# Foreign aid, foreign direct investment and domestic investment nexus in landlocked economies of Central Asia

Annageldy Arazmuradov

University of Bergamo

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Department of Economics and Management of Technology, University of Bergamo, Dalmine, Italy

E-mail: annageldy.arazmuradov@unibg.it

## Abstract

This paper investigates the relationship between foreign aid (ODA), foreign direct investment (FDI) and their effect on domestic investment in five landlocked and emerging economies of Central Asia. It is important for donor countries to understand whether their aid helps to bring in a private capital essential in transition period or not. If it does, it creates a ground for public-private partnership that could release from financial constraints and restore conditions for economic growth in transition economies. If it does not, then it calls for reassessing mechanisms of 'aid architecture'. We test ODA-FDI link on two levels: regional and country. Our results from seemingly unrelated regression on regional level indicate that (a) aid has a positive role on FDI inflows; (b) aid and FDI are complementing flows, and (c) FDI complements domestic investment, while ODA decrease it. However, on the country level only in Kyrgyzstan and Tajikistan, foreign aid catalyzes FDI inflows. We conclude that the ODA-FDI nexus is present in countries with low per capita GDP and economic growth. There is a need for improvement of aid mechanism and a room for public-private cooperation in economies of Central Asia.

**Keywords:** Central Asia; transition economies; foreign direct investment; official development assistance; gross fixed capital formation

**JEL classification:** F21, F30, P33, O11

## 1. Introduction

Do external financial flows help developing countries to grow? This is one of the most important questions in economic growth and development literature, especially as financial resources in developed economies are becoming more limited. Every year, OECD[1] donors give enormous

[1]Organization for Economic Co-operation and Development (OECD) has a development assistance committee (DAC) that base their decision on disbursing financial aid. It has four categories: 1.Least Developed Countries; 2. Other Low Income Countries (per capita GNI<$935 in 2007): Kyrgyzstan, Tajikistan, Uzbekistan; 3. Lower Middle Income Countries and Territories (per capita GNI $936-$3.705):

amount of financial resource to five landlocked post-communist and complex Central Asian economies (CA5)[2] in terms of official development assistance (ODA), which is broadly humanitarian assistance from developed countries.[3] ODA is administered by OECD Development Assistance Committee (DAC) that consists of 24 developed countries.[4] On the other side, multinationals from DAC donor countries launch their projects via foreign direct investment (FDI) searching for more profit. Both of these transfers are crucial to transition economies. FDI helps recipient countries to encourage specialisation in trade and raise income of low-skilled that would eventually lift their wages and decrease inequality. ODA aims to improve social welfare, decrease inequality and raise skilled workers pool through technical assistance. At least on a conceptual level, both flows extend common features to recipient countries.

In a historically important International Conference for Development (2002) document, "*The Monterey Consensus*"[5], and follow-up Doha Declaration on Financing for Development outcome report, FDI is viewed as an addition to ODA.[6] UNCTAD also stresses this point in advising local governments: "Channelling some ODA into investment projects financed jointly with domestic financial institutions…"[7]. It is important for donor countries to understand whether their

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Turkmenistan; (per capita GNI $3.706-11.455): Kazakhstan. DAC reviews every 3 years GNI per capita reported by World Bank and make a list of potential recipients. (OECD website: www.oecd.com)

[2] Central Asian economies comprise of: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Among them: *Oil and Gas Exporters*: Kazakhstan, Turkmenistan and Uzbekistan and *Oil and Gas Importers*: Kyrgyzstan and Tajikistan. Source: IMF.

[3] On principles, mechanism and opinions on effects of ODA see Hansen and Tarp (2000); Dalgaard *et al.* (2004); Lahiri (2006); Bourguignon and Sundberg (2007); Easterly (2007); Mavrotas and Nunnenkamp (2007) and Selaya and Sunesen (2008). We interchangeably call ODA as foreign aid in this paper.

[4] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States and the European Commission (EC). The World Bank, the International Monetary Fund (IMF) and the United Nations Development Programme (UNDP) participate as permanent observers. (OECD, Inside the DAC, A Guide to the OECD Development Assistance Committee, 2009-2010).

[5] The United Nations-sponsored summit-level meeting was held in Monterrey, Mexico, from 18 to 22 March 2002.

[6] Doha Declaration on Financing for Development: outcome document of the Follow-up International Conference on Financing for Development to Review the Implementation of the Monterrey Consensus. (http://www.un.org/esa/ffd/doha/documents/Doha_Declaration_FFD.pdf; United Nations, 2009).

[7] "Trade and Development Report 2008', United Nations Conference on Trade and Development (UNCTAD): http://www.unctad.org/Templates/Page.asp?intItemID=4580&lang=1 (Accessed 15 December 2011).

investments induce foreign direct investment. There are few bases behind this notion: (a) foreign aid is centred at improving local economic development and sustainability, (b) aid is aimed to facilitate more market access opportunities for emerging markets and (c) aid is supposed to increase social capital of population, among others. At first it seems they are two different flows and no link exists, because FDI is a capital account item and ODA is a transfer payment item of current account though both are the balance of payments (BoP) entries. For example, one of the ways the link arises when donors who give assistance are also ones who conduct FDI, called 'vanguard effect' according to Kimura and Todo (2010). Why ODA should be important for attracting FDI? Private capital is crucial to transition economies at initial phases but need to be attracted. Private investors are more selective and attentive since the cost of investment in developing countries is high, created by insecure governments, weak legal system and underdeveloped infrastructure. If there is no improvement of business environment in recipient county from inside, then one viable option is the foreign aid to tackle this issue from outside. In this sense the role of foreign aid in adjusting financial constraints to attract a FDI is imperative. This creates the need for international organizations such as World Bank to intervene and assist countries in developing "new market thinking" to deal with donors and foreign private investors. This usually implemented via various foreign aid projects and programs. If there is in fact an ODA-FDI connection then it could, given a certain sufficient conditions, (a) facilitate improvement of domestic business environment (b) help in designing of domestic modern market mechanisms to better secure foreign investment (b) create grounds for public-private partnership, such as tiding aid with domestic private sector investments. This "cooperation" would be a contribution to long-term economic development and help recipient economies to position themselves in international arena. If there is no connection, then it calls attention to reassessing the mechanisms of 'aid architecture' for long-term civil society building goals. For multinational enterprises (MNEs) from developed nations it is equally important to gain positive public opinion and further explore new markets for profit seeking motives. For recipient local societies and their governments, it is crucial to devise policies to favour a particular foreign capital that could bring tangible contribution to domestic welfare improvements.

Hence, the central focus of this paper is (1) to explore the possible link between aggregate ODA and FDI in five landlocked Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan with similar socio-economic situations and financial systems. Harms and Lutz (2006) studied 76 developing countries before 2000, excluding CA (5) economies, and found strictly positive effect of ODA on FDI especially in countries with unfavourable institutional environment. We specifically test their latter conclusion to see whether this also holds for Central Asia economies. And (2) to analyze the effect of these foreign flows on domestic investment. We test whether foreign flows finance domestic spending on infrastructure.

The link between ODA-FDI was studied only by few scholars and there is no specific consensus yet. For example, Kosak and Tobin (2006) state in their panel study of 90 various growths level group of countries from 1970 to 2001 that FDI and ODA are unrelated, as each had specific effects on economic growth. Caselli and Feyrer (2007) study groups of developed and developing countries also emphasise that foreign investment and foreign aid are more like substitutes than complements. None of mentioned studies above includes Central Asian

economies. According to the theory of FDI, private investments are favoured more when certain business conditions in host countries are met, such as macroeconomic stability, infrastructure, regulation and financial system intact (Navaretti and Venables 2004, Globerman and Shapiro 2002, Davies 2011). Foreign aid is essentially targeted at improving these conditions.

To quantify the above concerns we build a panel data set and estimate our data by simultaneous equations modelling called seemingly unrelated regressions (SUR) proposed by Zellner (1962) to account for simultaneity and cross-section error correlation. Differently from previous studies we estimate our model on pooled and individual country levels. The advantage of SUR is that it helps us better explore the ODA-FDI link regarding particular country simultaneously running three equations.

Our result on regional (pooled) regression level supports Harms and Lutz (2006) conclusions and we found positive influence of ODA on FDI inflows in CA (5). The same complementary effect of ODA is also corroborated in studies by Hien (2008), Selaya and Sunasen (2008), Asiedy *et al*., (2009) and Bhavan (2011). Moreover, we also found reverse positive effect, that FDI also attracts foreign aid (ODA). However, the relation of these flows to domestic investment is different: FDI complements, but aid substitutes domestic expenditures. In other words, FDI augments, but ODA finance domestic spending on regional CA (5) level.

On country (individual) regressions we see an interesting and compelling picture. There is no unilateral effect anymore, but fragmented one. Only two countries out of five namely, Kyrgyzstan and Tajikistan display consistent positive correlation of ODA to FDI and vice versa. We attach this finding to particular socio-political characteristics of these nations that is depicted with low GDP per capita and economic growth. Given that we don't observe this relation in Kazakhstan, Turkmenistan and Uzbekistan that seems to have broadly defined similar governance, market access and political conditions we arrive at a puzzle. Definitely, in these three nations incomes are higher and they are energy-exporters, but as appears in this study have no association between aid and FDI. So the only way we can address our observation is by stating the important role of national output: GDP per capita level: as low as 461$ (Kyrgyzstan) and 295$(Tajikistan) compared with 2.869$ (Kazakhstan), 1.364$(Turkmenistan) and 633$(Uzbekistan) on average for the period. We attach this result to this point, e.g. aid has a positive effect in stimulating FDI only at very low income levels. After that turning point the effect of aid regarding FDI gradually vanishes and natural economic mechanisms come into force.

We derive the following general policy recommendations: (a) in order for CA (5) economies to better accommodate FDI they better off re-consider their procedures toward foreign aid, i.e. identify the potential sectors and industries where ODA-FDI link is present, (b) ease the capital markets regulation, (c) enforce legal system and (d) encourage technological progress through trade in machinery and equipment, and finally, (d) direct aid on human capital to raise the "absorptive capacity" of nations. These supply-side management practices are supposed to contribute to the long-term economic growth. In the short-term, managing money supply, taxation and increasing government spending could boost the aggregate demand and hence increase national output, GDP.

We contribute to the empirical literature on ODA-FDI link by bringing new insights about foreign aid effects in transition Central Asian economies that could be helpful for international donor organisations, so that they could better devise their programs and do *'aid architecture'*, possibly enable better predictions of future aid packages. It could also provide thoughts on re-assessing public-private collaboration. Our understanding is that, the present paper is the first paper that studies foreign transfer flows' link in five remote economies in Central Asia.

The structure of the paper is as follows. Section 2 covers related past literature. Section 3 discusses ODA-FDI trends in Central Asian region. Section 4 covers our empirical investigation and data used. Section 5 contains a discussion on our results. Section 6 summarise the principal results and highlights future research prospects.

## 2. Theoretical Considerations

There are various ways foreign aid could affect foreign direct investment in host countries. According to Harms and Lutz (2006), if foreign aid is directed to infrastructure projects, human capital and complementary inputs then it could have an "*infrastructure effect*". Enhanced domestic conditions could lure foreign investors. Inflows of foreign aid are also expected to raise marginal product of capital (MPC) of domestic firms in recipient countries, which in turn attracts FDI. Another effect, '*rent-seeking*' might also appear, possibly arriving from the fact that local firms compete for rents from foreign aid. This situation reduces MPC that would result in less innovation activities, R&D spending and reduction in efficiency (e.g. Svensson, 2000; Harms and Lutz, 2006). The outcome of this behaviour would be more reliance on aid, which would discourage FDI. Clearly, foreign aid could add to '*financing effect*' that directly augments the balance of payment (BoP) of the recipient country. Arellano *et al.* (2009) argues that aid could increase the supply of tradable goods and reduce the price of non-tradable goods. They call it '*Dutch-disease effect'* that discourages the FDI. Kimura and Todo (2010) claim that there is also '*vanguard effect*' of foreign aid, meaning countries who give aid also tend to place an FDI in specific host economies. Mody *et al.* (2003) state that there is an '*information effect'* that foreign aid is carrying into host countries. Private information which is not accessible to the foreigner is revealed to investor via foreign aid. Aid programs help investors to collect data and build a study on recipient countries.

In general, channels of foreign capital entering the CA (5) region could be outlined as follows: foreign aid is directed into social infrastructure targeting *complementary inputs*, namely, health, education, water related projects and *economic infrastructure*, including energy, communication, and transportation. FDI is primarily focused on physical capital projects, production, manufacturing, banking and natural resource extracting sectors. Numerous research papers were devoted to analyses of FDI, but very few studies addressed the Central Asian (CA)

region that is located in the middle of the East and West continents trade route[8.] Among them, several studies focused on FDI effects in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (e.g. Garibaldi et al. 2001; Shiells 2003; Bayulgen 2005; Penev 2007; Kenisarin and Andrews-Speed 2008), but they were under the framework of Commonwealth of Independent States (CIS)[9] or Central and Eastern Europe (CEE)[10] that included countries with different economic setup[11]. Studies that focused solely on these five countries are scarce and addressed primarily the structural changes and political structure (such as in Gleason, 2001; Dowling and Wignaraja, 2006). Some other studies presented a narrative of economic policy developments in the region. For example, Dikkaya and Keles (2006) addressed the FDI developments in Kyrgyzstan through a case study approach. Other scholars, for instance Venables (2009) showed benefits of regional integration in Central Asia via general equilibrium modelling. Pomfret (2005, 2010) addressed Central Asian regional trade relations and policies, energy institutions, regionalism and integration into the world economy. Hoen (2010) expressed his opinion on transitional path of Central Asian countries. Kalyuzhnova (2003, 2008) thoughtfully reflects on social and economic developments, and energy related issues.

Moreover, the direct link between ODA and FDI was studied only in a handful of papers to the best of our knowledge. For example, Karakaplan *et al.* (2005), Harms and Lutz (2006), Kosack and Tobin (2006), and Selaya and Sunesen (2008) studied broad groups of developing countries. Kimura and Todo (2010) and Blaise (2005) focus on Japanese FDI and aid flow interactions. Carro and Larrú (2010) looked at ODA-FDI link in Argentina and Brazil. Kapfer *et al.* (2007) explored infrastructure aid-FDI links for 59 countries. Asiedu and Nandwa (2009) showed that aid mitigates appropriation risk on FDI for 35 low-income and 28 Sub-Saharan Africa. Hien (2008) looked at ODA-FDI in 28 provinces of Vietnam. Bhavan *et al.* (2011) analysed nexus between FDI and ODA for South Asian economies. Beladi and Oladi (2006) put the ODA-FDI link into a three-goods general equilibrium model and found that when foreign aid

[8] For example, the effect of foreign direct investment agglomeration effect for USA see Bobonis and Shatz, (2007), how economic freedom in the presence of FDI affects economies in Latin America consult Bengoa and Sanches-Robles (2003), and relation of market size to FDI in several Asian economies see Jaumotte (2004) among other comprehensive studies.

[9] CIS is the abbreviation for Commonwealth of Independent States that created in December 08, 1991. It consists of twelve countries: Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan and Georgia (that left CIS on August 14, 2008). The three Baltic States (also former Soviet Republics): Estonia, Latvia and Lithuania did not join the CIS.

[10] CEE or CEES-stands for Central and Eastern Europe former communist countries: Baltic States-Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Albania; states of former Yugoslavia- Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Kosovo, Montenegro and Macedonia.

[11] For more on mechanism of FDI in post-communist economies the reader is advised to consult Lansbury *et al.* 1996; Bengoa and Sanches-Robles 2003; Campos and Kinoshita 2003; Johnson 2006; Kenisarin 2008) among others.

is directed to public good, it could crowd out foreign investment in the recipient country, when given a factor intensity condition.

The findings on ODA-FDI link are mixed. Karakaplan *et al.* (2005) found that aid has a *negative effect* on FDI. On the other hand, Kosack and Tobin (2006) state that FDI and ODA are *unrelated* due to aid goes to support human capital, and FDI is private and thus goes to physical capital. Carro and Larrú (2010) also *could not find any systematic relationship* between FDI and ODA flows. Caselli and Feyrer (2007) studied marginal product of capital (MPC) and report that MPC is roughly the same across developing countries, and inflow of foreign aid only reduces MPC. In their study, foreign aid is *more substituted* to FDI. Further, in the study of 81 developing countries (excluding Central Asia from 1988-1999) by Harms and Lutz (2006) authors suggest that that after controlling for regulation in host countries, catalysing effect of aid is stronger in countries with unfavourable institutional environment. In South Asian countries, Bangladesh, Pakistan, Shi-Lanka and India foreign aid drives in the FDI according to the study by Bhavan *et al.* (2011).

## 3. Foreign Transfers' Trends in Central Asia

From 1991, all five countries declared their independence and started building their economies. Kazakhstan is the largest and by territory is the half the size of Europe[12]. Central Asia is under energy related political game between USA, Russia and China, according to Financial Times "*Investing in Central Asia 2008*" Special Report (FT.com, 2010). The importance of studying capital flows into these countries is justified by its strategic geographical location, which gives European Union economies, USA, Japan and China trading route to Afghanistan and further to the Middle East. Prospective growth and stability in the region could stimulate international trade, capital movements and intra Central Asian collaboration that could favour foreign investors. The region is rich in natural resources, especially in oil and natural gas, minerals and metals – they are of primary interest to multinational enterprises as input factors. For European Union, Central Asia is the potential source of future energy supply, especially natural gas.

The importance of attracting FDI inflows to CA (5) is that local firms are restricted and have constrains to funding opportunities. Availability of finance to support their businesses via FDI inflows (stock, portfolio and loans) is an alternative opportunity to revive the landlocked region's economic development.[13] Liquidity constraints prevent local firms from creating competitive

[12] According to reports from World Bank and International Monetary Fund Former Soviet Union (FSU), economies classified as *Energy Exporters* are Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan and Russia and *Energy Importers* are Armenia, Belarus, Georgia, Kyrgyzstan, Moldova, Moldavia, Tajikistan and Ukraine.

[13] More detailed analysis on FDI effects on recipient countries consult Navaretti and Venables (2004); Mody (2004), Krkoska (2001); Kirkpatrick (2006); Tondel (2001); Carstensen (2004); Mileva (2008), Dobrinsky (2007) and recently Hanousek *et al.*, (2011).

advantages through rigidities export markets. The region demonstrated high potential for market growth and trade relations. Industrial structure of Central Asian region characterised by oligopolistic markets in the main industrial sectors affiliated to mineral resources/energy, and with monopolistic domestic competition with numerous small-to-medium entrepreneurs. At the same time countries have their particular outlook for economic reforms and international policy and local developments. The major type of FDI in Central Asia is Greenfield investment.[14] This is when MNEs create their foreign operation units overseas and integrate vertically thus reducing the transfer costs and financial risks. Also, FDI inflows are mostly export-oriented and not directed to serve local markets according to Asian Development Bank report (ADB, 2009). Foreign capital lands in oil and energy sector, while service sector is almost untouched. The major types of foreign investment only happen after reaching agreement with top government officials. This may be due to fact that still after 1991, economies could not efficiently build sound regulations, functioning financial services and advances in structural reforms. Major investors are firms from USA, Japan, China, and developing Asia. Given these conditions and weak domestic competition offers a competitive advantage to multinational firms. MNEs that possess superior knowledge and technology simply enjoy the amateur markets of CA (5). In practice, MNEs enter the markets with political stability in the region as the only concern. This potential concern may bring to suppressing of domestic competition; however the benefits of FDI are well-known from the experience of Asian Tigers and at least in the beginning phase of the transition.

Table 1. Inward FDI, ODA, Domestic Investment and GDP for the period 1992-2009.

| **Country ↓** | **FDI** | | **ODA** | | **GFCF** | | **GDP** | |
|---|---|---|---|---|---|---|---|---|
| | Average FDI Flows ($) | Annual Average Growth (%) | Average ODA Flows ($) | Annual Average Growth (%) | Average DOM Flows ($) | Annual Average Growth (%) | Average GDP ($) | Annual Average Growth (%) |
| **KAZ** | 245.73 | 98.57 | 11.32 | 29.84 | 747.61 | 12.34 | 2.869.23 | 10.60 |
| **KYR** | 17.83 | 79.92 | 46.92 | 29.30 | 90.96 | 11.73 | 461.39 | 4.81 |
| **TAJ** | 13.96 | 95.53 | 25.41 | 29.59 | 48.68 | 18.45 | 294.66 | 6.67 |
| **TKM** | 105.34 | 36.92 | 6.49 | 25.01 | 216.86 | 7.57 | 1.364.01 | 10.72 |
| **UZB** | 7.71 | 17.84 | 5.79 | 13.47 | 159.04 | 4.07 | 633.32 | 5.12 |

Note: KAZ-Kazakhstan, KYR-Kyrgyzstan, TAJ-Tajikistan, TKM-Turkmenistan and UZB-Uzbekistan. All data for FDI –inward foreign direct investment, ODA- total official development assistance net, GFCF-gross fixed capital formation and GDP-gross domestic product are measured in per capita current US Dollars in thousands. The nominal (or current) series were transformed into per capita values by the following formula:$(Current(Nominal)\ value_i / Population_i$.For example GDP for Kazakhstan should be read: 2.869.23 $– means two thousand eight hundred sixty nine and ninety three US dollars and ODA for UZB as: 5.79$-five dollars and seventy nine cents per head. Source: UNCTAD, UNCTADstat (online database, 2011, http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx) .

[14] FDI is classified as "Greenfield investment" when the MNEs invest by building new factories, plants, offices, entities and buildings in host country. These new economic units have their own accounting books.

Table 1 presents that, on average for 1992-2009, Central Asian economies are different in terms of attracting FDI per capita. The huge foreign capital inflows are documented for the region: 188 million (or 8.14$ per head) in 1992 which soured up to 18.6 billion (or 1.710.42$ per capita) in 2009. We observe a sharp upward rise of total FDI from 2005 on. This could be due to influence from Asia, Chinese investors (Asia Economic Institute, 2012).[15] The first two countries in the ranking of the most attractive destinations for foreign capital inflows are leading energy-exporters of the region, Kazakhstan (245.73$ per head) and Turkmenistan (105.34$ per head) which could be explained due to investments in oil and gas industries. On the third place is Kyrgyzstan (17.83$ per head) that has rich metal deposits. All nations FDI's annual average growth was positive, with exceptional performance of Kazakhstan (99%), Kyrgyzstan (80%) and Tajikistan (96%).

Moreover, the average growth of real ODA per capita was positive and roughly homogeneous (29-30%) for all economies, except Uzbekistan (13%). The total foreign aid increased approximately more than tenfold from $117 million to $1.251 billion (or in capita terms from 13 to 154 $) between the sample period. Kyrgyzstan (47$/capita) and Tajikistan (25$/capita) are favourite destinations of donors. Even though the latter two counties are considered as energy-importers, Kyrgyzstan has huge mineral resources of non-ferrous metals (mercury ores and antimony), substantial coal reserves and gold, while Tajikistan is another region attracting much of the foreign aid and very rich in mineral deposits such as metallic ores (zinc, iron, mercury, gold, tin and lead) and common salts (such as carbonates, fluorites).

Domestic investment (GFCF) per capita had risen threefold from 12 billion to 41 billion dollars on average terms. Kazakhstan, Turkmenistan and Uzbekistan's per capita real gross fixed investments surged. Overall, average annual growth was around 11%. The lowest per capita GDP nations are Kyrgyzstan and Tajikistan, 461 and 294 $. We observe the pattern of more increase in FDI growth compared to ODA that raise a question on demand for foreign aid. It seems like economies are prospering by the help of FDI, does this mean that FDI is substituting ODA? Does foreign aid serve financing the domestic investment in the region because we observe the superior growth over domestic spending growth on average? We address these issues later in the paper.

[15] The presence of China in Central Asia was from the beginning of transition in 1991. Investors placed huge money in infrastructure projects in Kyrgyzstan and Tajikistan. The main goal was to satisfy the big demand for input factors and raw material that Central Asia possesses. Source: article "China is investing in Central Asia" http://www.asiaecon.org/special_articles/read_sp/12835.

# 4. Econometric methodology

## 4.1 Empirical Model

We build a model with three equations to estimate simultaneously: one for foreign direct investment (FDI), one for foreign aid (ODA) and one for domestic investment (DOM). The reason is that each foreign flow has its own mechanism. FDI is administered through a private channel and aid is through a public one. Both of these flows are part of balance of payments. Hence, we would assume some reverse association between them. Additionally, we would like to test external flows' effect on investments by local economies (DOM). This carries a crucial point: if the foreign flows reduce domestic investment, e.g. financing it, this means that economies of CA (5) are less concerned with long-term growth prospects. If they complement domestic flows then we consider it as a positive event that meliorates the process of transition. Since we deal with capital movements, we also include KOF globalisation index (Glob) to account for globalization rigidities of recipient economies (e.g. Dreher, 2006). This index is aimed at capturing domestic environmental conditions and aspects related to capital mobility. (see Appendix for more details). The year variable (Year) is included due to the need to control for individual country effects and because our sample is in long form (Cameron and Trivedi, 2009). Allowing for reverse causality or simultaneity, meaning FDI, ODA and domestic investment (DOM) are defined simultaneously, we estimate our model, using seemingly unrelated regressions (SUR) technique. In this way we are better able to reveal the possible link between these investment flows. Thus, our empirical model is set up as follows:

$$
\begin{aligned}
ln\,(FDI)_{i,t} &= \gamma_0 + \gamma_1 ln\,(ODA)_{i,t} + \gamma_2 ln\,(DOM - FDI)_{i,t} + \gamma_3 (Glob)_{it} + \gamma_4 (Year) + \varepsilon_{it} \\
ln\,(ODA)_{i,t} &= \beta_0 + \beta_1 ln\,(FDI)_{i,t} + \beta_2 ln\,(DOM - FDI)_{i,t} + \beta_3 (Glob)_{it} + \beta_4 (Year) + \epsilon_{it} \\
ln\,(DOM - FDI)_{i,t} &= \delta_0 + \delta_1 ln\,(FDI)_{i,t} + \delta_2 ln\,(ODA)_{i,t} + \delta_3 (Glob)_{it} + \delta_4 (Year) + \omega_{it} \\
& i = 1, \dots N\,; t = 1, \dots T
\end{aligned}
\tag{1}
$$

where $i$- countries (N=5) and $t$-time frame (T=18), *FDI*- foreign direct investment, *ODA*- official development assistance, *ala*- foreign aid, *DOM*- gross fixed capital formation in host country minus *FDI* since fixed capital portion of external flows, e.g. FDI is not financed by domestic residents, it should not be included in the domestic investment according to Younas (2011), *Glob*- is the KOF globalisation index. All the data for estimation were transformed into real per capita terms. The nominal series were deflated by the help of CPI.

Given dimensions of our sample the estimation was implemented by employing SUR estimation technique proposed by Zellner (1962). This method allows us to jointly estimate three equations for our sample. Also, SUR estimator is based on small N=5 and large T=18 that is the feature of our sample[16]. SUR imposes each country to have its own coefficient vector unlike

[16] Since our sample is in long panel format we technically cannot apply traditional fixed (FE) or random effects (FE) modelling or similar estimators such as instrumental variable (IV) generalized method of

pooled OLS or even fixed effect (FE) estimators (Baum 2006, p.238). Moreover, it allows cross-section error component correlation, i.e. contemporaneous correlation. Estimator is efficient under the homoscedasticity condition which is managed by imposing bootstrapped standard errors. SUR estimation permits us to allow for the serial correlation over panels. Our estimates are equivalent to maximum likelihood (ML) estimates due to specification of iteration over disturbance covariance matrix and parameter estimates.

The panel data advantage over cross section and time series is that we get bigger sample which increase degrees of freedom and reduce collinearity between variables. According to literature, using SUR would improve the efficiency of our estimates over the traditional pooled OLS (POLS) methods, where we cannot simultaneously estimate several equations. Hence, we prefer the SUR methodology.

## 4.2 Data

We construct a long form panel data where time dimension (T=18) exceeds the number of countries (N=5). All yearly aggregate variables are in real values[17]transformed into natural log to reduce variability and expressed in per capita terms to make feasible comparisons. We include a few explanatory variables because of our data dimensions; otherwise we will lose degrees of freedom. The data summary, correlation matrix, variables descriptions and sources are presented in Tables of the Appendix.

Firstly, we chose these five countries, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, because they share similar economic, geographic and political setup. The remaining ten Former Soviet Union (FSU) Republics were different from the historical and geo-political view[18]. From 1991, all our five Republics broke away from the Soviet Union and established their sovereign states[19]. Secondly, the so-called *initial conditions* principle appears if we were to

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moments (GMM) that are based on large N and small T assumption regarding a sample. However, we could apply pooled estimators such as generalised least squares GLS, but it does not allow us simultaneity estimate our equations. (Baum, 2006, Cameron and Trivedi, 2009).

[17] We deflated monetary variables by the Consumer Price Index (CPI) from IMF.

[18] Soviet Union had 15 Republics that after the break were all collectively called Commonwealth of Independent States (CIS). The breakdown of countries by geographical markup is following: Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan); Baltic (Estonia, Latvia, Lithuania); Eastern Europe (Belarus, Moldova, Ukraine); Eurasia (Russia); Transcaucasus (Armenia, Azerbaijan, Georgia).

[19] Independence status officially declared: Kazakhstan (December 16, 1991); Kyrgyzstan (August 31, 1991); Tajikistan (September 9, 1991); Turkmenistan (October 27, 1991) and Uzbekistan (September 1, 1991).

look at the economic factors driving capital flows into this region (e.g. De Melo *et al.*, 1997). Not all Soviet Union countries were the same before the break; Baltic, Transcaucasus and Eastern Europe countries had industrial bases, while Central Asian countries could be classified as agricultural and natural resources regions. Thirdly, the inclusion of only these five countries avoids the problem of *sampling bias*, for example, comparing countries with different levels of industrial setup that is very important in empirical investigation. Following our initial theoretical discussion and literature mentioned in earlier sections, we have constructed relevant variables for our model. Statistical reporting in home countries is not comprehensive and underdeveloped, so we use aggregate data from international organisations, such as United Nations Conference on Trade and Development (UNCTAD) and International Monetary Fund (IMF). This is coherent with the objective of our *ex-post* study; to understand ODA-FDI link after 18 years of independence, 1992-2009[20].

## 5. Results

The result of simultaneous estimation of equation # 1 on CA (5) regional level including all countries is presented in Table 2. Our regressors explain variability in FDI and ODA equations quite well that is inferred from R2, at 75% and 62% respectively. Both equations have high significance (see Chi2 and P-value). The same is true for DOM equation, R2=0.71%.

The FDI equation (upper part, Table 2) displays a highly statistically significant the coefficient (+0.69) for ODA at 1% level. This means that a one unit increase in ODA raise FDI by 0.69 units. Since our model is in log-log form, all estimates, except globalization and year can be interpreted as elasticities. This means that one percent invested in foreign aid would induce inelastic 0.69% increase in FDI. At first sight the elasticity appears very low, but upon careful inspection of the institutional and social-economic situation this result is plausible. This suggests that donors are at least trying to contribute to investment climate through their humanitarian projects and activates in CA (5) economies.

From the ODA equation (middle part, Table 2) we infer that 0.85 % increase in foreign aid is due to one percent increase in FDI – this is supported statistically. As one can easily observe, the same but reversed link, FDI-ODA, produces different and richer result that corroborates outcome from the first, FDI equation. Our elaboration on this result is that the ODA arrived earlier than FDI, because it was a support to assist countries at the beginning of transition in 1991. The FDI lagged behind due to uncertain political and economic situation in the first few years of independence. Hence, foreign aid assisted private investors, for example, via "information effect" that was mentioned before (e.g Mody et al., 2003). For that reason we started our analysis from 1992 to give lead time for ODA to be absorbed.

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[20] Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan were included in the sample.

The common logic of donor aid is that the aid should stimulate self-sustainable development. In another words, donors expect from aid recipients that they will have their own initiatives and stimulate economic/social progress after the aid term has finished. Agencies such as World Bank, IMF, ADB, UN, USAID and various embassies carry out their missions and have settled offices in CA(5). We assume that they have introduced foreign policies and served as a connection (or first-hand information) to private foreign investors (from their own countries) to learn about these countries, make contacts, find the right people, and ultimately invest. Private investors, who are public MNEs had to deal with hidden uncertainty/risks, especially, in transition economies of Central Asia. Our minor positive estimate of 0.85%, we believe, may also suggest that ODA helped them to place a private investment (FDI) and mitigate unsystematic (firm-related) risks up to a certain degree. This fact is illustrated in a study by Asiedu *et al.* (2009) where they demonstrate that foreign aid indeed reduces adverse effect of expropriation risk on FDI in Sub-Saharan developing economies. They found that foreign aid effect helped to mitigate host country governments' rigidities. For example, any foreign investor could rely on her embassy in CA (5) to get a back-support and assistance as one of the legitimate channel in recipient countries.

The positive sign of domestic investment (DOM) variable, +0.75%, in FDI equation (upper part, Table 2) also makes sense, because improvements in domestic infrastructure, coupled with abandoned natural resources, would attract private foreign investors assuming favourable socio-political situation and market conditions. In our result domestic capital (DOM) drives increases in foreign direct investment. This could be explained by the following: transition economies are restricted in capital reserves and hence would be demanding more of external assistance, for example, FDI. We could not find positive effect of domestic investment (DOM) on foreign aid (ODA). Contrary, we found statistically significant negative estimate, -0.40%. One possible explanation is that at the early stages of economic development, transition countries of CA (5) were more concerned with economic growth and stabilization and less with social development. As the economic growth prospered countries' current accounts' have increased due to revenues from mineral endowments and exports, which brought increased foreign currency reserves as well as foreign debt. This process added to domestic savings which in turn allowed tangible investments in fixed capital directed into building infrastructure, plants, and facilities by local governments in later years. The statistical data on domestic spending from Table 1 supports this proposition. Hence, improvements in domestic spending had reduced the need for foreign aid.

Now, domestic investment is complemented by FDI as shown by statistically significant positive sign at +1.06% (lower part, Table 2). Firstly, this confirms our result from FDI equation (see upper part, Table 2). This outcome is likely due to the priority FDI receives in fulfilling the immediate needs in infrastructure projects in CA (5) economies. Even though FDI is broadly considered as export-oriented in the region, which means that it is not oriented to serve local markets, it has rendered positive spillovers to recipient nations, as an increase in FDI inflows stimulated local economies to spend more on infrastructure.

Table 2. SUR Regional Regression.

| Dep.Var: FDI | | FDI equation | (B.SE) | (z) | (P-value) |
|---|---|---|---|---|---|
| ODA | $\gamma_1$ | 0.6931881 | 0.0995054 | 6.97 | 0.000 |
| DOM | $\gamma_2$ | 0.7480825 | 0.0802279 | 9.32 | 0.000 |
| GLOB | $\gamma_3$ | 0.0194746 | 0.022698 | 0.86 | 0.391 |
| YEAR | $\gamma_4$ | 0.1845425 | 0.0575444 | 3.21 | 0.001 |
| CONSTANT | $\gamma_0$ | -374.0946 | 114.795 | -3.26 | 0.001 |
| Dep.Var: ODA | | ODA equation | (B.SE) | (z) | (P-value) |
| FDI | $\beta_1$ | 0.8466694 | 0.1145693 | 7.39 | 0.000 |
| DOM | $\beta_2$ | -0.3974756 | 0.1458185 | -2.73 | 0.006 |
| GLOB | $\beta_3$ | -0.0094726 | 0.0252811 | -0.37 | 0.708 |
| YEAR | $\beta_4$ | -0.2020223 | 0.0559339 | -3.61 | 0.000 |
| CONSTANT | $\beta_0$ | 407.4895 | 111.6504 | 3.65 | 0.000 |
| Dep.Var: DOM | | DOM equation | (B.SE) | (z) | (P-value) |
| FDI | $\delta_1$ | 1.060911 | 0.0969386 | 10.94 | 0.000 |
| ODA | $\delta_2$ | -0.461506 | 0.1810261 | -2.55 | 0.011 |
| GLOB | $\delta_3$ | -0.0217236 | 0.0261163 | -0.83 | 0.406 |
| YEAR | $\delta_4$ | -0.1879391 | 0.0686111 | -2.74 | 0.006 |
| CONSTANT | $\delta_0$ | 381.9386 | 136.7174 | 2.79 | 0.005 |

| FDI | | ODA | | DOM | |
|---|---|---|---|---|---|
| Equation: N | 75 | Equation: N | 75 | Equation: N | 75 |
| R2 | 0.7504 | R2 | 0.6159 | R2 | 0.7144 |
| RMSE | 1.349887 | RMSE | 1.407508 | RMSE | 1.521222 |
| Chi2 | 488.88 | Chi2 | 182.39 | Chi2 | 308.42 |
| P-value | 0.0000 | P-value | 0.0000 | P-value | 0.0000 |

Note: All variables are in natural logarithms and in per capita terms. FDI- foreign direct investment, DOM-gross fixed capital formation, ODA- official development assistance, GLOB-is the KOF globalisation index. N-number of observations, R2-goodness of model fit, B.SE-bootstrapped standard errors (under 400 replications). RMSE-room mean square error. Chi2/P-value- shows whether the model's coefficients are statistically significant.

This happens in the form of creating market access, improving transportation facilities and roads, enhancing taxation and amending financial regulation among others. Further, as we observe foreign aid (ODA) does seem to influence domestic investment negatively, -0.46%. It shows that more aid induces less domestic investment, e.g. financing it. We see the same substituting relationship from the ODA equation (middle part, Table 2) where highly statistically significant estimate is also negative, -0.40%. This result seems like a support for the opponents of

foreign aid idea who state that aid serves as extra financial source and consumed not contributing to economic development. Since we are not discussing the effect of aid on economic growth and national output we could only reflect on this result by going further on country level regressions in the next section. A reference source to learn about arguments against foreign aid is Easterly (2007). For those who still believe in aid professor Gustav Ranis presents his view in support of this idea. (Ranis, 2011).

In sum, since FDI and ODA complement each other on regional level according to our findings we conclude that there an indication on viable positive link between aggregate foreign aid and private flows. What is more important here is that these flows are not competing (or substituting) flows: we comprehend it as FDI improves industrial and foreign aid helps human capital development. The role of private investment seems to be pro-growth since it induces more domestic spending according to our estimates.

## 5.1 Country Regressions

To gain better understanding and test our findings on regional level we run equation # 1 simultaneously for each separate country and present results in Table 3 below. Outcomes are very interesting, because they show differentiated picture. We begin looking at FDI equation framework and later on at ODA and DOM one.

Only two countries namely Kyrgyzstan and Tajikistan display statistically significant effects of foreign aid on FDI. More, we observe positive (driving in) effect for Kyrgyzstan and Tajikistan with substantial magnitude in Kyrgyzstan of +5.21% which means that 1% dollar of aid attracts 5.21% of FDI. In another words, foreign aid complements FDI in these countries. From social point of view this result could be associated with changes in political sector and social reforms in Kyrgyzstan that went through three revolutions and particular focus of DAC donors on Tajikistan which is considered the "poorest" among CA (5) economies. (see GDP value in Table 1). Further, both countries are favorable destinations of donors that are confirmed by sample ODA statistics. These nations are a step ahead in governance and reforms compared to neighbors in CA (5). Also, we assume that investors were lured by on-going institutional changes and new market opportunities. One may think that it is especially for that reason we see this complementing effect. The same crowding in effect of ODA is observed in Tajikistan, though only of +1.69% elastic magnitude. The lesser but still positive effect compared to Kyrgyzstan could be due to similar institutional improvements. However, from economic point of view we believe that observed link in these nations is due to low national output levels and economic growth. The latter claim comes from the fact that our globalization variable (Glob) is not significant. We should have observed significant relationship in Kazakhstan but don't that is considered the hub of donor's network and their institutions in Central Asia.

Table 3. SUR Country Regressions.

| COUNTRY: | | KAZ | KYR | TAJ | TKM | UZB |
|---|---|---|---|---|---|---|
| DEP.VAR/ | | FDI | FDI | FDI | FDI | FDI |
| ODA | $\delta_1$ | 0.095 | 5.207*** | 1.686* | 1.201 | -0.636 |
| | | [0.649] | [0.967] | [0.782] | [0.804] | [0.696] |
| DOM | $\delta_2$ | 0.576* | -1.625** | -0.131 | -0.405 | 1.356* |
| | | [0.308] | [0.663] | [0.525] | [1.612] | [0.523] |
| GLOB | $\delta_3$ | -0.007 | -0.181 | 0.078 | -0.347 | -0.226 |
| | | [0.141] | [0.122] | [0.285] | [0.386] | [0.392] |
| YEAR | $\delta_4$ | 0.043 | 0.719*** | 0.179 | 0.283 | 0.359 |
| | | [0.245] | [0.163] | [0.304] | [0.335] | [0.356] |
| CONSTANT | $\delta_0$ | -85.131 | -1439.02*** | -363.398 | -550.709 | -719.93 |
| | | [482.017] | [321.104] | [600.759] | [659.95] | [697.618] |
| N | | 17 | 15 | 16 | 11 | 16 |
| R2 | | 0.875 | 0.780 | 0.9496 | 0.979 | 0.969 |
| RMSE | | 0.482 | 0.586 | 0.588 | 0.405 | 0.332 |
| Chi2 | | 131.71 | 114.58 | 315.65 | 538.41 | 574.83 |
| P-value | | 0.000 | 0.0000 | 0.000 | 0.000 | 0.000 |
| COUNTRY: | | KAZ | KYR | TAJ | TKM | UZB |
| DEP.VAR/ | | ODA | ODA | ODA | ODA | ODA |
| FDI | $\beta_1$ | 0.058 | 0.186*** | 0.296** | 0.592 | -0.672 |
| | | [0.428] | [0.034] | [0.118] | [0.381] | [0.513] |
| DOM | $\beta_2$ | 0.456 | 0.323*** | 0.383*** | 0.609 | 1.483* |
| | | [0.348] | [0.113] | [0.112] | [0.841] | [0.694] |
| GLOB | $\beta_3$ | 0.178 | 0.035 | -0.072 | 0.372 | 0.086 |
| | | [0.126] | [0.027] | [0.113] | [0.399] | [0.305] |
| YEAR | $\beta_4$ | -0.344 | -0.138*** | -0.002 | -0.313 | 0.008 |
| | | [0.211] | [0.030] | [0.126] | [0.204] | [0.321] |
| CONSTANT | $\beta_o$ | 677.377 | 276.205*** | 5.553 | 609.558 | -28.875 |
| | | [413.718] | [59.284] | [250.095] | [403.547] | [633.988] |
| N | | 17 | 15 | 16 | 11 | 16 |
| R2 | | 0.899 | 0.971 | 0.989 | 0.989 | 0.975 |
| RMSE | | 0.378 | 0.112 | 0.251 | 0.292 | 0.342 |
| Chi2 | | 164.07 | 700.33 | 1499.83 | 1232.41 | 726.46 |
| P-value | | 0.000 | 0.0000 | 0.000 | 0.000 | 0.000 |
| COUNTRY: | | KAZ | KYR | TAJ | TKM | UZB |
| DEP.VAR/ | | DOM | DOM | DOM | DOM | DOM |
| FDI | $\delta_1$ | 0.793* | -0.536*** | -0.096 | -0.362 | 0.571*** |
| | | [0.466] | [0.200] | [0.606] | [144.53] | [0.142] |
| ODA | $\delta_2$ | 1.023 | 2.977*** | 1.600* | 1.104 | 0.591 |
| | | [0.832] | [0.844] | [0.873] | [121.14] | [0.398] |
| GLOB | $\delta_3$ | -0.192* | -0.105 | 0.147 | -0.507 | 0.038 |
| | | [0.118] | [0.073] | [0.199] | [18.09] | [0.189] |
| YEAR | $\delta_4$ | 0.345* | 0.411*** | -0.131 | 0.438 | -0.116 |
| | | [0.204] | [0.116] | [0.212] | [0.584] | [0.197] |
| CONSTANT | $\delta_0$ | -678.139* | -822.962*** | 257.660 | -852.846 | 236.818 |
| | | [401.979] | [230.793] | [419.033] | [640.971] | [387.984] |
| N | | 17 | 15 | 16 | 11 | 16 |
| R2 | | 0.930 | 0.796 | 0.978 | 0.978 | 0.992 |
| RMSE | | 0.579 | 0.337 | 0.504 | 0.382 | 0.224 |
| Chi2 | | 272.28 | 113.81 | 727.56 | 534.01 | 2559.90 |
| P-value | | 0.000 | 0.0000 | 0.000 | 0.000 | 0.000 |

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. KAZ-Kazakhstan, KYR-Kyrgyzstan, TAJ-Tajikistan, TKM-Turkmenistan and UZB-Uzbekistan. Bootstrapped (under 400 replications) standard errors in square brackets. The variable descriptions the same as in note for Table 2.

We obtained striking result on the ODA equation from Table 3, middle block. Here, only Kyrgyzstan and Tajikistan report moderate inelastic, but highly statistically significant estimates. Again, we see complementing effect of FDI in Kyrgyzstan by +0.19 % increase in ODA and for Tajikistan FDI's attracting effect is of + 0.30 %. These results confirm the first FDI equation (Table 3, first block) outcomes and we could conclude that there is indeed some indication of positive complementing correlation between ODA and FDI in these nations. The rest of countries display no connection of FDI to foreign aid.

As for relation of these foreign flows to domestic investment (Table 3, last block) we could observe that FDI is of high importance in three countries: Kazakhstan, Kyrgyzstan and Uzbekistan. However, we obtain substituting effect in Kyrgyzstan (-0.54%) and complementing ones in Kazakhstan (+0.79%) and Uzbekistan (+0.57%). This could mean that FDI finances domestic investment in Kyrgyzstan, in other words, local economy enjoys the rent as foreign private capital renders saving on domestic expenditures. On opposite, the complementing effect in the latter two countries display that FDI induces more spending, augmenting domestic investment. On the other hand, relation of ODA to domestic spending is important only in Kyrgyzstan (+2.98%) and Tajikistan (+1.60%) from our estimates. In both countries foreign aid attracts more funding from local authorities on domestic needs. This is positive and favorable from the objective of foreign aid that is aimed at long term sustainability in recipient country. In other words, as a first-order effect foreign aid paves the road to private foreign investors in these two countries and as a second-order effect it induces more domestic investment. Ideally, this process in its turn contributes to economic growth, bringing along market reforms and trade facilitation. However, we don't observe a tangible increase in national output in these nations.

We could try to give some support for our findings in previous paragraph. We found important results only for two countries, Kyrgyzstan and Tajikistan that are consistently reporting significant estimates from all three equations. We attribute this finding to additional following facts about these two countries. Firstly, these nations received sizable total foreign aid 1992-2009: Kyrgyzstan (23.8$-315$) while Tajikistan (11.9$-409$) millions much higher than the rest. Secondly, for the period of 2007/2008 the Kyrgyzstan was on the third place among the top ten nations from 181 world economies in pro-markets reforms. ("*Doing Business 2009"* Report IBRD/World Bank, 2008). This report especially tracks local government's actions in improving business environment. This gives us grounds to believe in viable link between foreign aid and foreign direct investment in this economy. Also, *"Investing Across Borders*-2010" report by World Bank Group places Kyrgyzstan on the first place among Central Asian economies in terms of domestic foreign ownership participation rate. From official document "*Tajikistan's Quest for Growth: Stimulating Private Investment*" Tajikistan's Quest for Growth: Stimulating Private Investment (World Bank, 2011) we could infer that Tajikistan's government placed a tangible actions for enhancing investment climate. To summarize, there may be other sources to support above notions. Our rationale from empirical estimation tend us to believe that positive "stimulating" effect between foreign aid and private capital is observed solely due to

impoverished economic conditions, low national output and domestic spending in Kyrgyzstan and Tajikistan.

## 6. Concluding Remarks

This paper attempts to tackle the currently debated issue on the link between foreign aid and foreign direct investment in five Central Asian economies for the period 1992-2009. Differently from previous contributions we applied seemingly unrelated regressions (SUR) technique to test the above conjecture.

One of the principal conclusions of this paper is that, on a regional level, aggregate foreign aid has a complementing effect on foreign direct investment in five Central Asian economies. The reverse effect is also present, so we accept the finding as a positive association or link between ODA and FDI in the region. Our finding is supported by findings of Harms and Lutz (2006), especially, in rigid institutional environments that are present in Central Asian economies.

Another important observation is that aggregate foreign direct investment inflows positively induce more of domestic investment. This is very important since as its well known that domestic investment increase the size of the capital stock, and therefore helps determine the long-run growth. Thus, we believe that foreign aid raises the local complimentary inputs quality such as education and health, while foreign direct investments brings advanced technology, and possibly shifts the production frontier upward and ultimately contributes to a raise in efficiency and productivity. Regarding foreign direct investment, this also implies that domestic firms are learning to better combine external technology with domestic inputs in production process.

However, the direct link between foreign aid and private investment on aggregate country level is found only in two countries, Kyrgyzstan and Tajikistan even though these nations have received less of foreign capital but more of aid on average for the period. We attribute this result as follows: foreign aid works in countries with low national incomes given sufficient foreign aid inflows, especially, in the early transition period.

If our finding on the interaction of donor aid on foreign private investment flows nexus is true, then international humanitarian organisations indeed could boost positive pro-growth changes in domestic economies in collaboration with multinational enterprises (MNEs). This means better understanding the role and value of donor aid could substantially reduce aid outflows, and increase its efficiency via a sort of public-private partnership. MNEs are most likely to be more collaborative with international donors operating in Central Asia and other developing economies around the world.

The future works could juxtapose our model and results on different transition individual economies and try to refute or corroborate the results found in this paper. We remain to think that capital flow studies reveal better results when approached from individual country level.

## Appendices

Table A1. Data Sources and Descriptions.

| Variable | Name | Description | Source |
|---|---|---|---|
| **FDI** | FDI | The Foreign Direct Investment. The value of capital of MNEs in host country in real terms. US Dollars at current prices in millions. | UNCTAD |
| **Official Development Assistance** | ODA | Net official Development Assistance received and aid received, US Dollars at current prices in millions. | World Bank Development Indicators (WDI online) |
| **Domestic Investment** | DOM | Gross Fixed Capital Formation minus FDI inflows. This way we can obtain local investments by government and private sector into fixed assets and human capital less payments for foreign debt. US Dollars at current prices in millions. | UNCTAD |
| **Globalization Index** | GLOB | KOF Globalization Index. Measures macroeconomic environment. | KOF |
| **Pop** | Pop | Population | UNCTAD |
| **CPI** | CPI | Consumer Price Index | IMF |

Table A2. Descriptive statistics Summary: Total Sample. Real Values.

| Variable | Units | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| **FDI** | Millions USD | 90 | 8560.768 | 40540.69 | -24 | 329166.7 |
| **ODA** | Millions USD | 90 | 13016.4 | 91989.88 | 5.884357 | 861000 |
| **DOM** | Millions USD | 90 | 1206949 | 9386283 | 20.38859 | 8.84e+07 |
| **Glob** | 0-100 | 85 | 38.42625 | 11.10762 | 15.14242 | 59.74965 |
| **Pop** | Millions USD | 90 | 11.13199 | 7.945662 | 3.881973 | 27.12806 |
| **CPI** | Percent | 90 | 2.759488 | 3.828602 | 1.00e-05 | 19.14858 |
| **Year** | Years | 90 | | | 1992 | 2009 |

Table A3. Correlation Matrix.

| | FDI | ODA | DOM | GLOB | Year |
|---|---|---|---|---|---|
| **FDI** | 1.0000 | | | | |
| **ODA** | 0.1282 | 1.0000 | | | |
| **DOM** | 0.0671 | 0.9843* | 1.0000 | | |
| **GLOB** | -0.1701 | -0.1784 | -0.1435 | 1.0000 | |
| **Year** | -0.2872* | -0.2274* | -0.2090* | 0.5478* | 1.0000 |

Note: variable are in real terms. Significant correlations at 5% significance level are marked by *.

## A4. Variables of the Model

### *Dependent Variables*

**Foreign Direct Investment (FDI) -** this is an aggregate per capita real value in current million of US dollars converted into real values dividing by Consumer Price Index (CPI) index. The reason for choosing flow and not stock value is because we seek to capture the link between FDI-ODA and we cannot do so in the case where FDI is stock, which means it is a part of domestic capital.

**Official Development Assistance** (**ODA**) - taken from UNCTAD database and in aggregate form. It includes what is actually received (and not disbursed meaning it was allocated, but not yet transferred to recipient county) as official development assistance and aid made by DAC donor countries. We use yearly aggregate data in this study. Variable was deflated by CPI and expressed in natural logarithmic form per capita.

**Gross Fixed Capital Formation** (**Capital**) - this variable is the domestic investment of the government into fixed assets such as plants, buildings, roads and infrastructure. Variable was deflated by CPI and expressed in natural logarithmic form per capita. Note that this variable is also in flow form and it is not a net value (after depreciation). It is investment to domestic capital stock.

### *Independent Variable: Environmental*

**KOF Globalization Index**- this index is composed of three components and defined as: (a) *economic globalization* - featured as long distance flows of goods, capital and services and market exchange attributes such as information and perceptions; (b) *political globalization* - depicted by a diffusion of government policies; and (c) *social globalization* - expressed as the dissemination of ideas, information, images and people.

Source: http://globalization.kof.ethz.ch/

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