Wider Economic Benefits of Transport Corridors:

Evidence from International Development Organizations

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Corridors: Many Proposals, Limited Resources, Uncertain Wider Economic Benefits (WEBs)

➢ Multiplicity of corridor initiatives under way.
➢ Huge gap between investment needs and financing capacity.
➢ Tremendous risks and forgone development opportunities in absence of clear economic thinking, appraisal methodology.
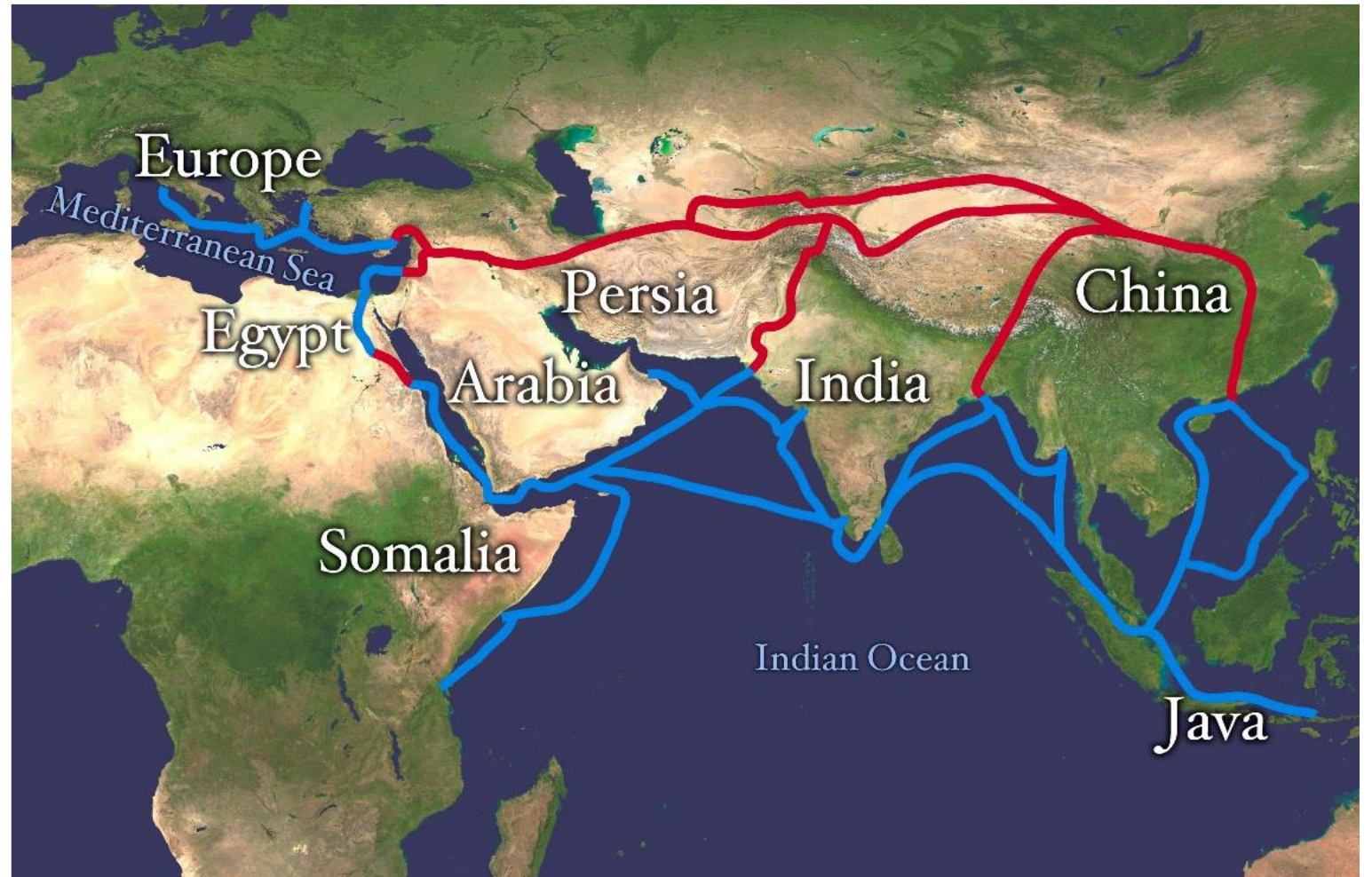
Corridors matter for what happens **around** them, not just on them

➢ Because of their backbone infrastructure, corridor projects are often appraised as transport projects.

➢ Despite the projects being potentially transformational, agglomeration spillovers and network effects are generally ignored.

➢ The literature on the WEBs of corridors typically looks at a single corridor to assess impacts.

➢ From a policy perspective there is much to learn from differences across projects and the resulting variation in the design and implementation of transport investment projects and the practitioners working on them.

Objective

Aim: To understand the relationship between the realization of WEBs and the environment in which the project is being designed and implemented

Key Questions:

1. <u>Initial Conditions</u>: What country characteristics help produce WEBs?

2. <u>Project Design and Characteristics</u>: What design and implementation characteristics of these projects may help generate WEBs?

3. <u>Complementary Policies</u>: When complementary policies and reforms may help ensure or amplify WEBs?

Sample Selection

Criteria: Transport investment built new, rehabilitated, or upgraded existing transport infrastructure of at least 100 linear kilometers on a given route
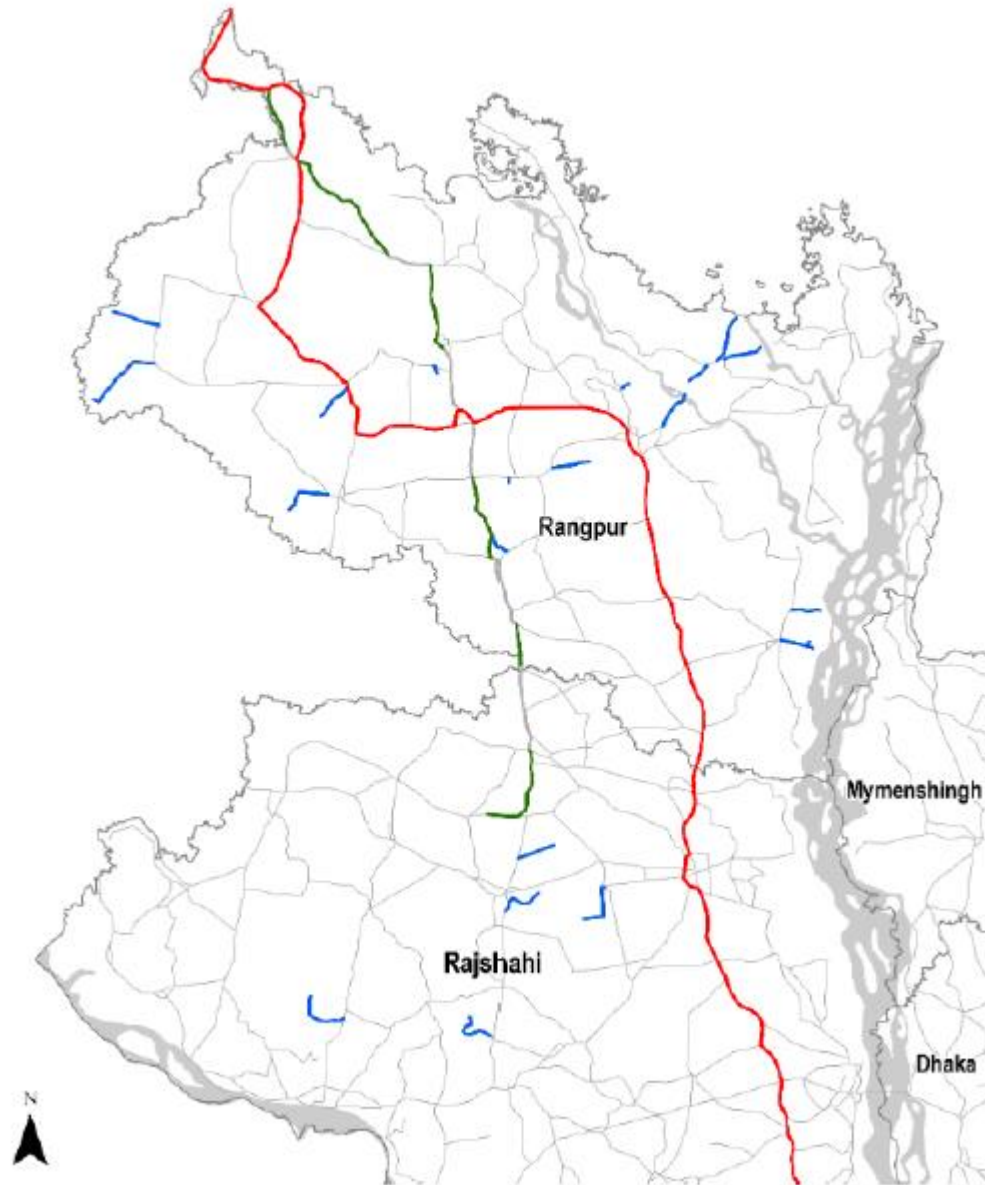
Empirical Strategy— Measuring WEBs

We use nighttime lights emission intensity to measure the WEBs (proxy for human and economic activity)

- ➤ Unit of analysis: Hexagons, each covering 260 square kilometers
- ➤ Measure: An overall value measured by the sum of lights observed at the pixel level
- ➤ Time Period: 1992 to 2012

Why Hexagons? Using hexagons is advantageous over square pixels because of their higher symmetry, sampling efficiency, equidistance, angular resolution, and consistent connectivity
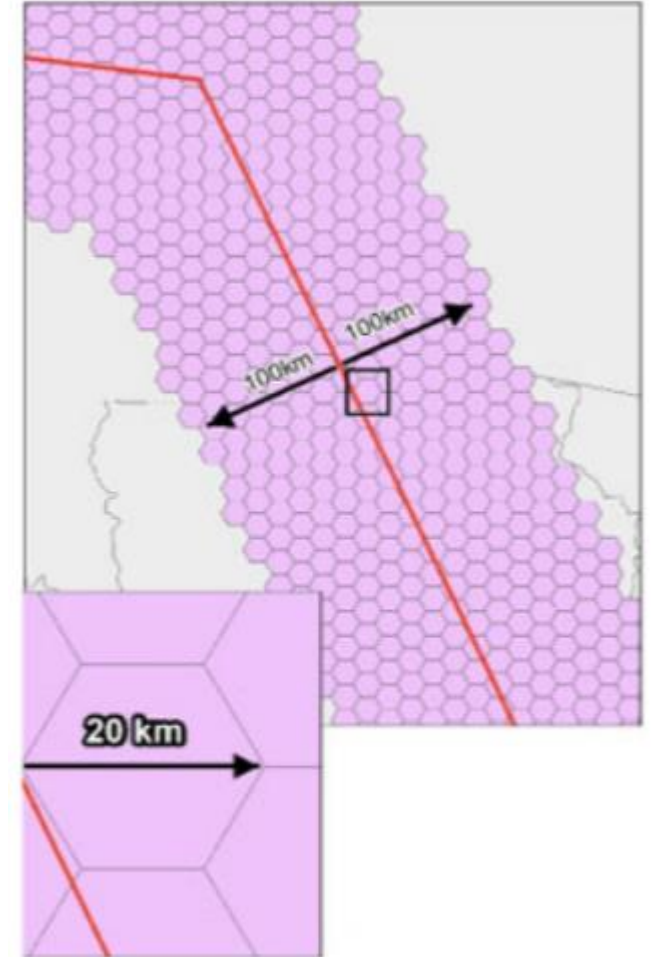
Empirical Strategy—Approach

Approach: Differences-in-difference approach (across space and across time)

$$N_{ijkt}$$
$$= (\beta_{00} + \beta_{01}P_{ijt} + \beta_{02}T_{ijk} + \beta_{03}T_{ijk}P_{ijt}) + \boldsymbol{I'}_{\boldsymbol{j}}(\beta_{11}P_{ijt} + \beta_{12}T_{ijk} + \beta_{13}T_{ijk}P_{ijt})$$
$$+ \boldsymbol{D'}_{\boldsymbol{ij}}(\beta_{21}P_{ijt} + \beta_{22}T_{ijk} + \beta_{23}T_{ijk}P_{ijt}) + \boldsymbol{C'}_{\boldsymbol{ij}}(\beta_{31}P_{ijt} + \beta_{32}T_{ijk} + \beta_{33}T_{ijk}P_{ijt})$$
$$+ \varepsilon_{ij}$$

➤ Subscript: "i" denotes projects, "j" denotes country, "k" location, "t" denotes time

➤ "N" denotes nightlights

➤ "P" denotes project completion (dummy)

➤ "T" denotes treatment variable (continuous b/w 0 and 1)

➤ "**I**" denotes initial conditions

➤ "**D**" denotes project design and characteristics

➤ "**C**" denotes complementary polices

β_{13}, β_{23}, and β_{33} estimate how initial conditions, project design/characteristics, and complementary policies could affect a WEB—the local economic activity

Empirical Strategy—Challenges

Challenges:
➢ Project corridor placement can be endogenous
➢ Project characteristics are not exogenous to the potential of the project itself

Some of the endogeneity issues addressed through the following sensitivity analysis but the results of the estimation should be interpreted as associations:

➢ Exclude points close to the nodes of a corridor

➢ Exclude urban centers (as measured by Human settlement data)

➢ Exclude partially treated hexagons (consider hexagons treated if 0-20km from spine and control if 80-100km from spine)
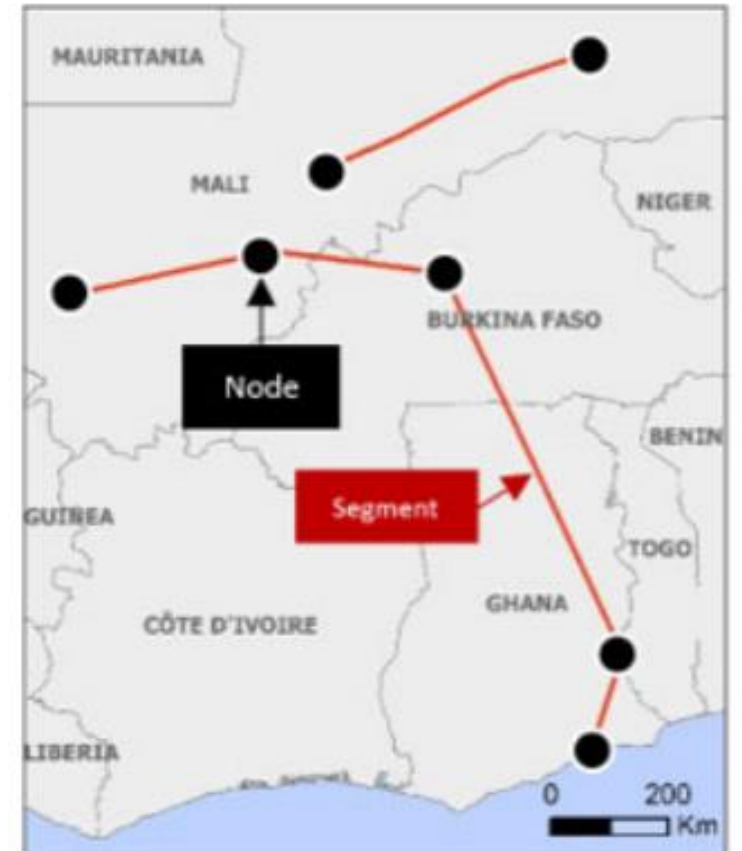
Results—Overview

For exposition purposes results from the same regression equations are presented piecemeal

And results for when treatment variable is continuous, and sample is restricted as follows:

➢ Full sample (40,572 obs.)

➢ Exclude 20% of the sample at the Nodes (17,813 obs.)

➢ Exclude if Human Settlement Index > 2.5 (40,426 obs.)

Table 2: Regression Results Using Continuous Treatment Variables and Hexagons of 0-100 Kilometers

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Post x Treatment	1.424 (1.395)	1.817 (2.011)	-2.079 (2.095)	-4.301 (3.422)	1.484 (1.389)	1.910 (2.006)
Landlocked-ness	-0.316 (0.204)	-0.228 (0.254)	0.158 (0.297)	0.554 (0.444)	-0.333 (0.203)	-0.252 (0.253)
Log land area (Ha.)	-0.0231 (0.0580)	-0.0532 (0.0841)	0.111 (0.0881)	0.160 (0.142)	-0.0242 (0.0578)	-0.0544 (0.0839)
Terrain ruggedness index	-0.000203 (0.000455)	-0.000323 (0.000475)	0.000383 (0.000711)	0.000622 (0.000729)	-0.000234 (0.000453)	-0.000357 (0.000472)
Log GDP per capita at appraisal (constant 2010 US$)	-0.121 (0.0858)	-0.0809 (0.0934)	-0.0522 (0.131)	0.178 (0.144)	-0.123 (0.0853)	-0.0889 (0.0928)
Theory of change	0.150** (0.0663)	0.147** (0.0732)	0.165 (0.104)	0.131 (0.113)	0.145** (0.0661)	0.143* (0.0729)
Private sector consultation	0.167 (0.132)	0.318** (0.154)	0.439** (0.203)	0.570** (0.229)	0.142 (0.132)	0.293* (0.153)
Degree of private sector involvement	-0.385*** (0.137)	-0.319** (0.138)	-0.832*** (0.216)	-0.747*** (0.217)	-0.381*** (0.137)	-0.316** (0.137)
Degree of connectivity increase	-0.00521 (0.0748)	-0.0721 (0.0816)	-0.0369 (0.113)	-0.174 (0.125)	-0.00835 (0.0745)	-0.0733 (0.0813)
Investment at border	0.0176 (0.264)	0.0726 (0.282)	-0.417 (0.429)	-0.533 (0.469)	0.0283 (0.264)	0.0892 (0.282)
Geographic scope	-0.127 (0.0932)	-0.0888 (0.0994)	-0.131 (0.143)	-0.199 (0.150)	-0.124 (0.0929)	-0.0845 (0.0991)
Openness at approval [(Imports + Exports)/GDP]	-0.0623 (0.419)	-0.132 (0.489)	1.212* (0.654)	0.965 (0.839)	-0.0599 (0.418)	-0.111 (0.486)
Any DPO in past 5 years		0.0726 (0.275)		1.001*** (0.362)		0.0578 (0.275)
Any DPO in past 5 years: Industry-trade-services		-0.175 (0.343)		-0.874 (0.560)		-0.135 (0.342)
Any DPO in past 5 years: Public administration		-0.204 (0.513)		-0.194 (0.776)		-0.231 (0.511)
Any DPO in past 5 years: Transport		-0.267 (0.187)		-0.138 (0.295)		-0.259 (0.187)
Observations	40,572	40,572	17,813	17,813	40,426	40,426
R-squared	0.318	0.331	0.356	0.374	0.320	0.333
Sample	All	All	Exclude 20% at the nodes	Exclude 20% at the nodes	Exclude if Human Settlement Index > 2.5	Exclude if Human Settlement Index > 2.5
Specification	No DPOs	With DPOs	With DPOs	No DPOs	No DPOs	No DPOs

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

#1. Initial Conditions have no demonstrable relationship with creation of WEBs

This could mean that these four characteristics had no bearing on the creation of WEBs.

OR

It could imply that the projects supported by international development organizations are able to neutralize any differences that may have emerged from these country characteristics.

Variables:	(1)	(2)	(3)
Landlockedness	-0.228	0.554	-0.252
	(0.254)	(0.444)	(0.253)
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Log GDP per capita at appraisal	-0.0809	0.178	-0.0889
(constant 2010 USD)	(0.0934)	(0.144)	(0.0928)
		Exclude 20%	**Exclude if**
Sample	**All**	**at the Nodes**	**HCI > 2.5**

#2. Well thought out projects are more likely to spur WEBs

A well-thought rationale for developing large pieces of infrastructure that can be effectively used by local businesses and the population is imperative to ensure that the investment does not end up being a white elephant

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#3. IOs need to revisit the way they engage with the private sector

Although consulting with the private sector may translate into WEBs (perhaps through improved project design), the expected efficiency gains from private sector involvement have not so far translated into higher levels of economic activity around the corridor
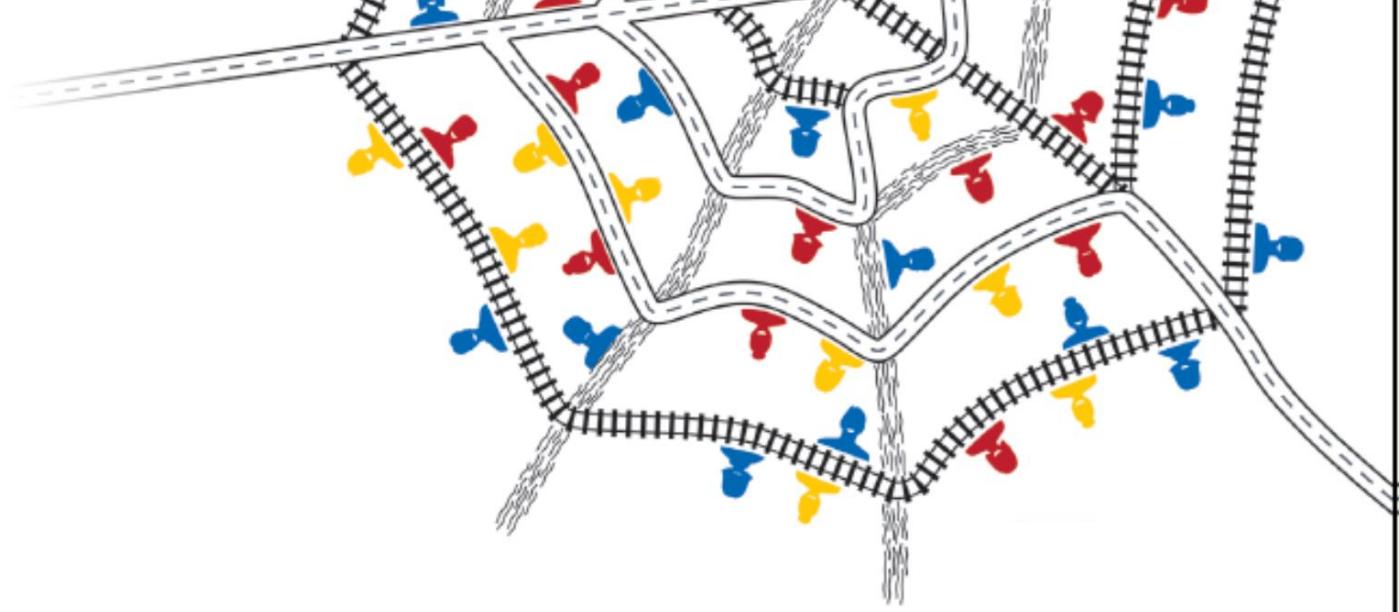
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Sample	All	Exclude 20% at the Nodes	Exclude if HCI > 2.5

#4. Policy reform does not lead to any discernable impact on WEBs

This does not imply that DPOs are ineffective

Because of their widespread (horizontal) nature, DPOs could be spurring economic activity equally between the treatment and control hexagons

Variables:	(1)	(2)	(3)
Openness at approval	-0.132	0.965	-0.111
[(Imports + Exports)/GDP]	(0.489)	(0.839)	(0.486)
Any DPO in last 5 years	0.0726	1.001***	0.0578
	(0.275)	(0.362)	(0.275)
Any DPO in last 5 years:	-0.175	-0.874	-0.135
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THANK YOU