

# CASE STUDY

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## Going Digital: Credit Effects of Land Registry Computerization in India

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### ABSTRACT

Digitization of land records represents a unique way to test for credit supply effects of improved land administration information over time. We exploit variation in the timing of the shift from manual to digital operation of Andhra Pradesh's 387 sub registry offices during the state-wide rollout of this intervention from 1999 to 2005. Data on credit disbursement and registered mortgages for the 1995-2007 period point to significant, though quantitatively modest, increases in credit access in urban areas. Institutional factors allow us to explain these results.



### BACKGROUND

Development economists have long highlighted the central role of institutions and how they impact growth and distribution of gains among populations (Greif 1993, North 1971). Since land is an important household asset in virtually all countries, property institutions can have a significant impact on economic outcomes. Secure property rights can reduce expropriation risk, thereby increasing investment incentives and reducing the need for individuals to spend resources on protecting their rights. They can also facilitate market transactions by allowing land assets to be traded and used as collateral in financial markets.

Although many empirical studies show that secure property rights can have significant investment effects, there is little evidence on their credit effects. To partly fill this gap, we examine the credit effects of land registry digitization in Andhra Pradesh, a southern Indian state. From 1999 to 2005, Andhra Pradesh implemented a program for Computer-Assisted Registration of Deeds (CARD), which streamlined procedures, provided automatic property valuation, and

digitized all encumbrance certificates (ECs)<sup>1</sup> from 1983. This occurred in three rounds, starting from offices with the highest transaction volumes, and finally covering all of the state's 387 sub registry offices (SROs). As a result, ECs, as well as market valuations, deed extracts, and other key documents became available online. It became possible for banks to ascertain property ownership status or pre-existing liens that could be offered as collateral. We hypothesized that this would reduce the bank cost of extending credit and facilitate an expansion of credit supply, either by lending to those who had previously been ineligible, or by lending more to existing customers.

Institutional factors that are characteristic to the setting, however, must be taken into account. India's land administration system differentiates between land records and land registration. In rural areas, land records maintained by village level officials are more accessible and up to date than land registries, which only operate at the *taluk* (block) level. In contrast, land registries are the only available form of documentary land ownership evidence in urban areas. Thus we expect the computerization of land registries to have a more pronounced effect in urban areas than in

rural ones where land records are used as an alternative.

### DESIGN

In order to determine whether the computerization of land registry affected credit access over time in Andhra Pradesh, we conduct rigorous empirical analysis using data from three sources. First, quarterly data from 1995 to 2007 on credit disbursed by all scheduled commercial banks to retail customers in all of the state's 1,064 *taluks* is collected from the Reserve Bank of India (RBI)<sup>2</sup>. Second, we use the state's Department of Stamps and Registration's annual data on different types of registered land transactions from 1995 to 2007 for all 387 SROs. Third, in light of the differences between rural and urban land administration, we use the 2001 Census for the initial share of urban population in any *taluk* or SRO.

Since CARD was implemented in three rounds, we exploit the variation in timing across SROs to single out the impact of computerization on credit supply and different types of registered land transactions. If computerization does indeed have a significant credit effect, we expect to see its



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clear impact on mortgages but not on other types of land transactions.

#### DESCRIPTIVE EVIDENCE

Panel A in Table 1 shows that credit markets in Andhra Pradesh evolved rapidly during the period in question. The volume of credit almost quintupled in real terms, from Rs. 525 billion in 1995 to Rs. 2,503 billion in 2007. *Prima facie*, the rate of growth seems to have accelerated after 2003, at a time when most SROs had already been computerized. Registered sales, mortgages, and non-monetary transactions also increased notably.

Panel B summarizes total credit amounts as well as the mean number of transactions for each land transaction type by SRO (overall, rural, and urban). The total volume of credit disbursed by commercial banks differed greatly between urban and rural areas, with the amount of urban credit (Rs. 2 billion) significantly higher than that of rural credit (Rs. 0.06 billion) on average. After computerization, credit is estimated to have doubled in both rural and urban areas; from approximately Rs. 1 billion to Rs. 2.55 billion in urban settings and from Rs. 0.04 billion to Rs. 0.09 billion in rural settings. It is also evident that the number of registered land transactions (for all types) is much higher in urban areas than rural areas. Focusing specifically on mortgages, there is a significant difference in their numbers for rural areas and urban areas (548 vs. 712). It must also be noted that the increase in registered mortgages after computerization is confined to the urban setting (673 to 798).

**Table 1: Evolution of retail credit and transaction volume in Andhra Pradesh, 1995-2007**

Year	Panel A			Panel B		
	Credit Sales	Mortgages	Non-Monetary Transactions	All	Before Comp.	After Comp.
1995	525	0.48	0.19			
1996	579	0.51	0.21			
1997	627	0.52	0.23			
1998	667	0.54	0.31			
1999	736	0.55	0.29			
2000	817	0.60	0.27			
2001	874	0.61	0.26			
2002	973	0.65	0.26			
2003	1094	0.72	0.27			
2004	1432	0.84	0.28			
2005	1986	0.88	0.28			
2006	2050	0.93	0.29			
2007	2503	1.09	0.33			
				<b>Total</b>		
				Credit	0.24	0.10
				Sales	1704	1115
				Mortgages	558	552
				Non-Mon. Transactions	488	258
				<b>Rural</b>		
				Credit	0.06	0.04
				Sales	1491	1014
				Mortgages	548	545
				Non-Mon. Transactions	393	227
				<b>Urban</b>		
				Credit	2.00	0.97
				Sales	4455	3171
				Mortgages	712	673
				Non-Mon. Transactions	1720	891

*Notes: Nominal values of credit are deflated using the RBI whole sale price index with 1993-94 as the base year; credit is reported in billions of 1993 Rupees. In Panel A, volume of land transactions (land sales, mortgages, non-monetary land transactions) are reported in millions. Panel B reports average number of land transactions registered per SRO.*

#### RESULTS

Although our empirical analysis points towards an insignificant impact of computerization on aggregate credit supply, we find that it does have a significant impact in areas that are at least partly urbanized. Computerization in urban areas considerably increased the overall number of registered mortgages, but had no effect on the number of other types of registered land transactions (i.e. land sales and non-monetary transactions). This is consistent with the idea that reduced bank transaction costs are the underlying driver to increasing credit supply.

Results in Table 2 point towards computerization's robust effect on credit supply that increases over time in fully or partly urbanized areas. While a naïve estimate (column 1) suggests a large effect, inclusion of proper controls in column 2 implies that computerization had no effect on overall credit supply. Yet, according to the point estimate, in completely urban SROs computerization did increase credit supply by 10.5%.

To examine whether and how the effect varies over time, we include variables that indicate time periods immediately preceding or following computerization in columns 3 and 4. Pre Q 1-5 is an indicator variable for five quarters leading up to the

computerization. Post Q 0-4 is an indicator variable for the quarter in which computerization was introduced and the first four quarters thereafter. Similarly, Post Q 5-8 is an indicator variable for the fifth to eighth quarters (representing the second year) after computerization, and Post 9+ is an indicator variable for the ninth quarter and beyond. In column 3, there appear to be no evidence for lagged effects of computerization in the aggregate. In contrast, column 4 suggests that computerization's impact on credit disbursement increases with the degree of urbanization; some delay in effect is also evident, with increases of approximately 3 percent to 5 percent in the first eight quarters, followed by a 15 percent increase thereafter. This may be due to the time it takes for banks to learn about the information provided by computerized registries and to adjust their processes in a way that can take advantage of this information.

Examining computerization's effect on the volume of registered mortgages provides an additional robustness check to support the plausibility of credit supply effects postulated above. Table 3 provides the evidence. Although computerization does not appear to have a significant effect on the volume of mortgages overall, in urban areas the number of mortgages is estimated to have increased by roughly 31 percent. Interaction with post-variables



*Figure 1: Accessing records via a computer*

**Table 2: Effect on credit access**

Dependent variable: log of credit disbursed by banks				
	(1)	(2)	(3)	(4)
Computerization	0.854*** [0.0109]	0.0163 [0.0147]		
Computerization * Urban Share (US)		0.105** [0.0495]		
Comp. * Pre Q 1-4			0.0149 [0.0132]	0.0202 [0.0135]
Comp. * Post Q 0-4			0.0155 [0.0123]	0.0193 [0.0238]
Comp. * Post Q 5-8			0.0232 [0.0199]	0.0344 [0.0215]
Comp. * Post Q 9+			0.0289 [0.0298]	0.0260 [0.0362]
Comp. * US * Pre Q 1-4				0.0112 [0.0313]
Comp. * US * Post Q 0-4				0.0313** [0.0165]
Comp. * US * Post Q 5-8				0.0513** [0.022]
Comp. * US * Post Q 9+				0.147** [0.0599]
Quarter*Year Fixed Effects	No	Yes	Yes	Yes
Taluk Fixed Effects	No	Yes	Yes	Yes
Observations	55,328	55,328	55,328	55,328
R-squared	0.18	0.96	0.96	0.96

*Notes: Robust standard errors clustered at taluk level.  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%*

**Table 3: Effect on the volume of registered land transactions**

	Mortgages	
	(1)	(2)
Computerization	0.13 [0.0794]	
Comp. * Urban Share (US)	0.311** [0.169]	
Comp. * Pre Y 1-4		0.0375 [0.0878]
Comp. * Post Y 0-2		0.1801 [0.1069]
Comp. * Post Y 3+		0.2123 [0.1647]
Comp. * US * Pre Y 1-4		0.134 [0.137]
Comp. * US * Post Y 0-2		0.177** [0.0751]
Comp. * US * Post Y 3+		0.325** [0.182]
Observations	5,031	5,031
R-squared	0.859	0.859

*Notes: All regressions include year and SRO fixed effects.  
Robust standard errors clustered at the SRO level.  
All dependent variables are in logs.  
\* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%*

suggests that computerization's impact on the volume of mortgages increases with time, from approximately 18 percent in the first two years to 33 percent thereafter.

## CONCLUSION

Our empirical analysis shows that interventions which reduce the cost of updating registries and make information more available to lenders (i.e. computerization) can increase credit access. However, factors such as limited record coverage, problems in the underlying information, and structural characteristics of the land administration system can limit the scope of this effect. Thus, when assessing the quality of a country's land information system, other meaningful metrics will likely need to be considered in addition to the cost of registering transactions. Our results also imply that it is unrealistic to expect an immediate, universal increase in credit access when land administration is improved.

The impact of computerization is estimated to be of rather modest magnitude, even in fully urbanized areas. This may be due to the limitations of registry information. If this

interpretation is correct, combining computerization with efforts to improve the quality and relevance of the underlying information could potentially result in additional benefits. For example, records and registries could be synchronized, or a survey could be added to unambiguously locate the property in question and determine its boundaries. This may improve not only credit access, but also land governance and conflict resolution. Exploring other dimensions of land administration and their impact is an important area for future research.

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*The findings, interpretations, and conclusions expressed are entirely those of the authors. They do not necessarily represent the views of the Government of India, and of the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.*

<sup>1</sup> *Encumbrance certificates (ECs) are abstracts that list all registered transactions by person or for a specific parcel of land.*

<sup>2</sup> *Scheduled commercial banks include all public and private sector banks with the exception of cooperative banks which contributed less than 10 percent to total lending from 1997 to 2006 (RBI 2008).*

## REFERENCES

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