Staff Working Paper ERSD-2010-07 **Date: February 2010**

What Constrains Africa's exports?

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Abstract. We examine the effects of transit, documentation, and ports and customs delays on Africa's exports. We find that transit delays have the most economically and statically significant effect on exports. A one day reduction in inland travel times leads to a 7 percent increase in exports. Put another way, a one day reduction in inland travel times translates into 1.5 percentage point decrease in all importing-country tariffs. In contrast, longer delays in the other areas have a far smaller impact on trade. We control for the possibility that greater trade leads to shorter delays in three ways. First, we examine the effect of trade times on exports of new products. Second, we evaluate the effect of delays in a transit country on the exports of landlocked countries. Third, we examine whether delays affect time-sensitive goods relatively more. We show that large transit delays are relatively more harmful because of high within-country variation.

Keywords: trade facilitation, export times, transit delays, gravity models.

JEL Classifications: F13, F14 and O55.

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I. Introduction

Earlier work has shown that delays in getting goods from the factory gate onto the ship hinder exports more than foreign tariffs do (Hummels (2001), Djankov, Freund and Pham (2010), and Portugal and Wilson (2009)). This is especially debilitating for Africa's exports because of extreme delays. This suggests that improving trade facilitation in Africa would significantly boost exports. But there are different ways to accomplish this, as the time delay has three distinct components: documentation, transit time, and port handling and customs clearance. In this paper, we explore whether these delays are equally burdensome or whether one of these binds relatively more, using detailed data on average trade times from the World Bank's *Doing Business* report.

Bureaucratic delays are the longest, taking 19 days on average. There is a lot of variation across countries. For example, it takes 36 days to process export documents in countries such as Angola, Zambia and Niger. In contrast, in Swaziland, it takes only 5 days to produce all necessary export documents. Bureaucratic delays may be especially burdensome if they change often, making them difficult to predict, or if officials use them as a means to extract rents. In contrast, documentation procedures may be less problematic if they are predictable and can be done in advance or if there is learning by doing.

Customs and ports delays are the second longest, taking on average 9 days. They are less variable than documents. Customs and ports could be especially restrictive if there is a hold-up problem. Once the goods arrive, customs and port authorities could extract high rents by delaying goods. In contrast, if customs and ports are reliable (but slow) or if exporters can pay for faster service they may cause fewer problems.

Transit costs are on average the shortest, taking 7 days. But, again, there is a lot of variation. For example, it takes 37 days for the goods to be shipped from3(whippede reli9)r ifga.00te(wers)1.9e is aeoe Tws

We use three distinct strategies to deal with the potential effect of export volumes on export times. First, we examine the effect of trade facilitation on trade in new products. These are goods that have not been exported in the past. The intuition is that trade in new products cannot affect the quality of trade facilitation infrastructure or the bureaucracy that is in place for exporting. Second, we examine the effect of requirements in the transit country on exports from landlocked countries. This controls for endogeneity because trade facilitation in transit countries is likely to be exogenous from the perspective of a landlocked country. Finally, we test whether lengthy delays have a greater effect on exports of time-sensitive goods. The intuition is that these products make up a small share of total 20.03r( )Tj fdp4 0 TD0.0007 Tcha to

former are based solely on travel distance and estimated speed of travel by type of road (paved or unpaved). These data do not incorporate delays due to average vehicles, borders, security, traffic, or other road conditions. We find that GPS distance negatively affects exports, but GPS travel time does not. Moreover, neither the economic effect nor the statistical significance of the *Doing Business* inland transit time variable changes when these variables are included. This suggests that the problem for inland transit lies in the quality and security of the roads, border delays and the efficiency of security checkpoints, the age of the truck fleet and competition in trucking. These are factors which are more closely linked with institutions than geography.

The paper proceeds as follows. The next section discusses the data. Section III presents the estimation strategy. Section IV describes the main results and robustness checks. Section V examines the effect of uncertainty on exports and the importance of geography. Section VI concludes.

II. Data

We use data on trade times based on answers to a comprehensive World Bank questionnaire completed by trade facilitators at freight-forwarding companies in 146 countries in 2007 and collected as part of Doing Business, a World Bank project that investigates the scope and manner of business regulationsin3.48 of Doing Bus by traat 5fo

if a certain storage period is required, the waiting times for loading the containers into the vessel and customs inspection and clearance times.

An example illustrates the data. An exporter in Rwanda spends 43 days on average to complete all requirements for shipping its merchandise abroad: 17 days each on delays resulting from documentation and inland transit, while port and custom procedures take respectively 6 and 3 days on average (see Figure1).

Table 1 presents the summary statistics for each

where the i and j subscripts correspond to the exporter and the importer, respectively. [5] The dependent variable represents bilateral exports from country i to country j. The variables of interest are the export times for transit, customs and ports, and documents. The coefficient on each represents the effect in percent of trade of a one day increase in that component. We focus on variables in levels, so that the coefficients are comparable—the effect of a one day change. However, for robustness, we also estimate the regression with the three variables in logs. We also include the standard determinants of trade in the regression equation: $_j$ are importer fixed effects which control for the extent to which the importer is isolated from the rest of the world; GDP_i and POP_i are respectively

development of infrastructure or the type of bureaucratic procedures in place. In addition, because they are a very small share of total trade they are unlikely to be associated with congestion effects. We also follow Djankov, Freund, and Pham (2010) and use trade times of transit countries as instruments for trade costs in landlocked countries and examine whether trade times affect time-sensitive goods relatively more.

IV. Results

We now estimate the augmented gravity equation from expression (1). The linear regression results for a sample of 44 Sub-Saharan Africa countries are reported in Table 3. The first column shows the results from estimation on all trade. All three variables are significant and their coefficients are similar, though it is somewhat higher for inland transit. However, this column does not deal with the problem of endogeneity of the right hand side variables. In column (2), we report results for trade in new goods only. The time variables are less likely to be endogenous to trade in new goods, since this trade was not around in the past when procedures and infrastructure for trade were developed. The results are somewhat different. While the coefficient on inland transit is little changed from column (1), the other coefficients fall considerably, suggesting that the previous column was also picking up the effect of trade on documentation procedures and customs and ports. In particular the results imply that a one day increase in transit time leads to a nearly 7 percent decline in exports.

In the next five columns, we report robustness tests. Columns (3)-(5) report the results of each variable independently and total time. This helps to deal with potential multicollinearity between the variables and also informs us whether each variable is significantly different from total time in its effect on exports. Only inland transit has an independent effect on exports. Moreover the total effect of inland transit, equivalent to 0.067 (0.049 + 0.018), is nearly four times as large as the effect of the other components of time. This outcome holds after the inclusion of foreign import tariffs in the regression (see column (6)). Including foreign tariffs also allows us to interpret a day in terms of tariffs. A one day delay is roughly equivalent to a 1.5 percent point reduction in *all* importer country tariffs. Finally in column (7) we report results using logs of the time variables. While a one percent reduction in total time leads to .5 percent more trade, a one percent reduction in transit time leads to about a .7 percent decline in exports. Again only transit time is independently significant (results for other variables are not reported).[106e 2 14T4 6]

Our second strategy to deal with the potential endogeneity of the export time variables is to use a sample of landlocked countries and use the variables for the transit country(ies) as the instrument. This

because of documentation or at the port. Our results imply that reducing time spent on inland transit

Given the dominance of transit time over the other time cost variables, in determining trade, we next investigate whether this is a pure geography effect. Specifically, we control for domestic geography by using the GPS estimated distance and time based solely on geography and type of road. In our regressions we include road distance in km from the principal city to the port of export (which is the relevant distance for which transport is calculated in the data). In addition, we include GPS-estimated total travel time. This variable is calculated as the total time it takes to get from the principal city to the port of exit by assuming a speed of 40 km per hour for unpaved roads and 80 km per hour for paved surfaces.[15] Both variables enter the equation in logs. If transit is primarily a geography effect then the GPS variables should pick up the effect.

Table 7 reports the results using the full sample. GPS distance is negative and significant, but does not alter the effect of inland transit time (columns (1) and (2)). GPS travel time is negative, but is not significant and the coefficient is very small. Column (4) shows results with all three variables, only transit time and GPS distance are significant. Columns (5) and (6) show results excluding the transit

from perishable products where time is most critical relative to preserved goods such as tinned food, differently.

Our results imply that while inland transit delays

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Table 1. Times to Export Descriptive Statistics by Geographic Region

Region	Statistics	Documents	Customs and Ports	Inland Transit
East Asia & Pacific (19)	mean	13.3	7.2	4.1
	sd	10.1	4.1	3.3
Europe & Central Asia (23)	mean	13.1	7.8	6.5
	sd	9.0	6.6	8.(.1

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Table 2: Correlation of explanatory variables

	GDP	POP	Total Exp time	Docs	Customs	Ports	Inland transp.	Docs (TC)	Customs (TC)	Ports (TC)	Inland transp. (TC)	Remote	GPS Dist. city to port	Travel time city to port	Uncert. Docs	Uncert. Customs and Ports	Uncert. Inland Transit
GDP	1																
POP	0.59	1															
Total Export time	-0.08	-0.04	1														
Documents	-0.11	-0.06	0.85	1													
Customs	-0.01	0.11	0.36	0.17	1												
Ports	0.26	0.09	0.37	0.17	0.39	1											
Inland transport	-0.15	-0.07	0.68	0.31	0.07	-0.02	1										
Docs (TC)	-0.05	-0.04	0.52	0.71	0.29	0.30	-0.08	1									
Customs (TC)	0.01	-0.10	0.33	0.23	0.79	0.36	-0.01	0.44	1								
Ports (TC)	0.22	-0.01	0.36	0.20	0.28	0.90	-0.02	0.30	0.36	1							
Inland transp. (TC)	0.003	0.06	0.38	0.22	0.21	0.25	0.33	0.30	0.19	0.15	1						
Remote	0.01	-0.14	-0.26	-0.16	-0.21	-0.16	-0.21	-0.17	-0.10	-0.16	-0.01	1					
GPS Dist. city to port	0.01	0.02	0.58	0.45	0.30	-0.03	0.54	0.18	0.19	0.06	-0.004	-0.46	1				
Travel time city to port	-0.01	0.01	0.63	0.46	0.20	-0.03	0.67	0.09	0.08	0.04	0.01	-0.42	0.95	1			
Uncert. Docs	-0.09	-0.19	-0.05	0.14	0.00	-0.20	-0.25	0.35	-0.03	-0.16	0.13	0.66	-0.07	-0.20	1		

Notes: TC stands for transit country.

Table 3: The Effect of export time components on Aggregate Exports (OLS regression)

Dependent variable: Aggregate exports	All Products (levels)	New Products (levels)	New Products (levels)	New Products (levels)	New Products (levels)	New Products (levels)	New Products (logs)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Inland transit time	-0.066***	-0.067***	-0.049***			-0.070***	-0.435***
	[0.012]	[0.015]	[0.017]			[0.024]	[0.134]
Customs and ports time	-0.046***	-0.013		0.016			
	[0.014]	[0.014]		[0.016]			
Documents time	-0.054***	-0.020***			0.018		
	[0.007]	[0.007]			[0.013]		
GDP	1.103***	0.960***	0.966***	0.970***	0.997***	1.024***	0.958***
	[0.053]	[0.061]	[0.060]	[0.061]	[0.059]	[0.084]	[0.060]
Population	-0.001	-0.255***	-0.259***	-0			

Table 4: The Effect of export time components on Aggregate Exports
Restricted Sample Regression

Dependent variable: Aggregate exports	OLS (levels)	IV (levels)	IV (levels)	IV (logs)	IV (logs)
	(1)	(2)	(3)	(4)	(5)
Inland transit time	-0.126***	-0.097***	-0.088***	-1.517***	-1.520**
	[0.015]	[0.020]	[0.031]	[0.475]	[0.686]
Customs and ports time	-0.252***	0.286	0.107	1.470	0.097
	[0.051]	[0.254]	[0.305]	[1.641]	[2.216]
Documents time	-0.048***	0.047	0.028	0.447	0.093
	[0.011]	[0.057]	[0.061]	[0.996]	[1.223]
GDP	0.419***	0.125	0.686**	0.261	0.709***
	[0.146]	[0.237]	[0.334]	[0.166]	[0.249]
POP	0.562***	-0.409	-0.482	-0.089	-0.180
	[0.148]	[0.479]	[0.564]	[0.451]	[0.606]
Distance	-1.110***	-0.905***	-1.371***	-0.936***	-1.377***
	[0.290]	[0.295]	[0.357]	[0.294]	[0.349]
Tariffs (simple av.)			-0.059*		-0.058**
			[0.030]		[0.029]
Observations	1038	1038	512	1038	512
R-squared	0.553	0.489	0.526	0.522	0.544

Notes: 1. Robust standard errors in brackets.*** p<0.01, ** p<0.05, * p<0.1. 2. Importer fixed effects, reporter remoteness and country pair specific variables (common language and common colony) are included in all regressions.

Table 5: The Effects of Export Time Components on Time Sensitive Products (OLS regression)

Dependent Variable Aggregate Exports by industry	Countries exporting at least one product (levels)	(logs)	Countries exporting 70% of the products (levels)	(logs)
	(1)	(2)	(3)	(4)
Inland transit time*Time sensitivity	-0.023	-0.174*	-0.038**	-0.229**
	[0.014]	[0.096]	[0.017]	[0.109]
Customs and ports time*Time sensitivity	-0.002	0.002	-0.002	0.037
	[0.022]	[0.200]	[0.025]	[0.228]
Documents time*Time sensitivity	0.014	0.252	0.016	0.226
	[0.009]	[0.182]	[0.010]	[0.202]
K abundance*Canned product	0.508**	0.539**	0.683***	0.710***
	[0.215]	[0.216]	[0.258]	[0.259]
Observations	637	637	526	526
R-squared	0.523	0.523	0.546	0.545

Notes: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table 6: The Effect of time uncertainty on Aggregate Exports Overall sample OLS regression

Dependent Variable: Aggregate Exports	Levels (1)	Logs (2)	Levels (3)	Logs (4)	Levels (5)	Logs (6)
Inland transit time uncertainty	-0.126***	-0.662***	-0.100***	-0.270**		
	[0.021]	[0.093]	[0.022]	[0.111]		
Ports and customs time uncertainty	0.023	0.228				
	[0.019]	[0.147]				
Documentation time uncertainty	-0.005	-0.174				
	[0.007]	[0.109]				
GDP	1.534***	1.571***	1.401***	1.322***	1.211***	1.185***
	[0.094]	[0.083]	[0.087]	[0.098]	[0.076]	[0.075]
POP	-0.474***	-0.489***	-0.353***	-0.315***	-0.156*	-0.219**
	[0.110]	[0.110]	[0.104]	[0.103]	[0.094]	[0.093]
Distance	-1.325***	-1.281***	-1.447***	-1.491***	-1.482***	-1.528***
	[0.207]	[0.199]	[0.183]	[0.182]	[0.183]	[0.183]
Inland Transit Time			-0.083***	-0.745***	-0.117***	-0.966***
			[0.016]	[0.134]	[0.015]	[0.101]
Observations	1679	1663	1881	1881	1881	1881
R-squared	0.600	0.592	0.595	0.597	0.589	0.595

Notes: 1. Robust standard errors in brackets.*** p<0.01, ** p<0.05, * p<0.1. 2. Importer fixed effects, reporter remoteness, a dummy for landlocked countries and country pair specific variables (common language , common colony and common border) are included in all regressions.

Table 7: Inland transit times and geography (OLS Regression)

VARIABLES	Levels (1)	Levels (2)	Levels (3)	Levels (4)	Levels (5)	Levels (6)	Logs (7)
Inland transit time (levels)	-0.085***	-0.083***	-0.081***	-0.088***			-0.914***
	[0.012]	[0.012]	[0.013]	[0.013]			[0.110]
GDP	1.119***	1.144***	1.173***	1.182***	1.203***	1.240***	1.103***
	[0.054]	[0.056]	[0.056]	[0.057]	[0.055]	[0.055]	[0.056]
POP	-0.074	-0.077	-0.185***	-0.191***	-0.142***	-0.246***	0.023
	[0.049]	[0.049]	[0.049]	[0.049]	[0.048]	[0.048]	[0.052]
Distance	-1.091***	-1.085***	-1.147***	-1.145***	-0.994***	-1.059***	-1.075***
	[0.130]	[0.130]	[0.132]	[0.133]	[0.131]	[0.133]	[0.128]
GPS distance principal city to port		-0.065***		-0.093*	-0.075***		-0.034
		[0.021]		[0.056]	[0.021]		[0.021]
Travel times principal city to port			-0.0004	0.248		-0.090	
			[0.065]	[0.168]		[0.063]	
Observations	3793	3793	3644	3644	3793	3644	3793
R-squared	0.498	0.499	0.501	0.502	0.493	0.495	0.504

Notes: 1. Robust standard errors in brackets.*** p<0.01, ** p<0.05, * p<0.1. 2. Importer fixed effects,

APPENDIX

Table A1: Summary results for first stage regressions

	Partial R2	F statistic	p-value