

The Political Economy of Foreign Aid and Growth: Theory and Evidence*

Sultan Mehmood[†]

University of Paris - IX

sultan.mehmood@dauphine.fr

Avner Seror[‡]

Chapman University

seror@chapman.edu

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Abstract

In this paper, we demonstrate that even when foreign aid is used to fund patronage, it may still have a positive - and significant - effect on economic growth in developing countries. First, we present a theory that formalizes the effect of aid on economic growth and patronage. Next, we provide evidence from Pakistan consistent with the predictions of the model that foreign aid increases economic growth, despite being used for patronage. The identification strategy we propose allows us to provide causal evidence for the predictions of the model.

JEL: F35, D72, O1

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[†]University of Paris-Dauphine, PSL, LEDa, Place du Maréchal de Lattre de Tassigny, 75016 Paris, France.

[‡]Chapman University, 1 University Drive, 92866 Orange, CA, USA.

1 Introduction

Foreign aid is one of the most important policy tools that rich countries use to fight global poverty. Most studies examining the effect of foreign aid on economic growth find positive effects (see for instance, [Burnside and Dollar \(2004\)](#); [Sachs \(2006\)](#); [Clemens et al. \(2011\)](#); [Werker, Ahmed and Cohen \(2009\)](#); [Arndt, Jones and Tarp \(2016\)](#); [Galiani et al. \(2017\)](#)).¹ Nevertheless, scholars have long recognised that it can also fund patronage, breed conflict, ethnic favoritism, corruption and consolidate autocratic regimes.²

In this paper, we reconcile these views in a theory that formalises the effect of foreign aid on growth and patronage. We also document an overall positive effect of foreign aid on growth, despite aid being used as a patronage mechanism. To provide causal evidence for the predictions of the model, we estimate the effect of US aid on patronage and economic growth in Pakistan using changes in aid legislations in the United States as an instrument for foreign aid flows coming into Pakistan. Our estimates imply that exogenous aid shocks exert positive impact on economic growth. We find that this positive effect of foreign aid on economic growth exists despite patronage, as aid is used to fund public employment and is disproportionately spent in the region of birth of the incumbent.

Our theoretical results show that when politicians cannot commit to public policies, they offer public employment in their region of birth. By doing so, they credibly transfer resources to a fraction of the citizenry, and consolidate their power. Inefficiencies on how foreign aid is spent then arise in our model, because politicians are unable to commit ([Acemoglu \(2003\)](#), [Robinson, Torvik and Verdier \(2006\)](#), [Besley and Coate \(1997\)](#), [Robinson and Verdier \(2013\)](#)). Some agents are diverted from the private sector to less productive public employment, in the region of birth of the incumbent. These inefficiencies - inherent to aid windfalls - are however counterbalanced by another effect: foreign aid - when used to fund patronage - also increases the incumbent's benefit of staying in power, making public policies more efficient. This, in turn, can lead to lower rent

¹Notable exceptions that find null effect (positive but statistically insignificant coefficient estimates) include ([East-erly, Levine and Roodman \(2004\)](#) and [Rajan and Subramanian \(2008\)](#)).

²See, for instance, ([Ahmed \(2012\)](#); [Nunn and Qian \(2014\)](#); [Hodler and Raschky \(2014\)](#); [Dreher et al. \(2016\)](#), [Easterly and Pfutze \(2008\)](#); [Asongu \(2012\)](#); [Kono and Montinola \(2009\)](#))

extraction and higher public investment. Hence, despite patronage, foreign aid can have a positive effect on economic growth.

In the context where the scope of informal employment is large, the inefficiencies implied by foreign aid on a less effective use of human resources are limited. Therefore, when resources are diverted from informal activities to the public sector, the negative effect of foreign aid on growth due to patronage is low. This explains why foreign aid - despite funding patronage - can lead to a substantial growth effect. We can reasonably expect this to be the case for many developing countries, including Pakistan where our data come from. Indeed, a large informal sector is typical for many developing countries ([International Labor Organization \(2018\)](#)). Finally, in the case of Pakistan, according to a recent 2017-2018 Labour Force Survey 71% of the total labour force operates in the informal sector ([Pakistan Bureau of Statistics \(2018\)](#)).

Testing our key theoretical result that foreign aid has a causal and positive impact on growth, however, faces an important empirical challenge: the decision to dispatch foreign aid is endogenous to recipient country fundamentals. As is extensively noted in the literature, weak or in some cases strong growth in aid recipient countries determines donors' decision to dispatch aid. This makes the aid-growth relationship endogenous. Formal analysis of instrumental variables used thus far points towards important shortcomings ([Bazzi and Clemens \(2013\)](#)). This is because most instruments employed exploit aid variations within the recipient countries "from factors such as geography, population and income that naturally leave open many concerns about the exclusion restriction" ([Qian, 2015](#), p. 302). Therefore, in our identification strategy, instead of relying on an instrument based on aid recipient country, we instrument foreign aid to Pakistan by changes driven by reasons orthogonal to Pakistan's domestic fundamentals. First, we use geopolitical events such as Soviet Invasion of Afghanistan and 9/11 attacks in the United States to identify the effects of aid on growth in Pakistan. Under the assumption, that these events are orthogonal to domestic fundamentals of Pakistan, we can estimate the causal effect of US foreign aid on output growth in Pakistan. Second, we examine the robustness of these results where we instrument foreign aid coming to Pakistan with broad changes in aid legislations in the United States. Under the assumption that changes in aid legislations in the US is determined by factors related to the US, not specificities of the

Pakistani economy, we can interpret the causal the effect of aid on growth.³

In accordance with the predictions of the model, we find that aid shocks are positively associated with output growth. A typical US aid shock consisted of about 1% of Pakistans GDP and equalled about USD 400 million. This is about half of what the government spent on education and is a little more than what it spent on healthcare in 2015 (UNESCO, 2016; [World Health Organization \(2016\)](#)). The estimates imply that this aid shock is associated with an additional 1% GDP per capita growth. Formal analysis of variance decomposition indicates that about 25% of total variation in GDP per capita of Pakistan can be explained by these aid shocks. Similar results are found with high frequency monthly output series with aid shock associated with an additional 1% increase in output growth.

Likewise, we show that aid funds patronage. First, we document that US aid shocks are associated with an increase in public employment in Pakistan. In particular, employment of public school teachers in Pakistan increases following the US aid shocks. Second, we show that US aid shocks are also associated with an increase in public spending. Specifically, we show that the public expenditure in Pakistan is 2% higher relative to the counterfactual of no such aid shock. Third, we find evidence that during time of aid windfalls, the birth region of the incumbent leader witnesses a disproportionate increase in output growth. In particular, output growth in the birthplace of the incumbent leader is 2% higher during the aid windfalls.⁴

We provide evidence in favour of the key identification assumption that allows us to interpret the differential impact of foreign aid at the birthplace of incumbent leader as causal. That is, we find no evidence that there are differential trends prior to the aid shocks. First, we show that the average industrial production in the birth-province of the incumbent leader (the treatment) versus the average industrial production in the provinces where the leader is not in office (the control), follows common trends prior to the geopolitical aid shocks. Second, we conduct a placebo test where we show that one, two or three years before the region becomes the birth region of the incumbent head of state during the geopolitical aid shock does not induce a disproportionate

³We provide evidence consistent with this interpretation of the results.

⁴This is consistent with the cross-country evidence presented by [Dreher et al. \(2016\)](#).

increase in output growth.⁵

Finally, we provide evidence that the positive effect of aid on growth is robust to several alternative explanations. In addition to the foreign aid channel, there are four leading alternative channels. First, if the US aid is correlated with non-US global aid, then our estimates would be biased upwards, with the geopolitical aid capturing the effect of total global aid flows. Second, the US aid shocks may have accompanied a change in US trade policy where trade with the US, not foreign aid, could have caused the change in economic performance. Third, the US aid shocks could have accompanied lucrative investment deals with the United States. Therefore, it may be that US investment, not aid, that explains the improved growth following the aid shocks. Fourth, important geopolitical events such as the Soviet invasion of Afghanistan may have increased the external threat perception in Pakistan. This may have led to increased investment in defence spending causing growth, instead of the aid shocks. We examine each of these explanations. We test for the non-US aid, US trade, investments and defence spending explanations by examining how these variables changed during the geopolitical shocks. We discover that following the geopolitical shocks, these variables are virtually unresponsive.⁶ Therefore, when we control for them in the regressions, we observe no discernible effect on the qualitative as well as statistical significance of the results.⁷

This paper relates to several strands of literature.⁸ First, our paper relates to the literature on the political economy of aid, which demonstrate that foreign aid finances patronage and consolidates incumbent politicians ([Ahmed \(2012\)](#), [Jablonski \(2014\)](#)), erodes democratic institutions ([Djankov, Montalvo and Reynal-Querol \(2008\)](#)), breeds conflict ([Nunn and Qian \(2014\)](#)), causes moral hazard problems ([Azam and Laffont \(2003\)](#)) and deteriorates governance in recipient coun-

⁵We further show that many of the potentially confounding factors (such as US trade, FDI, non-US aid and military spending) when interacted with the head of state dummy are statistically insignificant, while interaction term of head of state incumbency with aid windfalls is significant.

⁶We find similar results across three non-US aid flow series: total non-US global aid, UK aid (Pakistan's largest donor after the United States) and European Union aid.

⁷Interestingly, the military spending as a proportion of public spending and defence component of GDP continue to follow a downward trend even in 'high external threat' periods.

⁸Here, we cannot do justice to the large aid-growth literature, for a recent review, see for instance [Qian \(2015\)](#).

tries ([Wright and Winters \(2010\)](#)).⁹ Our model is robust enough to square the main issues raised by this literature, as we show that incumbent politicians use the revenues at their disposal in order to consolidate their power. Given that they are unable to commit to their future policies, incumbents disproportionately transfer revenues - through public employment - to their region of birth, where they can credibly and cheaply increase their support. We show that this widely documented political strategy in developing countries has a limited effect on growth when the informal sector is large. Furthermore, we demonstrate that through patronage, incumbent politicians increase the dynamic efficiency of public policies. This may explain the significant effect of foreign aid on economic growth in developing countries, as we document for the case of Pakistan.

There are few theoretical studies on foreign aid, mainly focused on agency problems and the allocation of aid in the presence of multiple donors or recipient countries.¹⁰ In this paper, we focus on the effectiveness of unconditional aid from a single donor to a single recipient country. We complement the existing theoretical literature by modelling the effect of foreign aid on the political equilibrium in the recipient country. In doing so, we adapt the theory of [Robinson, Torvik and Verdier \(2006\)](#) on the resource curse to the case of foreign aid.¹¹ In particular, both papers show that incumbents increase the scope of public employment in their own group (e.g. in their region of birth), because they cannot commit to public policies. Although, we simplify the determination of the political equilibrium, we extend [Robinson, Torvik and Verdier \(2006\)](#)'s model by assuming that incumbents can extract rents from the tax collection and we model the informal sector in the labour market. By doing so, we are able to demonstrate that foreign aid decreases rent extraction, while a large informal sector necessarily induces a positive relationship between foreign aid and economic growth.

Second, the paper speaks to the large cross-country literature on foreign aid and growth ([Burnside and Dollar \(2004\)](#); [Easterly, Levine and Roodman \(2004\)](#); [Clemens et al. \(2011\)](#); [Arndt, Jones](#)

⁹[Bourguignon and Gunning \(2016\)](#) provide a literature review on aid and governance.

¹⁰See for instance the seminal studies of [Adam and OConnell \(1999\)](#) and [Azam and Laffont \(2003\)](#). [Bourguignon and Platteau \(2017\)](#) provide a review of the theoretical literature on aid effectiveness, while they also present a framework that studies the trade-off between needs and governance in the allocation of aid.

¹¹See as well the related studies of [Robinson and Verdier \(2013\)](#) and [Robinson, Torvik and Verdier \(2017\)](#).

and Tarp (2016)). The paper complements this cross-country literature, especially the recent studies that try to identify the causal effect of aid on growth (Rajan and Subramanian (2008); Dreher and Langlotz (2017); Galiani et al. (2017); Temple and Van de Sijpe (2017)).¹² We contribute to this literature by estimating the impact of foreign aid on growth through relying on exogenous variation in foreign aid based on changes plausibly exogenous to the aid recipient characteristics at the national and subnational level.¹³ We also contribute to this literature by offering a national and subnational setting, thus, overcoming most of the common identification issues that arise in studies that exploit differences across countries.¹⁴ Third, our study complements the cross-country literature on politically motivated aid by providing an alternate politically motivated aid shock and introducing new identification strategies that rely on geopolitical events and changes in aid legislations in the donor country (Kuziemko and Werker (2006); Faye and Niehaus (2012); Dreher, Eichenauer and Gehring (2016)).

The remainder of the paper is organised as follows. In Section 2, we present a theory on the effect of foreign aid on redistribution and growth. Section 3 tests the predictions of the model, while Section 4 concludes. The mathematical proofs are relegated to the mathematical appendix.

2 The model

Public employment is widely regarded as a means of redistributing resources. For instance, Alesina, Baqir and Easterly (2000) show that politicians use public employment as a redistributive device

¹²In this strand of literature, our paper is closest to recent work by Galiani et al. (2017). They use crossing of an ‘arbitrary’ World Bank’s IDA income threshold (that leads to drops in foreign aid for the crossing countries) as an instrumental variable to document a positive impact of aid on growth. Nevertheless, Dreher and Lohmann (2015) use the same IDA instrument at a more disaggregated level to document that once regional fixed effects are included, positive effect of aid on growth disappears. Therefore, unobservable aid recipient characteristics might be confounding the effect of aid on growth.

¹³Nunn and Qian (2014) too use exogenous variations in donor countries, i.e., agricultural production in the United States, to link foreign aid with conflict in a cross-country setting.

¹⁴For instance, Easterly, Levine and Roodman (2004) demonstrates that in a cross-country regression one can strategically select a sample of countries (and time periods) that can exhibit a positive, negative or null effect of foreign aid on development.

in US cities. Similarly, [Alesina, Danninger and Rostagno \(2001\)](#) show for Italy that public employment allowed for transfer of resources from the North to the South. One major reason for the use of public employment in redistributive politics is that even though politicians cannot commit, they can credibly offer public jobs to their constituents.¹⁵ Indeed, commitment problems plague policy-making ([Acemoglu \(2003\)](#)), especially in developing countries.

Following [Robinson, Torvik and Verdier \(2006\)](#) and [Robinson and Verdier \(2013\)](#), our key premise is that the incumbent mitigates the commitment problem inherent to policy-making by offering public employment to members of his region of birth before the election, as he cares for their welfare. In turn, these agents have a higher likelihood of voting for the incumbent, because they know that the ‘transfer’ they received is costly to reverse after the incumbent is reelected.¹⁶

In this model, we first set a theory of redistributive politics through public employment that adapts the study of [Robinson, Torvik and Verdier \(2006\)](#) on the resource curse to the case of foreign aid. Next, we study the effect of exogenous aid shocks on the size of the public sector across regions, and then on the income generated by the country.

Consider a two-period probabilistic voting model and a society with two regions labelled A and B . The incumbent originates from region A . For simplicity, the mass of voters is normalised to unity, and each region is of equal size $1/2$.

Voters have linear preferences in their own income:

$$V_t^i(j) = w_t^i(j) - \tau_t^i(j), \quad (2.1)$$

with $w_t^i(j)$ their wage and $\tau_t^i(j)$ a lump-sum tax paid by the voters from region $i \in \{A, B\}$ in period $t \in \{1, 2\}$, when the incumbent originates from region $j \in \{A, B\}$. We denote $g_t(j)$ the fraction of the labour force employed in the public sector in period t when the incumbent originates from region j .

¹⁵[Alesina, Baqir and Easterly \(2000\)](#) suggest alternatively that public employments allow to transfer resources to the poor less visibly than tax-transfer schemes.

¹⁶Likewise, institutional changes mitigate commitment problems inherent to policy-making because they are not easily reversed. See for instance [Acemoglu and Robinson \(2000\)](#), [Bisin and Verdier \(2017\)](#), [Bisin et al. \(2018\)](#) and [Iyigun, Rubin and Seror \(2018\)](#).

For simplicity we assume that when an agent does not have a public employment, his wage is equal to his marginal productivity, which we denote $h > 0$. By contrast, we posit that the productivity in the public sector is lower than in the private sector. We normalise the productivity in the public sector to $h_p < h$. Therefore, when the incumbent offers public jobs to private workers, he necessarily reduces their productivity.

Finally, a fraction $z \in [0, 1]$ of the labour force is assumed to work in the informal sector. We can reasonably expect z to be large in the developing world. In Pakistan for instance, according to a recent 2017-2018 Labour Force Survey 71% of the total labour force operates in the informal sector ([Pakistan Bureau of Statistics \(2018\)](#)). This is typical for many developing countries ([International Labor Organization \(2018\)](#)).

The timing of the game is as follows:

1. In period 1, the incumbent offers public employments to a share $g(A)$ of the agents in region A and to a share $g(B)$ of the agents in region B . He also sets the transfers $\tau_1^A(A)$ and $\tau_1^B(A)$.
2. At the end of period 1, the agents vote for the incumbent or for his challenger from region B .
3. At the beginning of period 2, the incumbent from region $j \in \{A, B\}$ sets the tax rates $\tau_2^A(j)$ and $\tau_2^B(j)$ and possibly offers new public employments.

We assume that the incumbent values both the rents he extracts from the citizenry and the welfare of the voters in his region of birth:

$$W_t^A = v(r_t^A) + \alpha V_t^A(A), \quad (2.2)$$

with $\alpha > 0$ his degree of altruism for the voters from region of birth A and $V_t^A(A)$ the preferences of the voters in region A (see (2.1)). The utility function $v(\cdot)$ is assumed increasing and concave in the level of rent extraction r_t^A .

The bias that the incumbent has for his region of birth in the specification above is backed by a large empirical literature on the allocation of public spending. For instance, [Hodler and Raschky \(2014\)](#) show for 38,427 subnational regions covering 126 countries that political leaders divert foreign aid to their birth regions when in power where the transfer of resources is starkest in

weakly institutionalized countries. Similarly, [Lehne, Shapiro and Eynde \(2018\)](#) demonstrate that politicians allocate infrastructure contracts to members of their own network in India. [Luca et al. \(2018\)](#) also document similar ethnic favoritism, as nighttime lights are more intense in political leaders' ethnic homelands.

Furthermore, several anecdotal accounts point toward leaders in Pakistan favoring their birthplace regions, especially at times of aid windfalls. One example provided was the use of foreign aid to “give away” laptops, in the birthplace province of the incumbent leader ([Telegraph \(2012\)](#)). Nevertheless, there are a plethora of examples where several political observers and politicians from minority provinces have lamented the diversion of aid resources by incumbent leaders to their respective home constituencies. For instance, in the case of US aid: ‘Why there are so many US Aid tents found in Mardan and not anywhere else?’: Khan Hoti ([Dawn \(2015\)](#)). Likewise, a prominent senator representing a ethnic minority from Balochistan province noted for Chinese foreign aid: “It is, in fact, the China-Punjab (aid package) not China-Pakistan as stated officially, because it will mainly benefit Punjab and not the other provinces.”: Senator Achakzai (quoted in [Dawn \(2016\)](#)).

Credible policy:

A policy can be credible for two key reasons. Either it is ex post optimal for the incumbent, or the incumbent cannot easily renege on a policy he has already implemented. Public employment falls under the second category, as an incumbent can not easily renege in period 2 on a job he offered in the public sector in the previous period. Offering a public employment before the election is then a credible mean of transferring resources in this model. Furthermore, the incumbent can make no credible transfer to the agent in region B , as he does not value their welfare. These agents then expect $\tau_t^B(A) = \tau > 0$ for any period $t \in \{1, 2\}$, with τ a parameter that relates to the fiscal capacity of the state. We assume that τ leaves the agents above their survival constraint. For simplicity, we also assume that the incumbent's degree of altruism α is low, so that he can not credibly promise to the agents in his own region of birth a lower lump-sum tax, $\tau_t^A(A) = \tau > 0$.

Since the incumbent only values the welfare of the agents in his region of birth, he will only

offer public jobs in his region of birth, $g(B) = 0$. Furthermore, as the incumbent faces no reelection in period 2, he will not offer more public jobs in the last period of the game. We denote u the minimum wage in the public sector in any period $t \in \{1, 2\}$.

Assumption 1 *The incumbent's degree of altruism α is sufficiently low, so that $\tau_t^A(A) = \tau$, while he necessarily sets the wage of public employees to its minimum $u > h$.*

This assumption is made for convenience, although it seems natural to assume that in a given period, the incumbent always puts a higher value on a marginal increase in his own revenue than on a marginal increase in the revenues of the agents in his region of birth.

Voting model:

As in standard probabilistic voting theory (e.g. [Persson and Tabellini \(2002\)](#)), each voter v has an ideological bias σ^v toward the incumbent. This ideological bias is uniformly distributed over the segment $[-\frac{1}{2\beta}, \frac{1}{2\beta}]$. The parameter $\beta > 0$ accounts for the density in the distribution of the voters' ideological biases. When β is large, then the voters are relatively homogeneous. The incumbent also experiences a popularity shock θ in any period, with θ uniformly distributed over the segment $[-\frac{1}{2\phi}, \frac{1}{2\phi}]$, with $\phi > 0$ a density parameter.

A voter v from group $i \in \{A, B\}$ elects the incumbent when:

$$V_t^i(A) + \sigma^v + \theta > V_t^i(B). \quad (2.3)$$

An agent that does not have a public employment has a utility $V_t^i(A) = h - \tau$ from choosing A . Similarly, since B can not credibly commit to any platform, $V_t^i(B) = h - \tau$. It follows that an agent that is not a public employee chooses the incumbent A when $\sigma^v + \theta > 0$. From simple computations, we deduce that the incumbent gets half of the votes in the pool of agents with no public employments. This is unsurprising; neither the incumbent nor his challenger makes credible promises to these voters, which are then indifferent between the two types of candidates. A public employee, however, knows that given that he has been offered a job by the incumbent from region A , he will keep his public employment in the next period, so he elects A when:

$$u - \tau + \sigma^v + \theta > h - \tau. \quad (2.4)$$

We deduce that the probability that the incumbent is reelected which writes as follows:

$$P(g(A), w_2^A) = \frac{1}{2} + \frac{\phi g(A)}{2}(u - h). \quad (2.5)$$

The higher the share of public employees, the larger the probability that the incumbent is reelected, given that $u > h$ under assumption 1. Indeed, as long as the incumbent pays the public employees a higher wage than what is attainable in the private sector h - and creates these employments in his region of birth - he increases his probability of winning.

Predictions:

We denote $a_1 > 0$ the foreign aid that the incumbent receives in the first period, which we assume exogenous with respect to the characteristics of the economy.¹⁷ The incumbent sets the rents (r_1^A, r_2^A) and the share of public employments $g(A)$ so as to maximise

$$R(r_1^A, r_2^A, g(A)) = v(r_1^A) + \alpha(g(A)u + (1 - g(A))h) + P(g(A))(v(r_2^A) + \alpha(g(A)u + (1 - g(A))h)), \quad (2.6)$$

given that

$$r_1^A + r_2^A + 2g(A)u \leq 2\tau + a_1. \quad (2.7)$$

The aid a_1 enters directly into the budget constraint of the incumbent, and therefore affects his incentive to offer public employment and to extract rents. The optimal policy solves the following first-order conditions:

$$\begin{cases} v'(r_1) - P(g)v'(r_2) = 0 \\ (1 + P(g))\alpha(u - h) - 2v'(r_2)P(g) + \frac{dP(g)}{dg}[v(r_2) + \alpha(gu + (1 - g)h)] = 0, \end{cases} \quad (2.8)$$

with $r_2 = 2\tau + a_1 - 2ug - r_1$.

The first line of (2.8) relates to the optimal level of extraction in period 1. When setting the level of extraction in period 1, and for a given fraction of public employees, the incumbent trades-off the marginal value of capturing rents in the current period with that of capturing rents in the

¹⁷In section 3, we back this by introducing an identification strategy and presenting evidence in support of this contention for the case of the US aid to Pakistan.

next period. The higher the probability of being reelected $P(g)$ then, the higher the marginal cost at capturing rents in the first period, so the lower the level of extraction in period 1. We can then easily deduce from the first line of (2.8) a locus $r_1(g)$, which is decreasing with g (as $P(g)$ increases with g). In other words, the optimal level of extraction is a decreasing function of the share of public employments.

The second line of (2.8) gives the first-order condition with respect to the fraction of public employees in the region of birth of the incumbent g . First, when increasing g , the incumbent anticipates that he will increase his probability of winning, and hence the present value of the rents that he extracts in period 2. This effect is given by the last term in the LHS of the second line of (2.8), with $\frac{dP(g)}{dg} = \frac{\phi}{2}(u - h) > 0$. Second, the incumbent internalizes that a marginal increase in g will positively affect the welfare of the agents in his region of birth, since $u > h$. This effect is given by the first term in the LHS of the second line of (2.8). Finally, the incumbent anticipates that an increase in the share of public employees in the first period also means that he will be more constrained when capturing rents in the next period. This is the second term in the LHS of the equation.

As for the first first-order condition, we can show that the second line of (2.8) gives a locus $g(r_1)$, which is decreasing in r_1 . Indeed, the higher the level of extraction in period 1, then the lower the incentive of the ruler to transfer resources to the citizenry by creating public jobs. This is because the present value of extracting resources in period 2 is low when the level of extraction in period 1 is high. Hence, the incumbent has less incentive to offer public employments in order to be reelected.

Given the previous analysis, the two loci that we deduced from the first-order conditions are decreasing functions, so they intersect only once. There is a unique equilibrium. We establish the following result.

Proposition 1 *The share of public employments in the region of birth of the incumbent increases with the level of aid a_1 .*

Proof. The proof is available in Appendix A.1. ■

An increase in the level of aid induces an income effect that increases both the incentive of the incumbent to extract rents and to redistribute public jobs in his region of birth. Nevertheless, since rent extraction and redistribution of public jobs are substitutes, the net effect of aid on public employment is ambiguous. Indeed, as discussed previously, when the incumbent creates public employment, he also increases the marginal cost at capturing rents in the first period of the game. This is the key mechanism of this model: redistribution through public employment - by increasing the likelihood of winning the election - also disciplines the incumbent in period 1. Foreign aid - through patronage - increases the dynamic efficiency of the public policy. As it turns out, the income effect induced by the aid flow increases the incentive of the incumbent to redistribute resources through public jobs, and this effect is not offset by a higher level of rent extraction.

The income generated by the country is

$$Y_1 = a_1 - r(a_1) + h(1 - (1 - z)\frac{g(a_1)}{2}) + \frac{g(a_1)}{2}h_P, \quad (2.9)$$

with h_P the productivity in the public sector. Indeed, the income generated by the country is equal to the sum of the production in the private sector $h(1 - (1 - z)\frac{g(a_1)}{2})$, in the public sector $\frac{g(a_1)}{2}h_P$ and the aid flow net of the rents extracted by the incumbent, $a_1 - r(a_1)$. We establish the following result.

Proposition 2 *The income generated by the country increases with the level of aid a_1 when the informal sector is sufficiently large.*

Proof. The proof is available in Appendix [A.2](#) ■

In the general case, the effect of the aid flow a_1 on the total income is ambiguous. Indeed, there are three effects to consider. First, the aid flow increases the fraction of public employees, as established in proposition 1. Therefore, a share of the workforce in the region of birth of the incumbent is driven out of the private sector. A fraction $(1 - z)\frac{g(a_1)}{2}$ of the agents in the region of birth of the incumbent then switches from formal occupations in the private sector to public jobs. This shifts their productivity from h to h_P , with h_P possibly below h . When $h_P < h$, the redistribution through public jobs leads to a negative effect on the aggregate income, as the productivity of the workforce decreases.

The second effect to consider is that redistribution through public employment decreases the scope of informality, as a fraction $z\frac{g(a_1)}{2}$ of the agents with informal occupations in the region of birth of the incumbent now have formal jobs in the public sector. This tends to increase the reported national income.

Finally, there is a third effect to consider, which is that the aid flow has a direct effect on income, and so does the extraction of rents. The aid flow net of rents $a_1 - r(a_1)$ tends to increase with the level of aid a_1 , which means that the aid flow is not completely dissipated in rents.

The aid flow has a positive net effect on the national income when the first effect above is dominated by the sum of the two others. More specifically, aid increases the national income when - despite the possible loss of productivity due to a shift of a fraction of the labour force from the private to the public sector - the scopes of informality and rent extraction are sufficiently diminished. Again, the net effect of aid on national income crucially relies on the following mechanism: redistribution through public employments - by increasing the benefit of staying in office - also increases the dynamic efficiency of the public policy. This political channel could explain why we observe a positive effect of foreign aid on economic growth. Aid unambiguously increases the national income when the share of informal workers is sufficiently large, because in that case the loss of productivity that is induced by the redistribution through less productive public jobs is limited.

2.1 Bringing the theory to the data:

In order to test the predictions of this theory, we rely on data on US aid to Pakistan for two major reasons. First, Pakistan is characterized by weak institutions and a large informal sector. This makes the link between patronage and foreign aid particularly strong. Second, our data as well as the identification strategy for US aid to Pakistan allows for causal inferences.¹⁸

¹⁸Another related reason for us focusing on United States foreign aid to Pakistan is data availability. We have a long output series both at national and subnational level. Additionally, for Pakistan, the data availability, for instance data on public employment, allows us to directly test for key prediction of the model. This is atypical for studies on foreign aid where data constraints, particularly for aid recipient countries is particularly stark.

Pakistan and patronage:

First, Pakistan is a particularly interesting case study for this theory, as it is characterized by weak institutions, a large informal sector, state resources subjected to elite capture and low level of trust (see e.g. [Williams, Shahid and Martínez \(2016\)](#); [Cheema, Mehmood and Imran \(2016\)](#); [Acemoglu et al. \(2018\)](#)).¹⁹ In Pakistan, the link between aid and patronage is then particularly stark. Indeed, given the institutional background, foreign aid programs in Pakistan have come under strong criticism for their funding of patronage and lack of transparency ([Kopetchny \(2006\)](#)). As anecdotal evidence first, the use of British foreign aid money to give away laptops in birthplace of the incumbent leader (former prime minister Nawaz Sharif) ahead of elections caught attention of international media and was heavily criticised ([Telegraph \(2012\)](#)). Likewise, the use of Chinese aid to build infrastructure only around the birth-region of incumbent head of state led opposition leader in parliament to proclaim: “Nawaz is not the Prime Minister of Pakistan, he is the Prime Minister of Punjab (his home province)” Bilawal Bhutto quoted in [Dawn \(2016\)](#). In a well publicised World Bank’s Evaluation of Assistance Report by [Birdsall, Malik and Vaishnav \(2005\)](#), it was noted that although “growth rates were above the developing country average” during the aid program but “managing the economy and implementing reforms are not institutionalized nor embedded in a resilient and transparent system of government accountability or of adequate checks on abuse of power. ” Likewise, [Easterly \(2001\)](#) considered Pakistan a “puzzle” where he posed the question that “why in Pakistan the low human capital indicators ... social and institutional development did not prevent a respectable growth rate of 2.2 percent per capita over 1950-99?”.

The theory above partly answers to this puzzle, as we show that despite aid being used to fund patronage, it can still have a positive effect on growth. Our point is that incumbents use the foreign aid to redistribute resources in their region of birth, as it allows them to alleviate the commitment problems inherent in policy-making. This result is established in proposition 1. Nevertheless, we demonstrate in proposition 2 that as incumbents consolidate their power - through redistribution -

¹⁹For instance, [Khwaja and Mian \(2005\)](#) estimates the costs from corruption due to borrowing from public banks by politically connected firms in Pakistan to be in the range of 0.3 to 1.9% of GDP every year. Likewise, [Khwaja and Mian \(2008\)](#) show how political connections and political volatility in Pakistan also weakens the financial system and access to finance in the credit markets.

they also increase the present value of better public policies. This, we argue, is particularly true in the context of the developing world, where the effect of patronage through public employment on the reported income is limited. When the size z of the informal sector is sufficiently large for instance - as it is the case for Pakistan - the effect of patronage on the reported national income should be limited. Hence, after receiving aid revenues, incumbents may also increase their investments in public goods, and lower the rents they extract from the citizenry. This is precisely what we find in the empirical section below.

Pakistan and the US aid:

Pakistan is also an interesting case study, as our data and identification strategy we propose allows to provide causal evidence for the predictions of the model. Indeed, many scholars and policy makers have noted the highly variable and potentially exogenous United States foreign aid to Pakistan and its dependence on strategic factors related to US not Pakistan needs (Kopetchny (2006); Fair (2009); Haqqani (2013)). Analysis of foreign aid data confirm these observations where the aid series is highly variable and shows dramatic shifts following major geopolitical events. For instance, Pakistan was receiving about USD 500 million per year following the 9/11 attacks, whereas virtually no US aid was flowing to Pakistan in the 1990s (see Figure 1).

Historically, the United States foreign aid to Pakistan has flowed with varying intensity since Pakistan's independence from the British colonial rule in 1947. The first recorded assistance package to Pakistan was approved by congress in 1953 and involved a transfer of USD 75 million. The stated aim of this aid package was to cement strategic ties with Pakistan, following India's policy of "non-alignment" with the United States on several key geopolitical issues (Department of State Bulletin, 1953).²⁰ The second major assistance package was received following the Soviet Invasion of Afghanistan in the December of 1979. To curb the 'communist threat' in the region, the United States government began to lobby congress to resume foreign aid to Pakistan. This resulted in the United States providing an assistance package of US\$ 3.2 billion in the September of

²⁰The United States mission in Islamabad noted "it is in the security interest of United States to extend assistance to Pakistan for a friendly government of an important and strategic country" (Department of State Bulletin, 1953).

1981 (Gwertzman (1981)).²¹ Finally, the third, major aid package for Pakistan, was following the 9/11 attacks and to garner Pakistan's support in the global war on terror. This assistance package involved a transfer of "\$1.5 billion in annual non-military aid payments to Pakistan" (Epstein and Kronstadt (2012), 2013, p. 2).

This strategic nature of US aid was also noted in an US Congressional Oversight Hearing by the head of United Nations Assistance Mission on Pakistan:

The variation in assistance (to Pakistan) appears to have little to do with Pakistan's objective needs; rather Washington's changing policy priorities towards the country at different points in time and efforts to achieve U.S. objectives towards the country" (Fair (2009)). Likewise, quantitative analysis of the determinants of United States foreign aid to Pakistan shows that US aid is uncorrelated with "official development objectives or the recipient need" (Anwar and Michaelowa (2006), p. 195).

What seems to be highly correlated with United States foreign aid to Pakistan are major geopolitical events. For instance, on March 5, 1970, the Nuclear Non-Proliferation Treaty (NPT) was signed between the US, the UK and the Soviet Union (Shaker (1980)). This reduced the US incentive to give aid to Pakistan (given Pakistan's nuclear ambitions). Similarly, in December of 1979 Soviet Russia invaded Afghanistan. This, amidst the Cold War, increased US incentive to give aid to Pakistan. Our interpretation is that these geopolitical events exogenously vary foreign aid coming into Pakistan, while they do not directly affect the domestic fundamentals of Pakistan, which might be correlated with growth dynamics. From Figure 1, we observe that both aid allocations as well as actual US aid disbursements peak following the geopolitical shocks of Soviet Invasion of Afghanistan and 9/11 attacks.

In addition to the geopolitical events, foreign aid flowing to Pakistan is also correlated with changes in aid legislations in the United States. As can also be seen in Figure 1, when aid legislations in the United States were expansive, this too resulted in inflows of US foreign aid to Pakistan. Under the assumption that the changes in United States aid legislations occur due to changes in domestic and internal policies of United States, this provides another source

²¹ An earlier assistance package of US\$ 400 million was rejected, dubbed condescendingly as peanuts by President General Zia (Bose and Jalal (2004)).

of exogenous variation to estimate the causal effect of foreign aid on growth and patronage in Pakistan. Similar results using geopolitical events and changes in aid legislations in the United States as instruments for foreign aid to Pakistan strengthens the case that the results we obtain are causal. For a list of all changes in US aid legislations i.e. changes to the Foreign Assistance Act of 1961 from 1970 to 2015, see Table 1.²²

3 Empirical evidence

3.1 Data Sources and Main Variables

We combine publicly available and archival data sources to construct a national time series and a province-level panel for output series from 1972 to 2015.²³ The data sources include US Greenbook of Aid, IMF historical archives, Central Bank of Pakistan archives, World Development Indicators of the World Bank, Penn World Tables, Polity IV and ICRG institutional risk indices, UNESCO Institute of Statistics (2018); Arby (2008), Pakistan Bureau of Statistics (2018) and Global Terrorism Database (2018).

Outcome variables.—The main outcome variables are: annual national GDP per capita, annual province-level panel for industrial production and a monthly series for industrial production. These variables are converted to natural logarithms to simplify the interpretation and to remain in sync with much of the aid-growth literature.²⁴ The GDP figures are in constant per capita terms and obtained from the Central Bank of Pakistan.²⁵ The monthly industrial production data are obtained from the IMF historical archives. The province-level industrial production series is retrieved from a study commissioned by the Central Bank of Pakistan (Arby (2008)).

²²For description of the content of each change in aid legislation, see Table C.1 in Appendix C.3.

²³We start from year 1972 primarily because in 1971 East Pakistan split into Bangladesh i.e. Pakistan was not the same country before and after 1971. Although, we find similar results when we take full available sample of 1960-2015.

²⁴Juselius, Miller and Tarp (2014) discusses other advantages of the log transformation of aid variable such as mitigating non-normality, non-linearity and explosive roots.

²⁵The results are robust if we consider the GDP series from the Penn World Tables 9.0 or the World Development Indicators.

Foreign aid variables.—We employ four foreign aid regressors as explanatory variables. First, is the “Economic Support Fund” (ESF). An unarmarked budget support fund deposited by the US government to the Ministry of Finance in Pakistan. The stated aim of this “*strategic*” component of foreign aid is to “*advance U.S. foreign policy interests*” (State Department Briefings, 2010, p. 39).²⁶ As can we seen in Figure 1 (Panel A), the stated aim of this foreign aid matches well with observed behaviour of US policy makers, in light of changing world events.

Second, we generate a month-specific measure of foreign aid that is constructed based on important geopolitical event dates that changed the US government’s incentive to give aid to Pakistan. This dummy variable, also shown in Figure 1 (Panel A), takes the value 1 for positive aid shock months such as the Soviet Invasion and 9/11 attacks, and zero otherwise. Third, we construct a US Aid Legislation dummy variable. This variable switches on when the United States Congress makes the US aid policy expansive (and switches off when it makes it restrictive). Shaded areas in Figure 1 (Panel B) represent episodes of expansive foreign aid regimes in the United States.²⁷ Fourth, we use the US Official Development Assistance (ODA) aid flows measure used in much of the literature. The Economic Support Fund allocations as well as foreign aid flows are also converted to natural logarithms and their overtime evolution can be seen in Figure 1.

Additional variables: We use several additional variables in the analysis. This includes non-US aid, military aid, defence spending in Pakistan, US trade and investments. These variables are obtained from Ministry of Finance, the World Development Indicators and the Central Bank of Pakistan. The series for composite Polity IV index is obtained from database of [Marshall, Gurr and Jaggers \(2016\)](#) and “ICRG” country risk indicators and policy indices are obtained from Political Risk Services Group. Data on terrorism is obtained from the [Global Terrorism Database \(2018\)](#).

²⁶We find similar results when we use standard measure of aid flows employed in much of literature, as defined by the Development Assistance Committee (DAC), instead of the ESF. In fact, we find similar results across all the four aid regressors.

²⁷The coding of aid legislation as expansive is rather straightforward since it involves formalization of a assistance package as opposed to restrictive legislation that put explicit conditions on aid (e.g. no aid to human rights violators as in Morgan Amendment or no aid to countries trying to acquire a nuclear weapon as in Symington and Pressler Amendments). See Table 1 for the list of all the legislative changes to the Foreign Assistance Act and Table C.1 in the Appendix C.3 for the descriptions of these changes in aid legislations.

The public expenditures on education series is obtained from UNESCO’s Institute for Statistics, public employment data is obtained from [Pakistan Bureau of Statistics \(2018\)](#) the consumption data is obtained from the Central Bank of Pakistan, province level controls such as the provincial defence production, agricultural value added, value of construction projects is obtained from [Arby \(2008\)](#).²⁸

3.2 The Effect of Foreign Aid on Growth

Before estimating the impact of foreign aid on economic growth and a differential effect of aid at the birth region of incumbent leader we note that output growth in Pakistan experiences a change in trend around time of geopolitical events. A formal test confirms this. As can be seen from [Figure 2](#), GDP per capita and its cyclical component through the HP filter, respond heavily following major geopolitical events. A similar relationship is observed with the monthly industrial production series. Is this change in trend the result of the causal impact of foreign aid on output growth? In this section, we present evidence consistent with the view that US foreign aid shocks have a causal impact on output growth in Pakistan. Our baseline method is the Narrative Vector Autoregression (due to [Romer and Romer \(2010\)](#)). This method allows us to assess the dynamic impact of a economic shock on aggregate outcomes. We also show that the results are robust to using an alternate methodology.

We begin the analysis by estimating the bi-variate Narrative Vector Autoregression (NVAR, henceforth) model. A parsimonious two variable NVAR is estimated as the baseline, since it provides greater transparency, especially when making causal claims (as in [Romer and Romer \(2010\)](#)). To show the robustness of the results, we also estimate the NVAR with additional variables. The salient feature of this methodology allows one to completely circumvent the ordering restrictions which are needed to make causal claims in traditional VARs and allows us to trace the dynamic overtime impact of a unit shock on aggregate output in a transparent manner ([Ramey \(2011\)](#); [Monnet \(2014\)](#)).

²⁸For more details on the sources and explanations of the variables see the variable description section in the online Appendix [B.1](#).

The Impulse Response Functions (IRFs) trace the short and medium-term impact of aid shocks on the GDP per capita. We estimate standard errors with asymptotic theory as well as through bootstrapping (Stock and Watson (2001)). We report in this section the more conservative standard errors derived from asymptotic theory since their behaviour is well known (Ramey (2011)). In line with much of the literature, we present 1 standard deviation confidence bands as the baseline (as in Blanchard and Perotti (2002); Romer and Romer (2010); Monnet (2014)).²⁹

The NVAR model is represented as follows:

$$A(L)\vec{Y} = C + \vec{\varepsilon}, \quad (3.1)$$

where $A(L)$ is a lag polynomial equivalent to $A_1L^1 + A_2L^2 + A_3L^3 + \dots + A_pL^p$, while \vec{Y} , $\vec{\varepsilon}$ and C are $n \times 1$ vectors, with \vec{Y} representing a vector of ‘endogenous’ variables, $\vec{\varepsilon}$ the vector of disturbance terms and C the vector of intercept terms, respectively.³⁰ From this, a Structural Vector Autoregression (SVAR) is estimated where structure is imposed through the elements of the covariance matrix:

$$u_t = Be_t. \quad (3.2)$$

Nevertheless, since we only consider aid shocks that are plausibly exogenous, the standard SVAR equation (3.2) boils down to Romer and Romer (2010)’s NVAR equation.³¹

$$u_t = e_t, \quad (3.3)$$

with e_t is an element of $\vec{\varepsilon}$ that is, the structural errors and reduced form errors are identical. This means we are directly estimating (3.1) and do not require the contentious ordering restrictions used in VAR models to gain identification (Blanchard and Perotti (2002)).

²⁹Later, we show that the results are robust when we consider 2 and even 3 standard deviation confidence bands.

³⁰Note that $Y_t \in \vec{Y}$ and in our case, $Y_t = [\text{GDPpc}_t \text{ ESF}_t]^T$ for annual series and $Y_t = [\text{Industrial Production}_t \text{ Aid Dummy}_t]^T$ for monthly series.

³¹This is done by separating the shock variable into endogenous and exogenous component and plugging it into the output equation: $\Delta \text{Aid}_t = \sum_{i=1}^I b_i^I \varepsilon_t^i + \sum_{j=1}^J \omega_j^j \Rightarrow \Delta_t = \alpha + \beta \sum_{j=1}^J \omega_j^j + v_t$, where $v_t = \sum_{i=1}^I (1 + \beta b_i^I) \varepsilon_t^i$, which is then reformulated in a VAR framework and used to calculate the impulse response plots (see Romer and Romer (2010) for more details).

Figure 3 presents the estimated effect of foreign aid on GDP per capita, across the four aid regressors.³² The results yield evidence of a substantial positive link between foreign aid and output growth across all measures of foreign aid. 5 years following the USD 400 million foreign aid shock, GDP per capita is about 1% higher relative to the counterfactual of no such aid shock. In fact, formal analysis of variance decomposition indicates that at least 25% of total variation in GDP per capita in Pakistan can be explained by these aid shocks.³³

Next, we document the impact of geopolitical aid shocks and changes in aid legislations on industrial production. Since, we have industrial production data at a monthly frequency, we can better match it with geopolitical event dates and dates of changes in aid legislations.³⁴ Figure 4 presents these results. We note, once again, that 5 years following the aid shock (60 months), industrial production is about 1% higher relative to the counterfactual of no such aid shock.

The estimated effect of aid on growth is robust to several alternative mechanisms that one might expect can change following the geopolitical events. For instance, the results are similar when we add non-US World Aid, US trade, FDI and Pakistan's defence spending as control variables (see Figure 5).

A placebo test also confirms that these results are not driven by some mechanical statistical correlation of the aid shocks with the real sector. In Figure 6 we shows that there is no effect of a unit shock of Industrial Production on geopolitical or aid legislation dummy. Consistent with this, the results of variance decomposition also showed that less than 1% of variation in US aid can be explained by the movements in output growth. We take this, as evidence against reverse causality flowing from output growth to the aid shocks, as well as to conclude that the impact of geopolitical aid shocks on the real sector is not a statistical artefact.³⁵

³²We present the reduced form estimates of the NVAR when the IV results are presented.

³³The results of variance decomposition are presented in C.1 in the online appendix.

³⁴ Furthermore, Monnet and Puy (2016) argue that industrial production is a better tracker of real activity and output growth since it is recorded based on real time economic activity as opposed to ex-post linear interpolations as in GDP per capita and other national account measures.

³⁵We perform additional Placebo tests e.g. assessing the impact of aid shocks on world output (to see if the results are coming from some global trends) and to assess the impact of aid shocks on Indian output (where we chose India given common colonial history of Pakistan and similar institutions to examine regional effects) to find no effect of US

Next, we present the robustness of these results by instrumental variable regressions. Specifically, we instrument, the US foreign aid flows with geopolitical event and aid legislation dummies, and estimate the reduced form NVAR with OLS and 2SLS, respectively:

$$y_t = \beta_0 + L.USAid_t + Trend + SeasonalDummies + L.X_t + \varepsilon_t, \quad (3.4)$$

where, y_t is GDP per capita, US Aid is the US Official Development Assistance (ODA) aid flows and X_t is a matrix of available control variables used in the analysis.³⁶ Lag length is decided as in the NVAR based on information criteria that gives the optimal statistical fit relative to complexity.³⁷ Table 2 presents the results. The results yield strong evidence that foreign aid exerts a qualitatively and statistically significant impact on output growth. Considering the aid legislation instrument, a 1% increase in aid flows is associated with about a 0.15 percentage point increase in GDP per capita growth the following year.³⁸ Plotting the overtime impact of foreign aid with additional lags shows that this effect is persistent (see Figure 7).

Nevertheless, if the expansive US aid legislations signal global investors that the United States government favours Pakistan beyond its foreign aid policy, it might signal global investors that the investment climate in Pakistan is about to improve in expectation due to being in good books of the United States, then we might be picking up the impact of this favorable investment climate instead of the actual impact of US aid. Although, we cannot completely rule out this mechanism, but we conduct a placebo test that undermines this hypothesis. Since, there were several aid legislations could not pass both houses of Congress, so we use expansive US aid legislations that were tabled yet could not be enacted. Table 3 presents these results. The results show that instrumenting US foreign aid to Pakistan on global or Indian output growth. Results are available on request.

³⁶We obtain similar results when we use Economic Support Fund (ESF) aid allocations instead of US ODA aid flows as a measure of foreign aid.

³⁷Nevertheless, the results are not sensitive to the lag length ordering. In Figure 7, we plot coefficient estimates on foreign aid with varying lag lengths and conclude that the impact of foreign aid is robust and persists.

³⁸This magnitude of the impact of foreign aid is consistent with recent reviews where a “one percentage-point increase in Aid/GDP is typically followed an annual average real GDP per capita growth of 0.10.2 percentage points” (Clemens et al. (2011), p. 609). Likewise, the downward bias of OLS estimate is consistent with recent work by Galiani et al. (2017) Nevertheless, we should interpret the magnitudes here with caution as they do not capture the overall dynamic effect of aid over the 5 years as in the VAR results.

foreign aid with failed expansive aid legislations has no impact on output growth in Pakistan.³⁹

Finally, we provide evidence in favor of the exclusion restriction by conducting a check for balance for all available potential confounders of US aid. Table 4 presents these results. We note that detrended US FDI, trade, non-US aid, Pakistan's military spending is statistically similar with geopolitical dummy switched on and off but US aid flows, US aid allocations and GDP per capita are not.⁴⁰

3.3 The Effect of Foreign Aid on Patronage

This subsection is divided into two parts. First, consistent with the predictions of the model, we present evidence that aid shocks leads to higher public employment and expenditures. Second, we show how foreign aid shocks differentially impact birth province of incumbent leaders.

A key theoretical prediction of the model is that foreign aid increases public employment. Indeed, in proposition 1, we demonstrate that incumbents create public jobs as it is a credible transfer, which allows them to increase the likelihood of staying in office. We test for this by examining the impact of foreign aid on employment of public school teachers who are federal employees in Pakistan. This is consistent with anecdotal accounts from Pakistan where politicians use employment of public school teachers as a tool to dole out political favours (see for instance, [Aziz et al. \(2014\)](#)). Figure 8 (Panel A) present these results. We find that the USD 400 million foreign aid shock increases public employment by about 2% relative to the counterfactual of no such aid shock. Similarly, aid shock also increases public expenditures on education (see Figure 8, Panel B).

Next, we show that the gains from foreign aid are not homogeneously spread at the national level. To test the prediction of the model that gains from foreign aid are differentially distributed according to the birthplace of incumbent leader, we extend [Nunn and Qian \(2014\)](#) and [Temple and Van de Sijpe \(2017\)](#) intuition of interact time-varying variable related to the donor with a time and space varying variable related to the recipient, but at a subnational level. Specifically, we estimate

³⁹Later, we also show that investment risk and other political risk indices in Pakistan do not change following the geopolitical aid shocks.

⁴⁰Similar results are found with aid legislation dummy switched on and off.

the following equation:

$$y_{pt} = \beta(\text{GeographicalAid}_t \times \text{HeadofState}_{pt}) + \rho \text{HeadofStateBirth}_{pt} + \mathbf{X}'_{pt} \cdot \theta + \alpha_p + \gamma_t + t \cdot \phi_p + \varepsilon_{pt}, \quad (3.5)$$

where y_{pt} is the industrial production in province p at year t , α_p and γ_t are province and year fixed effects, respectively. As different provinces can have different development trajectories, for example due to different provincial policy choices, we control for these differential trends by adding province-specific trend, $t \cdot \phi_p$, to equation (3.5).

Geopolitical aid shock is the geopolitical shock dummy variable used in the time series analysis. The $\text{HeadofStateBirth}_{pt}$ is a province and time varying variable that takes the value of 1 for the birthplace province, in the years that the head of state is in office (and zero otherwise). Furthermore, we add the available province level controls (province agricultural output, construction and housing value added) to the list of covariates (X_{pt}). The interaction between the head of states birthplace and the geopolitical aid shock dummy is the main variable of interest. The coefficient on this interaction (β) gives us the estimate of the differential effect of the geopolitical aid shock if the incumbent head of state was born in that province.

Table 5 presents these results. The results imply that output growth during the geopolitical aid shocks is about 2 percentage points higher in the birthplace provinces of the incumbent leaders relative to those that were not in power during the aid windfalls. In absence of geocoded US aid data to Pakistan, we present two pieces of evidence that suggest that incumbent leaders divert aid resources to their respective birth provinces. First, we present anecdotal accounts. Second, we rule out several channels that might confound the results. Many anecdotal accounts point towards leaders favoring their birthplace regions, especially at times of aid windfalls in Pakistan. One example that was discussed with the use of foreign aid to “give away” laptops, in the birthplace province of the incumbent leader (Telegraph (2012)). Similarly, several political observers and politicians have lamented the diversion of aid resources by incumbent leaders to their respective home constituencies.⁴¹

⁴¹“Why there are so many US Aid tents found in Mardan and not anywhere else in the province?": Khan Hoti. or

In addition to the anecdotal accounts, we rule out several alternate channels that might result in the confounding of the impact of aid and diversion of resources to incumbent head of states birthplace during the aid windfalls. We add additional controls and their interactions to equation (3.5) and examine how the coefficient estimate on the interaction of incumbent’s birthplace and aid change. Table 6 presents these results. We note that results become more precise and that only the US aid shocks result in a disproportionate increase in output growth in the birthplace of incumbent head of states and that adding non-US foreign aid, US exports, US FDI and other potential confounders has no bearing on the results. We also present evidence that there are no differential trends prior to the aid shock. In particular, we show that average industrial production in the birth-province of the incumbent leader (the treatment) versus the average industrial production in the provinces where the leader is not in office (the control), follows common trends prior to the geopolitical aid shocks (see, Figure 9) . Finally, in Table 7, we present the results of a placebo test where we show that one, two or three years before the region becomes birth region of the incumbent head of state during the geopolitical aid shock does not induce a disproportionate increase in output growth in Pakistan.

3.4 Robustness Checks

In this section we conduct additional robustness checks and sensitivity analysis of the results. First, we show that the results are robust to additional alternative explanations linking US aid to Pakistan’s output growth. Second, we conduct econometric stability checks on the results.

There are additional alternative channels that might link US foreign aid to output growth in Pakistan. For one, even if the US economic assistance does not directly impact defense spending, it might still increase defense production in Pakistan, if for example, the US economic support funds were diverted to the military. Second, higher terrorism levels in Pakistan may draw more US aid, then the higher consequent GDP per capita growth might not be due to increased aid

“It is, in fact, the China-Punjab (aid package) not China-Pakistan as stated officially, because it will mainly benefit Punjab and not the other provinces.”: Senator Achakzai. Or “Nawaz is not the Prime Minister of Pakistan, he is the Prime Minister of Punjab (his home province)” : Member Parliament, Bilawal Bhutto, quoted in [Dawn \(2016\)](#)

per se, but its conflict reducing effect. Third, geopolitical aid shocks might give rise to a new political equilibrium which might in turn impact investment and political risk in Pakistan.⁴² The placebo test that attempted to link failed aid legislations in the United States to output growth in Pakistan, undermines this hypothesis to some extent, but it might not completely capture the change in investment and political climate following successful changes in aid legislation and the geopolitical shocks.

Although, it is impossible to completely rule out each of these channels, but we present evidence against them. Figure 10 presents the results. From Panel A, we observe that foreign aid exerts negligible impact on defence component of GDP in Pakistan. This implies that the defence component of GDP is not impacted by foreign aid shocks. Furthermore, controlling for terrorism, ICRG investor and Polity IV institutional index has no bearing on the results: foreign aid is still positively associated with output growth in Pakistan (Figure 10, Panel B, C and D).⁴³

Next, we conduct some key NVAR diagnostic tests that have been discussed in the literature (Romer and Romer (2010); Lütkepohl and Schlaak (2018); Monnet (2014)). First, we show that the results are not dependent on the chosen ordering restrictions that crucially determine standard VAR results (see for example, Fernández-Villaverde et al. (2007)'s critique of VARs on exactly this point). From Panel A of Figure 11, we observe that varying the ordering restriction of the NVAR has no impact on the qualitative as well as statistical significance of the results. Second, we show the results are statistically strong i.e. they are robust even when we consider two or even three standard deviation bands.⁴⁴ Panel B of Figure 11 presents these results. We observe especially from year 2 to 5, the IRF estimates are even within three standard deviation bands.

Finally, we show that results are robust to computing standard errors through bootstrapping in-

⁴²Depending on whether geopolitical events increased or decreased domestic risk in Pakistan, it can lead to an improvement or decline in economic performance.

⁴³In fact, none of the political and investment risk indices in Pakistan seem to change following the geopolitical events or changes aid legislations in the United States. This is why controlling for them in the regressions has no bearing on the main results.

⁴⁴Although, most of the empirical VAR literature uses one confidence interval bands (e.g. see Blanchard and Perotti (2002); Monnet (2014)). Nevertheless, to demonstrate the statistical power of the relationship between US aid shocks and output growth, we also report here the impulse responses with 95% and 99% confidence intervals.

stead of the asymptotic theory. [Kilian \(1998\)](#) and [Pool, De Haan and Jacobs \(2015\)](#) have suggested using bootstrapped confidence intervals especially when working with small samples. Although, we have continued to report more conservative standard errors, based on asymptotic theory, but in [Figure 11](#) (Panel C), we also compute standard errors by bootstrapping. We note that the results remain unchanged.

4 Conclusion

In this paper, we have demonstrated that although foreign aid can fund patronage, it may still have a positive - and significant - effect on economic growth in developing countries. By doing so, our theory links two strands of literature that grew apart in the recent decades: one demonstrating the positive effect of foreign aid on growth, the other emphasising the distortionary effects of foreign aid on patronage, ethnic favoritism and corruption.

Pakistan provides a particularly interesting context to empirically examine the predictions of the model, as political corruption is widespread, informal sector is large, while data on US aid, identification strategy and subnational output series allows us to provide causal evidence. We demonstrated that the effects of aid on patronage and economic growth are positive and significant. An aid shock of about USD 400 million leads to an additional 1% increase in GDP per capita growth and 2% increase in public employment. Moreover, the impact of aid is disproportionately larger in the region of birth of the incumbent.

This study furthers the debate on the use of foreign aid in the developing world, foremost by suggesting that aid - precisely because it funds patronage - increases incumbents' benefit of staying in power, making public policies more efficient. It also raises the important - and under-studied issue - of the interaction between aid and institution building in the developing world. In particular, since aid allows to increase the scope of commitment to future policies - through patronage - it may also prevent developing countries from building more inclusive political institutions.

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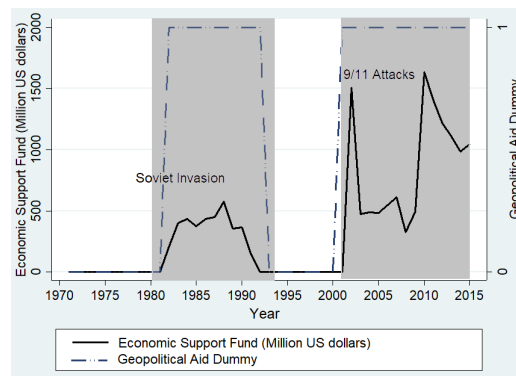
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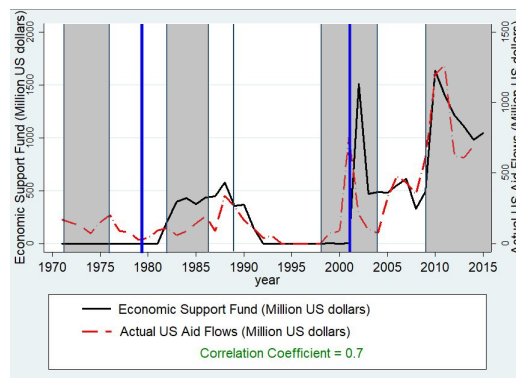
Figures

Figure 1: United States Foreign Aid to Pakistan (1971-2015)

(a) *Economic Support Fund (ESF) allocations and Geopolitical Events*



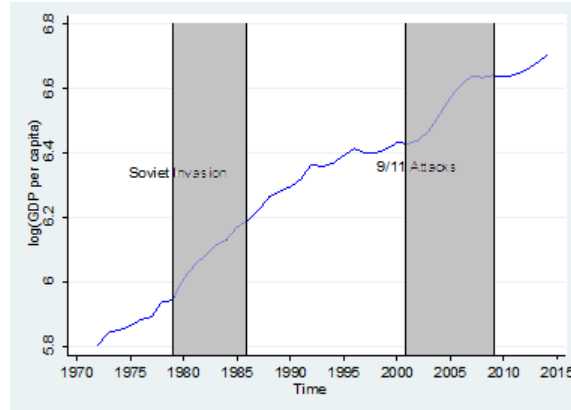
(b) *ESF aid, ODA foreign aid flows, Geopolitical Events, Changes in Aid Legislations*



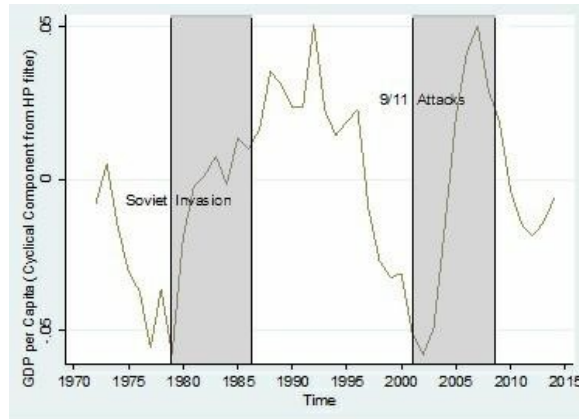
Note: The figure shows evolution of US foreign aid flows and economic support fund allocations over time. Thick vertical lines mark the geopolitical shocks of Soviet Invasion and 9/11 attacks. The thin vertical lines mark all the amendments to US Foreign Assistance Act. This includes Sparkman Amendment, Symington Amendment, Morgan Amendment, Symington Waiver, Pressler Amendment, Brownback Amendment and Kerry-Lugar Bill. Shaded areas represent periods of expansive aid legislations (Sparkman, Symington Waiver, Brownback, Kerry-Lugar Bill) in Panel B and geopolitical shocks of Soviet Invasion and 9/11 attacks in Panel A. See Table 1 and Table A in the appendix for more details.

Figure 2: Output series and Geopolitical Events

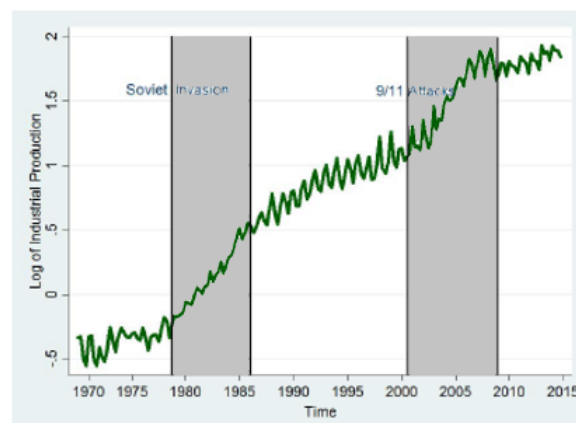
(a) *Aggregate GDP per capita series*



(b) *Cyclical Component of GDP per capita series through HP filter*



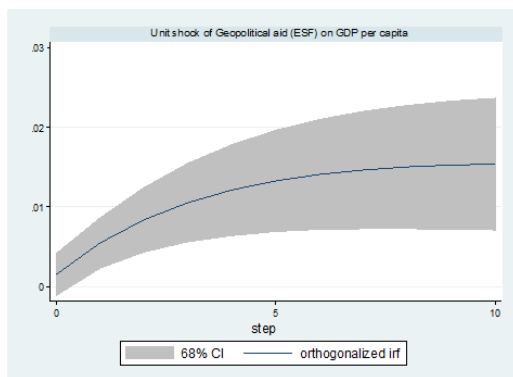
(c) *Aggregate Industrial Production Series*



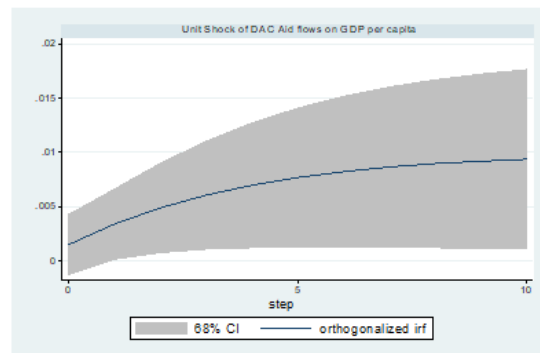
Note: The figures present evolution of output series from 1970 to 2015. Shaded areas represent time of geopolitical aid shocks following the Soviet Invasion of Afghanistan and 9/11 attacks.

Figure 3: Impact of Foreign Aid on GDP per capita (annual)

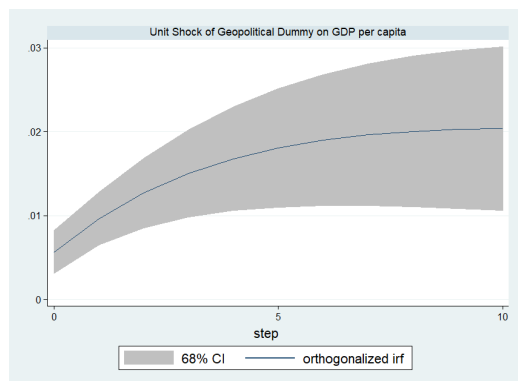
(a) *ESF Aid allocation shock on GDP per capita*



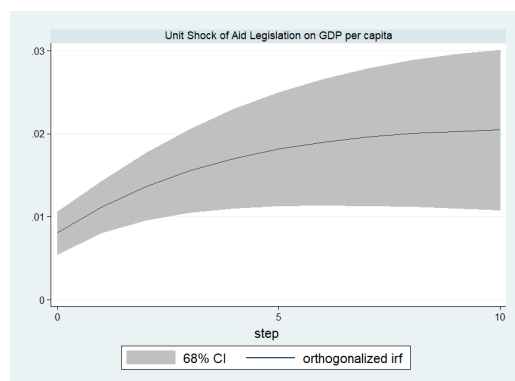
(b) *Foreign Aid flows shock on GDP per capita*



(c) *Geopolitical Aid Dummy on GDP per capita (reduced form)*



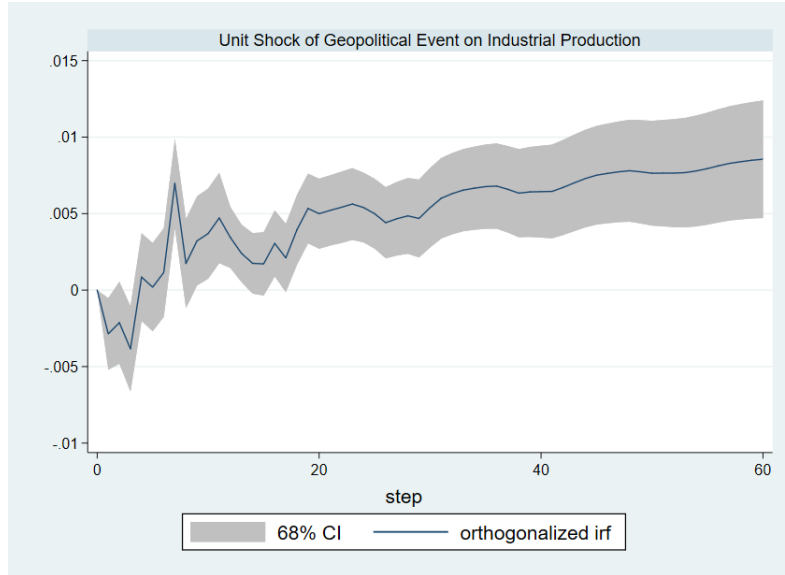
(d) *Aid Legislation Dummy on GDP per capita (reduced form)*



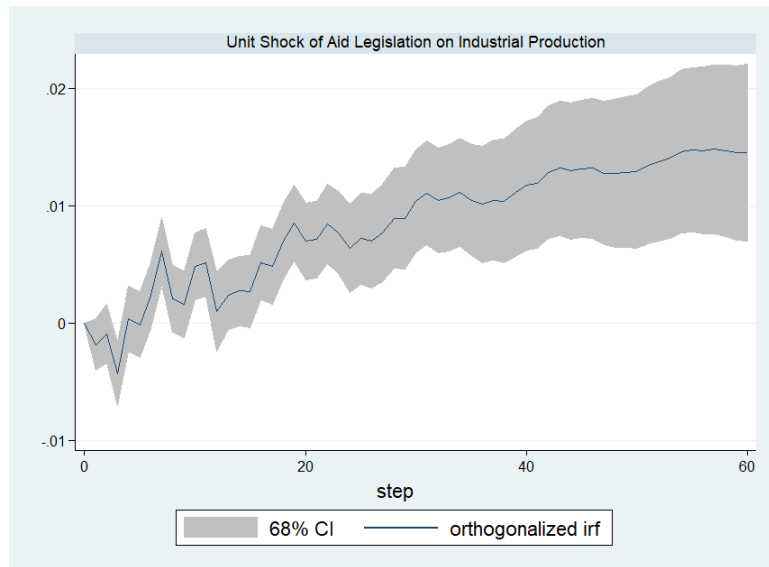
Note: The figures present the plots of impulse response functions from the baseline Narrative Vector Autoregression where the respective aid variable is shocked on GDP per capita series. The lag length selection is done according to information criteria (AIC and BIC).

Figure 4: Impact of Foreign Aid on Industrial Production (monthly)

(a) *Impact of Geopolitical Shock Dummy on Industrial Production*



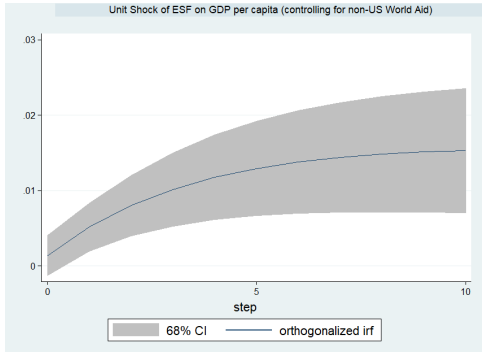
(b) *Impact of Aid Legislation Dummy on Industrial Production*



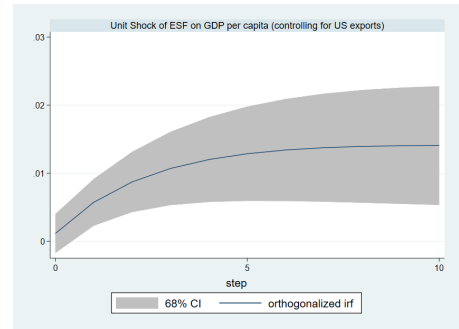
Note: The figures present the plots of impulse response functions from the baseline Narrative Vector Autoregression where the respective aid variable is shocked on monthly industrial production series.

Figure 5: Robustness to Alternative Explanations

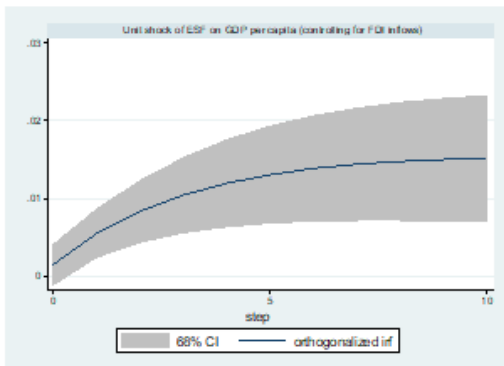
(a) *Impact of Foreign Aid on GDP per capita
(controlling for non-US World Aid)*



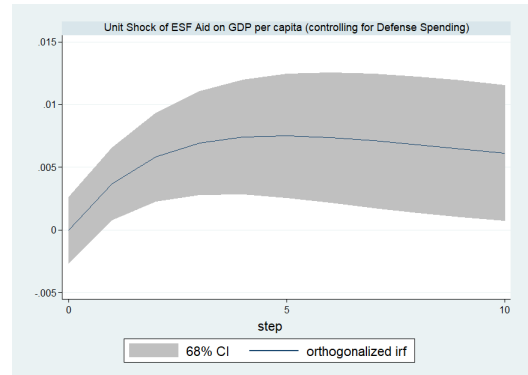
(b) *Impact of Foreign Aid on GDP per capita
(controlling for US Trade)*



(c) *Impact of Foreign Aid on GDP per capita
(controlling for US FDI)*



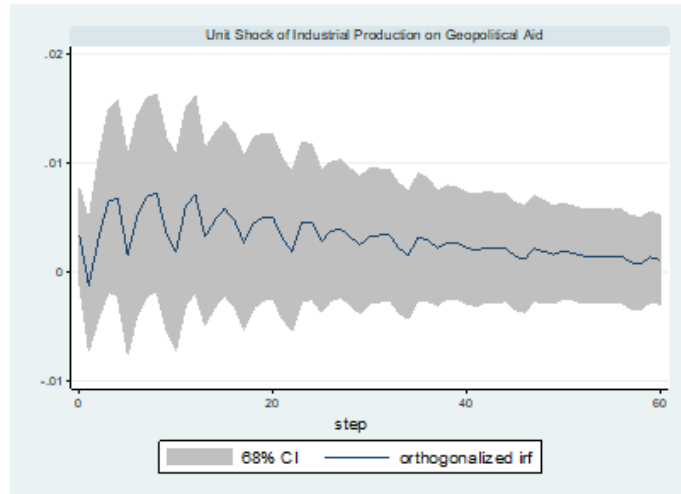
(d) *Impact of Foreign Aid on GDP per capita
(controlling for Defense Spending)*



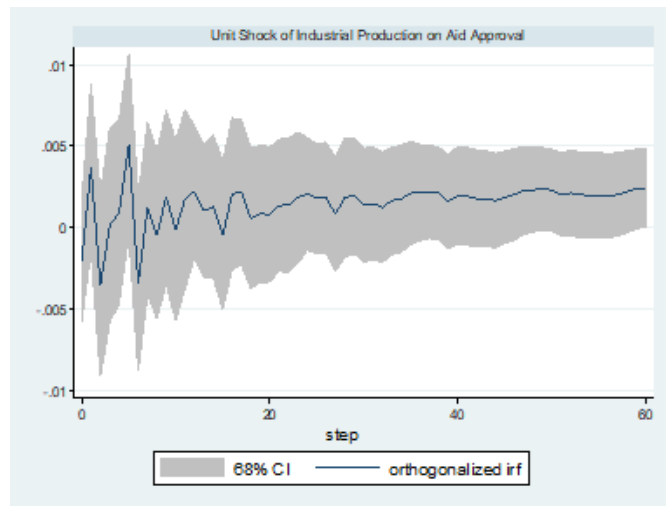
Note: The figures present the plots of impulse response functions where additional controls are added to the baseline Narrative Vector Autoregression. These include non-US world aid, US exports, US FDI and Pakistan's defense spending.

Figure 6: Placebo Test Reverse Causality

(a) *Impact of Industrial Production on Geopolitical Aid*

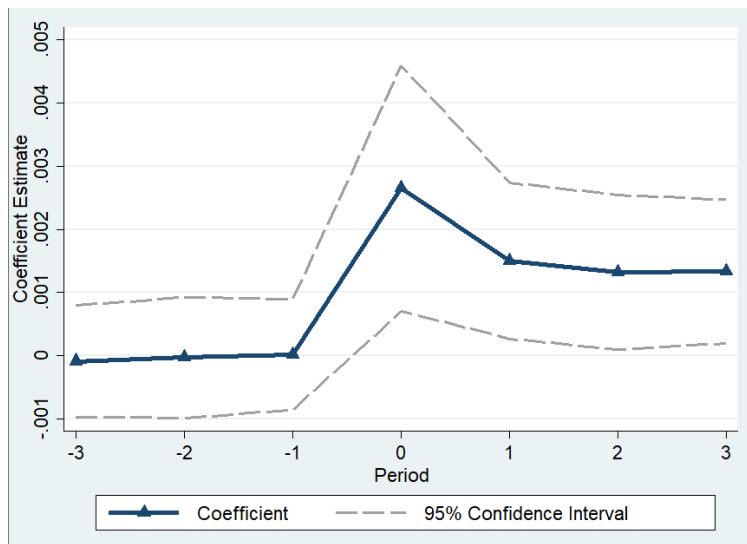


(b) *Impact of Industrial Production on Aid Legislation*



Note: The figures present the plots of impulse response functions where instead of the aid variable being shocked on the output series, the reverse is done: output series is shocked on the aid variable.

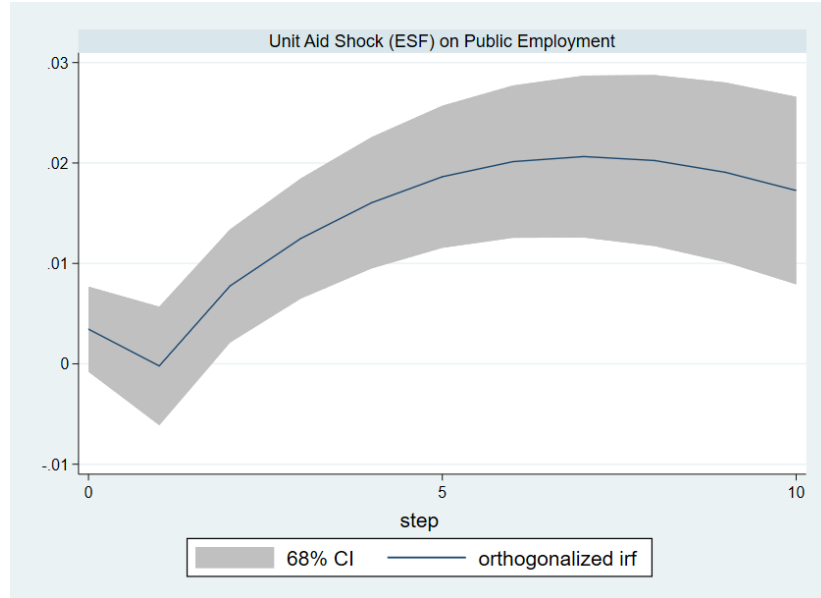
Figure 7: Plot of Coefficient Estimates in the IV regressions



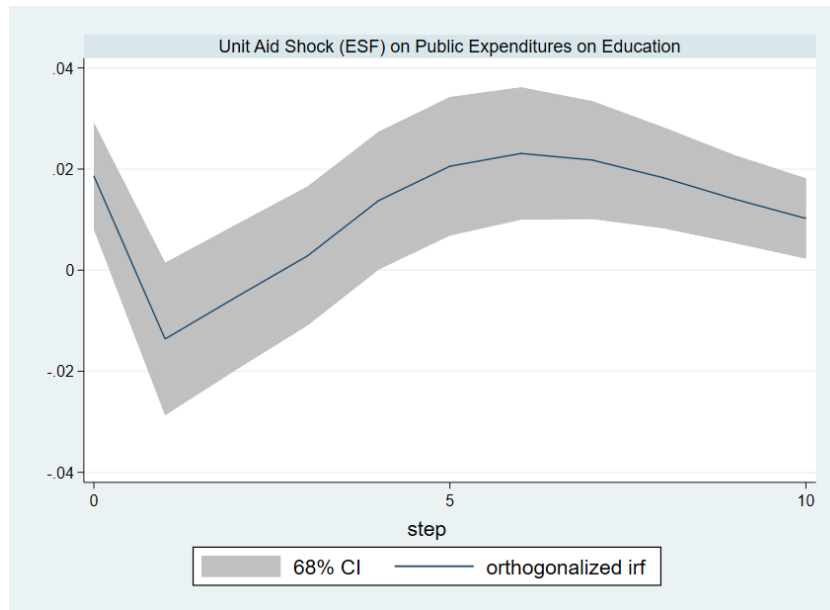
Note: The graph plots coefficients of US foreign aid flows instrumented by aid legislation dummy with leads and lags. Period 0 shows coefficient on the contemporaneous impact of aid, period 1 is one year lagged aid and so forth.

Figure 8: Effect of Foreign Aid on Patronage

(a) *Impact of Foreign Aid on Public Employment*

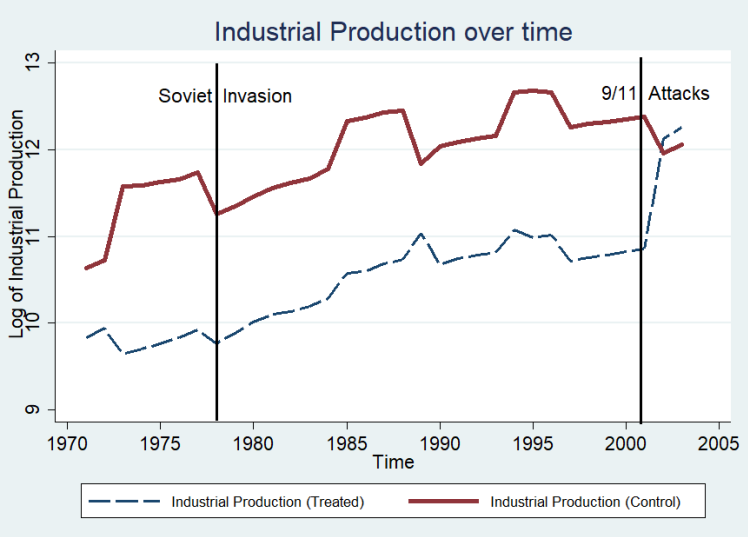


(b) *Impact of Foreign Aid on Public Expenditures on Education*



Note: The figures present the plots of impulse response functions where aid variable is shocked on public employment (Panel A) and public expenditures variables (Panel B). 45

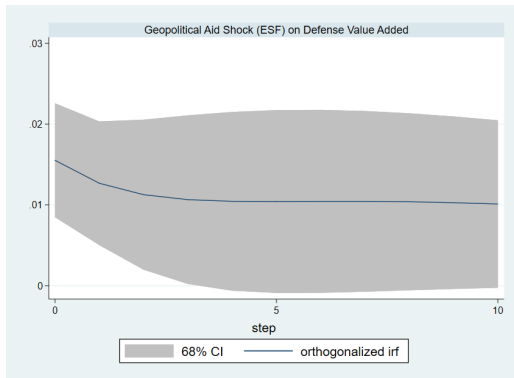
Figure 9: Industrial Production with Head of State Dummy taking the value of one (treatment) versus Head of State Dummy taking the value of zero (control).



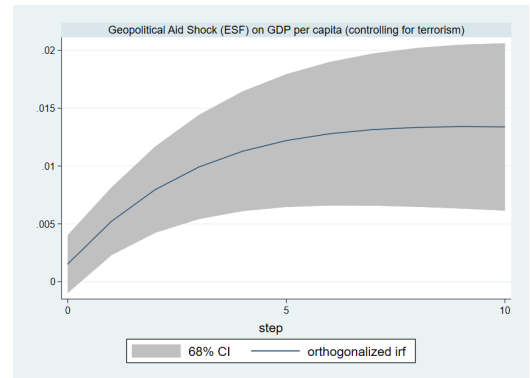
Note: The figure shows that average industrial production in the birth-province of the incumbent leader (the treatment) versus the average industrial production in the provinces where the leader is not in office (the control), follows common trends prior to the geopolitical aid shocks. Province level panel data is only available till 2004 so we are forced to terminate the analysis in the year 2004.

Figure 10: Additional Alternative Explanations and Controls

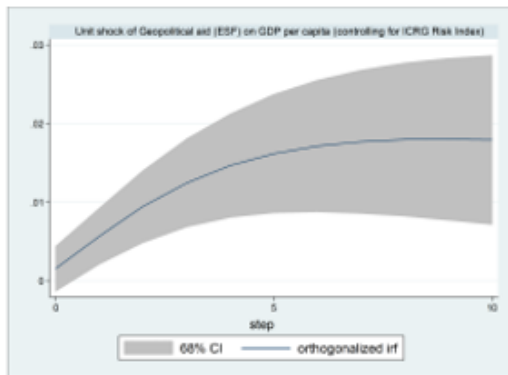
(a) *Impact of Foreign Aid on Defense Component of GDP per capita*



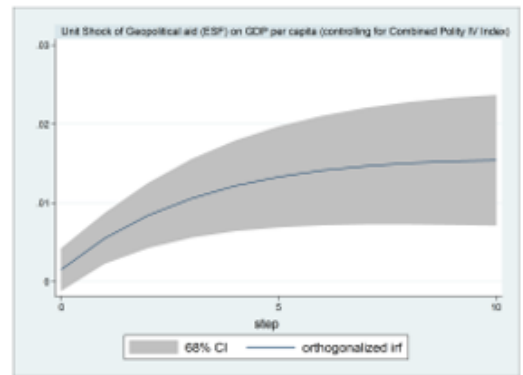
(b) *Impact of Foreign Aid on GDP per capita (controlling for terrorism)*



(c) *Impact of Foreign Aid on GDP per capita (controlling for ICRG Risk Index)*



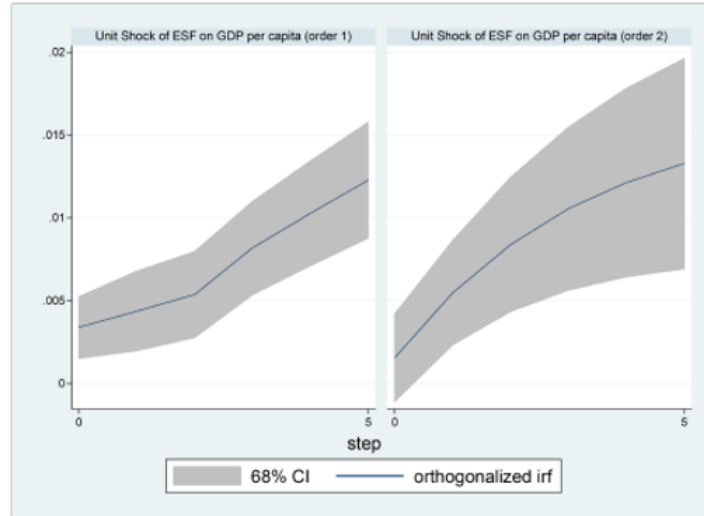
(d) *Impact of Foreign Aid on GDP per capita (controlling for Combined Polity IV Index)*



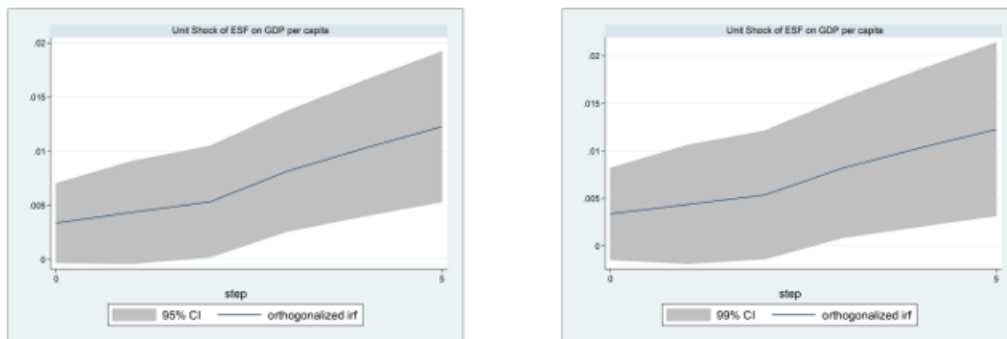
Note: The figure plots the impulse response functions with additional controls, especially controls for various political and investment 'risk' factors.

Figure 11: NVAR Diagnostics

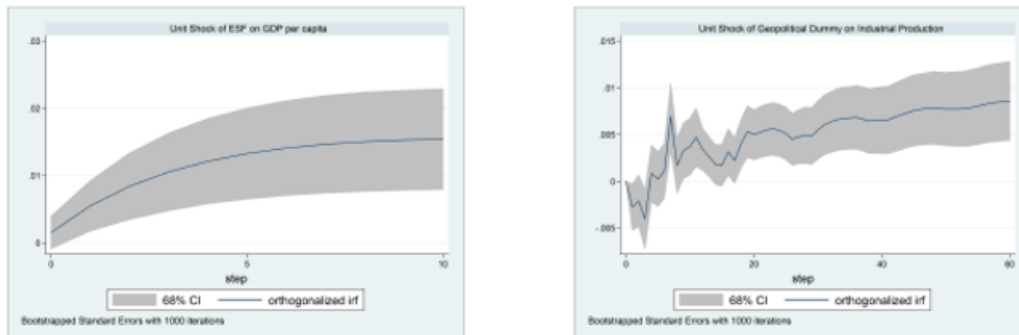
(a) *Robustness to Ordering Restrictions*



(b) *Robustness to 2 and 3 Standard Deviation Bands*



(c) *Robustness to Bootstrapped Standard Errors*



Tables

Table 1: Changes to Foreign Assistance Act of 1961 from 1970 to 2015

Name of Legislation	Year Tabled	Year Enacted	Passed	Aid Expansive
Sparkman Amendment	1973	1973	Yes	Yes
Symington Amendment	1976	1976	Yes	No
Humphrey Bill	1978	-	No	Yes
Morgan Amendment	1978	1979	Yes	No
Symington Waiver	1982	1982	Yes	Yes
Pressler Amendment	1985	1986	Yes	No
Fascell-Hamilton Bill	1991	-	No	Yes
Clinton Bill	1994	-	No	Yes
Brownback Amendment	1999	1999	Yes	Yes
Kerry-Lugar Bill	2009	2010	Yes	Yes

Note: The aid legislation dummy switches on in the year of enactment. Failed aid legislation switches on in year the legislation is tabled. Geopolitical Aid shock dummy for Soviet Invasion switches on from 1980 to 1985 for annual data, and 12/1979 to 07/1985 for monthly data. Likewise, Geopolitical Aid shock dummy for 9/11 attacks switches on from 2002 for annual data and 09/2001 for monthly data until the end of dataset. See Table A in the appendix B for further details on these changes in aid legislations.

Table 2: Instrumental Variable Results

<i>Log GDP per capita</i>	<i>Geopolitical Aid Instrument</i>		<i>Aid Legislation Instrument</i>		
	OLS	IV, 2 nd Stage	IV, 2 nd Stage	IV, 2 nd Stage	IV, 2 nd Stage
	(1)	(2)	(3)	(4)	(5)
L. Log Foreign Aid	0.00053 (0.00039)	0.0047* (0.0027)	0.0029* (0.0016)	0.0014** (0.00067)	0.0015** (0.00062)
Constant	0.0711 (0.0765)	-0.0348 (0.114)	0.262* (0.140)	0.0476 (0.0827)	0.228* (0.133)
Controls	No	No	Yes	No	Yes
Observations	43	43	43	43	43
R-squared	0.995	0.987	0.993	0.995	0.995

Note: Robust standard errors in parentheses. In column (2) and (3) US aid flows is instrumented by geopolitical aid shock dummy. In column (4) and (5) aid flows is instrumented by aid related legislative changes dummy. Lagged GDP per capita as well as controls added in line with the NVAR specification. One-year lag is chosen as per Bayesian and Akaike Information Criteria. Thus, estimates from this table can also be interpreted as a reduced form NVAR.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Placebo Test Impact of Failed Aid Legislations

	<i>Logarithm of GDP per capita</i>		
	<i>IV, 2nd Stage</i>	<i>IV, 2nd Stage</i>	<i>IV, 2nd Stage</i>
	(1)	(2)	(3)
L. Log Foreign Aid	0.0159 (0.0387)	-0.000953 (0.00267)	-0.00107 (0.00417)
Constant	6.032*** (0.654)	0.108 (0.0964)	0.167 (0.164)
Controls	No	No	Yes
Observations	43	43	43
R-squared	0.998	0.994	0.994

Note: In all columns, US aid flows is instrumented by failed aid legislation dummy variable that switches on when aid legislation was tabled but failed to pass (See Table 1 and Table A in the appendix). In column (1), we present simple bi-variate regression of GDP per capita and the instrumented foreign aid variable (without lagged GDP). In column (2) and (3), we estimate the underlying NVAR reduced form in the main results, without and with controls, respectively (instrumented by failed aid legislation). Robust standard errors are presented in the parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: A Check for the Exclusion Restriction - A Comparison of Means

Variables	No Aid Shock	Aid Shock	Difference	(p-value)
US Exports	-0.05	0.06	-0.12	0.29
US FDI	-0.10	0.08	-0.19	0.81
UK Aid	-0.00	0.00	-0.00	0.95
EU Aid	-0.06	-0.09	0.03	0.83
Military Spending	0.02	-0.01	0.03	0.44
US Aid Disbursements	-2.32	2.24	-4.56	0.00
US ESF Aid	-0.72	0.67	-1.39	0.00
Pakistan GDP	0.59	0.63	-0.04	0.00

Note: All variables (in logs) are regressed on a linear time trend to obtain their residuals, whose means are compared when Geopolitical shock dummy switched off and on, respectively.

Table 5: Differences-in-Differences Results

	Log of the Industrial Production			
	(1)	(2)	(3)	(4)
Aid Shocks X	0.422*	0.0323**	0.0191**	0.0210**
Birth Place of HofS	(0.169)	(0.00712)	(0.00575)	(0.00646)
Head of State	-1.550**	0.0222	0.0657	0.0315
	(0.372)	(0.0271)	(0.0467)	(0.0244)
Time Fixed Effects	Yes	Yes	Yes	Yes
Province Fixed Effects	No	Yes	Yes	Yes
Province Specific Trends	No	No	Yes	Yes
Controls	No	Yes	No	Yes
Observations	140	140	140	140
R-squared	0.649	0.998	0.998	0.998

Note: Robust standard errors clustered at province level in the parenthesis. Aid Shock is a dummy variable that takes the value of 1 in geopolitical aid shock years for all provinces. Birth Place of HoS is a time and province varying dummy variable that takes the value of 1 for the province where the head of state (Prime Minister or President) was born and during her/his term in office and zero otherwise.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Alternative Explanations, Additional Controls and Interactions

	Log of the Industrial Production		
	(1)	(2)	(3)
Aid Shocks X Birth Place of HoS	0.0210** (0.00646)	0.0211** (0.00644)	0.0263*** (0.00348)
Head of State	0.0315 (0.0244)	0.0315 (0.0254)	-0.524 (0.578)
EU Aid X Birth Place of HoS			0.0465 (0.0393)
UK Aid X Birth Place of HoS			0.0709 (0.0604)
US FDI X Birth Place of HoS			0.00659 (0.00426)
US Exports X Birth Place of HoS			-0.0328 (0.0331)
Defense Spending X Birth Place of HoS			-0.0199 (0.0773)
Year and Province Fixed Effects	Yes	Yes	Yes
Province Specific Trends	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Additional Table 5 Controls	No	Yes	Yes
Interaction Terms	No	No	Yes
Observations	140	140	140
R-squared	54 0.998	0.998	0.999

Table 7: Placebo Test

	Log of the Industrial Production			
	(1)	(2)	(3)	(4)
Head of State at t x Aid	0.0210** (0.00646)			
Head of State at t-1 x Aid		0.00736 (0.0118)		
Head of State at t-2 x Aid			-0.000743 (0.0122)	
Head of State at t-3 x Aid				-0.00742 (0.0125)
Head of State	0.0315 (0.0244)	0.0269 (0.0209)	0.0239 (0.0179)	0.0210 (0.0166)
Time Fixed Effects	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes
Province Specific Trends	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Constant	-39.08 (143.9)	30.22 (311.4)	24.56 (288.2)	-5.335 (93.53)
Observations	140	136	132	128
R-squared	0.998	0.998	0.999	0.999

Robust standard errors in parentheses (clustered at province level).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

For Online Publication: Online Appendix

Mathematical Appendix

A.1 Proof of Proposition 1

From (2.6) and (2.8), we deduce that

$$\frac{\partial^2 R}{\partial r_1^2} = v''(r_1) + P(g)v''(r_2) < 0, \quad (\text{A.1})$$

and by differentiating the first line of (2.8) with respect to a_1 , we deduce that:

$$\frac{\partial r_1}{\partial a_1} = \frac{P(g)v''(r_2)}{v''(r_1) + P(g)v''(r_2)} < 1. \quad (\text{A.2})$$

Also, by differentiating the second line of (2.8) with respect to a_1 and r_1 , we find that:

$$\frac{\partial g}{\partial a_1} = -\frac{\frac{\partial^2 R}{\partial a_1 \partial g}}{\frac{\partial^2 R}{\partial g^2}}, \quad (\text{A.3})$$

with $\frac{\partial^2 R}{\partial g^2} < 0$, so

$$\frac{\partial g}{\partial a_1} = -\frac{-2v''(r_2)P(g) + \frac{dP(g)}{dg}v'(r_2)}{\frac{\partial^2 R}{\partial g^2}} \quad (\text{A.4})$$

and

$$\frac{\partial g}{\partial r_1} = -\frac{\partial g}{\partial a_1}. \quad (\text{A.5})$$

As

$$\frac{dg}{da_1} = \frac{\partial g}{\partial a_1} + \frac{\partial g}{\partial r_1} \frac{\partial r_1}{\partial a_1}, \quad (\text{A.6})$$

We deduce from (A.2) and (A.5) that

$$\frac{dg}{da_1} > \frac{\partial g}{\partial a_1} + \frac{\partial g}{\partial r_1} = 0. \quad (\text{A.7})$$

This concludes the proof of proposition 1.

A.2 Proof of Proposition 2

By differentiating Y_1 with respect to a_1 , we find:

$$\frac{dY_1}{da_1} = 1 - \frac{dr}{da_1} - \frac{1}{2}((1-z)h - h_P) \frac{dg}{da_1}. \quad (\text{A.1})$$

$\frac{dg}{da_1} > 0$ from proposition (1).

$$\frac{d}{dz} \frac{dY_1}{da_1} Y_1 = \frac{h}{2} \frac{dg}{da_1} > 0, \quad (\text{A.2})$$

so $\frac{dY_1}{da_1}$ increases with z .

Furthermore,

$$1 - \frac{dr}{da_1} = 1 - \frac{\partial r}{\partial a_1} - \frac{\partial r}{\partial g} \frac{\partial g}{a_1}, \quad (\text{A.3})$$

with $\frac{\partial r}{\partial a_1} < 1$, see the proof of proposition (1). As $\frac{\partial r}{\partial g} \frac{\partial g}{a_1} < 0$, we deduce that

$$1 - \frac{dr}{da_1} > 0. \quad (\text{A.4})$$

This proves that aid tends to increase the national income by reducing the scope of rent extraction.

Furthermore, it also demonstrates that for $z = 1$, $\frac{dY_1}{da_1} > 0$ necessarily holds, so there exists a $\bar{z} < 1$ such that if $z > \bar{z}$, $\frac{dY_1}{da_1} > 0$. This concludes the proof of proposition 2.

B.1 Variable Definitions and sources

Real GDP per capita: logarithm of GDP per capita deflated by GDP deflator from Central Bank of Pakistan.

Industrial Production (monthly) = logarithm of Industrial Production Index from Central Bank of Pakistan (SBP).

Head of State Birth = This variable takes the value of 1 if: a) the head of state is born in that province where head of state (president or the prime minister) b) the head of state is in office

Terrorism = Logarithm of annual terrorism deaths as coded by Global Terrorism Database rubric. The data is obtained from the [Global Terrorism Database \(2018\)](#).

ESF: logarithm of Economic Support Fund from US Green Book of Aid. The section 202 of the Foreign Assistance Act of 1971 outlines the motivation for creation of budget based Economic Support Fund through Congressional legislation as follows: The Congress recognizes that, under special economic, political, or security conditions, the national interests of the United States may require economic support for countries in amounts which could not be justified solely under chapter 1 of part I. In such cases, the President is authorized to furnish assistance to countries (under the ESF), on such terms and conditions as he may determine, in order to promote national interest of the United States. (FAA, 1971). The Economic Support Fund (ESF) promotes the economic and political foreign policy interests of the United States by providing assistance to allies (FAA, 1961).

Aid Legislation = dummy variable that takes value 1 when an expansive aid legislation is enacted zero otherwise. For more details see Table 1.

Geopolitical Shock: dummy variable that takes value 1 in positive aid shock years such as Soviet Invasion till withdrawal, 9/11 till the end of War on Terror and zero otherwise.

US Aid Flows: logarithm of bilateral aid flows from United States also referred to Official Development Assistance (ODA) in the literature, from World Development Indicators of the World Bank. Constructed by Development Assistance Committee (DAC) criteria. US Exports = loga-

rithm of exports (in millions) to United States from Handbook of Statistics State Bank of Pakistan (various issues)

Combined Polity IV Index: This is composite Polity IV index computed in Gur et al. (2015), using the component AUTOC score and DEMOC score. The resultant combined polity scale ranges from +10 being strongly democratic to -10 being strongly autocratic.

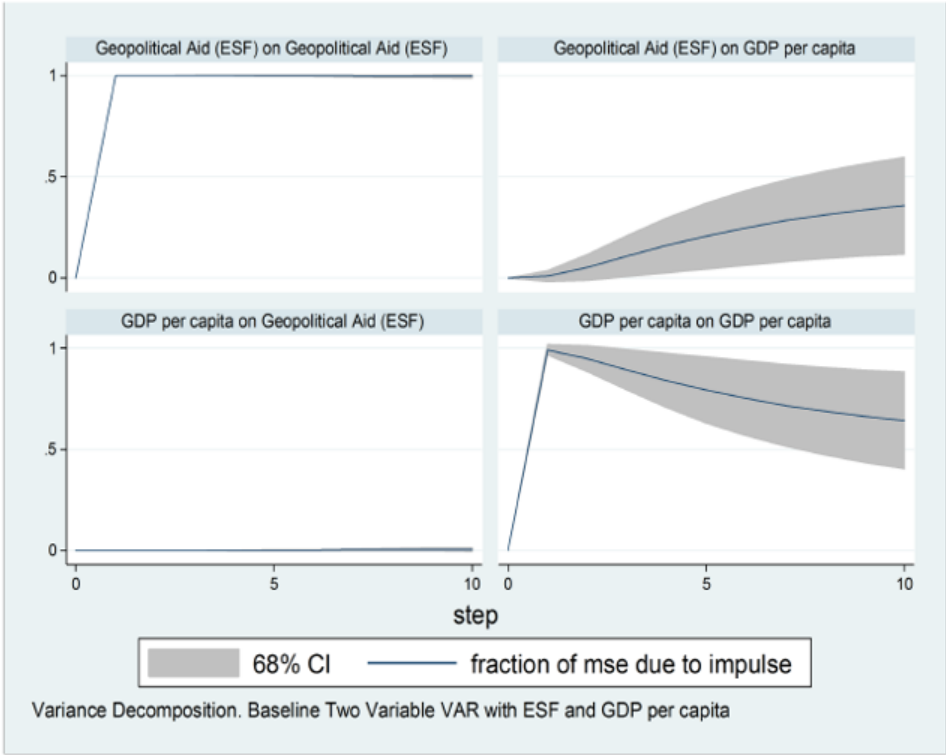
ICRG Risk Index: It is a composite risk rating of 12 risk country risk factors constructed by Political Risk Services Group (PRSG): Government Stability, Socioeconomic Conditions, Investment Profile, Internal Conflict, External Conflict, Corruption, Military in Politics, Religious Tensions, Law and Order, Ethnic Tensions, Democratic Accountability and Bureaucracy Quality Defense: logarithm of defense value added i.e. defense contribution to GDP, retrieved from [Arby \(2008\)](#).

Public Education Expenditures: logarithm of total general (local, regional and central) government expenditure on education (current, capital, and transfers). It includes expenditure funded by transfers from international sources to government. It refers to the current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment. Retrieved from UNESCO Institute of Statistics (UNESCO, 2016).

C.1 Additional Tables and Figures

C.2 Figures

Figure C.1: Variance Decomposition of baseline NVAR



C.3 Tables

Table C.1: Description of Changes to the Foreign Assistance Act

Name of Legislation	Description
Sparkman Amendment	Increases overall aid budget of the United States. Makes special appropriations for strategic partners (Egypt, Israel and Pakistan).
Symington Amendment	Sanctions against all countries that attempt to acquire a nuclear weapon.
Humphrey Bill	This bill attempted to increase the focus of foreign assistance on development, streamline bilateral and multilateral US aid.
Morgan Amendment	This bill curtailed foreign aid to all countries that were involved in gross human right violations.
Symington Waiver	This legislation declared that Symington amendment induced aid restrictions did not apply to strategic allies of United States.
Pressler Amendment	This legislation mandated that all US aid to its strategic partners is to be halted, unless the US President certified that the country did not possess a nuclear device.
Fascell-Hamilton Bill	The bill attempted to reduce certification requirements and micromanagement of foreign aid.
Clinton Bill	The bill attempted to increase aid for democracies and bring aid allocation under one umbrella.
Brownback Amendment	The legislation gave the US President, the executive authority to waive aid sanctions on Pakistan and India.
Kerry-Lugar Bill	Assistance Package for Pakistans support in War on Terror.

Note: All the above amendments to the Foreign Assistance Act were enacted except for Humphrey, Fascell-Hamilton and Clinton Bill, which failed to pass both houses of Congress.

Table C.2: Province-specific dummy that switches on when head of state is in power

Year	Prime Minister	President
1970-1971	5	1
1971-1973	5	2
1973-1977	2	1
1978-1985	-	5
1985-1988	2	1
1988-1990	2	3
1990-1993	1	3
1993-1996	2	1
1997-1999	1	1
1999-2002	1	2
2002-2004	4	2

Note: 1 represents Punjab, 2 is Sindh, 2 is Khyber Pakhtunkhwa (previously) NWFP, 4 is Baluchistan and 5 is birth outside Pakistan e.g. British India. The dummy switches on when either the Prime Minister or the President from the province is in office. The entry for Prime Minister for 1978-1985 is missing due to banning of political parties in the martial law regime of General Zia-ul-Haq.