greece and other Eurozone economies in recent years illustrates the difficulties of instituting flexible prices in the domestic economy, thereby raising the attractiveness of currency devaluation to boost exports.

Competitive pricing of the domestic currency thereby acts as de facto industrial policy in economies wherever it is pursued, helping counter deficiencies in infrastructure, regulatory frameworks and other factors that may adversely impact production of tradables. Devalued exchange rates can also help avoid some of the pitfalls associated with conventional industrial policy. Although subsidies and tax policies targeted at select industries can be beneficial in terms of
increased exports, they may not be the most efficient measures and can lead to significant distortions in the country’s political economy.\textsuperscript{26} In contrast, a strategy of competitive currency valuation would uniformly impact the economy, thereby minimizing “political and economic distortions that could result from state favoritism and state intervention.”\textsuperscript{27}

\textbf{Is Undervaluation Paving the Road to Income Inequality?}

Although the above discussion highlights the advantages of a development strategy oriented around exports and currency devaluation, this particular approach should not be considered a \textit{panacea} for all developing markets. While devaluation may be valuable to overall GDP growth and the tradables sector in particular, it may also affect the income distribution in the overall economy, in turn impacting the political system and long-run social stability.

I present a simple mechanism to determine the association (and possible causal relationship) between undervaluation and inequality. The model consists of income inequality, represented by a Gini index, as the dependent variable. The primary independent variable in the model is an index measuring the extent of exchange rate undervaluation, initially developed in a study measuring the impact of undervaluation on economic growth (Rodrik, 2008). In order to get a more accurate estimate of the effect of undervaluing currencies on income inequality, I also include other confounding variables. These control variables may broadly be divided into the categories of macroeconomics (e.g. GDP), trade (e.g. exports as a percentage of GDP), financial markets (e.g. government control of banking system, index of financial repression etc.) and socioeconomic factors (e.g. social expenditures, level of education etc.). Prior to estimating the effects on inequality empirically, it is useful to consider the mechanism(s) by which currency undervaluation might influence the outcome of interest. Below, I present one such theory that might bring about a causal connection between the two variables.
Consider an economy comprising two distinct segments, manufacturing goods and nontradables. This model assumes that manufacturing goods are traded across international borders and their sales are dependent on the exchange rate at any given point of time, whereas the nontradables sector is impervious to exchange rate fluctuations. A sustained period of undervaluation is going to disproportionately benefit the manufacturing exports sector. In this scenario, the increased economic growth owing to undervaluation pushes the production possibilities frontier outwards, and at the same time the curve would skew in the direction of the exports sector. In other words, not only does the economic pie increase in overall size, but a greater portion of it accrues to the manufacturing sector that benefits disproportionately from undervaluation.

The increased exports signify sustained profits for firms in the manufacturing sector, and dependent on the ownership structures in those businesses, the profits are channeled into higher disposable incomes for the investors/management in these firms. In the case of partially or completely state-owned enterprises, those profits theoretically accumulate within national treasuries.

Exchange rate depreciation may also adversely impact inequality through other means. Rising commodity prices in domestic markets that are a direct result of undervalued currencies, in particular food and fuel costs that form a significant portion of the budget in developing countries. The reduction in real consumption among the poorer sections of society, a consequence of the undervaluation, increases overall poverty and contributes to the income gap with the tradables sector, which benefits disproportionately from the depreciated currency.

The trend towards greater income inequality may be reinforced if exchange rate undervaluation is combined with “financial repression,” marked by limits on interest rates, credit allocation restrictions, and government control of banking activities. The control exercised by the state on the financial system can lead to “concentration of investment opportunities in few hands.”
allied with major political actors, particularly in authoritarian regimes. The channeling of credit towards politically favored enterprises hampers those industries that are not as well connected to the incumbent government, hampering the supposed reductions in inequality that may result from greater access to financial markets.

In the absence of countervailing policies that redistribute profits made by the tradables sector to the general population, all of the aforementioned factors should lead to increasing disparities between the top and the bottom ends of the income distribution. We would expect this relationship to be stronger for developing nations (since they are characterized by weak social safety nets) and countries where the government has effective control over the banking and financial systems (enabling it to restrain household consumption and channel credit to manufacturing). Given these arguments I have outlined in this section, there ought to be considerable empirical evidence demonstrating the relationship between sustained currency undervaluation and rising income inequality.

DATA DESCRIPTION

The cross-country panel dataset I shall be using for empirical investigation has observations across 85 countries between the years 1973 and 2010, and my unit of analysis is country-year. The dependent variable in my empirical analysis will be a measure of income inequality. The key independent variable in the model(s) shall be an index measuring the extent of undervaluation in a currency at a given point in time. In addition to these, I include some other variables as controls to provide a more unbiased effect of undervaluation on income inequality. In order to estimate the hypothesized effect of currency undervaluation on income inequality, the following regression model will be used:
\[ Gini_{it} = \beta_0 + \beta_1 \cdot \log(\text{undervaluation})_{it} + \beta_2 \cdot Polity_{it} + \beta_3 \cdot \text{Financial Repression}_{it} + \beta_4 \cdot State \ Ownership_{it} + \beta_5 \cdot Trade_{it} + \beta_6 \cdot \text{Years Schooling}_{it} + \beta_7 \cdot \text{GDP per capita}_{it} + \alpha_i \]

(A \_i denotes fixed effects indicators for countries present in the dataset)

Assuming there are no other time-varying variables omitted from this regression model that are associated with both \( \log(\text{undervaluation}) \) and Gini coefficient, \( \beta_1 \) should provide us with an unbiased estimate of the effect of currency undervaluation on income inequality.

Alternatively, if we use sustained undervaluation as our primary independent variable instead of the aforementioned logarithmic version of the index, then our model looks like the following:

\[ Gini_{it} = \beta_0 + \beta_1 \cdot \text{Sustained Undervaluation}_{it} + \beta_2 \cdot Polity_{it} + \beta_3 \cdot \text{Financial Repression}_{it} + \beta_4 \cdot State \ Ownership_{it} + \beta_5 \cdot Trade_{it} + \beta_6 \cdot \text{Years Schooling}_{it} + \beta_7 \cdot \text{GDP per capita}_{it} + \alpha_i \]

(A \_i denotes fixed effects indicators for countries present in the dataset)

In the following paragraphs, I provide details on each of the variables in the empirical model.

**Gini Coefficient** – This is a widely recognized measure of income distribution in the social science literature. The coefficient values range between 0 and 100, with a higher coefficient indicating a greater amount of dispersion in income levels for a given country. While there exist a variety of data sources providing this information, for my research I am using the World Income Inequality Database (version 2.0c, May 2008) made available by the World Institute for Development Economics Research (UNU-WIDER). The database has compiled income inequality measures from various studies over the years, and where data on income is unavailable, the Gini coefficients have been estimated using other criteria such as expenditure and consumption levels. There are a total of 2332 observations for the Gini variable in the dataset, with values ranging from a minimum of 15.5 to a maximum of 77.6, with a mean value of 38.78 and standard deviation equal to 11.52.

**Undervaluation** – Currency undervaluation is a challenging entity in terms of measurement. Here I am using an index constructed by Rodrik (2008), one that has been referred to in other research
(Hipolit, 2013) dealing with the subject of undervaluation. The index is derived using the Penn World Tables on domestic price levels, which scales a country’s nominal exchange rate with the nation’s purchasing power parity (PPP). Then an undervaluation index is calculated by adjusting for the Balassa-Samuelson effect (Ito et al, 1999). The advantage of using an admittedly complex operationalization for currency undervaluation is that this lends itself to comparison across countries and different time-periods. It should be noted that the index being in logarithmic form makes it less sensitive to changes, and would allow interpretations to be made in percentage terms rather than absolute units. This particular dataset contains 2591 observations for the undervaluation variable, with values ranging from a minimum of -3.16 to a maximum of 1.69, a mean index of -0.061 and standard deviation equal to 1.69. Note that values less than zero indicate an overvaluation of the currency in a given year, whereas values greater than zero signal an undervaluation.

Additionally, a “sustained undervaluation”35 indicator form of this construct may be used as the primary independent variable in place of the logarithmic functional form. The indicator shall be set to 1 if the undervaluation was sustained for three consecutive years, and 0 otherwise. There are 2433 observations for this variable in the dataset, ranging from 0 at a minimum to a maximum of 1. The mean value for sustained undervaluation is 0.446, and its standard deviation is 0.497.

**Polity Score** – Polity scores are an ordinal variable denoting the extent of democratic rule in countries, taking into account the strength of institutions, constraints on executive power, and existence of individual rights. These data are collected as part of the Polity IV project researching political systems in countries dating back to 1800. My dataset contains 2562 observations ranging from -10 to +10 (a higher score indicates a greater degree of political openness). The mean and standard deviation for this indicator are 3.428 and 6.958 respectively. The Polity scores shall serve as a control variable in the model.

**Financial Repression** – The financial repression index is an ordinal variable downloaded from “A
New Database of Financial Reform” that was constructed in 2010 (Abiad et al, 2010) as a way of comparing the different forms of control on nations’ financial system that are exerted by governments. This particular index is a composite measure of multiple channels of said repression, namely credit controls, interest rate controls, entry barriers, bank regulations, privatization, capital account, and securities markets (Hipolit, 2013). While the original composite index indicating the extent of financial liberalization (Abiad et al, 2010) ranged from 0 to 21, with a higher score signifying a greater degree of openness, Hipolit (Hipolit, 2013) redefined this particular scale by multiplying the composite index by -1, thus converting the scale to one of values ranging from -21 to 0. Under this particular variable definition, higher values imply a greater degree of repression in a country’s financial system. My dataset contains 2605 observations with minimum and maximum values of -21 and 0 respectively. The mean and standard deviation for this particular index are -10.28 and 6.326 respectively.

**State Ownership of Banking System** – This variable complements the financial repression index as a barometer of the amount of control exerted by governments on the banking channel. There are 2605 observations in my dataset with values ranging from a minimum of -3 to a maximum of 0 (higher values indicate greater degree of banking system by the government). Mean and standard deviation for this particular index are -1.240 and 1.178 respectively. This will also serve as a control in the regression model.

**Trade (% of GDP)** – Trade as a percentage of gross domestic product serves as another control covariate in my empirical model. There are a total of 2078 observations available for this particular variable, and values range from a minimum of 6.32 per cent to a maximum of 428.45 per cent (standard deviation = 34.48, mean = 61.38)

**Education** – I use education across countries as one of my control variables. As a proxy for education levels, I am using the Barro-Lee dataset that provides information on average years of
total schooling (including all primary, secondary, and tertiary education) in countries. The justification for using years of schooling rather than adult literacy rates (available from the World Development Indicators database) is that years of education are a more reliable indicator of human capital stock as compared with crude literacy measures (Barro & Lee, 2010). There are a total of 1898 observations for years of schooling in the dataset with a range between 0.023 and 13.09 years (mean = 5.459 years, standard deviation = 3.12 years).

**GDP per capita** – Per capita GDP is also a control variable I use in my regression model to account for the effect of development on a country’s income inequality. The data is available in terms of constant US dollars (year = 2000) to control for inflation. There are a total of 2562 observations available in the dataset ranging from a minimum of US$ 102.29 to a maximum of US$ 40,617.84, with a mean of US$ 6,890.52 and standard deviation equal to 8,873.39.

**Country and Time Fixed Effects** – To remove bias associated with time-invariant country characteristics, I use indicator variables known as “fixed-effects” dummies. These dichotomous variables help control for any country-level attributes (E.g. geographical location) that do not change over time. Additionally, I include indicator variables representing all years for which there are observations i.e. “time fixed effects”. This would let the model control for characteristics that affected all countries in the same manner at a given point in time (E.g. international oil shocks and financial crises).

**ANALYSIS**

Tables A through D in the appendix present a snapshot of descriptive statistics described in the previous section. I have also provided additional correlation plots between undervaluation and some key variables from the empirical model. The statistically significant and positive correlation between log (undervaluation) and Gini provides hints of the causal effect that I will be exploring fully in this
section of the paper. Of interest to the reader may also be some of the other correlations, including
a negative association between Gini and Polity scores, suggestive of a relationship between increased
representative rule and lesser inequality. The education variable is also negative correlated with
income inequality, indicating that more years of schooling could help ameliorate income disparities.

I began the empirical analysis of my research question by considering linear regression
results from a pooled cross-sectional model, wherein all country-year observations are assigned the
same predictive power. The model contains the Gini index as the dependent variable, and the
primary independent variable is a ‘sustained undervaluation’ indicator. This dichotomous variable is
set to one if the observation in question has an undervaluation index that is greater than zero, and is
also part of a consecutive three-year period where the country’s currency was undervalued. If either
of these conditions is not met, the sustained undervaluation indicator is set to zero. This particular
functional form of the undervaluation variable is intended to reduce “noise associated with one-time
depreciations linked to a currency crisis,”36 which may bias the estimated effect of undervaluation on
inequality. The cross-sectional model controls for other factors expected to impact income
inequality, namely democracy (represented by Polity score), financial repression, state ownership of
banking, trade, and education levels. The results of this pooled cross-sectional model, displayed
under the ‘Model I’ column of Table 1, show that sustained undervaluation has a statistically
significant effect on income inequality,37 and the coefficient’s positive sign and magnitude indicate
that there is a difference of 5.053 units in the Gini coefficient between countries that experienced
sustained undervaluation and those that did not undergo such undervaluation of their currency. In
other words, on average undervalued currencies are associated with increased income inequality, a
result that is consistent with my hypothesis. Additionally, of the other covariates included in this
model, we see that only education has a statistically significant impact on income inequality. The
standard errors calculated in this model also account for heteroskedasticity among the observations.
Although the standard errors may have been overestimated due to problems of autocorrelation, various visual and statistical tests on the model's residuals revealed that this is unlikely to be the case with this particular cross-sectional model. This obviates the need for statistical techniques such as the Newey-West estimator that are employed for obtaining more precise standard errors.

However, we cannot deduce a definitive causal effect of undervaluation on income inequality based on a naïve pooled cross-sectional regression, since there could be other factors omitted from this model that are associated with both inequality and undervaluation. If that were the case, the aforementioned parameter estimate off sustained undervaluation on inequality would be biased in a particular direction. To obtain a more accurate estimate on the undervaluation coefficient, we would need to account for some, if not all, of the endogeneity. I attempt to accomplish this through a model specification that includes country and time fixed effects. Prior to running the full fixed regression, I was able to determine that the country fixed effects did not have a statistically significant impact on the overall model through a Hausmann-Taylor test. Therefore, for my fixed effects specification listed in Model II of Table 1, I have only included the time fixed effects in the regression.

The results of this fixed effects specification demonstrate that sustained undervaluation leads to an increase in income inequality, and that this effect is statistically significant. Specifically, the model tells us that on average countries experiencing sustained undervaluation have a Gini index that is 2.96 units higher than for nations that have not undergone such undervaluation. This is consistent with my hypothesis linking currency undervaluation to increased inequality. Although the magnitude of coefficients for the other covariates specification is different in the fixed effects specification when compared to the pooled cross-sectional model, the sign and significance (or lack thereof) for each of them are similar. This fixed effects specification does allow us to claim that sustained undervaluation of currency leads to increased income inequality. A crucial assumption
underlying the assertion is that no other *time-variant* characteristics, affecting both undervaluation and inequality, have been omitted from this model, lending support to my hypothesis.\footnote{41}

Following standard practice in country-level macroeconomic analysis, I collapsed the individual country-year observations into 5-year periods between 1973 and 2010\footnote{42} for further exploration of the link between undervaluation and inequality. As in the original dataset of annual observations, I considered a pooled cross-sectional data model with Gini as the dependent variable, sustained undervaluation (as defined previously) as the primary independent variable, and all of the other controls that were also listed in Table 1. I provide the regression results with the collapsed 5-year window observations in the Model I column of Table 2. As expected, sustained undervaluation has a statistically significant impact on income inequality\footnote{43} in the collapsed version of the dataset, although the magnitude of this effect is less than was the case in the non-collapsed version from Table 1. The results of this cross-sectional regression may be interpreted such that the Gini coefficient for countries experiencing sustained undervaluation of the currency is 4.893 units higher on average than in countries that did not undergo sustained devaluation. This bolsters the relationship proposed in my research question.

Additionally, I also examined results from a pooled cross-sectional model that contained a “lagged” Gini indicator as an independent variable. The value of this “lagged” variable is the Gini index for a country in the previous time period (in this case, the last 5-year window). The purpose of this exercise is to ascertain any potential bias in the parameter estimate of sustained undervaluation in the absence of lagged Gini, given support for the theory of persisting income inequality within the literature.\footnote{44}
Table 1: Regression Results (Full Dataset)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Model I</th>
<th>Model II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustained Undervaluation</td>
<td>5.053**</td>
<td>2.965*</td>
</tr>
<tr>
<td></td>
<td>(1.335)</td>
<td>(1.546)</td>
</tr>
<tr>
<td>Polity Score</td>
<td>-0.144</td>
<td>0.068</td>
</tr>
<tr>
<td></td>
<td>(0.161)</td>
<td>(0.128)</td>
</tr>
<tr>
<td>Financial Repression</td>
<td>-0.024</td>
<td>-0.204</td>
</tr>
<tr>
<td></td>
<td>(0.182)</td>
<td>(0.177)</td>
</tr>
<tr>
<td>State Owned Banking</td>
<td>-0.937</td>
<td>-0.283</td>
</tr>
<tr>
<td></td>
<td>(0.671)</td>
<td>(0.572)</td>
</tr>
<tr>
<td>Trade (% of GDP)</td>
<td>-0.023</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.0353)</td>
</tr>
<tr>
<td>Education</td>
<td>-1.728**</td>
<td>-1.548**</td>
</tr>
<tr>
<td></td>
<td>(0.416)</td>
<td>(0.551)</td>
</tr>
<tr>
<td>Constant</td>
<td>51.74**</td>
<td>46.57**</td>
</tr>
<tr>
<td></td>
<td>(2.417)</td>
<td>(3.496)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>234</td>
<td>211</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.253</td>
<td>0.134</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Time Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: Heteroskedasticity-robust standard errors are provided in parentheses
* Coefficient is significant at 0.05 level or higher
** Coefficient is significant at 0.01 level or higher

The results of the pooled cross-section that includes such a lagged variable are provided in Model II of Table 2. By including the lagged Gini indicator in our model, we find that the effect of sustained undervaluation on inequality is considerably reduced, though it still exhibits a positive sign and is statistically significant at the 1 per cent level. When accounting for the Gini coefficient in previous time-periods, we find that countries with sustained currency undervaluation on average have a present-day Gini coefficient that is 2.034 units higher than countries that do not persistently undervalue their currencies. The correlation coefficient on the “lagged” Gini indicator in Model II is also statistically significant and positive in magnitude, indicating a small but significant effect on previous income inequality on contemporary inequality levels, thus providing empirical support for the inequality persistence argument.
Table 2: Regression Results (5-Year Windows)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged Gini</td>
<td>-</td>
<td>0.823**</td>
<td>0.665**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.042)</td>
<td>(0.057)</td>
</tr>
<tr>
<td>Sustained Undervaluation</td>
<td>4.893**</td>
<td>2.304**</td>
<td>1.699^</td>
</tr>
<tr>
<td></td>
<td>(1.102)</td>
<td>(0.818)</td>
<td>(0.988)</td>
</tr>
<tr>
<td>Polity Score</td>
<td>-0.137</td>
<td>-0.062</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.111)</td>
<td>(0.112)</td>
<td></td>
</tr>
<tr>
<td>Financial Repression</td>
<td>0.173</td>
<td>0.012</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.126)</td>
<td>(0.136)</td>
<td></td>
</tr>
<tr>
<td>State Owned Banking</td>
<td>-1.918**</td>
<td>0.447</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(0.533)</td>
<td>(0.512)</td>
<td></td>
</tr>
<tr>
<td>Trade (% of GDP)</td>
<td>-0.013</td>
<td>-0.132</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.011)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Education</td>
<td>-1.424**</td>
<td>0.016</td>
<td>-0.520</td>
</tr>
<tr>
<td></td>
<td>(0.296)</td>
<td>(0.291)</td>
<td>(0.226)</td>
</tr>
<tr>
<td>Constant</td>
<td>50.076**</td>
<td>8.396**</td>
<td>16.62**</td>
</tr>
<tr>
<td></td>
<td>(1.831)</td>
<td>(2.576)</td>
<td>(3.173)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>322</td>
<td>213</td>
<td>214</td>
</tr>
<tr>
<td>R²</td>
<td>0.278</td>
<td>0.781</td>
<td>0.115</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Time Fixed Effects</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: Heteroskedasticity-robust standard errors are provided in parentheses

^ Coefficient is significant at 0.10 level or higher
* Coefficient is significant at 0.05 level or higher
** Coefficient is significant at 0.01 level or higher

Subsequently, I considered various model specifications involving country and time fixed effects, as these would help me control for time-invariant characteristics that may be biasing the sustained undervaluation coefficient obtained in the previous cross-sectional regressions. Based on the aforementioned Hausman-Taylor test, it was determined that country-level fixed effects do not have a statistically significant impact on the regression model, therefore I included only time fixed effects in these type of model specifications. It should be noted that when I included all of the covariates from the pooled cross-sectional model, sustained undervaluation had no statistically significant impact on income inequality, although the coefficient did exhibit a positive sign.
I proceeded with the analysis by omitting selected variables from the list of controls that were used in the cross-sectional models. Results of a fixed effects specification have been published in Model III of Table 2, where the correlation coefficient on sustained undervaluation is positive and statistically significant at the 0.10 levels, indicating that countries with sustained undervaluation experience a Gini coefficient that is on average 1.699 units higher than those without undervalued currencies. However, this association is not robust to the inclusion of indicators on democracy (Polity score), financial repression, and state ownership of the banking system, since those controls have been omitted from this particular specification. The results in Model III of Table 2 indicate that the causal effect of undervaluation on inequality may not be as unambiguous as previously asserted. More robust econometric models are required for obtaining confirmation of a statistically significant relationship effect of undervaluation on income inequality.

An Arellano-Bond dynamic panel system GMM estimator is useful for researchers confronted with issues related to panel data analysis, namely endogenous error terms, autocorrelation, heteroskedasticity, and ambiguity on the direction of causality. This technique may also be useful for our purposes as the number of time slices in my panel dataset is considerably smaller than the number of countries.

I evaluated three distinct models using this type of estimator, and the regression results are available in Table 3. As with earlier models, all three specifications consist of Gini index as the dependent variable and sustained undervaluation as the primary independent variable. Model I, however, omits the “lagged” Gini index as a control variable, whereas Model II includes it in the list of covariates. For Models I and II, the sustained undervaluation coefficient is significant at the 0.05 and 0.1 levels respectively. The magnitude of the effect on income inequality is reduced if the model accounts for “lagged” Gini, consistent with the earlier specifications. It is noteworthy that the statistically significant correlation between sustained undervaluation and inequality in the dynamic
panel model endures even after controlling for Polity scores, financial repression and measures of state ownership of the banking system. Both of these system GMM estimator models reinforce my hypothesis of undervaluation causing a rise in income inequality.

Table 3: Arellano-Bond Dynamic Panel GMM Estimators (5-Year Windows)

<table>
<thead>
<tr>
<th>Dependent Variable: Gini</th>
<th>Independent Variable</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged Gini</td>
<td>-</td>
<td>0.501**</td>
<td>(0.188)</td>
<td>0.446**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.632)</td>
<td>(2.081)</td>
<td>(1.760)</td>
</tr>
<tr>
<td>Sustained Undervaluation</td>
<td></td>
<td>3.878^</td>
<td>(2.013)</td>
<td>4.479**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.115)</td>
<td>(0.154)</td>
<td></td>
</tr>
<tr>
<td>Polity Score</td>
<td>-0.318</td>
<td>-0.096</td>
<td>-0.098</td>
<td>(0.154)</td>
</tr>
<tr>
<td></td>
<td>(0.187)</td>
<td>(0.134)</td>
<td>(0.154)</td>
<td></td>
</tr>
<tr>
<td>Financial Repression</td>
<td>0.387</td>
<td>0.164</td>
<td>0.544</td>
<td>(0.339)</td>
</tr>
<tr>
<td></td>
<td>(0.393)</td>
<td>(0.356)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Owned Banking</td>
<td>-2.782</td>
<td>-0.651</td>
<td>-1.114</td>
<td>(1.170)</td>
</tr>
<tr>
<td></td>
<td>(0.793)</td>
<td>(1.199)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade (% of GDP)</td>
<td>-0.031</td>
<td>-0.015</td>
<td>-0.031</td>
<td>(0.029)</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.041)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-0.934</td>
<td>-0.435</td>
<td>-0.959^</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.667)</td>
<td>(0.607)</td>
<td>(0.569)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>48.88**</td>
<td>22.86*</td>
<td>38.58**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.783)</td>
<td>(9.970)</td>
<td>(8.389)</td>
<td></td>
</tr>
<tr>
<td>Number of Observations</td>
<td>329</td>
<td>213</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>7.86</td>
<td>13.57</td>
<td>35.83</td>
<td></td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Time Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Low-Income Countries Inclusive</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Note: Heteroskedasticity-robust standard errors are provided in parentheses

^ Coefficient is significant at 0.10 level or higher
* Coefficient is significant at 0.05 level or higher
** Coefficient is significant at 0.01 level or higher

Additionally, I have also experimented with the model by looking at the effects of sustained undervaluation on income inequality for countries at different stages of development. As an example of that, the Model III column in Table 3 provides regression results after excluding countries defined as “low-income” in the given 5-year timeframe. It is noteworthy that the estimated effect of sustained undervaluation on inequality increases in magnitude after observations for low-income
countries are removed. Moreover, the statistical significance of this correlation is greater in Model III as compared to Model II.\textsuperscript{50} This is suggestive of the relationship being stronger for countries that are in the middle-income or upper-income groups, lending support to a non-linear relationship involving income, undervaluation, and income distribution.

To summarize, my empirical analysis using cross-country datasets appears to confirm the hypothesis that exchange rate undervaluation leads to a rise in income inequality levels. The results are consistent with various regression specifications, including pooled cross-sectional data, panel data with time fixed effects and system GMM estimators. The relationship is also robust to the inclusion of other control variables, including “lagged” Gini coefficients, democracy indicators, financial repression, government control of banking, trade, and education levels.

**POLICY IMPLICATIONS**

A development strategy built around currency devaluation and manufacturing exports holds obvious appeal for low and middle-income countries, where governments are looking for ways to boost their populations’ living standards. The relationship between undervaluation and increased income inequality that has been explored in this paper, however, ought to give pause to public policy practitioners chasing the prospect of rapid growth by employing depreciation as a tool of industrial policy. A direct consequence of such an approach to development is an excessively powerful exporting sector that tends to profit disproportionally, with the rest of the economy lagging behind.

The implications of my argument linking undervaluation with income inequality depend on how political systems and social institutions respond to the specter of widening inequality. Based on their cross-country research, Alesina and Perotti (1996) concluded that rising inequality contributes to “increased socio-political instability which in turn decreases investment.”\textsuperscript{51} Others authors such as Glaeser (2005) have argued that unequal societies have governments that do not behave in a
Democratic manner, or may not respect property rights that are the basis of modern capitalist societies. Alesina and Angeletos (2005), in their research on redistribution policies in Western Europe and the United States, have claimed that higher levels of income inequality adversely affect perceptions of fairness. In highly unequal societies where people do not believe that income is mainly the result of individual initiative, but rather is dependent on elements of luck, bribery or familial connections, there will likely be a clamor for higher taxes, leading to higher deadweight losses and a reduction in economic well being. Meanwhile, Stiglitz (2012) points out that higher inequality reduces investments in human capital development, thereby affecting economic growth prospects.

There has also been extensive research regarding the long-term effects of inequality on the development process. In an analysis of factor endowments in the development process, Sokoloff and Engerman (2000) stressed the role of inequality levels in shaping long-run prosperity. Support for this hypothesis has been provided by Easterly (2007), where the author emphasizes the relationship between inequality and heightened barriers to educational attainment, institutional development, and shared economic prosperity.

The above discussion hints at a tradeoff wherein currency undervaluation leads to increased growth in the short run, but the resulting rise in inequality may generate instability in the long term, perhaps accompanied by stunted economic development. Faced with this tradeoff, one might expect that governments in countries following this particular development model would step in with redistributive measures to ameliorate widening income disparities.

However, an important piece of research suggests that the incentives for governments, particularly in authoritarian systems, may not lie in that direction. Freeman and Quinn (2012) unearthed evidence linking political transitions to integration with global financial markets, asserting that nations with autocratic governments, high inequality, and assimilated financial systems were
more likely to transition into democracy.\textsuperscript{57} Given that sustained currency undervaluation is typically a feature of authoritarian regimes,\textsuperscript{58} this raises the question of which interest groups benefit the most from democratization, and whether opening up of the political system is actually a way of entrenching power and influence for political elites and their allies in the business community. A perfunctory analysis of democratic transformations in recent decades, such as those in Taiwan and South Korea, reveal some recognizable patterns. Changes in the political institution within these countries were preceded by an extended period of export-led economic growth that boosted the fortunes of firms closely allied with national governments (E.g. Korean \textit{chaebol} conglomerates). Notwithstanding the opening up of domestic financial markets and establishment of property rights, and gradual dismantling of political controls, government and business elites have managed to retain a preeminent position within the political economy. Given these similarities and the empirical evidence unearthed in this paper, a question that should be asked by policymakers is whether currency undervaluation strategies are the best route to rapid growth for underdeveloped markets, or whether implicit subsidy to a sector of the economy is setting the stage for the entrenchment of the dictatorial regime, with the assumed gains accruing at the expense of the general welfare of the public? The rise in income inequality adversely affects economic and political stability, and impedes human development in the long term.

\textsuperscript{5} Kuznets, Simon. 1955. Economic Growth and Income Inequality. \textit{American Economic Review}, Volume 45, Number 1, p.17
\textsuperscript{6} Kuznets, Simon. 1955. Economic Growth and Income Inequality. \textit{American Economic Review}, Volume 45, Number 1, p.17
30 Ivanic, Maros & Martin, Will. 2008. Implications of higher global food prices for poverty in low-income countries. Agricultural Economics, 39 No. s1, pp. 405-416
37 Coefficient on sustained undervaluation has p-value < 0.001
38 Plotting the residuals over time did not expose patterns of autocorrelation. The Pearson’s R coefficient between the residuals and lagged residuals is a small negative value that is not statistically significant at the 90 per cent level.
40 The p-value for sustained undervaluation when including time fixed effects is just above 0.055, demonstrating the coefficient’s significance at the near 95 per cent level.
41 Note that running a similar specification that included both country and time fixed effects yielded the exact coefficients and standard errors as noted in Model II. I have chosen not to publish those results to avoid redundancy.
42 In the collapsed version of the dataset, there are a total of eight 5-year windows. The first window is for observations between the years of 1973 and 1975; the second one is for rows between 1976 and 1980, and so on, until the final 5-year window for observations between 2006 and 2010.
43 The coefficient on sustained undervaluation has a p-value of less than 0.001.
45 Coefficient for sustained undervaluation has p-value equal to 0.086.
The $p$-values for sustained undervaluation parameter estimate in Model I and Model II are 0.039 and 0.064 respectively.

I define a country as “low-income” if the per-capita income does not exceed an average of $1,000 in a five-year period (amounts calculated in US dollars for the year 2000).

The $p$-value for the sustained undervaluation parameter estimate increases from 0.064 in Model II to 0.012 in Model III.


## APPENDIX

Table A: Descriptive Statistics for Key Variables (Full Dataset)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini</td>
<td>1810</td>
<td>38.78</td>
<td>11.31</td>
<td>15.5</td>
<td>77.6</td>
</tr>
<tr>
<td>Undervaluation</td>
<td>2591</td>
<td>-0.061</td>
<td>0.500</td>
<td>-3.16</td>
<td>1.69</td>
</tr>
<tr>
<td>Sustained Undervaluation</td>
<td>2433</td>
<td>0.446</td>
<td>0.497</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Polity Score</td>
<td>2562</td>
<td>3.428</td>
<td>6.958</td>
<td>-10</td>
<td>10</td>
</tr>
<tr>
<td>Financial Repression</td>
<td>2605</td>
<td>-10.28</td>
<td>6.326</td>
<td>-21</td>
<td>0</td>
</tr>
<tr>
<td>State Ownership of Banking</td>
<td>2605</td>
<td>-1.24</td>
<td>1.178</td>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>Trade (% GDP)</td>
<td>2530</td>
<td>61.38</td>
<td>34.48</td>
<td>6.32</td>
<td>428.45</td>
</tr>
<tr>
<td>Years of Schooling</td>
<td>1163</td>
<td>6.594</td>
<td>2.91</td>
<td>0.088</td>
<td>13.09</td>
</tr>
<tr>
<td>GDP per capita (Year 2000 US Dollars)</td>
<td>2562</td>
<td>6,890.52</td>
<td>8,873.39</td>
<td>102.29</td>
<td>40,617.84</td>
</tr>
</tbody>
</table>

Table B: Descriptive Statistics for Key Variables (Consolidated 5-Year Periods)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini</td>
<td>631</td>
<td>40.1</td>
<td>11.14</td>
<td>16.6</td>
<td>76.6</td>
</tr>
<tr>
<td>Undervaluation</td>
<td>465</td>
<td>-0.036</td>
<td>0.489</td>
<td>-2.860</td>
<td>1.420</td>
</tr>
<tr>
<td>Sustained Undervaluation</td>
<td>532</td>
<td>0.441</td>
<td>0.468</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Polity Score</td>
<td>459</td>
<td>3.579</td>
<td>6.757</td>
<td>-10</td>
<td>10</td>
</tr>
<tr>
<td>Financial Repression</td>
<td>465</td>
<td>-10.48</td>
<td>6.324</td>
<td>-21</td>
<td>0</td>
</tr>
<tr>
<td>State Ownership of Banking</td>
<td>465</td>
<td>-1.251</td>
<td>1.156</td>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>Trade (% GDP)</td>
<td>453</td>
<td>62.10</td>
<td>34.63</td>
<td>10.82</td>
<td>397.1</td>
</tr>
<tr>
<td>Years of Schooling</td>
<td>774</td>
<td>6.452</td>
<td>2.866</td>
<td>0.447</td>
<td>12.75</td>
</tr>
<tr>
<td>GDP per capita (Year 2000 US Dollars)</td>
<td>458</td>
<td>6,926</td>
<td>9,016</td>
<td>111.36</td>
<td>39,079</td>
</tr>
</tbody>
</table>
### Table C: Correlations Among Key Variables (Full Dataset)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervaluation (2)</td>
<td>0.06*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polity Score (3)</td>
<td>-0.28**</td>
<td>0.16**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Repression (4)</td>
<td>0.23**</td>
<td>-0.04*</td>
<td>-0.49**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Owned Banks (5)</td>
<td>0.06*</td>
<td>0.09**</td>
<td>-0.30**</td>
<td>0.70**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade (% GDP) (6)</td>
<td>-0.19**</td>
<td>0.19**</td>
<td>0.11**</td>
<td>-0.35**</td>
<td>-0.31**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of Schooling (7)</td>
<td>-0.44**</td>
<td>0.15**</td>
<td>0.64**</td>
<td>-0.69**</td>
<td>-0.46**</td>
<td>0.38**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GDP per capita (8)</td>
<td>-0.56**</td>
<td>-0.20**</td>
<td>0.39**</td>
<td>-0.41**</td>
<td>-0.12**</td>
<td>0.19**</td>
<td>0.44**</td>
<td>1</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level or higher
** Correlation is significant at the 0.01 level or higher
Table D: Correlations Among Key Variables (5-Year Periods)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undervaluation (2)</td>
<td>0.06*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polity Score (3)</td>
<td>-0.28**</td>
<td>0.16**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Repression (4)</td>
<td>0.23**</td>
<td>-0.04*</td>
<td>-0.49**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Owned Banks (5)</td>
<td>0.06*</td>
<td>0.09**</td>
<td>-0.30**</td>
<td>0.70**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade (% GDP) (6)</td>
<td>-0.19**</td>
<td>0.19**</td>
<td>0.11**</td>
<td>-0.35**</td>
<td>-0.31**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of Schooling (7)</td>
<td>-0.44**</td>
<td>0.15**</td>
<td>0.64**</td>
<td>-0.69**</td>
<td>-0.46**</td>
<td>0.38**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GDP per capita (8)</td>
<td>-0.56**</td>
<td>-0.20**</td>
<td>0.39**</td>
<td>-0.41**</td>
<td>-0.12**</td>
<td>0.19**</td>
<td>0.44**</td>
<td>1</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level or higher
** Correlation is significant at the 0.01 level or higher
Figure 1: Correlation Plot of Gini Index and Undervaluation

Figure 2: Correlation Plot for Gini Index and Polity Score
Figure 3: Correlation Plot for Gini Index and Lagged Gini

Figure 4: Correlation Plot for Gini Index and Education
BIBLIOGRAPHY


Ivanic, Maros and Martin, Will. 2008. Implications of higher global food prices for poverty in low-income countries. *Agricultural Economics*, 39 No.s1, pp. 405-416


