Foreign Direct Investment and Inequality in Developing Countries: Does Sector Matter?

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Abstract
Scholars have studied the relationship between inward foreign direct investment (FDI) and within-country income inequality in cross-national contexts, but have not empirically investigated how FDI in different sectors might affect inequality in different ways. We use error correction models to analyze sectoral FDI data compiled from UNCTAD investment reports in 41 middle-income countries from 1989 to 2010, arguing that FDI in services is more likely to be associated with inequality than FDI in other sectors. We argue that skill biases and changes in employment patterns associated with service sector investments can help explain these findings.

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1

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1. Introduction

Economic liberalization has had important distributional consequences for developing countries. It is clear that many emerging economies experienced periods of increased inequality while undertaking liberal economic reforms. It is less clear what role these reforms played in decreasing or increasing inequality. Scholars offer conflicting theory and expectations regarding the links between economic openness and inequality, and empirical studies often arrive at incompatible conclusions or offer inconclusive results. With regard to trade openness, some researchers have concluded that trade reduces inequality in less developed countries through varying mechanisms (Wood, 1994; Birdsall, 1998), in line with the predictions of neoclassical trade models. However, other studies have contradicted these models, finding linkages between increasing trade and growing inequality (Rodrik, 1997; Meschi and Vivarelli, 2009). Other works consider financial liberalization as a potential driver of inequality, and come to varying conclusions (Quinn, 1997; Held et al., 1999). This article concentrates on a related element of economic liberalization: foreign direct investment (FDI). Despite the great scholarly attention

focused on multinational corporations in developing countries, their impact on patterns of inequality has only recently been investigated in cross-national empirical settings.

Advances in data availability have generated a substantial number of works on the relationship between aggregate FDI and inequality in the past two decades. Almost all of these studies treat FDI as uniform. We move beyond this approach and divide FDI by sector, in order to determine whether certain forms of FDI are more or less associated with income inequality.[1] This approach allows a more complete and fine-grained theoretic specification for the relationship between FDI and inequality, and helps explain why previous studies return varying results. We argue that increased FDI in developing countries has contributed to the redistribution of employment from sectors with relatively less polarised income structures (including manufacturing) to sectors with greater skill gaps and therefore greater wage differentials. Service sectors have absorbed more inward FDI in developing countries than other sectors in the past two decades, and exhibit relatively inegalitarian employment and wage patterns. We argue that both the employment and wage changes brought about and/or exacerbated by FDI have strong distributional consequences in host countries, and that these consequences vary by sector.

We employ a dataset of 41 middle-income countries over a 22 year timeframe (1989-2010 inclusive). The dataset is unique in that it relies on recent country reports to the UN Conference on Trade and Development (UNCTAD) to divide FDI into sectors. We find that FDI in services (tertiary sector) is associated with more income inequality, whereas FDI in manufacturing (secondary) is not strongly associated with higher inequality. We argue that skill-biased technological changes, together with the redistribution of investment and employment away from manufacturing and towards services, drive the association between FDI and higher inequality in developing countries. The other contribution in this article is the application of an

error-correction model (ECM). The dynamic ECM allows us to account for long-term and short-term effects of changes in the independent variables, while controlling for non-stationarity and other hazards of time series cross-sectional analysis.

2. Literature and Theory

According to the UN Conference on Trade and Development's World Investment Report, FDI inflows averaged 8.4 percent of gross fixed capital formation over the 1990s, but increased to 12.4 percent in the first decade of the new century (UNCTAD, 2012). During the same timeframe, varied measures of within-country income inequality increased (at times dramatically) in liberalizing economies, contrary to the expectations of neoclassical models. Goldberg and Pavcnik (2007) note that developing countries almost always implemented various liberalizing reforms concurrently, so that the distributional effects of trade liberalization become difficult to disentangle from other reforms, such as privatization or decreasing barriers to FDI. Nonetheless, numerous researchers have made theoretic and empirical connections between inward FDI and inequality in developing countries. A large number of macro studies assert that FDI increases inequality, though the theoretic mechanisms vary. Reuveny and Li (2003), Choi (2006), and Alderson and Nielsen (1999) find a positive association between FDI stocks and income inequality in their panel studies. Tsai (1995) argues that the relationship between FDI and increased income inequality is geographically limited and particularly strong in East Asia in the 1970s. Jaumotte et al. (2013) investigate 51 countries over 23 years, and find that while trade reduces income inequality, inward FDI is strongly related to an increase in income inequality.

In addition to cross-national studies, FDI has been connected to patterns of inequality in a number of country case studies. Because of the difficulty in comparing wages across countries, many of the case studies deal more specifically with wage inequality rather than broader cross-

national measures of income inequality.Chen et al. (2011) examine the links between FDI and wage inequality in China, arguing that foreign wage premiums discourage wage growth in domestic firms, thereby exacerbating inequality. Feenstra and Hanson (1997) and Jensen and Rosas (2007) both consider the links between FDI and inequality in Mexico, coming to different conclusions. Feenstra and Hanson find that increases in FDI are associated with increased demand for skilled labor relative to unskilled, and corresponding increases in wages for skilled workers. While Jensen and Rosas (2007) consider broader income inequality indexes rather than limited wage measures, they argue that FDI inflows generate demand for low skill labor, and connect *maquiladora* expansion with decreased income inequality in Mexican states from 1990 to 2000. Almost all the cross-national and country case studies rely on skill bias logic and/or wage premiums to explain the association between foreign capital and inequality. The country case studies often involve sector or industry-specific analysis, depending on the availability of wage and investment data. Yet sectoral distinctions are difficult to find in cross-national studies.

FDI, Wages, and Skill Bias

Much of the literature on FDI and inequality documents the apparent skill biases of international capital. Goldberg and Pavcnik (2007) note that increases in international capital flows are broadly associated with increased demand for skilled workers, over time. Capital goods often require additional skilled labor, as do short term forms of capital such as portfolio investments.[2] Feenstra and Hanson (1997) argue that global outsourcing increases the demand for skilled workers in both developed anddeveloping countries. The most basic production processes, even if they fall to relatively low wage locations, will require thresholds of skill, especially when these processes are integrated within multinational corporation production chains. As Rodrik (1997) argues, openness to trade can make it easier for firms engaged in multinational production in developing countries to trade unskilled labor for cheap imports,

therefore reducing relative demand for unskilled labor in the host country. As trade liberalization and FDI liberalization were often pursued concurrently in the past two decades, this dynamic may also contribute to skill-biased FDI patterns in emerging economies.

Skill-biased technological change (SBTC) also increases the skill premium, and has been used to explain inequality in emerging economies. SBTC is said to exist if new technology is a complement to skilled labor and a substitute for unskilled labor. As economic liberalization makes it easier for new technologies to shift from developed countries to developing countries, this should be associated with skill upgrading and an improvement in the relative position of skilled workers. In the case of FDI, it seems likely that technology-intensive production in developing countries should increase demand for skilled workers and therefore wage premiums. This would in turn increase inequality, as new technologies in industry align against the interests of locally abundant unskilled workers. Liberalization, according to SBTC, leads to increased imports of advanced machinery and techniques from developed countries. These imports are common in many different forms of FDI. Harrison and Hanson (1999) argue that this exact dynamic took place in Mexico, and that foreign firms employed more skilled workers after increasing technologically-sophisticated imports.

Feenstra and Hanson (1997) argue that the difference between high skill and low skill labor intensive industries depends very much on the development context of the country where these industries are located. In other words, the same activities that might be considered low skilled in developed countries are actually considered high skilled labor intensive activities in developing countries. If this is the case, trade liberalization would increase the demand for high skilled labor in both developed and developing countries, contrary to Heckscher-Ohlin expectations.[3] This would in turn increase the returns to these groups in both sets of countries,

heightening inequality in developing countries.[4] This result should also obtain when the form of exchange is not trade but FDI, as the activities of multinationals in developed countries that are subsequently moved offshore may stay the same while the relative skill context in the host country changes.

Various analysts have leaned on these logics to explain why inequality remained such a persistent problem in those developing countries that welcomed large amounts of FDI. There are a number of additional arguments about the linkages between overall FDI and inequality, and these arguments go in both directions. So-called 'race to the bottom' arguments hold that multinationals will exert pressure for lower wages, while simultaneously putting pressure on host governments to undercut unions (Drezner, 2001). These effects could increase inequality if lower socioeconomic classes suffer disproportionately. On the government revenue side, it is often argued that multinationals avoid taxes through sweetheart deals with host country governments, or even repatriate profits so as to avoid taxation. This in turn hollows out welfare programs in host countries, further worsening measures of income inequality.

Scholars who argue that openness to international capital does not raise inequality often concentrate on the growth-enhancing effects of FDI, which may benefit working classes. Some studies link FDI with higher growth rates and resulting decreases in both poverty and inequality (Blomström and Kokko, 1996). It is important to note that these studies focus on indirect linkages between FDI and income inequality (through the process of economic growth), not on the immediate impact of foreign investment on employment and wages. While growth may lead to reduced inequalities in the long term, the relationship between FDI and income inequality depends most directlyand immediately on the number of workers employed by multinational firms and the skill level (and resulting wages) of these workers. Models that predict decreased

income inequality from FDI rely on a bottom-up logic: lots of low skill workers are hired by multinationals and paid a better wage. This can raise the relative demand for low skill workers in the economy at large, thus reducing inequality. While there is ample evidence that multinationals pay better wages, the first step in this process is far less certain. The skill bias brought about by SBTC and other qualities intrinsic to FDI in developing countries make it more likely that FDI will target relatively high skill workers. Multinationals rely on proprietary assets, often in the form of new technologies and processes. Moreover, FDI in developing countries is increasingly directed to the heterogeneous service sector. This may result in a top-up rather than a bottom-up dynamic, and increasing income inequality.

While there are diverse potential causal pathways between FDI and inequality, we highlight one of the more important and direct mechanisms. This is the wage premium mechanism, brought about by skill bias. There is remarkable consistency in the finding that foreign firms pay more than their domestic counterparts in developing countries, controlling for size and sector. Skilled workers are the main beneficiaries of these increases (Blomström et al., 2000).[5]Moran (1998), in a study on FDI and development, documents a consistent link between FDI and higher wages, particularly in the automotive, petrochemical, and electronics/computer sectors. A number of country case studies also link FDI and other liberalizing reforms to increasing wage differentials and some of these separate workers by skill level.[6] There is also ample evidence that multinationals are often more skill-intensive than domestic firms in developing countries. Te Velde (2003) and Te Velde and Morrissey (2004) connect increases in FDI to an increase in demand for skilled workers in a number of Latin American and East Asian countries.In developing countries, imports of capital goods are more likely to be complementary to skilled labor (Harrison and Hanson, 1999). This in turn can result in capital-skill

complementarities and raise the relative demand for skilled workers. This kind of trade is even more likely within the confines of multinational production processes.

In sum, the overall association between FDI and higher direct wages has the potential to drive inequality in two directions. Jensen and Rosas (2007) argue that wage premiums increase wages of unskilled workers in developing countries, as they have opportunities to earn higher wages than they would working for domestic companies. However, the skill bias argument proposes that wage premiums accrue disproportionally to higher skilled workers. If multinationals pay better wages and target high skilled workers in developing countries, we should expect wage inequality to affect overall levels of income inequality. This should be true even if the investment activities are considered low skill in countries of origin. We argue that the relationship between FDI and income inequality is more likely to follow this second path, with some important sectoral distinctions.

Sectoral FDI and Inequality

It is likely that economic sectors should differ in the extent to which they transmit skill bias and inegalitarian wage and employment structures through FDI. There have been important shifts in the sectoral composition of FDI during the period of liberalization. After 1990, forms of inward investment in developing countries exhibited growing diversity. In particular, FDI in services expanded dramatically as a proportion of inward FDI. In 1970, service-oriented FDI accounted for a quarter of worldwide FDI stock. By 1990, that figure was just less than one half, and by 2002 it had risen to 60 percent or an estimated $4 trillion (UNCTAD, 2004). During the past two decades various service subsectors have seen dramatic internationalization, such as electricity, water, telecommunications, and business services. There are a number of reasons for this shift. First, for many of these locally-provided services, international trade is not an option

and FDI is the default form of transnational exchange. Secondly, many countries opened up service industries to foreign investment during the political reform period of the 1990s and 2000s. Firms that were once state-owned or limited to domestic ownership were auctioned off to foreign investors. Third, the expansion of market-seeking FDI in developing countries, some with rapidly expanding consumer classes, offset any dwindling demand for FDI in wealthy countries.

Employment and wage data for multinationals would allow us to track how sectors are impacted by foreign investment and in turn how these impacts might translate into patterns of income inequality. Unfortunately, firm-specific wage and employment data are proprietary and not readily available. However, sector-specific data on employment and wages do exist in the aggregate. While these data are not limited to multinational firms, they inform our understanding of the liberalization process and how FDI may have differential impacts on inequality patterns. Figure 1 presents different sectoral employment data taken from the ILO LABORSTA database for 31 of the countries in the sample, with a 1990 reference point.[7]Because of the heterogeneity of the service sector and our interest in the skill bias argument, the service sector is broken into two components: high wage subsectors such as electricity, gas, and water are in one category (utilities and communications) while low wage service subsectors such as retail, hotels and restaurants, and construction are grouped together (wholesale/retail). It is apparent that the most dramatic employment growth has taken place in the tertiary sector. Employment in wholesale/retail and utilities and communications increased relative to 1990 levels. Relative employment in the primary and secondary sectors, however, declined during the liberalization period. Productivity gains aside, a smaller proportion of workers now work in primary and

manufacturing sectors than they did in 1990 in these developing countries. The service sector

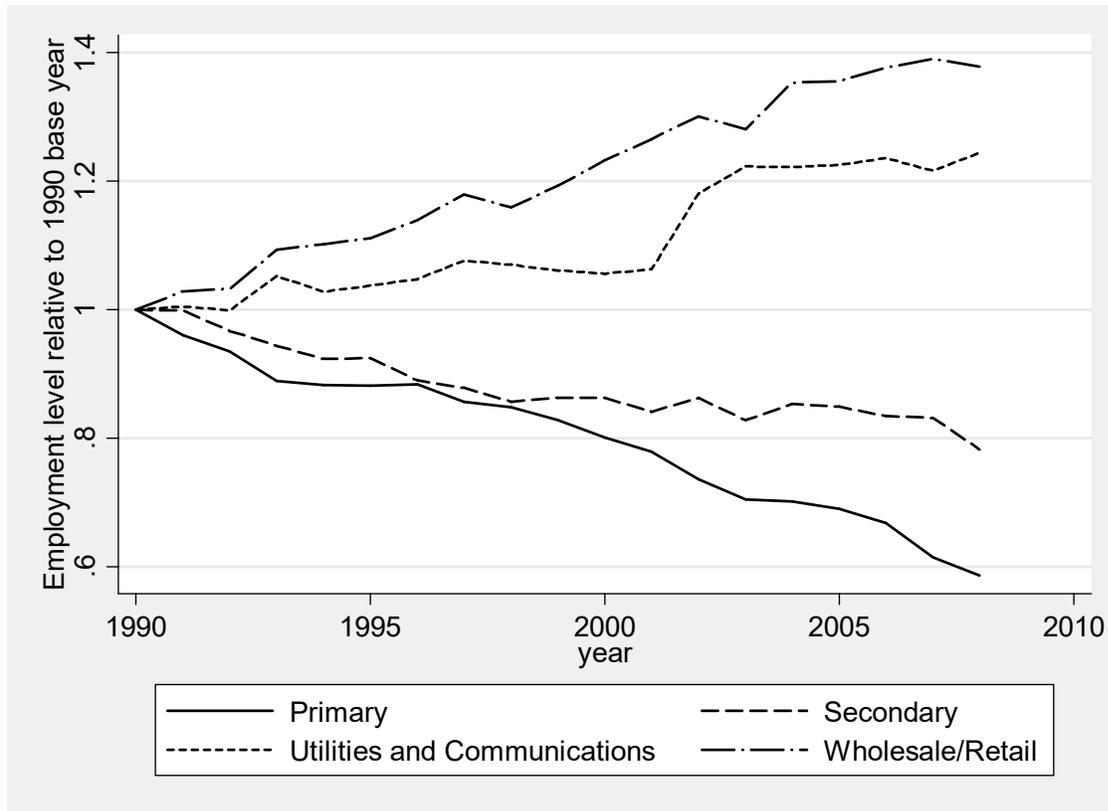saw large increases in employment during the time period considered.

Figure 1. Sectoral employment patterns
Notes: Tertiary Wholesale/Retail also includes employment in construction, hotels and restaurants. Employment figures refer to the sectoral percentage of total employment relative to the 1990 level. ILO data for 31 countries.

Beyond employment patterns, differences in wage growth among sectors should also

impact the relationship between FDI and inequality. We were able to gather wage data for most

of the countries used in the subsequent analysis, broken down by sector. According to sectoral

wage data from the International Labor Organization for 38 countries, average real monthly

wages increased in all sectors from 1991 to 2007. However, wage ratios between these periods

were highest in the primary (natural resources) sector over this time period (2.28), followed by

utilities and communications (tertiary, 1.67) and manufacturing (1.66). The wholesale/retail part

of the service sector saw the lowest growth in 2007 wages relative to 1991 levels, at 1.48.[8] While

these employment and wage data do not draw exclusively from multinationals, they demonstrate that the service sector is an increasingly important source of employment in developing countries, and that wage growth has been uneven among sectors. The low end of the service sector has not seen the same wage growth as other sectors.

There are a number of reasons to suspect FDI in services is more likely to generate inequality than investment in manufacturing or natural resource investments. The first is the heterogeneity of the service sector. As Evans and Timberlake (1980, p.534) explain, 'the tertiary includes everyone from the most highly paid doctors and lawyers to the most poorly paid domestic servants'. The growth of the tertiary in developing countries is therefore the growth of the sector in which income distribution is relatively more polarised. Evans and Timberlake assign primary responsibility for this growth to foreign capital, and connect increases in service sector employment with rising inequality. This is partly due to skill bias arguments. Among the relatively few studies that divide FDI by sector, scholars have argued that high end service sector investment is often complementary to high and medium skilled labor but a substitute to low skilled labor. In a study of service investment in Germany, Kaiser (2000) argues that SBTC can explain the decline in demand for low skilled labor and increase in relative demand for skilled labor, especially in the fast-growing business-related service sector. This dynamic may not be limited to developed countries, especially in high wage services.

Evidence also suggests that wage differentials for foreign firms in the service sector are greater than those in manufacturing. We have already noted the wage premiums accompanying foreign capital in high skill jobs, and the rising levels of service investment in utilities, business process outsourcing, and other relatively high skill service subsectors. Te Velde and Morrissey (2004), in their study of FDI by sector in five East Asian countries, found that FDI raised wages

for both skilled and low skilled workers, but that the gains for skilled workers were far greater. In Thailand, the authors were able to establish a strong relationship between incoming FDI and wage inequality, driven by SBTC in high skill sectors. This, coupled with the polarised income structures of service sectors, suggests a greater propensity for inegalitarian outcomes.

On the low wage end of the service sector, the potential for multinational-led wage growth exists, and this might at first glance be expected to lead to reduced inequality. Heckscher-Ohlin models predict increasing returns to unskilled labor in developing countries. However, there are important differences between low skill labor in manufacturing and low skill service industries. Informality is much more common in the service sector in developing countries than in manufacturing (Fiess et al., 2010). While foreign investors create formal employment in host countries, they may not result in a net gain in formal employment in the service sector. Bacchetta et al. (2009) note that FDI in export-processing zones tends to catalyze more informal services around the zone. Moreover, FDI in services such as hotels and retail has often displaced existing domestically-owned service providers during liberalizations, often forcing former employees of these displaced firms into the informal economy.

Low wage services also may be the most likely locations for race to the bottom dynamics to develop in poor countries. Mosley (2011) has argued that labor rights violations in developing countries are more likely where multinationals rely on subcontracting and other arms' length ownership arrangements, and that these kinds of ownership structures are more common in low skill industries. While other kinds of investments can generate virtuous cycles of skill and wage upgrading, low skill sectors may be susceptible to a whole range of negative outcomes. We have noted earlier that real wage growth in low skill services has been sclerotic in the countries under consideration. While foreign investors may pay more than their direct domestically-owned

competitors, these wage premiums are likely to vary considerably by sector. The slower growth of wages in low skill services, the rapid growth of wages in high skill services, and the overall expansion of services as a proportion of developing countries' economies combine to suggest inegalitarian outcomes.

There have been relatively few studies of wage and employment patterns among multinational service firms in developing countries. Durand (2007) examines the impact of multinational investment on the Mexican retail sector. He finds that large multinational retailers such as Wal-Mart have exerted tremendous competitive pressure on domestic retailers, and that real wages in the self-service retail segment dropped between 1994 and 2003 in part due to increased foreign investment. Moreover, there were a number of negative consequences for local suppliers, as powerful foreign firms substituted imports for local supply chains. Durand's study is all the more important because it suggests that the low skill segment of the service sector may see lower wages, or at least slower wage growth, as a result of FDI. Overall, this suggests a dynamic whereby wage premiums accrue to the high end of the service sector through skill bias, but relatively low skill service subsectors do not derive these benefits. For all the above reasons, we postulate that increased levels of service sector FDI should be associated with increased income inequality, controlling for employment levels and other important covariates.

H1: FDI in services is associated with increases in income inequality.

H1a: FDI in high wage services is associated with increases in income inequality.

H1b: FDI in low wage services is associated with increases in income inequality.

The link between manufacturing FDI and inequality is less certain. Manufacturing contains low skill and high skill components, just as in services. However, it is less likely that low end manufacturing firms offer minimal wages as frequently as low end services. Developing

countries are relatively well endowed with low skill labor, and Heckscher-Ohlin predictions on the relationship between liberalization and inequality are most likely to be realised in developing countries where FDI is low skill labor intensive. Pinto and Pinto (2008), in their study of partisan cycles and foreign investment inflows, argue that manufacturing investments are more complementary to labor than investments in other sectors. This suggests that manufacturing evidence may have more to offer low skilled labor in developing countries than service sector investment. If FDI-linked wage premiums are applied to low skilled manufacturing in developing countries, this may reduce inequality. Some of the case study and cross-national studies that identify a link between FDI and lower inequality are limited to manufacturing, despite its relative decline compared with other forms of investment. However, it should be noted that many studies have identified skill bias in manufacturing FDI. We suspect that there is more potential for inequality-reducing effects in the manufacturing sector, which until recent liberalization was the dominant form of investment into many developing countries.

H2: FDI in manufacturing is associated with decreases in inequality.

We have ambivalent expectations about the relationship between FDI and inequality in natural resource sectors. On the one hand, it is likely that FDI brings in technological advantages that may result in SBTC. However, as Leamer et al. (1999) acknowledge in their study of resource abundance and inequality in Latin America, natural resource sector investments often require large amounts of financial capital but little human capital. Indeed, figure 1 shows a significant decline in the proportion of primary sector workers relative to 1990. For this reason we may expect FDI in primary sectors to have a smallimpact on overall levels of inequality. In terms of wage levels, mining activities are better compensated, but agricultural activities are often low skill. Jaumotte et al. (2013) propose Heckscher-Ohlin processes in the agricultural

sector in developing countries, where trade liberalization raises the income of low skill agricultural workers. In order to untangle the relationships between different forms of FDI and inequality, we now turn to an empirical investigation of time series panel data.

3. Data

We work with a pool of 41 developing countries from Eastern Europe, Latin America, Southern Europe, Africa, and Southeast Asia for which we were able to gather sectoral FDI data. While the countries can be accurately described as middle-income, several of them achieved rapid development during the time period under consideration. No extremely poor countries are represented in this group, due to lack of data. The countries vary widely in terms of subsector data. Though all of the countries have some coverage of primary, secondary, and tertiary FDI after 1989, some countries have collected subsector data while others have not. Subsector data in services were relatively common, which allowed a finer-grained secondary analysis. Data are taken from UNCTAD, Division on Investment Technology and Enterprise Development (UNCTAD, 2012).[9] FDI stock is recorded for each sector in millions of US dollars. These amounts were then matched with GDP figures from the World Development Indicators for each year.[10] The primary independent variable is sectoral FDI stock as a percentage of GDP. Stocks are used as opposed to more volatile year-to-year flows. The result is an unbalanced panel dataset.

The dependent variable is within-country income inequality. The measure of income inequality is the Standardised Gini Indexfrom the World Income Inequality Database (SWIID).[11]The SWIID database, based at the United Nations University in Helsinki, uses the Deininger and Squire (1996) framework for computing inequality, and continuously extends and updates inequality data based on availability. While there are some criticisms of the D&S framework and alternatives are being developed, the WIID remains a common reference point

17

for many cross-national studies on inequality.[12] Descriptive statistics for all variables included in models, for the 41 countries under consideration, are available in the appendix.

In addition to sectoral FDI data, the model includes a set of controls common in the political economy literature on FDI and income inequality. Trade openness comes from the World Development Indicators and is measured as exports plus imports as a percentage of GDP, following Reuveny and Li (2003). Overall levels of unemployment may have a profound impact on inequality, and we therefore include unemployment data from the WDI.[13] Measures of employment by sector were also included, taken from the ILO-LABORSTA database: employment in agriculture, hunting and forestry (Tabulation categories A and B in ISIC-Rev 3), employment in manufacturing (Tabulation category D in ISIC-Rev 3), employment in services (Tabulation categoriesE, F, G, H and I in ISIC-Rev 3), employment in electricity, gas, water supply, transport, storage and communications (Tabulation categories E and I in ISIC-Rev 3), and employment in wholesale and retail trade, hotels and restaurants, and construction (Tabulation categories F, G and H in ISIC-Rev 3), in all cases as percentage of total employment. These are imperfect proxies for the tripartite division of sectoral FDI data. However, the impact of overall employment in a sector should be analytically distinct from our primary hypothesis. A service sector that employs a large number of people may have a different association with income inequality than one which is dominated by foreign capital. We therefore include these employment variables as controls in the models. Finally, we include a measure to capture the impact of broader socio-economic institutions. The quality of democracy may have an impact on inequality, as diverse interests within societies compete for scarce resources. The literature on the potential link between democracy and inequality is vast, and cross-national studies come to varying conclusions. The polity2 measure is taken from the Polity IV database

(Marshall and Jaggers,2012). This measure classifies countries according to 10 point democracy scores and 10 point autocracy scores. The scores are then combined and in practice range from -10 (least democratic) to 10 (most democratic).

4. Empirical Model

The structure of the dataset is unbalanced time series panel data. Pooling data in such a way violates a number of OLS assumptions. Temporal data in panels lead to autocorrelation, which violates the independent errors assumption. Panel data also make it more likely that error terms will differ across panels (in our case, countries), which turns OLS estimates inefficient. There are a number of alternatives available to researchers to deal with these violations. Among the most common are Generalised Least Squares (GLS) models with fixed effects and pooled OLS with panel-corrected standard errors and a lagged dependent variable or autoregressive correction. We are particularly interested in changes within individual countries over time. Cross-national differences in inequality do not change much over time, as inequality is a slow moving variable and cross-country differences are influenced by long-term historical factors.[14] While it is important to control for cross-country variation in the error term, the sources of that particular variation are not particularly interesting to us. The model proposed for the analysis is therefore an Error Correction Model (ECM) with country fixed effects and year dummy variables. The ECM is well-suited for the analysis because it simultaneously allows estimating within-country changes in inequality, which is a slow-moving dependent variable, in both accumulated levels *and* year-to-year changes. The ECM also controls for non-stationary data (through differencing both the dependent variable and the independent variables). The lagged dependent variable is used as an additional predictor and controls for unit effects as well as autocorrelation. Based on theassumption that the dependent and independent variables are in a long-term equilibriumrelationship, ECMs allow for assessing long term effects on the dependent

variable (Banerjee et al., 1993; DeBoef and Keele, 2008). Error correction models are sporadically applied to studies of FDI (Ahlquist, 2006).

The ECM model describes a short term equilibrium relationship given by $\Delta Y_{it} = \alpha + \Delta X_{it-1} \beta_k + e_{it},$ and a term $\phi(Y_{it-1} - X_{it-1} \gamma)$, which measures the deviation from this short term equilibrium relationship:

$$\Delta Y_{it} = \alpha + \Delta X_{it-1} \beta_k + \phi(Y_{it-1} - X_{it-1} \gamma) + e_{it} \tag{1}$$

The dynamics of the models are as follows: a change in X_{it-1} produces an immediate change in Y_{it}. This short term effect is determined by the coefficient β_k. When the impact of X_{it-1} on Y_{it} moves the relationship from its long term equilibrium, the discrepancy or error $(Y_{it-1} - X_{it-1}\gamma)$ is corrected at a yearly rate of ϕ. Eq. (1) can be transformed so that it can be estimated via OLS. If we assume that β_j can be defined as $-(\phi\gamma)$, with both ϕ and γ coming from eq. (1), it follows that $\gamma = \beta_j / -\phi$. Eq. (1) can be rewritten as:

$$\Delta Y_{it} = \alpha + Y_{it-1}\phi + \Delta X_{it-1} \beta_k + X_{it-1} \beta_j + e_{it} \tag{2}$$

Eq. (2) can be estimated with OLS. The dependent variable is measured as a first difference, and the independent variables include a lagged level of inequality and both the lagged level and yearly changes of the other independent variables, including FDI. The model is based on the assumption that the dependent and independent variables are in a long-term equilibrium relationship, but the short-term dynamics of the variables in the system are influenced by the deviation from equilibrium. The coefficients (β_j) measure long-term effects, allowing assessment of whether trends in independent variables are related to long term trends in inequality. The coefficients (β_k) measure short-term effects of changes in the independent variables.

The short term changes (β_k) are potentially more important if they persist over time. The substantive magnitude of the long term relationship between the levels variables (X_{it-1}) and the

dependent variable is determined by the parameter γ, which is calculated as $\beta_j/-\phi$. This indicates

the long-run equilibrium relationship, as ϕ gives the yearly rate at which the unpredicted annual

changes in the Y variable return to the trend line. Because ϕ is bounded between 0 and -1, the

smaller the value of ϕ, the longer influence of changes in Y induced by X will persist over

time.This is a parameter of relevance to us, as we are interested in the long term effect of levels

of sectoral FDI on overall inequality. A value between 0 and -1 for the coefficient ϕ, associated

with the lagged dependent variable,also indicates a stationary process. This is the case in all our

estimated models.

As suggested by a Fisher Test, the measures for FDI stock for secondary and

wholesale/retail sectors, trade, employment in the primary, secondary, and tertiary sectors,

unemployment, and the democratic recordare treated as integrated I(1) processes.Country

dummies are part of all three models, but are not reported for ease of visual interpretation. An F-

test for the significance of the fixed effects indicated that, at a five percent (or better) level of

significance, the fixed effects belong in the model.A Variance Inflation Factor (VIF) analysis

showed that the models do not suffer from multicollinearity.Heteroscedasticity, multicollinearity,

and unit root tests are all available in the appendix.

Some of the models demonstrated evidence of panel heteroscedasticity. For those models,

we employ robust standard errors.[15] We also include year dummies to control for the effect of

contemporaneous shocks across countries (for example, a worldwide FDI boom in a particular

year). The use of robust standard errors, lagged dependent variables,andtime dummy variables

can deflate the statistical significance of the other regressors. While this carries some risk that

causal hypotheses will be rejected prematurely, it also increases our confidence that results

which do emerge as significant are not the consequence of unsound assumptions. As Kaufman

and Segura-Ubiergo (2001) note, significant results under these restrictions should increase confidence in both the model and its assumptions.

5. Results

Table 1 presents the results for the three main sectors of FDI, all measured as a percentage of GDP. The dependent variable in each model is income inequality. The models differ only in the FDI measure included and the employment measure control variable, which in each model corresponds to the FDI sector. The results support two broad conclusions: (a) the effect of FDI on inequality is not the same across sectors, and (b) FDI in the service sector has a strong positive association with income inequality.

Sectoral Distribution of FDI and Inequality

The overall level of FDI stock in services as a percentage of GDP is positively related to inequality and significant at the .05 level (model 3). The year on year change is also positively related to inequality. The effect of service FDI is independent of employment in the service sector as a percentage of total employment. Increases in service sector FDI as a percentage of GDPwill cause short term deviations from the equilibrium between inequality and FDI, causing inequality to be lower than expected given those changes. In the short term,inequality will increase .051 points per each unit increase of FDI stock in services. Inequality will respond in the long run by increasing a total of 0.59 points, spread over future time periods at a rate of 10.5 percent per time period. This is a small but substantively significant effect, given the slow-moving nature of income inequality. Graphs of the long-term impact of service sector FDI on inequality are available in the appendix.

Table 1. FDI by economic sector and Inequality. Error Correction Models.								
	Model 1			Model 2			Model 3		
	Coeff.	Robust σ2		Coeff.	σ2		Coeff.	Robust σ2	
FDI in Primary Sector t-1	-0.048	0.035							
Δ FDI in Primary Sector	-0.099	0.065							
FDI in Secondary Sector t-1				0.019	0.021				
Δ FDI in Secondary Sector				0.018	0.027				
FDI in Tertiary Sector t-1							0.062	0.031	**
Δ FDI in Tertiary Sector							0.051	0.031	*
GDP growth t-1	-0.043	0.025	*	-0.011	0.024		-0.021	0.040	
Δ GDP growth	-0.013	0.022		0.008	0.020		0.018	0.024	
Trade as % of GDP t-1	-0.003	0.006		-0.003	0.005		-0.004	0.012	
Δ Trade as % of GDP	0.009	0.007		0.002	0.006		0.006	0.015	
GDP per capita (PPP) t-1	0.000	0.000		0.000	0.000		0.000	0.000	
Δ GDP per capita (PPP) t-1	0.000	0.000		0.000	0.000		0.000	0.000	
Employment in Primary Sector t-1	0.020	0.012							
Δ Employment in Primary Sector	0.003	0.018							
Employment in Secondary Sector t-1				-0.086	0.036	**			
Δ Employment in Secondary Sector				-0.152	0.042	***			
Employment in Tertiary Sector t-1							0.025	0.046	
Δ Employment in Tertiary Sector							-0.027	0.047	
Unemployment t-1	-0.077	0.026	***	-0.087	0.027	***	-0.074	0.055	
Δ Unemployment	0.004	0.036		0.001	0.037		0.015	0.046	
Democratic record t-1	-0.123	0.049	**	-0.045	0.044		-0.198	0.053	***
Δ Democratic record	-0.022	0.058		0.046	0.056		-0.136	0.126	
Long-run multipliers									
FDI in Primary Sector t-1	-0.374	0.289							
FDI in Secondary Sector t-1				0.179	0.211				
FDI in Tertiary Sector t-1							0.591	0.227	**
GDP growth t-1	-0.333	0.191	*	-0.101	0.219		-0.197	0.384	
Trade as % of GDP t-1	-0.025	0.048		-0.024	0.049		-0.038	0.111	
GDP per capita (PPP) t-1	0.000	0.000		0.000	0.000		0.000	0.001	
Employment in Primary Sector t-1	0.159	0.106							
Employment in Secondary Sector t-1				-0.820	0.417	*			
Employment in Tertiary Sector t-1							0.238	0.455	
Unemployment t-1	-0.606	0.218	***	-0.821	0.308	***	-0.698	0.592	
Democratic record t-1	-0.965	0.432	**	-0.430	0.425		-1.882	0.653	***
Lagged dependent variable	-0.128	0.028	***	-0.105	0.028	***	-0.105	0.041	**
R2 (within)	0.13			0.13			0.20		
N	332			315			224		
Countries	41			30			24		
Note: * p ≤ .1, ** p ≤ .05, *** p ≤ .01 (two-tailed test). Models include country and time fixed effects, not shown in the table.									

Sectoral FDI in manufacturing (model 2) is not significantly related to inequality. We attempted to use an alternate measure of sectoral FDI, as a percentage of total FDI, for all three sectors, as an additional robustness check for this result. This returned a negative coefficient for manufacturing, but it was not statistically significant. We can therefore not claim that manufacturing FDI is positively or negatively related to inequality. Given that services FDI is strongly and positively related to inequality, the absence of an effect for manufacturing FDI may

be loosely interpreted as not contradicting neoclassical predictions concerning low skilled labor in developing countries. That is, in comparison to services, manufacturing investment may be more likely to display inequality-reducing effects. It is interesting to note that overall employment in manufacturing is negatively and significantly related to inequality. However, the FDI relationship in our analysis is not strong. At the very least, we suggest that less polarised income structures in manufacturing may lead to more egalitarian outcomes, subject to further research. The control variables for all three models largely behave as expected. Trade openness has no consistent relationship with inequality, and it does seem that democratic governance is associated with decreases in inequality. Overall unemployment has a significant negative relationship with inequality in models1 and 2.

Service Subsector FDI and Inequality

While subsector data for the primary sector were not common among the countries in the analysis, there were a number of opportunities to subdivide the service sector. The service sector is heterogeneous in terms of skill bias, and we anticipated that some service subsectors would perhaps be more strongly associated with inequality than others. We therefore constructed indicators for five subsectors of the service industry, consistent with UNCTAD classification schemes. These five subsectors were: (1) electricity, gas and water; (2) transport, storage and communications; (3) construction; (4) wholesale trade; (5) hotels and restaurants. In order to test whether low skilled jobs within the service sector might be linked to inequality, we then sorted these five subsectors into two broad categories. The first was a combination of the electricity, gas and water and transport, storage and communications subsectors. We postulated that this 'utilities and communications' group of service FDI would have a positive relationship with inequality, based on the employment restructuring and wage premiums brought by foreign firms in many of these countries.

The second group was formed through a combination of the construction, wholesale trade, and hotels and restaurants categories. We postulated that FDI into this group would increase inequality, but perhaps not as strongly as the high wage subsectors. Table 2 relays the results of this secondary analysis. We constructed employment figures that would match the subsector groupings, drawing again from ILO employment data and using the percentage of overall employment as the indicator. While the n is reduced in these analyses, reflecting the lack of subsector data in some of the countries, the results are nonetheless noteworthy. As with overall tertiary FDI stock, the two subsector groupings were also significantly and positively related to inequality. In the first category (model 4), FDI in utilities and communications is positively related to inequality. The long-term effect of FDI in these sectors on inequality is statistically significant ($p < .05$). In the short term, inequality will show an increase of .057 points per each unit increase of FDI. Therefore, the former will respond in the long run by increasing a total of 1.32 points, spread over future time periods at a rate of 7 percent per time period.

In model 5, FDI in construction, wholesale trade, hotels and restaurants is also positively and significantly related to inequality. The long-term effect on inequality is statistically significant ($p < .05$). In the short term, inequality will show an increase of .082 points per each unit increase of FDI. Therefore, the former will respond in the long run by increasing a total of 1.76 points, spread over future time periods at a rate of 5 percent per time period. While the limitations of our data do not allow us to speculate on the displacing effects of foreign investment in low wage services, we do note that many of these subsectors were well-developed with domestic firms at the time of liberalization, and the entry of FDI provoked massive restructuring and often layoffs. The domestic firms in these service subsectors were often

subsumed within multinationals or priced out of competition. It appears that FDI in services is strongly linked to higher inequality, regardless of subsector. We also attempted to subdivide manufacturing sector FDI data into high and low skill subsectors, based on the classification system devised by Blanton and Blanton (2009).[16]Employment figures were also constructed to correspond to these subsector classifications. However, the UNCTAD subsector data yielded models with only ten countries and an average of 11 years per country, and therefore the models were too limited to draw firm conclusions.

In general, models 1 through 5 confirm our general argument that FDI in services is linked to greater inequality. We contend that skill bias and resulting wage premiums in the service sector, alongside employment redistribution brought on by the entry of FDI, affected inequality in developing countries. Tertiary FDI flooded developing countries during processes of liberalization. Rapid structural changes brought on by multinational firms with technological advantages producedlarge employment shifts among sectors with different levels of skill bias. Numerous domestic firms, many in services, were absorbed into multinationals or driven out of business. In many cases public utilities were privatised and restructured. The skill biases inherent in high end service firms and the more polarised income structures of service sector investments likely contributed to inequality.

Table 2. FDI by service subsector and inequality. Error Correction Models.						
	Model 4			Model 5		
	Coeff.	Robust σ2		Coeff.	σ2	
FDI in Utilities and Communicationst-1	0.091	0.042	**			
Δ FDI in Utilities and Communications	0.057	0.035				
FDI in Wholesale, Hotels, Restaurants and Construction t-1				0.080	0.040	**
Δ FDI in Wholesale, Hotels, Restaurants and Construction				0.082	0.056	
GDP growth t-1	-0.064	0.040		0.001	0.025	
Δ GDP growth	-0.025	0.023		0.019	0.016	
Trade as % of GDP t-1	0.004	0.012		-0.004	0.010	
Δ Trade as % of GDP	0.007	0.012		0.004	0.008	
GDP per capita (PPP) t-1	0.000	0.000		0.000	0.000	
Δ GDP per capita (PPP)	0.000	0.000		0.000	0.000	
Employment in Utilities and Communicationst-1	0.109	0.160				
Δ Employment in Utilities and Communications	0.115	0.085				
Employment in Wholesale, Hotels, Restaurants and Construction t-1				0.065	0.031	**
Δ Employment in Wholesale, Hotels, Restaurants and Construction				-0.066	0.049	
Unemployment t-1	-0.075	0.050		-0.051	0.050	
Δ Unemployment	0.029	0.043		0.039	0.044	
Democratic record t-1	-0.105	0.058	*	-0.064	0.070	
Δ Democratic record	-0.036	0.125		-0.062	0.069	
Long-run multipliers						
FDI in Utilities and Communicationst-1	1.318	0.634	**			
FDI in Wholesale, Hotels, Restaurants and Construction t-1				1.759	0.915	*
GDP growth t-1	-0.930	0.628		0.016	0.552	
Trade as % of GDP t-1	0.064	0.171		-0.084	0.228	
GDP per capita (PPP) t-1	-0.001	0.001		-0.001	0.001	
Employment in Utilities and Communicationst-1	1.585	2.292				
Employment in Wholesale, Hotels, Restaurants and Construction t-1				1.437	0.748	*
Unemployment t-1	-1.092	0.808		-1.121	1.160	
Democratic record t-1	-1.518	0.834	*	-1.411	1.559	
Intercept	-0.069	0.055		-0.046	0.035	
Lagged dependent variable	0.11			0.17		
R^2(within)	229			239		
N	30			31		
Countries	-0.069	0.055		-0.046	0.035	
Note: * p ≤ .1, ** p ≤ .05, *** p ≤ .01 (two-tailed test). Models include country and time fixed effects, not shown in the table.						

Robustness Checks

In constructing the five core models in this paper, we addressed numerous potential hazards of cross sectional time series analysis. As indicated in the appendix, our main models are robust to unit roots and do not suffer from multicollinearity. Where heteroscedasticity was evident, we employed robust standard errors. However, the conclusions derived from the first five models may be artifacts of additional complicating factors. In order to increase confidence

in the results, we conducted a number of additional robustness checks. These are presented in consolidated form in the appendix. The first robustness models are restricted models, removing all covariates except the lagged dependent variable, the FDI variable (both level and difference), country and time fixed effects, and robust standard errors when suitable. These bare bones models return consistent results. Services FDI is associated with increased inequality, especially in the wholesale, hotels, restaurants, and construction subsectors.

As an additional robustness check, we employ a dynamic specification, utilizing an Autoregressive Distributed Lag (ADL) model. As recent work by Grant and Lebo (2015) has demonstrated, ECM results are sometimes problematic with stationary data. They argue that a stationary dependent variable (as are ours) may produce significant ECM estimates. In our case, using ADL models produce results which are consistent with the original ECM specification.A final set of models accommodates potential influential outliers within the data. Outliers were identified using DFBETA influence statistics. Having identified the potentially influential outliers, which were present only in Model 1, these country-year observations were then excluded from the main models and the models were run again. The results are identical in all other aspects to the main model.

6. Conclusions

Increases in inequality in developing countries during periods of economic liberalization have been puzzling for scholars. Neoclassical trade models predict declining inequality upon increasing exposure to trade, and while narrow trade models have sometimes corroborated this prediction it is more common to find ambivalent results. This paper has suggested an alternate explanation for rising inequality in developing countries, proceeding along two tracks. First, we have argued that FDI, as an important form of capital flowing into developing countries, exhibits distinct characteristics which make it less likely to reduce inequalities in developing countries.

These characteristics include a greater potential for the transmission of SBTC and wage premiums. This is not at all inconsequential, as recent studies have shown larger shares for FDI in overall global capital flows, and a growing role for intra-firm trade as a proportion of overall trade. The growth of vertically-integrated global production systems, along with the dramatic increase in FDI in developing countries, challenges researchers to develop distinct theoretical linkages between FDI and a variety of socioeconomic outcomes.

The second track for our argument concerns the composition of FDI in developing countries. We have argued that certain types of FDI, mainly service-oriented FDI, are more likely to produce inequality in liberalizing countries than others. Tertiary FDI often contains a skill bias, which results in wage premiums for high skilled service workers and can deepen inequalities. Given that the liberal reforms of the 1990s and afterward generated massive amounts of service-oriented FDI inflows, our argument can help explain increases in inequality in these countries. Wage premiums for skilled workers based on technological advantages of foreign firms, coupled with the sectoral redistribution of employment brought on by increased foreign capital, make inegalitarian outcomes more understandable.

Our analysis suggests that developing country governments should pay close attention to dominant forms of inward FDI, and the distributional consequences of that investment. Many countries have established investment promotion agencies (IPAs) to actively recruit foreign firms, and many of these IPAs make distinctions between high and low quality FDI. Much of what governments define as high quality FDI falls into the service category, for example IT investments such as business or knowledge process outsourcing. As beneficial as these investments may be, high skill service firms should not be expected to solve income distribution problems in developing countries. If developing countries regard FDI as a mechanism for rapid

broad-based economic growth, governments must be careful to match investments with the skill profiles of their working populations. To the extent that service investments are booming in developing countries, governments should be aware that investments in the service sector may have inherent distributional limitations.

There are a number of ways in which our conclusions may be developed further and challenged. We are limited by the availability of sectoral FDI data. Though we were able to collect sectoral data for a number of developing countries, it is important to underscore that they are all middle-income countries. We are therefore reluctant to claim that our argument applies to the poorest developing countries, which often struggle to attract *any* form of FDI. Furthermore, we were not able to divide the available sectoral data in a way that would subject our hypotheses to more rigorous testing. In particular, the lack of subsector data in the primary and manufacturing sector was frustrating. It may be useful to investigate these subsectors in developed countries. It would also be helpful to incorporate multinational-specific wage data into the analysis, to better corroborate claims of skill bias in developing countries. Finally, although we believe cross-national studies such as ours are useful in demonstrating broad associations, micro-level studies that track firm hiring practices, wage differentials,and employment tenure in developing countries would undoubtedly lend analytic weight to the various claims advanced here.

Notes

[1]There are a number of recent works that have begun to disaggregate FDI. See for example Hecock and Jepsen (2014), who examine the institutional determinants of FDI by sector in 15 Latin American countries. However, to our knowledge none have applied sectoral FDI data to patterns of inequality.

[2]This dynamic is not limited to capital flows, but is sometimes applied to trade as well. Wood (1997) argues that the expansion of trade in some regions has been partly responsible for the bias against unskilled workers.

[3]It should be acknowledged that Heckscher-Ohlin applies primarily to trade liberalization (not FDI). However, the theoretic framework is commonly applied to various forms of liberalization, including FDI.

[4]Meschi and Vivarelli (2009) refer to this dynamic as the global vs. local validity of the Stolper-Samuelson theorem. Markusen (2006) echoes this point by noting that a shift in services from North to South causes the real and relative price of skilled labor to rise in both locations.

[5]Te Velde (2003, p.17) provides a review of the substantial literature establishing a micro-level wage premium for FDI, and notes that studies that distinguish between average wages in separate skill categories find that wage differentials are greater in non-production (relatively skilled) workers than for production (less skilled) workers.

[6]Lipsey and Sjöholm (2004), in their survey of firms in Indonesia, find that foreign owned firms pay 12 percent more than local owned firms to blue collar workers, but that they pay 22 percent more to white collar workers. In a study of manufacturing firms in Thailand, Movshuk and Matsuoka-Movshuk (2006) find that wage differentials for production (blue collar) workers in foreign-owned plants are smaller than differentials for non-production (white collar) workers in

1996 (16/20 percent respectively) and 1998 (40/51 percent respectively). For a review of additional case studies documenting the skill bias and wage premiums of foreign capital, see Anderson (2005, p.1057).

[7]The indexes describe the distribution of the employed by economic activity, according to either ISIC-68 or ISIC Rev.3, or to both versions side by side, in cases where the latest revision of this international classification has been adopted during the time series covered.

[8]Monthly wage data, adjusted for inflation, from Occupational Wages around the World (OWW) database, accessible at http://www.nber.org/oww/. Ratios for wage data are calculated in the following manner: [average 2006-2008 / average 1990-1992]. Averages are formed using all available data points. Wage data were not available for Kazakhstan, Morocco, Macedonia, Panama, Paraguay and Vietnam.

[9]We are grateful to the FDI statistics team, Division on Investment Technology and Enterprise Development for providing the data and for responding promptly to questions about the data.

[10]Because millions of US dollars were used for the FDI data, the GDP data were measured in current dollars (not inflation-adjusted).

[11]From the world income inequality database, volume 2a. Available at http://www.wider.unu.edu/wiid/wiid-introduction-2007-1.htm.

[12]See Atkinson and Brandolini (2001) for a criticism of the D&S database.

[13]The unemployment measure, taken from the World Development Indicators, refers to the share of the labor force that is without work but available for and seeking employment.

[14]See Zorn (2001) and Ahlquist (2006) for a further discussion of between versus within effects and the application of these different models to these questions.

[15]Heteroskedastic panels were indicated by a Breusch-Pagan /Cook-Weisberg test.

[16]Blanton and Blanton (2009) are able to use finer-grained manufacturing FDI data as they only consider US FDI data from the Bureau of Economic Analysis.

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