Does Aid Affect Governance?

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I. Channels from Aid to Growth

Why is there little robust evidence that foreign aid significantly enhances the economic growth of poor countries? For a while it appeared that we had learnt the answer; aid is frittered away by some recipient countries through corruption and mismanagement. So, while on average aid does not seem to have a positive impact on growth, in countries with good policies it does (see Burnside and Dollar (2000)). Recently, however, a number of studies question this explanation.[1] These studies suggest that even in countries with good policies, there is no robust association between aid and growth. The search for an alternative explanation is becoming immensely important as industrial countries are being exhorted to increase their aid budgets in order to help developing countries achieve the Millennium Development Goals.

Perhaps a clue to where the explanation may lie is in Figure 1. We plot the log of the manufacturing to GDP ratio in a country against the log of the ratio of aid received to GDP for that country for two separate dates (the late 1990s and the early 1980s, separated by about 15 years), after correcting for the country's per capita PPP GDP, per capita PPP GDP squared, and country and time fixed effects. As the figure suggests, the more aid a country has received, the smaller its share of manufacturing. The coefficient estimate suggests that a 1 percentage point increase in the ratio of aid-to-GDP is associated with a reduced share of manufacturing in total GDP of about 0.2-0.3 percentage points.[2]

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[1] See, for example, Easterly (2003), Easterly, Levine, and Roodman (2004), Hansen and Tarp (2001), Roodman (2004), and Rajan and Subramanian (2005a).

[2] Because we include fixed effects, the association between aid and manufacturing depicted in the chart is a temporal one, that is, within countries over time rather than one between countries.

Without further analysis, we do not know if this relationship is causal – though the simple argument for reverse causality that as a country gets poorer (and manufacturing shrinks) it gets more aid is unlikely to be the entire explanation because we correct for per capita income. Yet the relationship if causal, offers a proximate explanation for why aid may not have led to substantial growth. As pointed out by Jones and Olken (2006) and Johnson, et. al (2006), virtually all countries that have had a sustained period of growth in the post-war period have seen a large increase in their share of manufacturing and manufacturing exports.

But what is the deep underlying cause? The one we focus on here is poor governance. By expanding a government's resource envelope, aid reduces its need to explain its actions to citizens, which may reduce its need to govern well (Knack (2001) and Brautigam and Knack (2004)). In particular, poor governance could lead to a deterioration in the quality of institutions necessary for a good business environment, as the government falters in its responsibilities to maintain rule of law, ensure a predictable judiciary and contract enforcement, and limit corruption. In a companion paper (Rajan and Subramanian (2005b)), we examine another channel through which poor governance could affect manufacturing, the mismanagement of the real exchange rate.

We use the methodology in Rajan and Zingales (1998) to test the hypothesis that aid might reduce the quality of governance. They suggest that one way to check whether a channel is at work is to see whether industries that might be most affected by a channel grow differentially (faster or slower depending on the nature of the effect) in countries where that channel is likely to be more operative. The industry characteristic we are interested in is the degree to which an industry depends on governance (hereafter referred

to as "governance" sensitivity or dependence), the channel is the quality of governance, and countries that get more aid are likely to be the ones where the channel is most adversely affected. The estimation strategy is then to run regressions of the form:

(1) $Growth_{ij} = Constant + \beta_{1.....m}$*Country Indicators $+ \beta_{m+1....n}$* Industry Indicators $+$ β_{n+1}*(Industry i's share of manufacturing in country j in the initial period) $+$ β (Aid to country j* Sensitivity of industry i to governance) $+ \varepsilon_{ij}$

where $Growth_{ij}$ is the annual average rate of growth of value added of industry i in country j over a ten-year period, 1981-1990, obtained by normalizing the growth in nominal value added by the GDP deflator; $\beta_{1.....m}$ are the coefficients of the country fixed effects; $\beta_{m+1....n}$ are the coefficients of the industry fixed effects;[3] β_{n+1} is the coefficient of the initial period share of industry i in total value added in country j (which controls for convergence-type effects). Aid to country j is the average aid to GDP ratio for that country over the sample period. The coefficient of interest for us is β. It captures an interaction between a country-specific aid variable and an industry's sensitivity to governance. We posit that countries that receive more aid should see a more negative impact in industrial sectors that are more governance-sensitive.

The chief advantage of this strategy is that by controlling for country and industry fixed effects, the problem of omitted variables bias or model specification, which seriously afflicts cross-country regressions, is diminished. Essentially, we are making predictions about within-country differences between industries based on an interaction between a country and industry characteristic. Moreover, because we focus on differences between

[3] We focus on the 1980s because of the large sample size; for the 1990s, data are available for only 15 developing countries.

manufacturing industries (rather than between, say, manufacturing and services industries), we can rule out factors that would keep manufacturing underdeveloped as explanations of our results – for these factors should not affect the differences between manufacturing industries.

II. Sensitivity to Governance

Clearly, the success of this method depends on whether we have a plausible measure for the dependence of an industry on the governance environment. Blanchard and Kremer (1997) develop such a measure. Broadly speaking, the fewer other industries an industry buys from – that is, the more concentrated its purchases -- the more the possibility it has of regulating transactions via long term repeated relationships or vertical integration, and less its need to rely on explicit governance by the courts or regulatory authorities. If the country has little governance capacity, industries that depend on contracts or arm's length transactions (that is, score lower on the concentration index) are likely to either have to distort their organizational structure or transact less, both of which will affect their growth.

The governance dependence measure (from Levchenko (2004), which is based on Blanchard and Kremer (1997)), is calculated as follows from U.S. input-output data: for each manufacturing industry i, we obtained its intermediate goods purchases from other industries k. The Herfindahl index for each sector i is calculated as the sum of the squares of the shares of the purchases of each input k in total input purchases of i. We multiply the Herfindahl index by -1 to get the HERF measure, where a value of zero indicates an industry that is

highly dependent on public institutions to govern its transactions, while a value of -1 denotes an industry that transacts fairly narrowly, and thus is less dependent on public institutions.[4]

Ideally, we would like to measure the number of outside transactions with different firms by a *firm*, whereas our measure is at the industry level. Second, ours is a measure of concentration of outside purchases, which does account for the fact that the fraction of outside purchases in total output can also vary. Third, our measure is derived from U.S. data which raises questions about its applicability to developing countries, where, for example, patterns of vertical integration could be very different from that in the U.S. (though clearly, that adaptation is part of the channel through which poor governance institutions will affect growth).

One way of validating our measure is the following. If good governance is indeed necessary for the growth of governance-dependent industries, then it must be the case that in countries that have better governance, industries that are more governance dependent should grow faster relative to sectors that are less governance dependent. This is a hypothesis that we can test, and the results are presented in Table 2.

We regress the growth rate of industry i in country j on a country-specific measure of governance quality and the industry-specific measure of governance dependence, after controlling for country and industry fixed effects. In column 1, the country measure of governance quality is investment protection, which is a good proxy for our notion of

[4] To check the robustness of our result, we compute an alternative measure of governance dependence based on the gini coefficient. The finite sample approximation to computing the Gini coefficient for sector i is: 1- ($\sum$ cumulative share of input purchases/0.5*N), where inputs are ranked in ascending value of purchases and N refers to the total number of the k intermediate sectors from which purchases are made. As N becomes large, the value of the Gini tends toward the range 0 and 1 and for reasons explained above, we multiply the Gini coefficient by -1.

governance quality as representing the rule of law and contract enforcement, and the industry measure of institutions intensity is HERF (summary statistics for all variables are presented in Table 1 in the web version of the paper). The sample comprises all developing countries in the UNIDO database (see the web version for a list of countries in the sample). The coefficient on the interaction term is positive and significant at the 1 percent confidence level, suggesting that in countries that have better governance, industries that are more governance dependent grow faster. Specifically, the annual growth rate of an industry that is one standard deviation higher in governance dependence in a country that has one standard deviation better institutions is 0.8 percent higher , which is a sizeable magnitude given that the average annual growth rate of industries is 2.1 percent in our sample.

The rest of the table consists of robustness checks. In column 2, we replace the investment protection with a composite of the ICRG measures of governance quality[5], in column 3, we replace the HERF measure of institutional dependence with the GINI measure, in column 4, we also include an interaction between initial per capita GDP and governance dependence to check whether the country measure of governance quality is just a proxy for its income, and in column 5, we include an interaction between governance quality and the industry fraction of outside purchases in output. Finally, in column 6, we account for the noisiness of the data by winsorizing all variables at the 5 and 95 percent level. The central result is robust.

[5] The composite index aggregates subcomponents of the political risk in the ICRG database as follows: Quality of Bureaucracy + Law and Order + Control of Corruption + 2*Investment Protection (constructed to be comparable to the index in Knack and Keefer (1995)). Each subcomponent is normalized to be between 0 and 1 as is the overall index.

It appears then that our governance dependence variable, postulated on theoretical considerations by Blanchard and Kremer (1997), picks out industries that thrive (relatively) in an environment with good governance. A finding in our core difference-in-difference estimation that aid affects the relative growth rate of these industries should then give us more confidence (than in a simple cross-country regression between aid and institutions) that the channel through which the effect is transmitted is governance quality.

III. Endogeneity of Aid

Because we examine growth differentials between industries within countries, the results are less sensitive to the rationale for why aid is given. For example, even if aid is given only to countries that display poor growth, inter-industry growth differentials should not be seriously affected. However, suppose low growth is primarily because countries have poor quality institutions, and aid is systematically given to countries that have low growth. In this case, we might be attributing to aid what is actually driven directly by governance quality. The way to address this is through instrumentation, which allows us to disentangle the direction of causality. We instrument for aid based on strategic, historic, and cultural links between donor and recipient (see Rajan and Subramanian, 2005a for details of the instrumentation process). Our main identification assumption is that non-economically-motivated aid is unlikely to be driven by governance quality.[6]

IV. Core Result

[6] One concern is that our instruments based on strategic and colonial links could be correlated with governance quality, thus violating the exclusion restriction underlying the instrumentation. Fortunately, in our sample, the direct correlation between our instrument for aid and the measures of governance quality are not high (less than .01 in magnitude) and not statistically significant.

We estimate the core specification in Table 3. In the first column of Table 3, we present the OLS estimate, in the second the IV estimate, in the third the IV estimate with standard errors clustered at the country level, in the fourth, IV with standard errors clustered at the industry level. In all cases the interaction coefficient is negative and significant at standard levels, suggesting that in a country that receives more aid, governance dependent industries grow relatively slower. Specifically, the annual growth rate of an industry that is one standard deviation higher in governance dependence (HERF) in a country that receives one standard deviation more aid is 2.8 percentage points lower, which is a sizeable magnitude given that the average annual growth rate of industries is 2.1 in our sample.

Finally, we examine the robustness of this result in Table 4. In column 1, we focus only on those countries that obtain average aid over the period (1981-1990) of more that 1 percent of GDP. In column 2, we replace the HERF measure of governance dependence with the GINI measure. In both cases, the interaction coefficient is statistically and economically significant.

One could also argue that not all forms of aid are equal – a number of economists try to identify certain forms of aid that are particularly likely to be "good" or development oriented. Specifically, technical assistance is explicitly geared toward building capacity and institutions, and if the logic bears out, we should expect to see a less negative interaction with this form of aid. This is what we check in the estimate reported in column 3. It turns out that the estimate is again negative and significant. Either all forms of aid are correlated with one another so that "good' aid is hard to tell apart from other aid, or aid inflows are fungible, so it does not matter whether the use of certain inflows are carefully specified or not, aid frees up resources elsewhere.

In column 4, we include an interaction between initial per capita GDP and governance dependence to check whether aid is just a proxy for the country's per capita income. The basic interaction coefficient continues to be significant even with this inclusion. In column 5, we also include an interaction between governance quality and governance dependence. If aid inflows "work" by reducing the quality of institutions, then introducing this interaction should weaken the basic interaction. It does: the magnitude on the coefficient declines substantially and it is also no longer statistically significant.

One could also ask if the effect of aid is felt because of the disproportionate power of certain groups : for example, it could be the case, that aid strengthens the power of elites, who then find it against their interests to foster broad-based governance reform. One crude proxy for power differences is income inequality. We include in column 6 an additional interaction term between the extent of income inequality in a country (measured by the gini coefficient) and the governance dependence of an industry. Again we find that the aid-interaction is weakened in statistical significance and magnitude.

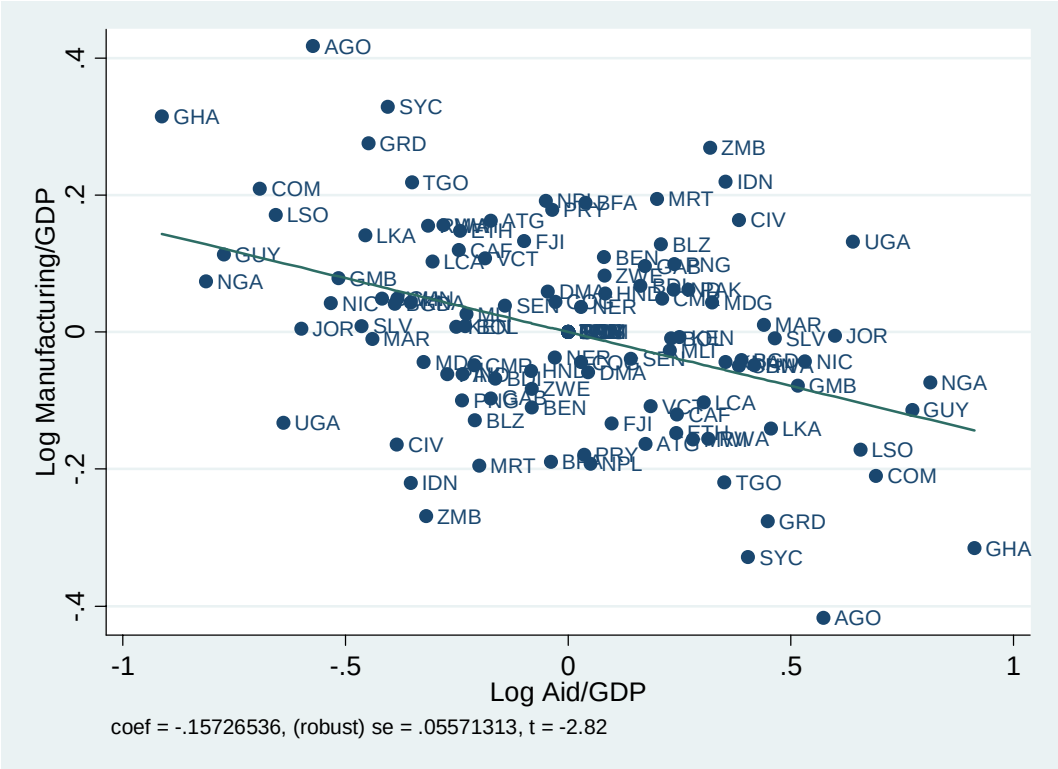
Finally, when we include country indicators, we cannot estimate the effects of individual country specific variables. In column 7, we drop the country indicators and include standard explanatory variables in growth regressions. Interestingly, the direct correlation of aid inflows (which is instrumented) is negative**,** suggesting industry growth rates in countries that receive more aid are lower. This certainly is consistent with the graph with which we started the paper.

V. Conclusions

One of the ways aid might have adversely affected growth in the past is by constraining the growth of the manufacturing sector. A possible channel we provide evidence

for in this paper is that aid might be particularly associated with weak governance, possibly because aid inflows reduce the need for governments to tax the governed or enlist their cooperation.

Chart 1: Manufacturing and Aid between 1980 and 2000



This plot represents the conditional relationship between the change in the size of the manufacturing sector between 1980 and 2000 in a country and the change in aid over the same period. It is based on running a panel regression where the dependent variable is log of the ratio of the share of value added in manufacturing to GDP for a country (at two dates, the late 1990s and the early 1980s), and the explanatory variables are the country's per capita PPP GDP, per capita PPP GDP squared, and fixed effects for the country and the time period. All variables are averages for the period 1980-85 and 1995-2000, respectively. To facilitate comparability with the core results in the paper, the sample was chosen according to the same criteria as in the core the sample of the paper, namely to include countries that had an aid-to-GDP ratio greater than 1 percent or are low-income countries. Data on manufacturing are from the World Bank's World Development Indicators.

Table 1. Summary Statistics 1980s

A. Across Countries and Industries in the Core Sample

Variable Names	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
Growth Rate of Value Added ij	0.021	0.102	-0.457	0.618	809
Initial Industry Share ij	0.046	0.065	0.000	0.562	809

A. Across Industries in the Core Sample

Variable Names	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
Governance Dependence i - Herfindahl	-0.145	0.070	-0.253	-0.042	809
Governance Dependence i - Gini	0.964	0.012	0.932	0.984	809

A. Across Countries and Industries in the Core Sample

Variable Names	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
Aid to GDP j	0.038	0.040	0.0003	0.176	809
Technical Aid to GDP j	0.008	0.009	0.0001	0.036	809
Investment Protection j	0.470	0.105	0.303	0.745	748
Quality of Institutions j (ICRG 5 composite index)	0.447	0.133	0.183	0.771	748
Initial GDP per capita j	7.987	0.760	6.406	9.347	758
Sachs-Warner Trade Policy Index j	0.333	0.410	0.000	1.000	809

Note: The core sample corresponds to the regressions in Table 3. It includes all developing countries for which we have data on the growth of value added, the initial industry share, the aid to GDP and the institutional intensity.

The Growth Rate of Value Added is the average over the decade of the annual growth rate of value added in industry (i) of country (J).

Initial industry share (ij) is the initial share of the value added of industry (i) in the total value added of all manufacturing sectors in country (j).

Governance dependence (i) (Herfindahl) is the negative of the Herfindahl index of concentration of outside purchases for industry (i), calculated as the sum of the square of the shares of purchases of each input on the total input purchases. It ranges between 0 (institutions-intensive) and -1 (not institutions intensive).

Governance-dependence (Gini) is the negative of the Gini index calculated as 1 - (sum of cumulative share of input purchases/0.5*N), where inputs are ranked in ascending value of purchases and N is the total number of sectors from which purchases are made. Herfindahl and Gini measures are obtained from Levchenko (2004).

Outside purchases (i) is the ratio of total input purchases to the gross value added of industry (i).

Aid to GDP in country (j) is the average over the decade of the ratio of aid to GDP for that country.

Technical Aid to GDP in country (j) is the corresponding measure for the technical component of aid received by country (j).

Investment protection (j) is the ICRG measure of investment profile in country (j) that relies on risk assessments regarding contract viability/expropriation, profit repatriation and payment delays. We use a normalized 0 to 1 version of the original 1 to 12 ICRG measure (average over the decade for country j).

Institutional quality (j) is a measure of the quality of institutions of country (j), constructed as the normalized 0-1 sum (quality of bureaucracy + law and order + control of corruption + 2*investment); the decadal average for country (j) relies on original monthly ICRG data for each component.

Initial income is measured by the log of the initial level of per capita PPP GDP, as reported in the Penn World Tables database.

SW trade policy index is the Sachs and Warner measure; see Sachs and Warner (1995).

Table 2. Validating the Use of the Governance-Dependence Index Across Samples, Specifications and Definitions

(Dependent variable is the annual average rate of growth of value added of industry (i) in country (j) for the 1980s)

	1	2	3	4	5	6
	OLS	OLS	OLS	OLS	OLS	OLS Variables winsorized at 5% and 95%
Initial industry share (ij)	-0.370***	-0.370***	-0.366***	-0.354***	-0.371***	-0.415***
	[0.069]	[0.069]	[0.068]	[0.070]	[0.069]	[0.065]
Investment protection(j)*Governance-dependence (i) (Herfindahl)	1.194***			1.260***	1.164***	0.637*
	[0.336]			[0.338]	[0.347]	[0.342]
Institutional Quality (ICRG)*Governance-Dependence (Herfindahl)		0.827***				
		[0.260]				
Investment protection(j)*Governance-dependence (i) (Gini)			6.163***			
			[1.931]			
Initial GDP per capita (j) * Governance-dependence (i) (Herfindahl)				0.004		
				[0.052]		
Investment protection(j) * Outside purchases (i) (Herfindahl)					-0.01	
					[0.048]	
Observations	811	811	811	748	811	811
R-squared	0.46	0.46	0.46	0.47	0.46	0.49

All standard errors reported below the coefficient estimates are robust. ***, **, * denote significance at, or below, 1, 5 and 10 percent respectively.
All regressions include country and industry effects, not reported above for presentational simplicity. Governance-dependence (Herfindahl) (i) is the negative of the Herfindahl index of concentration of outside purchases for industry (i), calculated as the sum of the square of the shares of purchases of each input on the total input purchases. It ranges between 0 (institutions-intensive) and -1 (not institutions intensive). Governance-dependence (Gini) (i) is the negative of the Gini index calculated as 1 - (sum of cumulative share of input purchases/0.5*N), where inputs are ranked in ascending value of purchases and N is the total number of sectors from which purchases are made. The Herfindahl and Gini measures are obtained from Levchenko(2004).
Outside purchases (i) is the ratio of total input purchases to the gross value added of industry (i).
Initial industry share (ij) is the initial share of the value added of industry (i) in the total value added of all manufacturing sectors in country (j).
Investment protection (j) is the ICRG measure of investment profile in country (j) that relies on risk assessments regarding contract viability/expropriation,
profit repatriation and payment delays. We use a normalized 0 to 1 version of the original 1 to 12 ICRG measure (average over the decade for country j).
Institutional quality (j) is a measure of the quality of institutions of country (j), constructed as the normalized 0-1 sum (quality of bureaucracy + law and order + control of corruption + 2*investment); the decadal average for country (j) relies on original monthly ICRG data for each component.

Table 3 . Impact of Aid on Institutions

(Dependent variable is the annual average rate of growth of value added of industry (i) in country (j) for the 1980s)

	1	2	3	4
	OLS	IV	IV Standard Errors Clustered by Country	IV Standard Errors Clustered by Industry
Initial industry share (ij)	-0.452***	-0.509***	-0.509***	-0.509***
	[0.068]	[0.074]	[0.100]	[0.073]
Aid/GDP(j)* Inst.intensity(i) (Herfindahl)	-2.126*	-9.902***	-9.902**	-9.902**
	[1.146]	[3.778]	[4.691]	[4.713]
Observations	809	809	809	809
R-squared	0.46	0.43	0.43	0.43

All standard errors reported below the coefficient estimates are robust. ***, **, * denote significance at, or below, 1, 5 and 10 percent respectively.
All regressions include country and industry effects, not reported above for presentational simplicity. Governance-dependence (Herfindahl) (i) is the negative of the Herfindahl index of concentration of outside purchases for industry (i), calculated as the sum of the square of the shares of purchases of each input on the total input purchases. It ranges between 0 (institutions-intensive) and -1 (not institutions intensive). See Levchenko (2004).
Initial industry share (ij) is the initial share of the value added of industry (i) in the total value added of all manufacturing sectors in country (j).
Aid to GDP in country (j) is the average over the decade of the ratio of aid to GDP for that country.
In all regressions the dependent and independent variables are winsorized at 5% and 95% of their sample distributions.

Table 4. Impact of Aid on Institutions; Robustness Checks

(Dependent variable is the annual average rate of growth of value added in industry (i) in country (j) during the 1980s)

	1	2	3	4	5	6	7
	IV	IV	IV	IV	IV	IV	IV
	Aid/GDP >1%						
Initial industry share (ij)	-0.489***	-0.540***	-0.494***	-0.416***	-0.404***	-0.418***	-0.366***
	[0.075]	[0.082]	[0.070]	[0.068]	[0.069]	[0.073]	[0.080]
Aid/GDP(j)* Governance-dependence (i) (Herfindahl)	-10.640**			-9.684**	-1.436	-3.577	-8.583**
	[4.865]			[4.066]	[3.463]	[2.667]	[3.832]
Aid/GDP(j)* Governance-dependence (i) (Gini)		-82.862***					
		[27.750]					
Technical Aid/GDP(j)*Governance-dependence(i) (Herfindahl)			-41.831**				
			[16.791]				
Initial Income (j)*Governance-dependence(i) (Herfindahl)				-0.231**			
				[0.092]			
Inst. Quality ICRG (j)* Governance-dependence(i) (Herfindahl)					0.312		
					[0.311]		
Income inequality(gini)(j) *Governance-dependence (i) (Herfindahl)						-0.002	
						[0.005]	
Aid/GDP(j)							-1.395**
							[0.592]
Initial income 80s							-0.007
							[0.006]
SW trade policy index							0.059***
							[0.007]
Observations	545	809	809	758	748	678	758
R-squared	0.41	0.37	0.44	0.45	0.48	0.48	0.13

All standard errors reported below the coefficient estimates are robust. ***, **, * denote significance at, or below, 1, 5 and 10 percent respectively.
All regressions include country and industry effects, not reported above for presentational simplicity. Governance-dependence (Herfindahl) (i) is the negative of the Herfindahl index of concentration of outside purchases for industry (i), calculated as the sum of the square of the shares of purchases of each input on the total input purchases. It ranges between 0 (institutions-intensive) and -1 (not institutions intensive). Governance-dependence (Gini) (i) is the negative of the Gini index calculated as 1 - (sum of cumulative share of input purchases/0.5*N), where inputs are ranked in ascending value of purchases and N is the total number of sectors from which purchases are made. The Herfindahl and Gini measures are obtained from Levchenko (2004).
Initial industry share (ij) is the initial share of the value added of industry (i) in the total value added of all manufacturing sectors in country (j).
Aid to GDP in country (j) is the average over the decade of the ratio of aid to GDP for that country.
Institutional quality (j) is a measure of the quality of institutions of country (j), constructed as the normalized 0-1 sum (quality of bureaucracy + law and order + control of corruption + 2*investment); the decadal average for country (j) relies on original monthly ICRG data for each component.
Income inequality is measured by the Gini coefficient of income inequality; data were obtained from the World Development Indicators database.
Initial income is measured by the log of the initial level of per capita PPP GDP, as reported in the Penn World Tables database.
SW trade policy index is the Sachs and Warner measure; see Sachs and Warner (1995).
In all regressions the dependent and independent variables are winsorized at 5% and 95% of their sample distributions.