

FOREIGN DIRECT INVESTMENT AND INCOME INEQUALITY IN ARMENIA: AN ECONOMETRIC ANALYSIS

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Introduction. The theoretical literature on the relationship between FDI and income inequality is characterized by conflicting theories, such as modernization or dependency and world-systems theories. Modernization theory is related to neoclassical economics and suggests that an increase in foreign capital at the early stages of development may exacerbate income inequality; however, this effect is expected to diminish as FDI increases further. This theory is consistent with the Kuznets hypothesis, which considers the relationship between economic development and income inequality as characterized by an inverted U-shaped curve [Kuznets, 1955]. Thus, the relationship between FDI and income inequality can also be described in the same way. Dependency and world-systems theory deviates from modernization theory by arguing that FDI can attract capital-intensive production, which restricts employment and therefore increases income inequality [Mihaylova, 2015].

Methodology. As the results of the studies show, the Palma coefficient characterizes the level of inequality quite accurately [Ghazaryan, 2022a], so this ratio was chosen as an index of inequality for the empirical assessment of the income inequality in Armenia. The following model was constructed to assess the FDI-income inequality relationship:

$$Palma_t = \beta_0 + \beta_1 FDI_t + \beta_2 FDI_t^2 + \beta_3 X_t + \varepsilon_t \quad t = \overline{1999, 2020}, \quad (1)$$

where *Palma* characterizes the level of income inequality calculated by the Palma ratio, *FDI* is foreign direct investment, *FDI*² is the square of FDI, which reflects the possibility of a non-linear relationship between FDI and inequality. All variables are taken with their natural logarithms so that the obtained coefficients are interpreted as elasticity coefficients. *X* is a vector of other control variables included to improve the robustness of the estimates, as well as to assess the effects of other macroeconomic factors on inequality. Real GDP per capita, share of urban population, secondary and higher education enrollment rates, government spending on health and education, unemployment and female employment rates, as well as inflation were chosen as control variables. Descriptions of and details about all variables are in Table 1. If the evaluation results show that the relationship between FDI and income inequality in Armenia is characterized by a U-shaped (i.e. $\beta_1 < 0$ and $\beta_2 > 0$) or inverted U-shaped (i.e. $\beta_1 > 0$ and

$\beta_2 < 0$) curve, it will mean that FDI in Armenia alleviates (exacerbates) income inequality, but the effect will change upon reaching a certain stage of development. This will occur at the turning point, estimated by the partial derivative of the equation (1) that captures the marginal effect of FDI on income inequality. The turning point at which the effect of FDI reverses occurs at the point where the partial derivative equals zero. Solving that equation for FDI yields the turning point.

Table 1. Measurement units of variables, definition and data collection source

Variable	Definition	Measurement unit	Source
Palma	Palma coefficient	$\frac{\text{richest 10\%'s share}}{\text{poorest 40\%'s share}}$	WB WDI ¹ and author's calculations
FDI	FDI (net inflows)	US dollar	UNCTAD WIR [23]
GDP	real GDP per capita	constant 2017 \$, PPP	WB WDI
URB	share of urban population	as a percentage of the total population	Statistical Committee of RA ²
SSE	gross secondary school enrollment rate	ratio of actual and expected values	WB WDI
TSE	gross tertiary school enrollment rate	ratio of actual and expected values	WB WDI
EXPHLT	government expenditure on healthcare	% of GDP	WB WDI
EXPEDU	government expenditure on education	% of GDP	WB WDI
UNEMP	unemployment rate	% of labor force	WB WDI
EMPF	female employment rate	% among working-age women	WB WDI
INFL	inflation, consumer prices	annual %	WB WDI

Table compiled by author

$$\frac{\partial \text{Palma}}{\partial \text{FDI}} = \beta_1 + 2\beta_2 \text{FDI} = 0 \implies \text{FDI} = \frac{-\beta_1}{2\beta_2} \quad (2)$$

If the relationship between FDI and inequality is characterized by a non-linear function, then the convexity (concavity) of that function is determined by the sign of β_2 : if $\beta_2 < 0$, then the relationship is concave, if $\beta_2 > 0$, then it is convex [Kaulihowa, 2018].

Literature review. Some panel studies of developing countries support the view that FDI exacerbates income inequality [Basu et al., 2007; Reuveny et al., 2003; Choi et al., 2006]. Some studies have shown that the impact of FDI on inequality varies depending on the country's level of economic development: in developed countries, the impact of FDI is negative, that is, the level of inequality decreases, but in the case of

¹ <https://databank.worldbank.org/reports.aspx?source=world-development-indicators>

² <https://www.armstat.am/en/>

developing countries, it is the opposite. Although FDI aggravated income inequality in the case of developing countries, the non-linear component showed that this effect decreases further [Figini et al., 2011]. This finding is consistent with the modernization theory of FDI, which states that the impact of FDI varies by stage of development. Meanwhile some researchers have found no significant relationship between FDI and inequality [Te Velde et al., 2004; Milanovic, 2002; Sylwester, 2005].

Real GDP per capita was included in the model as a traditional measure of economic development. Some studies check the presence of a non-linear (inverted U-shaped) relationship between GDP and income inequality. However, recent literature generally doesn't support Kuznets's hypothesis that GDP growth has a positive effect on inequality in the short term and a negative effect in the long term [Meschi et al., 2009]. Economic growth can have both a positive and a negative impact on income inequality. Aghion argues that economic growth should mitigate inequality in the country [Aghion et al., 2002], but the effect can be the opposite if this growth isn't efficient and just increases the incomes of the rich people. Opinions on the impact of urbanization on inequality vary, as empirical studies in this context have produced mixed results. The analysis carried out for African countries showed that there is a positive relationship between urbanization and inequality [Sulemana et al., 2019]. The analysis made for four Asian countries showed that urbanization exacerbates inequality in the Philippines, Indonesia and India, while in China the effect is negative [Kanbur et al., 2013]. The results of some studies show that this relationship can also be characterized by an inverted U-shaped curve [Wu et al., 2017]. Education promotes the acquisition of a profession and the development of skills, so it is believed that educated people have more opportunities to move into high-paying employment. That is, the greater the number of people involved in education, the more people will be able to raise their incomes, which is expected to reduce inequality. It is the level of education that increases the skilled labor force, which in turn alleviates the level of inequality in the country [Jensen et al., 2007]. Government expenditures on education and healthcare contribute to the formation of human capital in the country, which in the long run can lead to an increase in incomes and their effective redistribution. Many studies have shown that these social costs are effective levers for income redistribution. Government expenditure on education can increase individual productivity as well as create opportunities for poor people to move into higher paying jobs. It is important that this social spending is targeted especially at the poor, which will reduce inequality and poverty in the short term [Anyanwu et al., 2010]. High unemployment rate can exacerbate inequality as it pushes more people to the bottom of the income distribution [Shahbaz, 2010]. Since gender inequality is strongly associated with income inequality both in the world and in Armenia [24], the factor characterizing the level of women's employment was also included in the model. The unemployment rate is expected to have

a positive effect and the female employment rate to have a negative effect on inequality. The results of some studies are in line with our expectations [Lee et al., 2013]. Inflation can have contradictory effects on inequality. Some researchers argue that inflation should alleviate income inequality by redistributing income from the rich to the poor, while empirical results prove otherwise [Scully, 2002].

Scientific novelty. In order to evaluate the relationship between FDI and income inequality in Armenia, the Palma ratio was evaluated as an indicator characterizing the level of inequality. Results of the empirical analysis revealed that FDI-income inequality relationship in Armenia is characterized by an inverted U-shaped curve. It has been argued that FDI exacerbates income inequality, but there is a turning point after which further increases in FDI will alleviate inequality. That turning point was estimated as a 19% share of FDI in GDP.

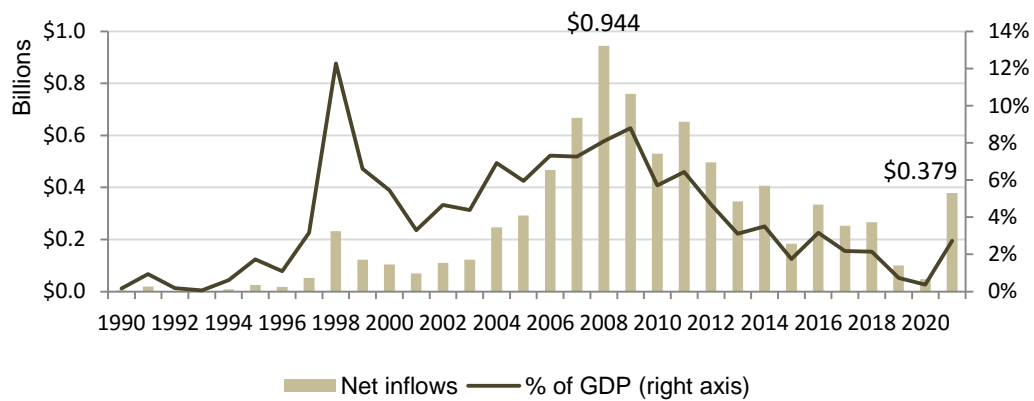


Figure 1. Dynamics of foreign direct investments in Armenia

Analysis. Until 2008, the net inflows of FDI were growing at a high rate, and in that year about 944 million dollars of foreign capital came to Armenia. However, after the crisis, the trend was changed, reaching only 47 million in 2020. The sharp decline in that year was mainly due to the outbreak of Covid-19, which caused them to decrease by more than 53% compared to the previous year. During the same year, this indicator decreased by 80% in Europe and by 35% in the world [23]. The downward trend of FDI in the post-crisis years is mainly due to the unfavorable investment climate in the country, which is related to the tax and customs policy, as well as the war tensions in the region. However, the investments in 2021 have increased considerably, amounting to about 380 million, and have even approached the volume of 2014. To evaluate the constructed model, the stationarity of the series was first checked, for which the unit root (ADF) test according to Akaike's criterion was applied (Table 2). Variables that are I(1) processes were included in the models by first difference. We have estimated 9 models, the empirical results of which are presented in Table 3. In the first model, the influence of FDI and real GDP per capita on the dynamics of income inequality was evaluated. As

stated earlier, squared term of FDI has been added to check the presence of a non-linear relationship. And indeed, the results show that the relationship between FDI and the level of inequality in Armenia is characterized by an inverted U-shaped curve, which supports Kuznets's hypothesis that in the early stages of development, the impact of FDI on inequality may be positive, but after reaching a certain level of development, the sign of this impact may change.

Table 2. Panel unit root tests

	Variables in levels		and	Variables in 1st differences	
	Intercept	Trend intercept		Intercept	Trend intercept
ln Palma	-3.003158*	-3.219416		-3.564697**	-1.118100
ln FDI	-3.187460**	-3.275109**		-5.708935***	-5.515924***
ln GDP	-0.038661	-3.472029*		-3.555235**	-3.507428*
URB	-3.738007	-2.414662		-3.989907***	-3.564848*
SSE	2.944709*	3.641304*		-5.671146***	-4.853413**
TSE	-2.878197*	-3.935003**		-3.846005***	-3.781914**
EXPHLT	-3.047728**	-2.558830		-5.444644***	-3.594307*
EXPEDU	-3.276050**	-3.357629*		-5.171605***	-4.975384***
ln UNEMP	-4.153794***	-2.393031		-4.360294***	-4.905582***
ln EMPF	-1.399005	-1.973998		-6.276622***	-6.176976***
INFL	-3.547162**	-3.455660*		-4.780494***	-4.573295***

Notes: * p<0.1, ** p<0.05, *** p<0.01

Source: author's calculations

This study uses the Serial correlation LM test to check autocorrelation and Breusch-Pagan-Godfrey test to check heteroskedasticity in the residuals, as well as histogram-normality test to check the normal distribution of the residuals. According to the results of the tests shown in Table 3, we have to accept the null hypotheses, i.e. there is no autocorrelation, the residuals are homoscedastic and normally distributed.

The results show that economic growth is exacerbating inequality in Armenia, which means that it is mostly distributed among the top decile groups, thus further exacerbating income polarization. In the second model, the level of urbanization was added and found to have a negative effect on the level of inequality. This may mean that people, moving from villages to cities, are generally able to get a job and earn more than they could while living in the countryside. Such trend is certainly positive in the short term, but excessive urbanization may have a negative impact on the overall development of the country, since as a result some aspects of the economy (e.g. agriculture) will suffer. Secondary and higher education enrollment rates were included in models 3 and 4, respectively. As the obtained results show, secondary education has a negative but statistically not significant effect on the level of inequality. Turning to higher education, we can argue that it has a negative and statistically significant, but minor effect on inequa-

lity: a 1 percentage point increase in enrollment mitigates inequality by only 1%. This means that people with higher education do not have significant advantages in occupying high-paying positions in the Armenian labor market. In the 5th and 6th models, the shares of government expenditures on healthcare and on education were included.

Table 3. Empirical results and residual tests (dependent variable: Palma ratio)

	1	2	3	4	5	6	7	8	9
ln FDI	4.9*** (3.43)	6.0*** (4.36)	4.7** (2.33)	5.1*** (4.02)	4.8*** (3.99)	5.9*** (4.85)	6.6*** (4.39)	5.2*** (3.57)	5.1*** (3.18)
ln FDI²	-0.1*** (-3.46)	-0.2*** (-4.39)	-0.1** (-2.33)	-0.1*** (-4.03)	-0.1*** (-3.97)	-0.1*** (-4.87)	-0.2*** (-4.43)	-0.1*** (-3.60)	-0.1*** (-3.20)
Δ ln GDP	0.8** (2.16)	0.5 (1.50)	0.9* (1.80)	0.3 (0.71)	0.6* (1.82)	0.4 (1.35)	1.0*** (2.99)	0.9** (2.43)	0.8* (1.96)
Δ URB	-	-0.4** (-2.24)	-	-	-	-	-	-	-
SSE	-	-	-0.002 (-0.29)	-	-	-	-	-	-
TSE	-	-	-	-0.01** (-2.49)	-	-	-	-	-
EXPHLT(-1)	-	-	-	-	-0.4** (-2.58)	-	-	-	-
EXPEDU(-3)	-	-	-	-	-	-0.1** (-2.59)	-	-	-
Δ ln UNEMP	-	-	-	-	-	-	0.6** (2.21)	-	-
Δ ln EMPF	-	-	-	-	-	-	-	-0.7 (-1.10)	-
INFL	-	-	-	-	-	-	-	-	0.003 (0.24)
Constant	-46.7*** (-3.38)	-57.4*** (-4.31)	-44.8** (-2.28)	-47.8*** (-3.95)	-45.6*** (-3.95)	-55.8*** (-4.79)	-62.2*** (-4.35)	-48.9*** (-3.52)	-48.0*** (-3.15)
Obs.	21	21	16	21	20	20	21	21	21
F-stat (prob.)	9.79 (0.00)	10.34 (0.00)	4.72 (0.02)	11.16 (0.00)	11.65 (0.00)	13.45 (0.00)	10.25 (0.00)	7.74 (0.00)	6.95 (0.00)
adj. R²	0.569	0.651	0.498	0.670	0.692	0.724	0.649	0.574	0.543
Table 3 (continued)									
Turning Point	19.0%	19.1%	19.1%	19.2%	19.3%	19.2%	19.0%	19.1%	19.0%
<i>Histogram - Normality Test</i>									
JB (prob.)	0.78 (0.68)	1.09 (0.58)	0.87 (0.65)	0.52 (0.77)	1.78 (0.41)	4.21 (0.12)	0.55 (0.76)	0.68 (0.71)	0.93 (0.63)
<i>Serial Correlation LM Test</i>									
F-stat (prob.)	0.87 (0.44)	1.18 (0.34)	0.78 (0.49)	1.52 (0.25)	1.32 (0.30)	1.34 (0.29)	0.11 (0.90)	0.61 (0.56)	0.69 (0.52)
<i>Heteroskedasticity Test (BPG)</i>									
Obs*R-sq. (prob. χ²)	3.41 (0.33)	3.41 (0.49)	4.46 (0.35)	1.96 (0.74)	4.57 (0.33)	4.37 (0.36)	5.33 (0.25)	4.73 (0.32)	3.76 (0.44)

Notes: * p<0.1, ** p<0.05, *** p<0.01, t-values are in parentheses.

Source: author's calculations

As the impact of social costs is not expected immediately, but after a certain time, so these variables were included into the model with their lagged values. As the results

show, health spending affects inequality with a lag of 1 year, and education spending with a lag of 3 years. A 0.1 percentage point increase in the share of health and education expenditures alleviates inequality by 3% and 1.1%, respectively. The effects of unemployment rate and female employment rate on income inequality are estimated in models 7 and 8, respectively. The results show that a 1% increase in unemployment exacerbates the level of inequality by about 0.6%, and the female employment rate has a negative but statistically insignificant effect. The effect of inflation on inequality is estimated in model 9, and the results show that this effect is statistically insignificant.

Conclusions. Summarizing the results of all evaluated models, we can state that the relationship between FDI and income inequality in Armenia is characterized by an inverted U-shaped curve. This means that FDI exacerbates income inequality, but there is a turning point after which further increases in FDI will alleviate inequality. Considering the formula (2), we can suppose that Armenia will reach that turning point when the share of FDI in GDP exceeds the 19% threshold. Empirical results show that economic growth in Armenia is accompanied by deepening inequality: a 1% increase in real GDP per capita exacerbates inequality by 0.5-1%. Rising unemployment rate also exacerbates inequality, while urbanization, enrollment rate in higher education, and government expenditures on healthcare and education mitigate it. Secondary school enrollment rate, female employment rate and inflation have no statistically significant impact on the level of inequality.

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As the results of the studies show, the growth of FDI, providing the society with capital and advanced technologies, promotes human development [Ghazaryan, 2022b]. However, there is a lot of evidence that the increase in FDI also leads to the deepening of income inequality [Chintrakarn, 2012]. Taking into account the debates in the theoretical literature about the FDI-inequality relationship, as well as the various results of empirical studies, this article aims to reveal the nature of the FDI-income inequality relationship in Armenia. For this purpose, a regression model was constructed, where the square of FDI was also included in order to check the possibility of non-linear relationship. Models were estimated using the OLS method, and estimations were performed using the EViews 10 software package. The empirical results show that the relationship between FDI and income inequality in Armenia is characterized by an inverted U-shaped curve. This means that FDI exacerbates income inequality, but there is a turning point after which further increases in FDI will alleviate inequality.

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