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1. Introduction

Equality was one of the lofty goals sought by socialists during Communism in Central and Eastern Europe. It is a commendable aim but proved unrealistic, even though levels of income inequality in those countries were much lower during the Communist era than they are at present (Milanovic 1998, 40). Decreasing levels of inequality is an important issue but how should it be addressed in the context of different countries? Do differences between countries materially impact inequality? This paper will seek to show that, in terms of transition economies, different income categories of countries experience different relationships between income inequality and its contributing factors. This study will first test the issue of income inequality to show that the income category, as determined by the World Bank’s Atlas Method, does make a difference in income inequality. It will then show that there are different relationships between income inequality and its contributing factors depending on the particular income category.

These findings may be used to aid in the creation of sound policy to decrease income inequality in transition economies.

Before delving into statistical modelling and analysis, transition economies and income inequality will be discussed in order to improve understanding of the issue at hand. The overview of transition economies describes the Communist system and its collapse in the Former Soviet Union (FSU) and Central and Eastern European (CEE) countries, as well as provides a description of the transition period reforms and policies. Some of the negative outcomes of the transition process, their causes and the differences in outcomes across countries will also be discussed. Next, a literature review that follows a general-to-specific format will summarize the literature with respect to income inequality overall, income inequality in developing countries, and income inequality in transition economies. A theoretical overview follows, which is
presented in order to describe the variables that are going to be used in the model. The variables are divided into five categories: economic; demographic; political; cultural and environmental; and macroeconomic. The associated variables for each category are described on their own as well as in relation to income inequality.

The empirical basis of the study is discussed in sections 5 and 6. The countries and their associated income categories are outlined, followed by a description of the dataset, including relevant information such as sources, measurement, potential data issues, and expected relationships with income inequality. The methodology delineates each step of the empirical process. This includes the selection of Gini coefficients\(^1\), model estimation techniques, and the tests to determine which technique produced the optimal model.

Finally, the results from the statistical modelling are explained and analyzed. The results from three estimation techniques are given as well the results from three tests. The results from the preferred model are examined in detail: the coefficients are analyzed, followed by a detailed description of the results obtained for each income group. In the final section, conclusions are drawn and future research on the subject is proposed. The supporting information for sections 2, 3, and 4 is included in the Appendices along with full STATA results from the estimation of the various models.

\(^1\) The Gini coefficient is a measure of income inequality. It is further described in section 5.2.
2. Overview of Economic Transition in Central and Eastern European Countries

What are the outcomes of economic transition from a centrally planned system to a market economy? This question has been the subject of considerable research and debate since the transition started in the early 1990s. This section gives an overview that provides both the framework and the foundation for the rest of this study. The main features of both the socialist system and the process of transition are outlined, with particular emphasis on privatization. Various outcomes from the transition process that are related specifically to this study are discussed. The issue of income inequality within this setting is only mentioned briefly as it will undergo further analysis in section 3.

Socialist countries share three common features: a single ruling party controls the economy, the means of production are owned collectively, and the economy is coordinated by central planning (Lavigne 1999, 3). The socialist system broke down, according to Lavigne, initially due to political revolution which lead to events such as the fall of the Berlin Wall and the Polish election of a non-communist party in 1989 (1999). There were also various economic factors contributing to the system’s collapse. The centrally planned system had inherent flaws, such as declining growth and low productivity of both labour and capital (Lavigne 1999, 92). The implementation of perestroika, which resulted in enterprises gaining more rights, destabilized the economy to the point of crisis in 1989 (Lavigne 1999, 95). The system’s collapse started a transition process wherein countries shifted away from central planning and Communism while moving towards capitalism and democracy. While this shift encompasses political, economic, and social spheres of each country, this study focuses predominantly on the
economic aspects of the issues while still incorporating the political and social aspects into the empirical model.

The transition period has seen two main categories of reforms, as outlined by Lavigne (1999). One involves stabilisation policies, such as price liberalization, foreign trade liberalization, convertibility of currency, and overall macroeconomic stabilization. The other involves structural policies, such as privatization, banking reform, and free competition rules in the market. One structural reform that was and is particularly important is privatization, which is broadly defined as “all measures contributing to the de-statistisation of economic activity” (Lavigne 1999, 163), that is, measures that shift economic activity away from the control of the state. Private sector organizations have higher levels of productivity than state-run organizations (Fischer and Sahay 2000, 19), which would positively impact the low levels of productivity seen under central planning.

These policy packages were in accordance with the Washington Consensus and implemented under the guidance of the International Monetary Fund and the World Bank. Countries undergoing the transition were generally offered the same bundle of stabilization and structural policies at the start of the transition period yet the countries took varying approaches. There were differences in the sequence of policy implementation based upon each country’s perspective on the optimal interaction between policies. The speed of transition also differed as some countries took the rapid ‘shock therapy’ approach while others favoured the gradualist approach (Lavigne 1999, 119).

On the whole, many of the outcomes from the stabilization and structural measures were less successful than anticipated, as illustrated by the large declines in output. The reduction in output, known as the transformational recession, persisted for long periods of time. The
transformational recession lasted 2 to 3 years for CEE countries, while lasting 5 to 10 years for FSU countries (Popov 2007, 2). As of 2002, on average, transition economies had only recuperated to the point of producing 84 percent of pre-transition output levels (Zagha and Nankani 2005, 31). The initial decline in output in transition economies is attributed to several causes: the initial economic conditions (Fischer and Sahay 2000, 15), particularly due to issues such as over-industrialization (Berg et al. 1999, 53); war during the start of the transition period (Berg et al. 1999, 41); and adverse supply shocks caused mainly by post-deregulation price changes (Popov 2007, 2). This decrease in output, however, was not uniform across all transition countries, as shown in Figure 2.1.

**Figure 2.1: Output Profile in Transition Economies (Real GDP) index 1989 = 100**

*Source: Fischer and Sahay 2000, 19*

The literature outlines different factors that explain this cross-country variation in declines in output. One explanation is the differences in structural reforms (Berg et al. 1999, 53). The FSU, for example, had slower initial rates of structural reform (Fischer and Sahay 2000, 15) than the CEE countries, which may explain their larger drop in output. Some research, such as the study by Berg et al. (1999), shows that initial economic conditions did not have as much of

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2 FSU denotes the same countries as OFSU in Figure 2.1
an effect on the difference in output decreases because various countries with poor initial 
conditions, such as Poland, overcame their situation through policy reform (Berg et al. 1999, 38).
Other studies do indicate that initial economic conditions did have an impact on the reduction in 
output. The reduction was caused by the distortions created by the centrally planned system, such 
as overly large agricultural farms and over-industrialization (Popov 2007, 2). Institutional 
collapse also deepened and lengthened the transformational recession because the state was 
unable to execute its traditional functions or enforce regulations (Popov 2007, 3).

Apart from the negative impact on economic conditions, the transition process also had 
negative impacts on social conditions. The Human Development Index dropped between 1990 
and 1995 for all countries except Poland (Lavigne 1999, 150). Citizens faced decreases in public 
expenditure paired with losses in social safety nets and rising unemployment (UNICEF 1999, 5). 
The MONEE Project, through the United Nations Children’s Fund (UNICEF), found that 
education suffered, with both funding and quality decreasing. The level of health of these 
countries also decreased, with many transition countries facing health crises and the spread of 
new epidemics like HIV/AIDS (1999). Beyond this, the MONEE Project claims that more 
children lived in poverty at the time of publication than before the start of the transition process 
(1999).

Yet another negative outcome stemming from the transition process is the increase in 
income inequality. Prior to transition, socialist countries in Europe enjoyed income distributions 
that were more equitable than those seen in most capitalist economies, reporting Gini coefficients 
below those of member countries of the Organization for Economic Co-operation and 
Development (OECD) and other countries at comparable levels of development (Milanovic 
1998, 15). Since the transition process started, however, income inequality has on average
increased and has shown increased dispersion, as displayed in Figure 2.2. The importance of income inequality as a whole, for developing countries, and specifically for transition economies is discussed more fully in section 3.

**Figure 2.2: Gini Coefficient Over Time in 13 Transition Economies**

*Data Source: Transition Report 2011*
3. Literature Review

Income inequality, which is the unequal distribution of income among households (Todaro and Smith 2009, 826), is an important issue within the study of economic development. Countries with greater income inequality are disadvantaged in that the richer segments of that population hold a much larger share of a country’s wealth in comparison to the poorer segments of that population (Todaro and Smith 2009, 826). Precise measurement of income inequality is important and any measurement must satisfy four criteria: the anonymity principle, where it does not matter who earns what income; the population principle, where it does not matter what size the population is; the relative income principle, where only relative incomes are of importance; and the Dalton principle, where “if one income distribution can be achieved from another by constructing a sequence of regressive transfers, then the former distribution must be deemed more unequal than the latter” (Ray 1998, 177). The Gini coefficient, a frequently-used measure of inequality, satisfies these four criteria. It is the measure of income inequality used in this study and is described in greater detail in section 5.2. Other measures include: size distributions, dividing the population into quintiles or deciles; Lorenz curves, which plot the percentage of income recipients against percentage of total income; and functional distributions, which compare income gained through labour with income gained through interest, rent, and profit (Todaro and Smith 2009, 216).

The root of much of the study on income inequality is found in Kuznets’ 1955 “Economic Growth and Income Inequality”. This seminal text is based mainly on speculation, as Kuznets himself admits in the conclusion, as there was a paucity of empirical information at the time. It offers an attempt at explanation by studying the effects of savings and the shift from the agricultural to the industrial sector. It also compares income inequality in developed versus
developing countries, providing a logical, speculative argument that income levels would be more unequal in underdeveloped countries due to the disproportionate income share of the highest income bracket. As this paper seeks to show and as found in various academic papers, Kuznets recognizes that there are differences in income inequality across different stages of economic growth (Kuznets 1955, 22-23).

Subsequent research has built upon Kuznets’ work, looking at changes in income inequality both in terms of how it changes throughout a country’s economic growth process and studying what factors have an impact on inequality. Some studies, which have used higher quality datasets than those datasets available to Kuznets, have found that there is no strong link between inequality and growth, instead finding strong relationships between growth and poverty (Deininger and Squire 1996, 565). Studies focusing on impacting factors have found mixed results when studying a group of countries, as factors may have different effects on income inequality depending on the country or group used. For example, when researching a potential relationship within OECD countries between inequality and imports of manufactured goods, a relationship was found when the group of countries included non-European countries but the relationship did not exist if these countries were not included in the sample (Gustafsson and Johansson 1999, 600).

Much of the recent study on income inequality has been more focused than the broad work of Kuznets and other pioneers in this field of research. The following sections track important findings in increasingly focused areas, by first looking at income inequality within developing countries, and then delving deeper into studies on income inequality within transition economies.
3.1 Income Inequality in Developing Countries

The study of income inequality is of particular importance within the context of developing countries because of the effect of income inequality on an economy. The economically damaging effects are more severe for developing countries because they already have weak economies and significant poverty rates. Income inequality can cause economic inefficiencies within a country: less people can qualify for credit, due to their lack of collateral; savings will be lower, as the middle class has the highest average savings rate and it represents a small group in these countries; and there will be an inefficient allocation of assets, for example, the rich will own the majority of the land (Todaro and Smith 2009, 223). Income inequality is also detrimental to the social and political spheres of a country as it can increase socio-political instability (Park 1996, 87) and facilitate rent-seeking behaviour including cronyism and bribery (Todaro and Smith 2009, 223).

Often, as economic growth is important to developing countries, income inequality is studied in terms of its relationship to growth. There is no consensus, however, on the impact of income inequality on growth within Third World countries. Some studies have shown a strong positive correlation between the two (Samanta and Heyse 2006, 252) whereas others argue that high enough inequality can reduce growth (Ravallion 1997, 56), thus yielding a negative correlation. Ravallion, in the same 1997 study, also showed that countries with high levels of income inequality gain less from economic growth in terms of poverty alleviation as the impact on absolute poverty is reduced. The impact of growth on income inequality is also unclear. Empirical evidence has shown that changes in income distribution are generally not correlated with growth, as in roughly half of the cases inequality increases and in the other half, it decreases (Bruno, Ravallion, and Squire 1998, 138).
Not only is it challenging to form solid conclusions about a relationship between income inequality and growth, it is also difficult to form general conclusions about income inequality in developing countries. Differences can come from different regions and time periods (Wood 1997, 55), the openness of the country to globalization (Rudra 2004, 701), and numerous other differences between countries. This perspective is extended to this study, where differences in income categories across transition economies will be analyzed. Even within a country there can be differences, such as the impact of economic growth among various groups of the poor (Ravallion 2001, 1803). These differences make broad cross-country analysis more difficult when searching for general conclusions; therefore, conclusions must often be more specific to particular situations.

**3.2 Income Inequality in Transition Economies**

Income inequality is a current and significant issue within transition economies. The socialist system saw lower levels of income inequality in comparison to countries at similar levels of development but all transition countries saw an increase in inequality after the fall of Communism (Bandelj and Mahutga 2010, 2133). The average Gini coefficient of disposable income increased from 24 to 33 in just nine years and there was also an increase in the dispersion of Gini coefficients among former socialist countries (Milanovic 1998, 40). The increase in both average and dispersion of the Gini coefficients is illustrated in Figure 2.2 found in section 2. At first, this increase in income inequality was tolerated by the people in transition economies because it was seen as a sign of an increase in potential opportunities, but then tolerance decreased over time as the income distribution process was increasingly seen as unfair and people became unsatisfied with the economic situation within their countries (Grosfeld and Senik 2010, 18).
Many studies seem to agree that the different levels of income inequality seen in transition economies, the phenomenon described by Milanovic (1998), are due to different governmental approaches taken towards stabilization, liberalization, privatization, and the resulting policies (Bandelj and Mahutga 2010; Ivanova 2007; Porras 2010). Certain policies had a negative impact on equality, including those which decreased social services (Ivanova 2007, 167) and fostered foreign investment over domestic investment (Bandelj and Mahutga 2010, 2133). A lack of certain policies also negatively impacted equality, such as the lack of an educational policy to encourage adaptability to changing technology (Aghion and Commander 1999, 291). Beyond policy, some governments were more predisposed to combat rising inequality; these were the countries with higher rates of government effectiveness and more financial resources (Grimalda, Barlow, and Meschi 2010, 398). Further differences can be explained through the different styles of reform, such as their speed and sequence (Ivanova 2007, 167), initial conditions prior to the transition (Porras 2010, 69), and different models of capitalism found in transition economies. Izyumov and Claxon (2009) found that democratic capitalist countries suffered a smaller increase in inequality than autocratic capitalist countries, who in turn suffered a smaller increase than clan capitalist countries. A table outlining the characteristics of each model of capitalism is found in Appendix 8.1.

It is the importance of the issue of income inequality, the increasing dissatisfaction with income inequality, and the array of contributing factors that leads to this current study. It is the scope of this study to analyze the differences that can be found in the effect of certain factors on income inequality within low-, middle-, and high-income European transition economies. Many government actions and policies have not yielded positive results toward reducing income inequality. The outcome of this study may provide guidance for policy towards decreasing
inequality and will enrich the existing literature on the relationship between income inequality and its contributing factors within transition economies, specifically the CEE and FSU countries.
4. Theoretical Overview

There are a wide range of variables that have a potential impact on income inequality. For the purpose of this study, variables are categorized and are used in the econometric model to represent these particular categories. The categories are as follows: economic factors; demographic factors; political factors; cultural and environmental factors; and macroeconomic factors. These five categories of factors of income inequality have been directly based on Kaasa’s (2005) extensive work on the subject. Economic factors are typically comprised of the wealth, growth, and development aspects of a country’s economy. These are the factors upon which most research has been done (Kaasa 2005, 8). Demographic factors look at the characteristics of a country’s population. They cover a wide range, with everything from where people live (urban versus rural) to household composition to education. Political factors consider the government’s role in income inequality. Cultural and environmental factors cover a broad range of factors that take into account characteristics inherent to the country itself. This can include cultural aspects such as traditions and environmental factors such as natural resources. Finally, the macroeconomic factors allow for the study of a country within an international context. Globalization and increasing financial integration make this an increasingly important category. These five categories allow research to become more focused as well as able to study the effects of certain types of factors in comparison to others.

4.1 Economic Factors

4.1.1. Gross Domestic Product (GDP) per Capita

When discussing economic factors, a country’s GDP per capita demands inclusion as it is a measure of a country’s wealth generation per person. It is widely used in relation to income
inequality within economic development literature so its inclusion within this study allows for comparison with past research. As discussed in section 3, the root of research on income inequality and a country’s wealth comes from Kuznets (1955). The results of subsequent studies have offered mixed results in terms of the effect of wealth or growth on income inequality (Deininger and Squire 1996; Gustafsson and Johanson 1999). The inclusion of a national wealth factor within this study is not guaranteed to bolster claims on either side of the argument but it may shed some light on its effects within particular transition economies.

Studies that focus specifically on GDP as a measure of economic wealth are consistent with these ambiguous results. Ogwang (1994) provides a compelling empirical argument for a relationship between income inequality and GDP per capita. His nonparametric regression method to study the Kuznets inverted U-Curve found that both the conditional means and conditional variances of the inequality measures follow an inverted U-shape. Similar results were found when substituting GDP per capita for either the Physical Quality of Life Index or the Human Development Index. Alternatively, arguing for a lack of relationship between GDP and income inequality, Chowdhury’s (2003) use of the Granger test of causality suggests statistical independence between GDP per capita growth rate and income inequality growth rate, using Theil’s entropy index as a measure of income inequality. The main conclusion drawn from past work is that more empirical study is necessary (Aghion, Caroli, and Garcia-Penalosa 1999, 1653).

4.2 Demographic Factors

4.2.1 Rural Population
An important demographic factor in this analysis is urbanization. This factor can often be associated with industrialization, which can logically be argued as having an effect on income inequality due to the potential for higher earnings in the industrial sector, leading to the potential for a difference in income between urban workers in the industrial sector and rural workers in the agricultural sector. The effect of urbanization on income inequality is of importance in the analysis of transition economies due to the governmental focus and centrally planned economies’ reliance on both the industrial and the agricultural sectors during Communism. This reliance stemmed from over-industrialization and overly large agricultural farms, which were two of the centrally planned economy distortions (Popov 2007, 2). During transition, however, there was a dismantling of agricultural co-ops and farm sizes decreased to the point of subsistence agriculture. Agricultural output subsequently dropped, creating the potential for growing income inequality between the industrialized urban areas and the rural agricultural areas.

While this theoretical argument may be intuitive, the effect of urbanization on income inequality is not clear in empirical study. Some studies show that there is no statistically significant relationship between income inequality and urbanization. A study by Li et al. (1998) included an urbanization ratio in their empirical work using a stepwise regression analysis. They found that it was statistically insignificant when added to their base regression. Nomiya’s (1992) study of sixty-five different countries went a step further, arguing that there is no consistent cross-national support for a relationship between urbanization and income distribution based on a regression analysis to test urbanization theories related to modernization and urban bias. They believe that the lack of cross-national support is due to the differences in a country’s development path.
Other studies have found a significant, positive relationship between these two variables. Nielsen and Alderson (1997) performed a study on roughly three thousand counties in the United States during 1970 to 1990. They speculated that the more urbanized counties would have less inequality based on a theoretically negative relationship between economic development and inequality. Addressing heterogeneity problems with a random effects model, they found that urbanization, as represented by population density, has a significant and positive effect on income inequality, as represented by the Gini coefficient. Ullman’s (1996) case study with municipal regions in Brazil has also found a significant positive relationship between urbanization and income inequality but only for certain definitions of urbanization. These definitions include measures of density and availability of basic sanitation, but not for any geographic definitions. These studies are particularly useful as they both look at multiple rural areas within one country.

4.2.2 Primary School Completion Rate

Education, represented in this study by the primary school completion rate, is an important demographic factor to take into account because it is viewed as a “powerful social equalizer” (Chu 2000, 39). Improved or increased education could potentially have an equalizing effect on income distribution and thus lessen income inequality within a country. The expansion of education through higher primary school completion rates could decrease income inequality as it would increase the level of human capital within a country with a greater opportunity for education (Dao 2008, 298). Countries aiming to raise their primary school completion rates could do so through an increase in educational funding from the government. Children from families with any level of income would have an equal opportunity for a basic level of education, which would level out the playing field from an early age. Higher percentages of the population
with primary school education would decrease the percentage of people in the lower end of the income distribution without necessarily increasing the amount in the higher end or shifting the distribution. This would have a narrowing effect on income distribution which would result in a drop in income inequality.

Empirically, the expansion of education is often found to decrease income inequality. Chu (2000) used the indirect quantile approach to regress schooling level and dispersion in schooling on log-income using data from 1966 to 1995 for Taiwan. The results yielded an income share elasticity of schooling level to Gini of -0.789, meaning that an increasing level of schooling will decrease income inequality. Psacharopoulos and Steier (1988), in their study of 1975 to 1984 data from Venezuela, also found that educational expansion decreased income inequality because the greater supply of educated people narrowed the earnings differentials. They, like Chu, used a semilog regression with individual earnings as the dependent variable and with independent variables to account for years of schooling, work experience, and weekly hours worked. Interestingly, Sylwester (2002a) found that the negative effect of public education expenditures on income inequality is larger in higher income countries. This creates some potential expectation for the effect of primary school completion rate within the high income (HI) group of countries in this study, as it is outlined in section 5.1.

Primary school completion rate itself is specifically shown to decrease income inequality. Dao (2008) employs a linear model with the Gini coefficient as the dependent variable and a variety of explanatory variables related to human capital, including primary school completion rate. Income inequality is found to depend in a negative linear way on primary school completion rate, as well as other variables associated with human capital, and the interaction between primary school completion rate and income is found to be statistically significant. Dao’s work
concluded that expanding primary education does decrease income inequality in developing countries.

### 4.3 Political Factors

#### 4.3.1 Privatization

At first glance, the level of privatization may not intuitively seem to be a political factor; however, it is a political factor for transition economies as it relates to the share of the government sector within a country. Transition economies with greater levels of privatization may indicate a shift away from Communism. Privatization’s effect on inequality is mainly found in analysis for transition economies (Kaasa 2005, 16) as it was not a feature of the socialist system. As such, its inclusion in this study represents the effects on income inequality that are unique to the situation within a transition economy. The general consensus of numerous studies on the subject is that privatization increases inequality. The reasoning behind this conclusion varies. Explanations include the redistribution of assets (Aghion and Commander 1999, 277), rent-seeking behaviour (Alexeev 1999, 449), and the creation of non-wage incomes through entrepreneurship (Grimalda, Barlow, and Meschi 2010, 394).

While the explanations vary, the empirical results are found to be consistent with one another. In one of the first cross-national analyses of factors affecting income inequality, a pooled cross-sectional time series analysis found a significant positive association between inequality, represented by the Gini coefficient, and privatization, represented by the size of the private sector (Bandelj & Mahutga 2010, 2137). This study also included FDI inflow in the analysis, to represent global integration, and found that countries whose privatization strategies favoured foreign investment over domestic investment saw the creation of greater inequality.
The study by Grimalda et al. (2010) looked at the Private Share of Value Added (PSVA) to represent privatization, using the unit root test and rejecting the hypothesis of non-stationarity at the 1% level. This indicator also showed a significant positive effect of privatization on the Gini coefficient.

### 4.3.2 Political Rights

The level of political rights, on the other hand, is a very intuitive political factor under consideration in this study’s model. The particular indicator for political rights used in this study, more specifically detailed in section 5, is a political rights index created by Freedom House which is “based on an evaluation of three subcategories: electoral process, political pluralism and participation, and functioning of government” (Freedom House 2011, 30). Under the framework of the Freedom House system, liberal and electoral democracies\(^3\) are desirable as they are characteristics of ‘free’ countries. As such, this political rights index can be used as a proxy for democratization. Democratization within a country would provide certain political rights that could create new opportunities for citizens as they are able to play a larger role in the politics of the country, which could be in their best interest. A strong democracy would be beneficial to a country through its creation of efficient institutions and maintenance of a strong rule of law (Popov 2007, 27-28).

The impact of democratization on income inequality, however, is not clearly shown as desirable or undesirable as a variety of relationships between the two have been shown in different studies (Kaasa 2005, 17). Some studies show a negative relationship: for example, Sylwester (2002b) shows in his two-stage least squares model that there is a negative relationship

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\(^3\) According to Freedom House, an electoral democracy scores at least 7 out of 12 on its electoral process and has an overall score of at least 20 out of 40. All ‘free’ and some ‘partly free’ countries are electoral democracies. It is considered to be different from a liberal democracy, wherein only ‘free’ countries are liberal democracies. Definitions of free, partly free, and not free countries can be found in Appendix 8.2.
between the dependent variable of changes in income inequality and the independent variables of the level of democracy and the degree of democratization. Multiple measures for democracy were used, including indexes for civil liberties, political freedoms, and a compilation of the two. He notes that when various democracies are removed from the dataset, as in the Lesser Developed Countries sample, there is a weaker relationship between changes in income inequality and democracy. Other studies indicate that there is a positive relationship, arguing that authoritarian regimes would have less income inequality because they have more opportunities to reduce inequality (Durham 1999, 43) or because they are better at protecting the poor (Beitz 1982, 145). Other studies, such as Nielsen and Alderson (1995), show an insignificant relationship between income inequality and democratization.

Democratization’s impact on income inequality is of particular importance to this study when set in the context of former socialist countries. Nielsen and Alderson (1995) show this difference clearly in their panel data empirical study on the effects of numerous indicators on income inequality. The independent variables included a political democracy index as well as a Marxist-Leninist regime indicator, which was equal to 1 for all of the former Communist countries in the dataset. The random effects estimators showed that political democracy had an insignificant effect on income inequality but a much stronger effect was found for the Ordinary Least Squares (OLS) estimators. The Marxist-Leninist indicator was shown to have a strong negative effect on inequality in the random effects model. This finding is congruent with the work of Gradstein and Milanovic (2004), where change in Gini coefficient was plotted against change in political freedom and it was shown that all points were in the northeast quadrant, where both democracy and inequality increase. It was also noted that inequality increased at a decreasing rate as countries became more democratic.
4.4 Cultural and Environmental Factors

4.4.1 Corruption

Corruption is shown to be connected to cultural traditions (Kaasa 2005, 20) as it can be more prevalent in some societies than others and, over time, could become more entrenched within a culture to the point where it may be culturally accepted. Its prevalence in transition economies reached “endemic levels” (Kaufmann and Siegelbaum 1997, 419) during the 1990s, during which time former socialist countries in Europe were starting their transition away from Communism. This widespread corruption could have impacted income inequality in that corruption is fuelled by the desire to gain the most personal benefit from the distribution of scarce resources (Husted 1999, 339). Although issues stemming from the lack of available data have potentially rendered hypotheses questionable (Kaasa 2005, 20), indexes incorporating data from surveys allow for the inclusion of corruption in an empirical study.

The results from the relevant research indicate that there is a significant positive correlation between corruption and income inequality. Gupta et al. (2002) regressed corruption and other indicators such as education inequality and social spending on the Gini coefficient. A statistically significant positive result was shown when the model was estimated using both OLS and Instrumental Variable techniques. Specifically, they showed that a one standard deviation increase in the corruption indicator yielded an 11 percent increase in the Gini coefficient. Li et al. (2000) used a corruption index created by Political Risk Services to determine the effect of corruption on the Gini coefficient. The statistically significant result of their regression showed a quadratic pattern in the effect of corruption on the Gini coefficient in that there is an inverted U-shaped curve. The significant positive correlation found in these and many other studies provide a strong case for including corruption in a study on income inequality and it would be expected
to have a significant effect within this study as corruption has been an ongoing issue within transition economies.

4.5 Macroeconomic Factors

4.5.1 Foreign Direct Investment (FDI)

In terms of macroeconomic factors, FDI is of importance to this study because it can capture the potential effects of the increasing openness to the international market that transition economies have experienced since the fall of Communism. It should be noted that there are differences in each country’s degree of openness, as seen when comparing the transition economies who are European Union members to those who are non-members (Grimalda, Barlow, and Meschi 2010, 387). These differences in openness, and the resulting differences in FDI, should be studied within income inequality research as it may provide policy guidance in the face of growing integration within both regional and global markets.

Much of the research done on the effect of FDI on income inequality has determined that increased FDI often increases income inequality (Kaasa 2005, 23). Bandelj and Mahutga’s (2010) work found that FDI had a significant and positive impact on income inequality for the first decade of market transition. They also found that FDI has a more substantial impact than privatization, another variable in their model, as the significant impact of privatization disappears with the addition of FDI to the model. The research of Grimalda et al. (2010) also found a strong positive significant effect of FDI on income inequality, but only for European Union New Member States (NMS) as a group and not for the grouping of the Commonwealth of Independent States and South Eastern Europe area (CIM&SEE). They reason that this is due to differences in the purposes of FDI in these two groups of countries, as the NMS countries primarily received
investment in technology-intensive sectors, while the CIS&SEE countries received more investment in low-technology sectors. Alderson and Nielsen (1999) are cautious in their conclusions based on their random effects regression model analysis, as the results suggest a strong positive relationship between income inequality and foreign investment stock, while suggesting a weak relationship between income inequality and the flow of foreign investment. They conclude that higher levels of income inequality are related to relative dependence on foreign investment.

4.5.2 Inflation

When prices were liberalized in transition economies, there was an expected increase in prices from the low administered prices to market-clearing prices. This increase in prices, along with the printing of money to cover budget deficits, pushed up inflation. Hyperinflation levels were reached in some countries, with the high levels persisting in many countries through to the late 1990s (Lavigne 1999, 129). However, inflation rates have declined through the 2000s (World Bank 2011c). The rampant changes in inflation seen across all countries throughout the transition process should be included in this analysis because changes in prices not only impact the country’s economy as a whole but also the livelihood and wellbeing of its citizens.

It is unclear if inflation actually has an impact in terms of income inequality. From the work of Bulir (2001) to incorporate inflation into the Kuznets inverted U-curve hypothesis, there exists a nonlinear positive relationship between inflation and inequality. Regressions under both OLS and Instrumental Variable techniques were created using a cross-country dataset of 75 countries with the Gini coefficient as the dependent variable. The results showed that a reduction in a high rate of inflation significantly lowers income inequality, while the reduction in a low rate of inflation has much less of an impact in lowering income inequality. This positive
relationship is also shown in the work of Parker (1998), whose technique employed the Johansen cointegration estimator and control variables for other influences on inequality, where inflation increases inequality in the long run. Not all studies find this result. For example, the work of Gustafsson and Johansson (1999) found that inflation did not have a statistically significant impact on the Gini coefficient for either the fixed effects or random effects estimates.
5. Data and Methodology

5.1 Countries

This study will consider thirteen Central and Eastern European transition countries. They are: Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Slovakia, and Ukraine. The majority of these countries are members of the European Union (see Appendix 8.3 for European Union versus non-European Union membership).

The countries are divided into three categories for the purpose of analysis to analyze whether differences in income categories cause differences in the relationship between income inequality and the factors that contribute to income inequality. The categories are low-income (LI), middle-income (MI), and high-income (HI). These categories are consistent with the World Bank’s categories of lower-middle-income, upper-middle-income, and high income, respectively. The World Bank classifies income groups based on Gross National Income (GNI) per capita and is calculated using the World Bank’s Atlas Method (World Bank 2011e), which uses a conversion factor to lessen any impacts caused by exchange rate fluctuations (World Bank 2011i). The division of the thirteen countries to be studied is outlined in the table below and is listed alphabetically. See Appendix 8.4 for a table showing GNI per capita in each country arranged from smallest to largest within each category.
Table 5.1: Division of countries into groups, based on GNI per capita, 2010

Source: World Bank 2011a

<table>
<thead>
<tr>
<th>Low Income (LI) $1,006-$3,975 GNI per capita</th>
<th>Middle Income (MI) $3,976-$12,275 GNI per capita</th>
<th>High Income (HI) $12,275 GNI per capita or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moldova</td>
<td>Belarus</td>
<td>Czech Republic</td>
</tr>
<tr>
<td>Ukraine</td>
<td>Bulgaria</td>
<td>Estonia</td>
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<td></td>
<td>Latvia</td>
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</table>

Although the countries are not divided equally between the categories, using the World Bank’s categorization system will allow the results of this study to be put within a global framework of levels of development. It is also important to use a reputable method for category formation which can be comparable with methods used in other studies.

5.2 Data

The strength of empirical work depends in part on the strength of the data used in the study. This section will outline the different aspects of the data, such as definitions of the variables, any anticipated issues with the data, and the expected effect on the Gini coefficient, which is the dependent variable in this study. All data is yearly and spans from 1990 to 2006. Data prior to 1990 would be from the socialist era and so the data may not necessarily be representative of the true economic situation. A listing of missing data points in this study’s dataset are outlined in a table in Appendix 8.5.

The Gini coefficient represents income inequality. It satisfies the four criteria of proper measurement of income inequality, outlined in section 3.1, and is a frequently-used measure of inequality, which allows this study to be compared with other studies and fit into the larger body of work on the subject. The Gini coefficient is found using the following formula:
\[ G = \frac{1}{2n^2 \mu} \sum_{j=1}^{m} \sum_{k=1}^{m} n_j n_k |y_j - y_k| \]

where \( y \) is a distinct amount of income, \( m \) is the number of distinct incomes, \( n \) is the number of people earning the distinct income, and \( \mu \) is the mean of the income distribution (Ray 1998, 186-189). A greater value of \( G \) signifies a higher level of inequality. For this dataset, the Gini coefficient is measured in terms of a percentage. The data was obtained from the World Income Inequality Database, created by the United Nations University’s World Institute for Development Economics Research. One potential limitation with the Gini coefficients from the World Income Inequality Database is that the Gini coefficients were compiled from different sources and did not all use the same data when they were calculated. For example, for the population covered, some Gini coefficients were calculated using the entire population while others were for segments of a population. Many of the years in the Database provided numerous Gini coefficients, each from a different study. The selection rationale of the appropriate Gini coefficient for each year for this study’s dataset is outlined in section 5.3. Although the Gini coefficient data may not be flawless, many of the coefficients from the World Income Inequality Database were similar in value.

Gross Domestic Product (GDP) per capita is simply the GDP divided by the population. It has been retrieved from the World Bank and uses the midyear population. It is measured in terms of US dollars, as of 2011. There are no missing data points and there are no known or reported issues with this data. Its anticipated effect on the Gini coefficient is uncertain, as past research has not come up with a conclusive relationship between GDP and income inequality, as described in section 4.1.1.

The first demographic factor is rural population as a percentage of the total population, where the definition of ‘rural area’ is defined by the national statistical offices of each country.
This data has been taken from the World Bank and is calculated as “the difference between total population and urban population” (World Bank 2011g). There are no missing data points for this variable. There are no identified issues with this data except any potential issues stemming from the possibility of differences in the definition of ‘rural area’ by each country’s statistical office but this difference should not affect the data to any great extent. The expected effect on the Gini coefficient is unclear, as some studies show no statistically significant relationship and others show a positive and significant relationship.

The second demographic factor is the primary completion rate as a percentage of the relevant age group from the World Bank’s dataset. It is calculated by dividing the number of students completing the last grade of primary school, minus repeaters, by the total number of children in the country of “official graduation age” (World Bank 2011j). There are many data points missing from the dataset, however, this issue may be negated by the fact that the vast majority of missing data points are for the same timeframe. It is expected that an increase in the primary completion rate will decrease income inequality. Thus, it is anticipated that an increase in the primary completion rate will decrease the Gini coefficient because smaller values of G indicate greater equality.

The private sector share of GDP data represents privatization, one of the political variables in the model. This data has been obtained through the Transition Reports put out by the European Bank for Reconstruction and Development (EBRD 2011) and is measured as a percentage. It is important to note that it includes income generated from both formal and informal activities. There are certainly limitations to the accuracy of the data when taking into account the informal activities as information may not be available or reliable. It is, however, important to include informal activities whenever possible because of their pervasive effect on
economic life starting in the socialist era and continuing on throughout transition. Privatization is anticipated to have a positive, statistically significant effect on the Gini coefficient. This means that when privatization increases, income inequality increases.

An obvious choice for a political factor, the Political Rights index is an index created by Freedom House that runs on a scale from 1 to 7, with 1 representing ‘most free’. The index is based on survey data that evaluates three categories: “electoral process, political pluralism and participation, and functioning of government” (Freedom House 2011). As it is based on survey data, there could be issues relating to bias in the survey answers. Further, there could be a bias towards liberal democracies, as the ‘more free’ countries are labelled liberal democracies. The effect of political rights on the Gini coefficient is uncertain, as studies have found a variety of negative, positive, and insignificant relationships between the two variables.

The Control of Corruption index was created by the World Bank as part of their Worldwide Governance Indicator’s project. It is an indicator on a scale of -2.5 to 2.5 and it is based on a wide variety of core variables from numerous sources. It represents “perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests” (World Bank 2011b). There are two main potential issues with this variable. The first is that it has a large amount of missing data as nine years are not accounted for, as outlined in Appendix 8.5. The data is, however, missing in the same time period for all countries which creates a balance. The second issue is that it is an index with some of the contributing data coming from surveys, which could be subjected to bias. It is anticipated that corruption has a significant positive relationship with the Gini coefficient so the Control of Corruption should negatively impact the Gini coefficient.
Foreign Direct Investment (FDI) net inflow, as obtained from World Bank data, is measured in US dollars, as of 2011. It is measured as the “net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor” (World Bank 2011f). With this dataset, there are missing data points; however, all but one are found in the timeframe of 1990 to 1992. Any potential effects with missing data should be lessened by this fact. A positive relationship between FDI and income inequality is expected.

The last variable to be described is inflation, with data obtained from the World Bank. In this study, it is measured as the growth rate of the GDP deflator and shows “the rate of price change in the economy as a whole” (World Bank 2011c). It is measured as a percentage and there are few missing data points in this dataset; only four countries in the year 1990. The expected effect is a positive relationship with the Gini coefficient so an increase in inflation would mean an increase in income inequality.

5.3 Methodology

The strength of empirical work also depends on the strength and rigour of the methodology. This study’s methodology is detailed in this section and the results are discussed in section 6. In addition to the data outlined in section 5.2, the study employs two dummy variables to account for the three different income groups, as outlined in section 5.1. The LI variable is assigned a value of 1 for each country in the low-income group and the MI variable is assigned a value of 1 for each country in the middle-income group. Group division and each country’s annual GNI per capita for 2010 can be found in Appendix 8.4. All of the regressions and tests are performed using STATA.
As mentioned in section 5.2, many years for several countries within the World Income Inequality Database had more than one Gini coefficient. These Gini coefficients were taken from different studies and often found using different techniques or data. A process of elimination was developed to select the preferred Gini coefficient from all coefficients offered by the dataset. First, the number of Gini coefficients provided was determined. If there was only one provided for a particular year, then that was the coefficient to be used, regardless of source or technique. Second, the data with the best quality rating was selected. The World Income Inequality Database provides a quality rating for each data source, on a scale from 1 to 4, where 1 represents the best quality. The Gini coefficients of a lower quality were eliminated. Third, the data not based on ‘all’ of the population was eliminated to get a clear picture of income inequality within the country as a whole. If none of the Gini coefficients for that year have a population coverage of ‘all’, the coefficient with the largest population coverage was selected. Fourth, the source was considered, with the optimal source being the World Bank. Finally, if there was a Gini coefficient from each quarter, the fourth quarter was selected.

Once the dataset had been finalized and organized, the models were estimated. The use of panel data allows for different estimation methods which result in potentially different models. Three of these were used in this study. The first is the pooled OLS model, which is a standard regression used for either cross-section or time series data. It ignores the panel data nature of the dataset (Gujarati and Porter 2009, 593). Since it does not distinguish between countries and time periods, it masks the heterogeneity within these categories, yielding biased and inconsistent estimates (Gujarati and Porter 2009, 594) so it would only be used if the panel data nature of the dataset is irrelevant. The second is the Fixed Effects Model (FEM), which allows the intercept to vary across subjects but not across time (Gujarati and Porter 2009, 596). Its advantage is that it
produces estimates that are always consistent regardless of whether the underlying model is random or pooled (Gujarati and Porter 2009, 606). It cannot, however, estimate coefficients for time-invariant variables (Gujarati and Porter 2009, 607), such as the dummy variables for LI and MI that were used in the model. The FEM would be significant if the income categories do not matter in the analysis. The final method is the Random Effects Model (REM), which allows intercepts to vary in the same way as the FEM, but treats intercepts as random and part of a composite error term (Kennedy 2008, 285). One advantage for this model is that the variance of the residual can be divided into two parts; within-country variance and between-country variance (Clarke et al. 2010, 5-6). Its disadvantage is the random effects assumption, which means that the residual is uncorrelated with the covariates (Clarke et al. 2010, 12), may not hold.

Using each of these three estimation methods, all possible models were run using STATA. Only one variable per category was included in a given model to ‘represent’ that category. The optimal model, which is the model that best fits the data, was selected based on its significance. The optimal model should be statistically significant as a whole. This standard is different for the different forms of regression: the pooled OLS model must have a high R-squared value, the FEM must have a significant F-value, and the REM must have a significant Wald chi-squared value. The coefficients must be significant as well, according to the t-value for pooled OLS and FEM or the z-value for REM. Significance for both the model and the coefficients was determined with a five percent level of significance ($\alpha=0.05$). The optimal model may not include every category, depending on the significance of the coefficients. In this case, insignificant variables from each statistically significant model will be dropped one at a time to determine the impact on the significance of the other variables.
Once one optimal model was obtained for each of the regression models, three tests were performed to determine which model was preferred. As previously mentioned, all of these tests were performed using STATA and therefore the decision as to the best model was dependent on the STATA output. The F-test determines the preferred model between the pooled OLS model and the FEM, with the following hypotheses:

\[ H_0: \text{pooled OLS model is the preferred model} \]
\[ H_a: \text{FEM is the preferred model} \]

The Breusch-Pagan Lagrange Multiplier test determines the preferred model between the pooled OLS model and the REM, with the following hypotheses:

\[ H_0: \text{pooled OLS model is the preferred model} \]
\[ H_a: \text{REM is the preferred model} \]

The final test is the Hausman test, which determines the preferred model between the FEM and the REM using the following hypotheses:

\[ H_0: \text{REM is the preferred model} \]
\[ H_a: \text{FEM is the preferred model} \]

After the tests were completed, the preferred model was revealed and ready for analysis. If the resulting model showed statistical significance for the LI and MI dummy variables, then there was additional testing carried out. A regression was run using the optimal model for each income category. This helps determine if differences in income category do in fact change the relationship between income inequality and the factors affecting income inequality. If the dummy variables were not statistically significant, then it would be concluded that the income category to which a country belongs may not have a significant effect on income inequality or the related factors of income inequality.
6. Empirical Results

6.1 Models

Using STATA, all possible combinations involving one variable per category were run individually, using each of the three estimation techniques, to determine the optimal model: the general model that best fits the data. The resulting models that exhibited overall statistical significance at the 5 percent level ($\alpha = 0.05$) were then run again, using each of the three estimation techniques, dropping insignificant variables to see how it would affect the model as a whole and if it would change the significance of the other coefficients. This rigorous process yielded the following general model that best fits the data:

$$Gini_{it} = \beta_1 + \beta_2 GDPpc_{it} + \beta_3 PrivSec_{it} + \beta_4 Infla_{it} + \beta_5 LI_{it} + \beta_6 MI_{it} + u_{it}$$

where,

Gini = Gini coefficient

GDPpc = GDP per capita

PrivSec = private sector share of GDP

Infla = inflation, GDP deflator

LI = Low Income dummy variable

MI = Middle Income dummy variable

i = Country

t = Year

As shown, not every category is represented in this model. This will be discussed further at the end of section 6.3.

The resulting models from each of the three estimation techniques are as follows. All models are statistically significant overall and each coefficient is statistically significant as well.
\textit{OLS}: \[ \text{Gini}_{it} = 22.04763 - 0.0004858\text{GDPpct}_{it} + 0.1481553\text{PrivSec}_{it} + 0.0036835\text{Infla}_{it} + 10.1876\text{LI}_{it} + 5.520776\text{MI}_{it} \]

\textit{FEM}: \[ \text{Gini}_{it} = 25.20465 - 0.0003324\text{GDPpct}_{it} + 0.1567257\text{PrivSec}_{it} + 0.0030596\text{Infla}_{it} \]

\textit{REM}: \[ \text{Gini}_{it} = 20.69265 - 0.0003401\text{GDPpct}_{it} + 0.1561426\text{PrivSec}_{it} + 0.0030872\text{Infla}_{it} + 11.21757\text{LI}_{it} + 6.33274\text{MI}_{it} \]

The optimal model of these three, based on the tests discussed in section 6.2, is discussed in depth in section 6.3. There are important aspects to note for the above models. The first is the similarity in the coefficients. Regardless of the estimation technique used, the coefficients for the respective variables exhibit the same sign and similar values. The coefficient with the largest difference in value is the constant, with the constant term in the FEM as the largest of the three. This is likely because it has absorbed the time-invariant dummy variables accounting for the income categories, which were dropped from the FEM by STATA due to their collinearity. This is typical for the estimation of the FEM, due to the time-invariant nature of these dummy variables. It should be noted that although the coefficient values may seem small, this is logical within the context of the model because the value of the Gini coefficient cannot exceed 100 percent. Full STATA-generated results for each of the above models can be found in Appendices 8.6, 8.7, and 8.8, respectively.

\textbf{6.2 Tests}

As described above, three tests were performed to determine the preferred model out of the three models outlined in section 6.1. The first test was the F-test to decide between the pooled OLS model and the FEM. The test yielded an F-value with a probability value of 0.0000. As such, we reject the null hypothesis at the 5 percent significance level. This means that the
FEM is preferred over the pooled OLS model. This is a promising find for the study because a pooled OLS model ignores the panel data nature of the dataset, so the preference of the FEM over the pooled OLS model could indicate that using panel data was a good choice. However, the pooled OLS model must be rejected in the next test to prove the usefulness of using panel data.

The next test was the Breusch-Pagan Lagrange Multiplier test to decide between the pooled OLS model and the REM. The test yielded a chi-bar squared value with a probability value of 0.0000. Again, we reject the null hypothesis at the 5 percent significance level. This implies that the REM is preferred over the pooled OLS model. This solidifies the importance of using panel data in the analysis because both the FEM and the REM take into account the panel data nature of the dataset.

The final test was the Hausman test, which decides between the FEM and the REM. The test resulted in a Wald chi-squared value of 1.09 with a probability value of 0.7798. As such, we do not reject the null hypothesis, meaning that the REM is preferred to the FEM. Therefore, based on the results of the three tests, the REM is determined to be the optimal model for analysis. This is of particular importance to this study because of the REM’s inclusion of the dummy variables. The results of the REM will be further analyzed in section 6.3.

6.3 Results

Based on the results from the tests outlined in section 6.2, the model that best fits the data is the REM. It takes both the cross-sectional and time series aspects of panel data into account, unlike the pooled OLS model. It also takes the dummy variables separately into account, unlike the FEM which absorbs them into the constant term. Because the dummy variables for income category are represented as their own terms within the REM and because they both have significant coefficients, it can be discerned that the income category to which a country belongs,
and therefore its level of income represented by GNI per capita, does have an impact on the income inequality within the country. The use of the REM also dictates how the coefficients within the model are to be analyzed. First, they represent changes across time and between countries, because of the nature of panel data. Second, the constant term in the model represents the average of the cross-sectional intercepts (Gujarati and Porter 2009, 602). The R-squared within value is 0.3137, indicating that there may be missing variables, which is quite likely because this particular model does not take into account every potential variable which may affect income inequality in all its complexity.

As the model that best fits the data was determined to be the REM, the model was ready for analysis, starting with the constant term. On average, holding all independent variables at zero, the Gini coefficient across time and between countries is 20.69265. It is particularly related to the average level of income inequality within HI countries, as there is no dummy variable for the effect of the HI category. On its own, this is a fairly low level of inequality, as the Gini coefficient ranges from most equal to least equal on a scale from 0 to 100 percent.

The first independent variable is GDP per capita, representing the ‘economic factors’ category. All else equal, an increase in GDP per capita by one unit across time and between countries results in a decrease in the Gini coefficient by 0.03401 percent. This may seem like a small amount but one must note the size of the GDP per capita in this data, which ranges from $321.0269725 for Moldova in 1999 to $13,887.30239 for the Czech Republic in 2006. Further, as mentioned previously, the Gini coefficient cannot exceed 100 percent so a coefficient must be small in order to allow for this. Overall, increases in GDP per capita decrease the level of income inequality.
The results from previous studies regarding the relationship between income inequality and GDP per capita are ambiguous in terms of the effect the latter has on the former, so there were no firm expectations of the outcome before the regressions were run. This study finds that there is a statistically significant relationship, bolstering the results found by Kuznets (1955) and Ogwang (1994) discussed in section 4.1.1. The difference between the two is that Kuznets and Ogwang looked at non-linear functions, resulting in an inverted-U shaped relationship. This study found significance in a linear relationship for this dataset. Further investigation into potential non-linear relationships would be beneficial in future study of GDP and income inequality, sharing the view of Aghion et al. (1999), who found that the main conclusion from past study is that further study is necessary.

The next independent variable in the model is the private sector share of GDP, measuring privatization as part of the ‘political factors’ category. Holding all else equal, a 1 percent increase in the private sector share of GDP across time and between countries would result in an increase in the Gini coefficient by 15.61426 percent. Thus, increased privatization increases the level of income inequality. This can cause a significant impact on inequality as the private sector share of GDP reached between 70-80 percent during the 2000s for the majority of countries in the dataset. A private sector share of GDP equal to 80 percent increases the Gini coefficient by roughly 12.5 percent. This increase in inequality would make quite a difference in a country, especially compared to the very low levels of privatization seen during Communism and at the start of the transition process.

The positive relationship found in this model reinforces the positive relationship between privatization and income inequality found by Bandelj and Mahutga (2010) as well as Grimalda et al. (2010). This positive relationship is found using different variables to represent privatization;
Bandelj and Mahutga used the size of the private sector while Grimalda et al. used the Private Share of Value Added. This strengthens the evidence of a positive relationship between privatization and income inequality as it is found across differing variables. A significant relationship between the two is of particular importance because privatization was not a feature of the socialist system (Kaasa 2005, 16). Its inclusion in the analysis shows the effects of the transition process and the introduction of the capitalist system in these countries.

The third independent variable is inflation, here measured as the growth rate of the GDP deflator. All else being held equal, an increase in the growth rate of the GDP deflator by one unit across time and between countries yields an increase in the Gini coefficient by 0.30872 percent. Thus, an increase in inflation increases the level of income inequality. As with the case of GDP per capita, this may seem like a small change in income inequality but it makes a large difference in the Gini coefficient during years of hyperinflation, such as in Ukraine in 1993 when the growth rate of the GDP deflator reached an annual percentage of 3334.798345.

Results from the work of Bulir (2001) and Parker (1998), outlined in section 4.5.2, provide the expectation of a positive relationship between inflation and income inequality. This expected relationship has been shown in this study as well. Bulir’s model showed a non-linear relationship between the two, in that a reduction in a high rate of inflation had a larger impact on income inequality than the reduction in a low rate of inflation, while the model in this study yields a linear relationship for this dataset. Herein lies another similarity between the interpretation of the GDP per capita’s coefficient and inflation’s coefficient as further study is recommended to analyze different shapes of relationships between inflation and income inequality. While some past studies, such as the one done by Gustafsson and Johansson (1999),
show an insignificant relationship for both the fixed effects and the random effects estimates, this study yields a statistically significant relationship in both models.

The final independent variables in this model are the dummy variables: LI and MI. As the base category is the HI group, the interpretation of the estimated coefficients for LI and MI can be done in comparison with the HI group. For LI countries, the constant term becomes 31.91022. For MI countries, the constant term is 27.02539. Thus, on average, LI and MI countries have higher levels of income inequality than HI countries, with LI countries more unequal than MI countries.

Both of the dummy variables for LI and MI are statistically significant at the 5% level, indicating that the income level of a country, based on the categories created under the World Bank’s Atlas Method (World Bank 2011i), does have an effect on the country’s level of income inequality as represented by the Gini coefficient. This finding agrees with the hypothesized result that a country’s income category does have an impact on the level of income inequality within that country.

Since this study has shown a relationship between the income category and income inequality, the next part of the hypothesis can be tested. The second part predicts that different income categories yield different relationships between income inequality and the factors that affect income inequality. This hypothesis was tested by running the same REM model once for each income category and analyzing the coefficients in the model. The results show that there are differing relationships between income inequality and the factors of income inequality depending on the country’s income category. The models show differences in magnitude, the direction of the relationships, and in their significance. The models are as follows:

$$LI: \text{Gini}_{it} = 35.70937 - 0.008557\text{GDPpc}_{it} + 0.235328\text{PrivSec}_{it} + 0.0028549\text{Infla}_{it}$$
\[ MI: \text{Gini}_{it} = 23.50054 + 0.001323\text{GDPpc}_{it} + 0.1868987\text{PrivSec}_{it} + 0.0081225\text{Infla}_{it} \]

\[ HI: \text{Gini}_{it} = 24.8364 - 0.000065\text{GDPpc}_{it} + 0.0682318\text{PrivSec}_{it} + 0.0050133\text{Infla}_{it} \]

It is important to take into account the fact that the number of observations is small, especially for the LI regression as only two countries are included in this group. Thus, the results must be interpreted with caution. Further research would be needed when data for a larger number of countries or a longer period of time can be included.

The LI model is overall statistically significant at the 5 percent significance level and each coefficient is significant at the 5 percent level as well. All of the signs of the coefficients are the same as they are in the original model. The coefficient for GDP per capita is larger, so it plays a larger role for LI countries than the transition countries studied as a group. The coefficient for the private sector share of GDP is roughly 50 percent larger than the one found in the original model, so privatization plays a larger role than average as well. The coefficient for inflation is smaller than in the original model, but only slightly.

The MI model is also statistically significant at the 5 percent level, as is every coefficient except the coefficient for GDP per capita. GDP per capita shows a positive relationship, as opposed to a negative one, but it has an insignificant coefficient so it may be removed from the analysis. The coefficient for the private sector is similar to the original, but the effect of inflation is shown to be greater.

Lastly, the HI model is also statistically significant at the 5 percent level, however, neither GDP per capita nor inflation are significant. The effect of the private sector is less than half as large as in the original model, so privatization does not have a strong relationship with income inequality in the HI countries. The results from the HI and MI models show that further
research must be done to determine which variables are of significance in terms of influencing income inequality for these two income categories. These differences between income groups show interesting policy implications, in that lower income countries must take different variables into account when attempting to increase equality levels relative to higher income countries, resulting in differing policy implications. Full STATA results from the models can be found in Appendices 8.9, 8.10, and 8.11.

Lastly, there is the issue of categories that are not represented in the model. There are no variables accounting for ‘demographic factors’ or ‘cultural and environmental factors’ in the model of best fit. The potential demographic factors included rural population, which did not have a conclusive expected relationship with income inequality, and primary school completion rate, which was anticipated to have a negative relationship with income inequality. The cultural factor would have been corruption, which had an expected positive relationship with income inequality. It is particularly surprising that corruption was not significant, as it has such an impact on transition economies, but it could be due to issues with the data itself. The Control of Corruption index could be inherently flawed as corruption is not easy to measure. There could also be issues with the missing data points, as the number of data points for this variable was limited. The exclusion of these factor categories may be due to the specific variables used or the issues with the data, so further study should attempt to continue exploring potential relationships between factors from these categories and income inequality.
7. Conclusions and Future Research

Income inequality in the CEE and FSU has increased after 1990 when the countries started their economic transition, from a centrally planned economy to a market economy, and political transition, from an authoritarian system to a democratic system. The level of income inequality differs across country income categories, as do the relationships between the contributing factors of income inequality and income inequality itself. This study provides support for this statement based on the optimal random effects model that best fits the data and takes economic, political, and macroeconomic factors into account. The importance of this study is that it adds to the existing literature on income inequality within transition economies, which may be used to inform policy based on current and future research on the subject.

In this paper, a theoretical foundation was created before the statistical analysis began. This started by first looking at the transition process in terms of the socialist system and its subsequent collapse, the reforms and policies that took place in the transition period, and the outcomes of transition to date. One such outcome is the increase in income inequality, which was discussed in the literature review section. A general discussion on the literature pertaining to income inequality as a whole and how it is measured was followed by increasingly specific reviews on income inequality in developing countries and in transition economies. An overview was given on the theory behind all of the variables in the statistical models. These variables were divided into five categories and discussed in terms of the variables themselves and their relationship with income inequality. These variables are GDP per capita, rural population, primary school completion rate, privatization, political rights, corruption, FDI, and inflation. Some studies showed various relationships between the variables and income inequality while others were inconclusive.
After the theoretical foundation was laid, the empirical study was presented. The thirteen countries under analysis were grouped into three income categories. The dataset and the aspects relevant to the data were then described, covering the topics of source, measurement, potential issues, and the expected relationship between each variable and income inequality. The next section outlined each step of the methodology, starting with proper Gini coefficient selection and ending with the three tests to determine the best technique for model estimation out of the three estimation techniques; pooled OLS, FEM, and REM.

Once all the data and methodology-related explanations were given, results were displayed and analyzed. Each model from the three estimation techniques was described along with the finding that the general model included GDP per capita, privatization, and inflation. The results from the three tests were then described. The REM proved to be the optimal model and it was thus examined in detail. First, all of the model coefficients were discussed in terms of their impact on the Gini coefficient and in relation to the results from past studies described in the theoretical overview. Next, analysis was performed for each model that was individually estimated for each of the three income categories, with discussion in relation to the original model. The two omitted categories, ‘demographic’ and ‘cultural and environmental’, were not included in the model because of statistical insignificance. This could be due to issues within the data.

There are numerous opportunities for future research stemming from this study. The first is the use of different variables. The variables under each category of income inequality factors were limited in this study, so future research could include a wider variety of variables. New variables are necessary particularly for the ‘demographic’ and ‘cultural and environmental’ categories because the ones used in this study were not significant in the models that were
analyzed. For the demographic category, different variables representing education could be used, such as literacy rate. For the cultural and environmental category, studies could focus more on environmental factors, such as those relating to resources. Experimenting with different functional forms would also be important in future study. This paper only looked at linear relationships but some of the variables may have a more meaningful or statistically significant relationship using non-linear functional forms.

Further, revisiting this topic in the future is important from the perspective of data availability. Some variables, such as literacy rate, were not used in this study due to unavailability of data or large amounts of missing data points in existing datasets. This problem could be eliminated in the future if more data becomes available from these countries. It will also be of benefit to have larger sample sizes in the future. More reliable data may be available as the process of transition progresses, allowing for larger datasets. The larger sample size will provide more concrete evidence for certain relationships and show if the relationships found in this study persist as countries progress further in the transition process or when additional countries are added.

Not only does this study provide the start of future research on relationships across income inequality factor categories for countries with different levels of income, it may also inform future policy to lessen income inequality in transition economies. The relationships between income inequality and the variables in this study were shown to differ across income categories so policies to decrease the disparity should differ across these categories as well. Policies to decrease inflation would benefit countries in the LI and MI categories, although countries would have to take into account relationships between inflation and other variables such as, for example, unemployment. Policies related to privatization would impact inequality
for all three income categories and governments would want to search for policies that could support privatization yet mitigate the effect of high levels of privatization on income inequality. Appropriate policy impact would depend on future research as previously mentioned. This research should be designed to understand the relationships between the variables more fully before an influence on policy is attempted.
8. Appendices

8.1 Characteristics of Different Models of Capitalism

*Source: Izyumov and Claxon (2009)*

<table>
<thead>
<tr>
<th>Political System</th>
<th>Democratic Capitalism</th>
<th>Autocratic Capitalism</th>
<th>Clan Capitalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representative country</td>
<td>Poland</td>
<td>Uzbekistan</td>
<td>Russia</td>
</tr>
<tr>
<td>Separation of powers</td>
<td>Present</td>
<td>Formally present, but effectively absent</td>
<td>Present, but executive power dominates</td>
</tr>
<tr>
<td>Rule of law</td>
<td>Strong</td>
<td>Very weak</td>
<td>Weak</td>
</tr>
<tr>
<td>Party System</td>
<td>Multi-party</td>
<td>Effectively one-party</td>
<td>Multi-party</td>
</tr>
<tr>
<td>Freedom of the press</td>
<td>Present</td>
<td>Absent</td>
<td>Present, but government controls main media outlets</td>
</tr>
<tr>
<td>Government control by special interests</td>
<td>Not significant</td>
<td>Significant</td>
<td>Very significant</td>
</tr>
<tr>
<td>Role of law-enforcement services</td>
<td>Limited</td>
<td>Very important</td>
<td>Very important</td>
</tr>
<tr>
<td>Civil society</td>
<td>Strong</td>
<td>Very weak</td>
<td>Weak</td>
</tr>
<tr>
<td>Index of political freedoms*</td>
<td>8-10</td>
<td>0-2</td>
<td>6-8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic System</th>
<th>Democratic Capitalism</th>
<th>Autocratic Capitalism</th>
<th>Clan Capitalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of privatization</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Model of privatization</td>
<td>Relatively open, foreigners allowed</td>
<td>Government dominated, foreigners not allowed until later period</td>
<td>Insiders dominated, foreigners not allowed until later period</td>
</tr>
<tr>
<td>Property and contract rights</td>
<td>Strong</td>
<td>Very weak</td>
<td>Weak</td>
</tr>
<tr>
<td>Entry barriers for new businesses</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Separation of economy from polity</td>
<td>Strong</td>
<td>Very weak</td>
<td>Weak</td>
</tr>
<tr>
<td>Shadow economy (% of GDP, estimate)**</td>
<td>Relatively small (26.8)</td>
<td>Large (41.8)</td>
<td>Large (45.6)</td>
</tr>
</tbody>
</table>

* Polity democracy index for 2000 on the scale of 0-10, as presented in Hodgson 2006, 877
** Average for each group in 1995-2000, author’s computation based on Johnson, Kaufman and Shleifer 1997, 183; Schneider and Klinglmair 2004, 11.
8.2 Free, Partly Free, and Not Free Country Definitions

Source: Freedom House 2011

*Freedom in the World* applies one of three broad category designations to each of the countries and territories included in the index: **Free, Partly Free, and Not Free.**

A **Free** country is one where there is open political competition, a climate of respect for civil liberties, significant independent civic life, and independent media.

A **Partly Free** country is one in which there is a limited respect for political rights and civil liberties. Partly Free states frequently suffer from an environment of corruption, weak rule of law, ethnic and religious strife, and a political landscape in which a single party enjoys dominance despite a certain degree of pluralism.

A **Not Free** country is one where basic political rights are absent, and basic civil liberties are widely and systematically denied.
### 8.3 Members and non-members of the European Union

*Source:* European Commission 2011

<table>
<thead>
<tr>
<th>Members</th>
<th>Non-Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>Belarus</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Moldova</td>
</tr>
<tr>
<td>Estonia</td>
<td>Russia</td>
</tr>
<tr>
<td>Hungary</td>
<td>Ukraine</td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td></td>
</tr>
</tbody>
</table>

### 8.4 Income Groups Organized by Smallest to Largest GNI per capita (2010)

*Source:* World Bank 2011d

<table>
<thead>
<tr>
<th>Low Income (LI) $1,006-$3,975 GNI per capita</th>
<th>Middle Income (MI) $3,976-$12,275 GNI per capita</th>
<th>High Income (HI) $12,275 GNI per capita or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moldova $1,810</td>
<td>Belarus $6,130</td>
<td>Poland $12,410</td>
</tr>
<tr>
<td>Ukraine $3,010</td>
<td>Bulgaria $6,250</td>
<td>Hungary $12,980</td>
</tr>
<tr>
<td></td>
<td>Romania $7,840</td>
<td>Estonia $14,370</td>
</tr>
<tr>
<td></td>
<td>Russia $9,910</td>
<td>Slovakia $16,210</td>
</tr>
<tr>
<td></td>
<td>Lithuania $11,390</td>
<td>Czech Republic $17,890</td>
</tr>
<tr>
<td></td>
<td>Latvia $11,620</td>
<td></td>
</tr>
</tbody>
</table>
8.5 Missing Data Points

*Sources:* World Bank, World Income Inequality Database, European Bank for Reconstruction and Development, Freedom House

<table>
<thead>
<tr>
<th>Country</th>
<th>Gini</th>
<th>Primary Completion</th>
<th>Political Rights</th>
<th>Control of Corruption</th>
<th>FDI</th>
<th>Inflation</th>
</tr>
</thead>
</table>
8.6 STATA Results: pooled OLS model

Number of obs = 207
F(5, 201) = 27.31
Prob > F = 0.0000
R-squared = 0.4045
Adj R-squared = 0.3897
Root MSE = 5.3658

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>3931.62125</td>
<td>5</td>
<td>786.324249</td>
</tr>
<tr>
<td>Residual</td>
<td>5787.13941</td>
<td>201</td>
<td>28.7917383</td>
</tr>
<tr>
<td>Total</td>
<td>9718.76065</td>
<td>206</td>
<td>47.1784498</td>
</tr>
</tbody>
</table>

| Gini    | Coefficient | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|---------|-------------|-----------|------|-----|---------------------|
| GDPpc   | -.0004858   | .00020    | -2.41| 0.017| -.0008841           | -.0000875         |
| PrivSec | .1481553    | .0219305  | 6.76 | 0.000| .104912             | .1913986          |
| Infla   | .0036835    | .0012335  | 2.99 | 0.003| .0012512            | .0061159          |
| LI      | 10.1876     | 1.415378  | 7.20 | 0.000| 7.396702            | 12.97849          |
| MI      | 5.520776    | .9595365  | 5.75 | 0.000| 3.628727            | 7.412825          |
| _cons  | 22.04763    | 1.458803  | 15.11| 0.000| 19.17111            | 24.92415          |

8.7 STATA Results: FEM

note: LI omitted because of collinearity
note: MI omitted because of collinearity

Fixed-effects (within) regression

Number of obs = 207
Group variable: Country1

Number of groups = 13

R-sq: within = 0.3137
between = 0.0136
overall = 0.0751

Obs per group: min = 14
avg = 15.9
max = 17

F(3, 191) = 29.10
Prob > F = 0.0000
| Gini  | Coefficient | Std. Err. | t     | P>|t|  | [95% Conf. Interval] |
|-------|-------------|-----------|-------|-------|----------------------|
| GDPpc | -.0003324   | .0001534  | -2.17 | 0.031 | -.0006349            |
| PrivSec | .1567257   | .0174124  | 9.00  | 0.000 | .1223805             |
| Infla | .0030596    | .0009063  | 3.38  | 0.001 | .001272              |
| LI    | 0 (omitted due to collinearity) |
| MI    | 0 (omitted due to collinearity) |
| _cons | 25.20465    | .9205432  | 27.38 | 0.000 | 23.38891             |

\[\text{sigma}_u | 5.8176736\]
\[\text{sigma}_e | 3.8528075\]

\[\text{rho} | .69512646 \text{ (fraction of variance due to } u_i)\]

---

F test that all \(u_i=0: \) \(F(12, 191) = 25.54 \quad \text{Prob > F} = 0.0000\)

### 8.8 STATA Results: REM

Random-effects GLS regression

<table>
<thead>
<tr>
<th>Number of obs</th>
<th>207</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of groups</td>
<td>13</td>
</tr>
</tbody>
</table>

R-sq: within = 0.3137
between = 0.4645
overall = 0.3998

\[\text{Wald chi2(5)} = 95.65\]
\[\text{corr}(u_i, X) = 0 \text{ (assumed)}\]
\[\text{Prob > chi2} = 0.0000\]

| Gini  | Coefficient | Std. Err. | z     | P>|z|  | [95% Conf. Interval] |
|-------|-------------|-----------|-------|-------|----------------------|
| GDPpc | -.0003401   | .0001527  | -2.23 | 0.026 | -.0006394            |
| PrivSec | .1561426   | .0172868  | 9.03  | 0.000 | .122261              |
| Infla | .0030872    | .0009037  | 3.42  | 0.001 | .001316              |
| LI    | 11.21757    | 3.847553  | 2.92  | 0.004 | 3.676501             |
| MI    | 6.33274     | 2.77202   | 2.28  | 0.022 | .8996808             |
| _cons | 20.69265    | 2.27997   | 9.08  | 0.000 | 16.224               |

\[\text{sigma}_u | 4.4365026\]
\[\text{sigma}_e | 3.8528075\]

\[\text{rho} | .57006798 \text{ (fraction of variance due to } u_i)\]
8.9 STATA Results: REM for LI Countries

Random-effects GLS regression Number of obs = 32
Group variable: Country1 Number of groups = 2

R-sq: within = 0.6558 Obs per group: min = 16
between = 1.0000 avg = 16.0
overall = 0.6720 max = 16

Wald chi2(3) = 57.35
corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

| Gini  | Coef.    | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|-------|----------|-----------|------|------|---------------------|
| GDPpc | -.008557 | .0015904  | -5.38| 0.000| -.0116741 -.0054399 |
| PrivSec| .235328  | .0426146  | 5.52 | 0.000| .151805  .3188511 |
| Infla | .0028549 | .0012891  | 2.21 | 0.027| .0003284 .0053814 |
| _cons | 35.70937 | 2.453443  | 14.55| 0.000| 30.9007  40.51803 |

sigma_u | 0
sigma_e | 4.1066944
rho | 0 (fraction of variance due to u_i)

8.10 STATA Results: REM for MI Countries

Random-effects GLS regression Number of obs = 95
Group variable: Country1 Number of groups = 6

R-sq: within = 0.4976 Obs per group: min = 14
between = 0.1180 avg = 15.8
overall = 0.3267 max = 17

Wald chi2(3) = 78.65
corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

| Gini  | Coef.    | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|-------|----------|-----------|------|------|---------------------|
| GDPpc | .0001323 | .000281   | 0.47 | 0.638| -.0004185 .000683  |
| PrivSec| .1868987 | .0236242  | 7.91 | 0.000| .1405961 .2332014 |
| Infla | .0081225 | .0015429  | 5.26 | 0.000| .0050985 .0111466 |
| _cons | 23.50054 | 1.660359  | 14.15| 0.000| 20.2463  26.75479 |

sigma_u | 2.4136747
sigma_e | 3.5522445
rho | .31586106 (fraction of variance due to u_i)
### 8.11 STATA Results: REM for HI Countries

Random-effects GLS regression

- Number of obs = 80
- Number of groups = 5

R-sq: within = 0.1475  
  Obs per group: min = 15
  between = 0.4180  
    avg = 16.0
  overall = 0.0775  
    max = 17

Wald chi2(3) = 10.27  
  Prob > chi2 = 0.0164

corr(u_i, X) = 0 (assumed)

| Gini   | Coef.  | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|--------|--------|-----------|------|-----|-----------------------|
| GDPpc  | -.000065 | .0001661 | -0.39 | 0.696 | -.0003906 | .0002606 |
| PrivSec| .0682318 | .0250214 | 2.73 | 0.006 | .0191908 | .1172728 |
| Infla  | .0050133 | .0040253 | 1.25 | 0.213 | -.0028762 | .0129028 |
| _cons  | 24.8364 | 1.583783 | 15.68 | 0.000 | 21.73225 | 27.94056 |

- sigma_u  | 1.5470737 |
- sigma_e  | 2.7517424 |
- rho      | .24017175  (fraction of variance due to u_i)
9. References


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UNICEF. 1999. *After the fall.* Florence: UNICEF.


