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Does Aid in Roads Attract Foreign or Domestic Firms? Evidence from Cambodia*

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Abstract:
Less developed countries have received substantial foreign aid in transport infrastructure, making its quantitative assessment important. This paper employs the first comprehensive census on all the business establishments in Cambodia for 2011 and examines the effect of aid in road infrastructure on the location of foreign and domestic firms. Estimating a negative binomial model, we find that aid disbursements in roads have little influence on the number of foreign firms across communes. While aid has a significantly positive effect on that of domestic firms, its economic impact is relatively smaller than other determinants such as population size, electricity access, and labor supply. Thus, there appears to be a limited impact of aid in roads on the location of economic activity in Cambodia.

Keywords: Foreign Aid, Transport Infrastructure, Count Data, Cambodia
JEL classification: F21, F23, O18, R12

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I. Introduction

Less developed countries (LDCs) have faced a wide range of constraints to promote economic growth. One of crucial barriers to growth is inadequate economic infrastructure to supply reliable services in transport, energy, and water. For instance, OECD estimates that more than 1 billion people around the world have no access to roads and 2.3 billion people lack reliable electricity (OECD, 2007). It is estimated that 5.5% of GDP in LDCs is necessary for annual investment in infrastructure including rehabilitation and maintenance for the period 2005-2015 while the actual investment falls far short (IMF and World Bank, 2005). To meet the financing demand for infrastructure investment, LDCs have received a substantial amount of official development assistance (ODA). The expectation is that foreign aid in infrastructure would reduce transaction costs of economic activity and eventually contribute to poverty reduction and economic growth. However, it is an empirical question whether ODA projects in infrastructure can achieve the desired effects, and a quantitative assessment is crucial for better policy designs in foreign aid.

This paper focuses on aid projects in road infrastructure and assesses their impact on foreign and domestic firms in Cambodia. Our analysis is important in several aspects. The share of paved roads in total roads was 45.0% on average for the world in 2004, but was only 6.29% for Cambodia (The World Development Indicator, World Bank). This implies a sizeable demand for investment in roads for economic growth. To meet the financing demand, the ODA disbursements of 627 million U.S. dollar have been completed for road rehabilitation and construction whereas those of 1.3 billion US dollar are ongoing.[1] Because the Cambodian government's revenues were merely 2.029 billion U.S. dollars in 2011, these ODA projects should yield quantitatively large impacts (The CIA World Factbook). Moreover, the target location of these projects on roads widely ranges from the capital to rural areas. As the benefits from improving roads depend on the geographic location of aid and economic activity, we hypothesize that aid in roads should improve business environments mainly in the recipient regions to encourage economic activity there. Therefore, we assess the impact of aid by investigating whether foreign and domestic firms have been attracted to the regions that receive a larger amount of aid disbursements in road infrastructure.

Our analysis is related to the large literature on the impact of foreign aid on economic growth (Burnside and Dollar, 2000; Hansen and Tarp, 2001; Rajan and

[1] Section 3 describes the details of the Cambodia ODA Database. Transportation accounted for 16.7% of the completed aid disbursements in the database accessed as of July 2012.

Subramanian, 2008).[2] The empirical evidence so far appears to be inconclusive as to whether foreign aid promotes economic growth. On the other hand, official aid also possibly promotes private investment by both domestic and foreign investors in the recipient countries because aid projects in public infrastructure would increase the marginal product of capital. For instance, Harms and Lutz (2006) and Selaya and Sunesen (2012) investigate whether foreign aid promotes foreign direct investment (FDI). Their findings indicate that aggregate aid has little effect on FDI to possibly reflect a negative effect of rent-seeking and crowding-out in private investment, but aid in public infrastructure has the positive effect. By contrast, Kimura and Todo (2010) find that foreign aid from Japan has a positive impact on FDI from Japan. Additionally, Reinikka and Svensson (2002) examine whether private investment of domestic firms is encouraged by better public infrastructure. Their firm-level sample in Uganda shows a positive relationship between productive investment and reliable access to public electricity supply.

These previous studies mainly exploit variations across countries in aid and investment for identification. However, the majority of aid projects in infrastructure target not uniformly on a country, but unevenly on different regions within a country. Aggregating aid disbursements over the regions may mask the positive impact of aid on economic activity. In particular, aid in road infrastructure is specific to the target location and its potential benefits should mainly accrue to the recipient regions. Our contribution is to exploit geographically fine variations in aid spending to identify whether aid in roads have attracted domestic and foreign firms. Additionally, we use the Economic Census of Cambodia in 2011 (EC2011), which covers all the business establishments in all areas of Cambodia. As the EC2011 is the first census implemented in Cambodia, we provide the first formal evidence on the linkage between firms' location and aid in road infrastructure in the case of Cambodia.

We employ a negative binomial regression model to analyze the impact of aid on a count of firms across communes. Our estimation results suggest that aid in roads has little influence on the location of foreign firms, but has a significantly positive association with the location of domestic firms. Specifically, a one-standard deviation increase in completed aid disbursements in roads is predicted to increase the average number of domestic firms in a corresponding commune by 3.0%. However, we find that

[2] Another strand of related literature examines the impact of infrastructure capital on aggregate productivity and output. See for example Bom and Ligthart (2008), Calderón, Moral-Benito, and Servén (2011), and Canning and Pedroni (2008).

the impact of aid spending is quantitatively smaller than that of population size, unskilled labor, and electricity accessibility.

The rest of this paper is organized as follows. Section 2 describes the econometric framework. Section 3 presents data description. Section 4 reports the estimation results and the relative importance of location determinants for foreign and domestic firms in Cambodia. Section 5 concludes.

II. Econometric Framework

In this paper, the outcome of interest is the number of firms that are located in each commune of Cambodia. The purpose of our analysis is to estimate the impact of aid disbursements received in a commune on a count of firms in the corresponding commune. As we exploit a cross-sectional variation across communes, the aid disbursements are considered to have a positive impact when more firms are located in one commune with more aid than the other commune with less aid, holding other determinants of firms' location constant. Since the dependent variable takes on nonnegative integer values only, a standard approach for count data is to specify the Poisson distribution. However, we need to assume the equality of mean and variance in the Poisson distribution, which is not likely to hold in our sample.

To accommodate possible overdispersion, we adopt the negative binomial distribution with the probability mass function as follows:

$$\Pr(Y = y \mid \mu, \alpha) = \frac{\Gamma(\alpha^{-1}+y)}{\Gamma(\alpha^{-1})\Gamma(y+1)} \left(\frac{\alpha^{-1}}{\alpha^{-1}+\mu}\right)^{\alpha^{-1}} \left(\frac{\mu}{\alpha^{-1}+\mu}\right)^{y} \quad (1)$$

where y is a count of firms and $\Gamma(\cdot)$ is the gamma distribution with a variance parameter of α (Cameron and Trivedi, 1998). The first moment is $\mathrm{E}(y \mid \mu, \alpha) = \mu$, and the second moment is specified as $\mathrm{Var}(y \mid \mu, \alpha) = \mu(1 + \alpha\mu)$. The variance becomes equal to the mean as $\alpha \to 0$, implying that the negative binomial distribution can be reduced to the Poisson distribution. To specify the negative binomial regression model, we assume that the observed count of firms in commune *i* is drawn from a negative binomial distribution with mean μ_i, which depends on the observed characteristics of communes as follows:

$$\mu_i = exp(\beta_0 + \beta_1 AID_i + Z'_i\gamma). \quad (2)$$

AID is the variable of foreign aid disbursements that are received by commune *i*. *Z* is a vector of control variables that possibly affect the attractiveness of commune *i* for firms' activity. In estimation, we test the overdispersion for the null hypothesis of $\alpha = 0$ against the alternative of $\alpha > 0$.

β_1 is the coefficient of the *AID* variable for commune *i* and its estimate is of our interest. We hypothesize that foreign aid in road rehabilitation and construction improves road accessibility in the recipient commune for both firms and consumers. The improved road access to other markets increases the location attractiveness of the recipient commune for firms' production. The improved accessibility also attracts consumers from other regions to the recipient commune. Taken together, we predict that more firms should be located in the communes with more aid than those with less aid. Theoretically, Reinikka and Svensson (2002) shows that roads are the public infrastructure capital used as complementary inputs for production, with a poor supply of public complementary capital decreasing the expected profitability. In the case of other public infrastructures such as electricity and water, firms can make investment in their own private complementary capital to substitute for possibly deficient public capital. However, the public nature of road networks may not allow firms to exclude other users from free riding, making private investment in roads difficult. In this respect, foreign aid in roads would play a large role in eliminating a fixed cost of transportation inputs in the recipient commune.

To isolate the impact of aid on firms' location, we include a number of other determinants. As demand effects encourage firms to locate themselves in the large market with dense interactions with consumers, we control for the size and density of population in commune *i*, denoted by *POP* and *DEN*. We also include the share of high and low skilled workers in commune *i* to control for a labor supply in a local labor market, denoted by *HSK* and *LSK*. Unemployment rate (*UEMP*) is included to capture a gap between labor demand and supply in the local labor market. Additionally, we include a wide variety of other infrastructure variables to explicitly disentangle the effect of aid in roads from them. These variables include electricity accessibility (*ELCTR*), water accessibility (*WATER*), national roads at the 1-digit level (*ROAD1*) and at the 2-digit level (*ROAD2*), special economic zones (*SEZ*), and major airports (*AIR*). These infrastructures provide crucial public complementary capital, thereby attracting private investors. Finally, some firms may be attracted to border regions for accessibility to the foreign market, so that we control for the presence of borders in each commune.

III. Data Description

To measure the number of foreign and domestic firms across communes, we use *the Economic Census* of Cambodia in 2011(EC2011). The census was conducted to survey economic activities for all the establishments and enterprises over the entire territory of

Cambodia in March 2011. The EC2011 was mainly funded by the Japanese ODA and implemented by the National Institute of Statistics, the Cambodian Ministry of Planning, in cooperation with the Japanese government.[3] The survey aims to collect the basic information on firm activities, including area of business place, ownership status, main business activities, employment, establishment year, and so on. The administrative geographic units consist of 1,621 communes in 24 provinces including the Municipality of Phnom Penh. There were total 505,134 establishments in 2011.

Data on foreign aid come from the Cambodian ODA database.[4] It is maintained by the Cambodian Rehabilitation and Development Board of the Council for the Development of Cambodia. To promote effective aid management, all development finance to Cambodia from all sources has been recorded and provided for public access in this database. Details of aid projects cover the start/end dates, total committed funding in U.S. dollar, target sector, target location, and so on. We retrieved all the projects on road-related infrastructure such as national roads and bridges, which stipulates the target roads and/or target province(s).

To estimate the amount of project disbursements received by target commune, we first identify the target communes for each project based on the information of target roads and bridges. When only target province is stipulated, we assign all the communes that belong to the target province. After excluding duplicate communes in each project, total disbursements are distributed to the corresponding communes with a weight of commune-level land area. Focusing on the completed aid projects by 2011, we present the geographic variation across communes of these project disbursements in thousand U.S. dollar in Figure 1, with the darker area receiving larger aid. It is evident that aid disbursements in roads differ widely by commune, implying that aggregating aid over regions may confound the impact of aid projects on economic activity. Additionally, the communes in the presence of national roads appear to receive larger aid, suggesting the importance of controlling for the presence of national roads in regression analysis.

[Figure 1 here]

Data on control variables related to population and households are taken from *the*

[3] Details of EC2011 are found at the Japanese government's website: http://www.stat.go.jp/english/info/meetings/cambodia/census11.htm
[4] Data are available at the website: http://cdc.khmer.biz/

Population Census of Cambodia in 2008.[5] The number of high skilled workers is measured by the population that has completed technical diploma, undergraduate degree, or graduate degree. The number of low skilled workers is approximated by the population that has completed primary and/or secondary education. The variables of high and low skilled labor are defined as a share of total labor force, respectively. An unemployment rate is defined as unemployed workers as a share of total labor force. We measure electricity accessibility as the percentage share of households with access to city power or generator for light, and water accessibility as that of households having access to piped water, tube pipe well, or protected dug well. The location of national roads at the one- and two-digit level is identified by the map of Cambodian road network published by the Cambodian Ministry of Public Works and Transport. Finally, data on special economic zones and major airports are taken from the Cambodia Investment Guidebook in 2010.[6]

IV. Estimation Results

This section presents the estimation results. We first show the location determinants for foreign firms and then those for domestic firms. Finally, marginal effects of independent variables on the expected number of firms are presented to discuss the economic magnitudes of location determinants.

Before proceeding to show the results, we present the summary statistics of the commune-level sample in Table 1. Our sample is a cross-section dataset with 1,621 communes. There were 91 foreign firms in total for the year 2011, and the average number of these firms in a commune was less than one. While most communes did not have any foreign firm in operation, the maximum number of foreign firms in a commune was 15, possibly suggesting a strong geographic concentration of foreign firms. On the other hand, there were 505,002 domestic firms in total after excluding foreign firms and NGO establishments from the whole sample in EC2011. On average, each commune had 312 domestic firms with a standard deviation of 462.

[Table 1 here]

[5] Details of the population census in 2008 are found at the website:
http://www.nis.gov.kh/index.php/pop-demog-stat/censuses/census2008
[6] The guidebook is available at the website of the Japan International Cooperation Agency (JICA):
http://www.jica.go.jp/cambodia/english/office/topics/invest.html

A. *Impacts on Foreign Firms*

Table 2 presents the estimation results for foreign firms. In column (1), we measure *AID* by completed aid disbursements by the year 2011. In column (2), we use a measure of completed and uncompleted aid disbursements to capture a possible anticipatory effect on the location decision of private investors. The estimated coefficients and their standard errors are reported in each column. The estimate of a variance parameter α of the gamma distribution is 1.98 in column (1) and 1.97 in column (2). We employ a likelihood-ratio test to examine the null hypothesis of $\alpha = 0$, and find strong evidence to reject the null for both specifications. Thus, the evidence lends support to the use of a negative binomial regression model for our analysis.

[Table 2 here]

Across specifications with alternative definitions of *AID*, we find the positive, but insignificant coefficients. The results imply that holding other determinants of foreign firms' location constant, aid disbursements to improve roads have no significant impact on the location of foreign firms. This finding is generally consistent with the findings in Kimura and Todo (2010), but inconsistent with the evidence in Selaya and Sunesen (2012) that FDI is attracted to the country with larger aid in public infrastructure. Compared with the prior work, we find little evidence of aid on FDI even at the regional level within a country.

The results indicate the other important determinants across alternative specifications. First, *POP* and *DEN* have the significantly positive coefficients, suggesting that foreign firms are attracted to the commune with the larger population size and the greater density of population. *HSK* also exhibits the significantly positive coefficient, which is in contrast with the insignificant coefficient of *LSK*. Taken together, it can be interpreted that foreign firms are seeking not unskilled labor but skilled labor. Additionally, *ELCTR* has the significantly positive coefficient among a number of infrastructure-related variables. The implication is that a reliable supply of electricity services would be crucial for foreign firms in making the location decision. Consistent with our findings, prior work such as Kinda (2010) also finds that electricity problems significantly discourage direct investment in developing countries.

We have examined the above findings by extending the specification in Table 2 in two respects, which are not reported to save space. First, we decompose the completed disbursements of aid in roads into grant and concessional loan projects because the

financing type of aid projects might have a different impact on economic activity. More specifically, no repayment is required for the transfer of funds from the grant aid whereas the concessional loan is the provision of funds that consists of a minimum 25 percent of the grant element. While each variable is estimated separately in the similar specification, the aid variables are found to have the insignificant coefficients.

Second, we limit the sample to a group of foreign firms that were established after the year 2010 because new foreign investors might be more responsive to the improved roads. We find that the aid variables remain to exhibit the insignificant coefficients. However, these results still exhibit the robust evidence that foreign firms are attracted to the commune with the larger population size, a higher share of skilled labor, and better access to electricity.

B. *Impacts on Domestic Firms*

Table 3 presents the results for domestic firms, with the alternative definitions of *AID*. We conduct a likelihood-ration test to examine whether a variance parameter α is strictly over zero. The test shows strong evidence of overdispersion, which supports a negative binomial distribution. The key variable, *AID*, has the significantly positive coefficient in column (1), but the insignificant coefficient in column (2). This result implies that completed aid disbursements in roads have the positive impact on the expected number of domestic firms across communes whereas the total amount of both completed and uncompleted aids has the little influence. Thus, domestic firms are attracted to the communes with improved road infrastructure, but are not likely to choose their location for anticipatory effects of improved roads in future.

[Table 3 here]

Among other independent variables, we find that many control variables have the significant coefficients across specifications. *POP* has the significantly positive coefficient. As is the case of foreign firms, domestic firms tend to be attracted to the larger population size. *HSK* and *LSK* exhibit the significantly positive coefficients, implying that both skilled and unskilled labor attract domestic firms. A high unemployment rate (*UEMP*) is negatively associated with the number of domestic firms. In terms of infrastructure-related variables, more domestic firms tend to choose the communes with better access to electricity (*ELCTR*) and water (*WATER*). Additionally, the presence of national roads (*ROAD1* and *ROAD2*) is positively associated with the

number of domestic firms.

As is done for the case of foreign firms, we experiment with alternative specifications for domestic firms. First, we separately estimate the impact of completed aids in grant and concessional loan. We find the insignificant coefficient for the grant aid, but the significantly positive coefficient for the concessional loan aid, suggesting that the positive impact of completed aid in roads would be due to the concessional loan component. As the concessional loans accounted for 81.8% of the completed aid disbursements, this result highlights that the quantitative magnitude of aid disbursements in transport infrastructure appears to be crucial for the impact on economic activity. Second, we restrict the sample to a set of domestic firms that were established after 2010. The coefficient of *AID* is not significant, implying that recent domestic investors might not respond to the improved roads by foreign aid.

C. *Relative Importance of Location Determinants*

The discussions up to this point have primarily focused on the statistical significance of estimated coefficients, but it is equally important to examine the economic magnitude of their impacts on the expected number of foreign and domestic firms. While our main focus is the impact of aid in roads, the relative importance of location determinants in Cambodia should give an important policy implication.

To interpret the estimated coefficients in a negative binomial model, we compute the factor change in the rate μ of equation (2) due to an increase in the value of *AID* and other control variables. Specifically, we report a percentage change in the expected count of firms for a one-standard-deviation increase δ in independent variables (Long and Freese, 2006; chapter 8). For instance, we express a percentage change in the predicted count of firms for a δ unit change in *AID* holding other variables constant:

$$100 \times \{exp(\beta_1 \times \delta_{AID}) - 1\}. \quad (3)$$

Equation (3) allows us to compute the percentage change in μ for the other independent variables by using the corresponding coefficient and standard deviation. Moreover, a unit change in the independent variables is held at one standard deviation to ensure comparability across the computed percentage change in the predicted mean of firm counts.

Table 4 present the marginal effects on the expected number of firms for column (1) in Tables 2 and 3, respectively. As discussed previously, the *AID* variable as measured by completed aid disbursements has the insignificant coefficient for foreign firms, but the significantly positive coefficient for domestic firms. Specifically, a

one-standard-deviation increase in *AID* is associated with an increase in the expected number of domestic firms by 3.0%. To address whether this impact is quantitatively larger relative to other determinants, we compare the other independent variables in column (2). Among them, *POP* has the largest impact by 84.4%, followed by 26.8% of *ELCTR* and 15.8% of *LSK*. These impacts are fairly larger than the impact of *AID*. On the other hand, the size of the *AID* impact is roughly similar to 5.4% for *HSK*, 4.1% for *ROAD2*, and 3.5% for *WATER*. In sum, aid in roads play a role in attracting domestic firms, but its impact is substantially smaller than the major determinants such as the population size, electricity access, and low skilled labor.

These above discussions raise a question of whether domestic and foreign firms are attracted to the regions with similar characteristics. Comparing the results in columns (1) and (2), we find that the population size and electricity accessibility also play a significantly and quantitatively large role in attracting foreign firms. By contrast with domestic firms, high skilled labor has the quantitatively larger influence on the location of foreign firms. This result implies that economic activity of foreign firms should be relatively more intensive in high skill tasks, so that an abundant supply of skilled labor attracts foreign investors. Additionally, access to electricity has the larger impact on foreign firms than domestic firms. An implication is that a reliable supply of electricity services plays a crucial role in the location decision of foreign firms.

D. *Discussions*

We conclude this section by discussing the identification issues and policy implications. Our identification approach is to investigate whether more firms are located in a commune with more aid than another commune with less aid. By exploiting a cross-sectional variation across communes, we attempt to identify a long-term influence of aid projects on economic activity. As an investment project of transportation infrastructure is based on a long-term demand forecast such as over 30-year lead time (Estache, 2010), it is arguably a most sensible approach to rely on cross-sectional comparisons at the geographically fine level of regions. Nevertheless, it is not possible to rule out commune-level unobserved effects that may affect both firms' location and aid disbursements of road infrastructure. From an econometric point of view, our estimated coefficient of *AID* might be subject to an omitted-variable bias. In our approach, a wide variety of control variables help to mitigate the potential bias of unobserved effect to some extent. An ideal strategy is to exploit instrumental variables that are significantly correlated with geographic distribution of aid disbursements in

roads, but has little association with the location of economic activity. Unfortunately, appropriate instruments in the context of Cambodia are not readily available.

Another issue related to the identification is the measurement of aid projects in road infrastructure. We use the most comprehensive and objective database on ODA projects in Cambodia to carefully classify the target location of every single aid projects of interest. Then, we estimate the total amount of aid disbursements received by target communes. Prior work tends to use the aggregate amount of aid as categorized by transport sector whereas the availability of transportation infrastructure is often approximated by the total length of roads at the country level (Straub, 2011). In this respect, we exploit a substantially improved indicator of foreign aid in road infrastructure. Nevertheless, an alternative approach is to measure physical improvements in road networks due to foreign aid. A physical indicator of transportation infrastructure can be related to economic activity to assess the impact of foreign aid in roads. However, a comprehensive dataset on physical impacts of foreign aid is not available in Cambodia.

Finally, our analysis sheds some light on aid allocation. Prior work has examined whether aid allocation is driven mainly by donors' interests or recipients' needs. Based on country-level analysis, it is generally suggested that aid allocation is influenced by the strategic interests of donors such as political ties and economic relationships in trade and FDI (Collier and Dollar, 2002; Claessens et al., 2009). Compared with these studies, we analyze geographic allocation of aid across regions within a country, showing that aid allocation has a positive influence on domestic firms, rather than foreign firms. As Claessens et al. (2009) shows that bilateral aid flows after the late 1990s started to respond more to the economic needs of recipient countries, our findings imply that spatial aid allocation in Cambodia might favor the infrastructure needs of local firms.

V. Conclusion

Inadequate economic infrastructure in many LDCs is one of crucial constraints to economic growth. To finance demand for infrastructure investment, LDCs have increasingly received a substantial amount of foreign aid, making its quantitative assessment more important than ever. In this paper, we shed light on this policy issue by investigating whether aid in roads has attracted foreign and domestic firms in Cambodia. Based on a negative binomial model, our results show that aid disbursements in road infrastructure have little influence on the location of foreign firms. While aid has a significantly positive correlation with the location of domestic firms, its impact is

quantitatively smaller than other location determinants including the population size, access to reliable electricity, and a supply of low skilled labor. Additionally, our results imply that foreign firms tend to seek the regions with larger population, better electricity access, and a greater supply of skilled labor.

While this paper provides the first formal evidence on the link between aid in roads and firms' location in Cambodia, further analysis is needed to better understand the impact of aid. Our analysis focuses primarily on the number of firms, and aid could also influence other firm characteristics including sales, employment, and investment. The analysis of these characteristics helps us to understand the channels through which aid in transport infrastructure possibly affects economic activity. It also remains to analyze other types of public infrastructure such as power generation plants, water purification facilities, and telecommunications networks. While these infrastructure projects should contribute to economic activity, their impacts are likely to be more complex than road improvements.

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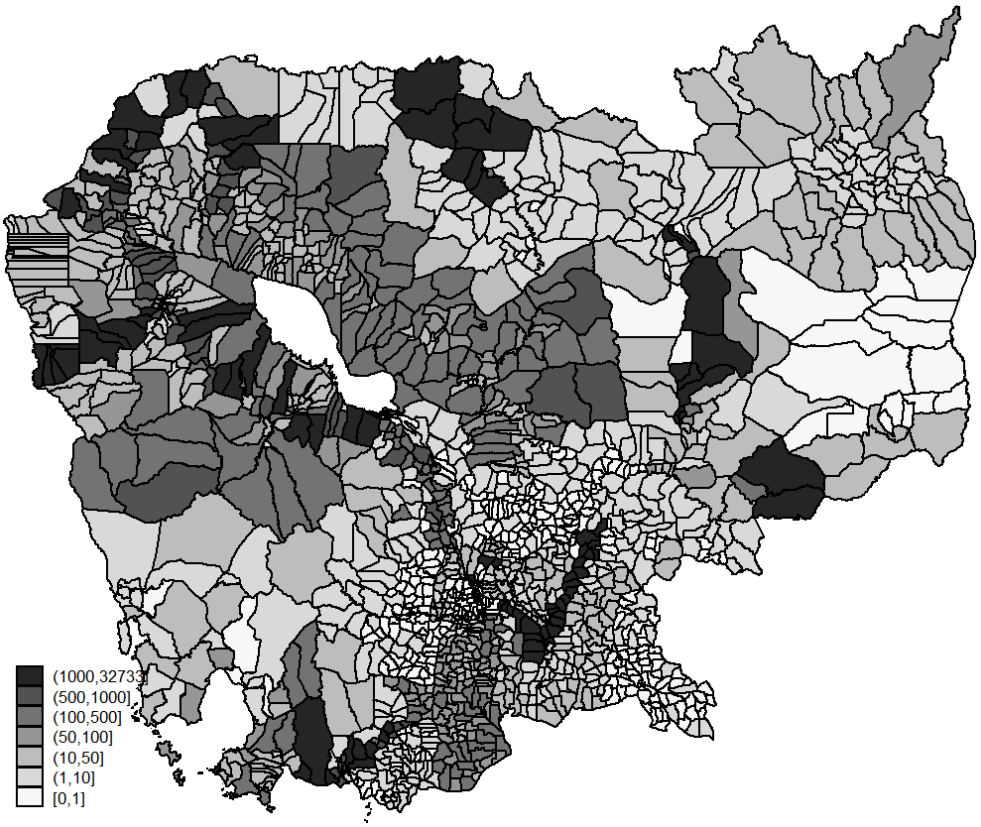
Figure 1. Geographic Disbursements of Completed Aid in Roads for Cambodia



Note: Unit is in thousand U.S. dollar.

Source: Cambodian ODA Database

Table 1. Summary statistics of the commune-level sample (No. of obs. = 1,621)

Variable	Description	Mean	Std. Dev.	Min	Max
FF	Number of foreign firms	0.06	0.54	0	15
DF	Number of domestic firms	312	462	9	5,319
CAID	Log of completed aid disbursements	2.75	2.24	0.001	10.4
CUAID	Log of completed and uncompleted aid disbursements	4.48	2.25	0.002	11.2
POP	Log of population	8.82	0.64	5.70	11.4
DEN	Log of population density measured by population size over area	4.98	1.58	-0.23	12.6
HSK	% Share of population completing technical diploma/university degrees	1.90	4.59	0	51.2
LSK	% Share of population completing primary/secondary education	59.4	24.0	2.48	100
UEMP	% Share of unemployed population	1.33	2.07	0	14.9
ELCTR	% Share of households with access to city power/generator for light	18.8	27.7	0.34	100
WATER	% Share of households with access to piped water/tube pipe well/protected dug well	41.6	31.1	0.27	100
ROAD1	Dummy for 1-digit national road	0.31	0.46	0	1
ROAD2	Dummy for 2-digit national road	0.18	0.39	0	1
SEZ	Dummy for special economic zone	0.08	0.27	0	1
AIR	Dummy for major airports	0.03	0.16	0	1
BORD	Dummy for border regions	0.06	0.24	0	1

Notes: The total disbursement of foreign aid in road infrastructure is distributed to its target communes with a weight of land area; the completion is set at the year 2011.

Table 2. Negative binomial estimation of determinants of foreign firms' location.

Dependent variable: number of foreign firms.

	(1)		(2)	
Variable	Coefficient	Std. Err.	Coefficient	Std. Err.
CAID	0.072	(0.090)		
CUAID			0.047	(0.100)
POP	0.76**	(0.28)	0.77**	(0.28)
DEN	0.25*	(0.12)	0.24*	(0.12)
HSK	0.069**	(0.023)	0.069**	(0.023)
LSK	-0.0098	(0.014)	-0.010	(0.013)
UEMP	-0.069	(0.065)	-0.070	(0.065)
ELCTR	0.031**	(0.0097)	0.031**	(0.0097)
WATER	-0.0038	(0.0084)	-0.0036	(0.0086)
ROAD1	-0.23	(0.54)	-0.16	(0.53)
ROAD2	-0.27	(0.52)	-0.26	(0.55)
SEZ	0.067	(0.63)	0.050	(0.63)
AIR	0.82	(0.74)	0.82	(0.75)
BORD	-0.32	(0.79)	-0.33	(0.79)
Constant	-12.7***	(2.46)	-12.7***	(2.52)
Alpha	1.98	(0.69)	1.97	(0.69)
Likelihood-ratio test of alpha=0	51.64		50.99	
(P-value)	(0.00)		(0.00)	
Log likelihood	-182.6		-182.8	
Pseudo R-squared	0.32		0.32	
No. of obs.	1,621		1,621	

Notes: Standard errors are in parentheses; ***, **, and * denote 1 percent, 5 percent, and 10 percent significance level, respectively.

Table 3. Negative binomial estimation of determinants of domestic firms' location.

Dependent variable: number of domestic firms.

	(1)		(2)	
Variable	Coefficient	Std. Err.	Coefficient	Std. Err.
CAID	0.013*	(0.0054)		
CUAID			0.011	(0.0061)
POP	0.95***	(0.020)	0.95***	(0.020)
DEN	0.010	(0.010)	0.0071	(0.010)
HSK	0.012**	(0.0036)	0.011**	(0.0036)
LSK	0.0061***	(0.00060)	0.0062***	(0.00060)
UEMP	-0.013*	(0.0061)	-0.012*	(0.0061)
ELCTR	0.0086***	(0.00065)	0.0086***	(0.00065)
WATER	0.0011**	(0.00038)	0.0012**	(0.00040)
ROAD1	0.064*	(0.028)	0.075**	(0.027)
ROAD2	0.10***	(0.028)	0.095**	(0.030)
SEZ	-0.064	(0.043)	-0.069	(0.043)
AIR	-0.0044	(0.071)	0.0017	(0.072)
BORD	-0.098*	(0.045)	-0.099*	(0.045)
Constant	-3.75***	(0.16)	-3.77***	(0.16)
Alpha	0.17	(0.0060)	0.17	(0.0060)
Likelihood-ratio test of alpha=0	1.10E+05		1.10E+05	
(P-value)	(0.00)		(0.00)	
Log likelihood	-9441.2		-9442.7	
Pseudo R-squared	0.14		0.14	
No. of obs.	1,621		1,621	

Notes: Standard errors are in parentheses; ***, **, and * denote 1 percent, 5 percent, and 10 percent significance level, respectively.

Table 4. Marginal effects on the expected number of firms

Variable	(1) Foreign Firms	(2) Domestic Firms
CAID	17.6	3.0*
POP	63.1**	84.4***
DEN	49.2*	1.7
HSK	37.6**	5.4**
LSK	-20.9	15.8***
UEMP	-13.3	-2.6*
ELCTR	135.6**	26.8***
WATER	-11.2	3.5**
ROAD1	-10.0	3.0*
ROAD2	-10.0	4.1***
SEZ	1.8	-1.7
AIR	14.0	-0.1
BORD	-7.5	-2.3*

Notes: Marginal effect is computed by a percentage change in the expected number of foreign/domestic firms from increasing one standard deviation in each variable; marginal effects for foreign and domestic firms are calculated from column (1) in table 2 and 3, respectively; ***, **, and * denote 1 percent, 5 percent, and 10 percent significance level for the corresponding coefficients, respectively.