Working paper

Evaluating the Kisan Credit Card Scheme

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Evaluating the Kisan Credit Card Scheme: Some Results for Bihar and India
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Abstract

The Kisan Credit Card Scheme was introduced in India in 1998-99 has since become a flagship program providing access to short term credit in the agricultural sector. According to the Government of India, over a 100 million cards had been issued cumulatively by March 2011. Using data from 2004-05 to 2009-10, the paper critically examines the determinants of KCC lending across states in India and districts in Bihar. We also examine the effects of the scheme on agricultural growth and yields. Our results suggest that states with initially better access to agricultural credit show sbsequently greater amounts of KCC lending. However, Bihar and other BIMARU states also show faster adoption rates that cannot be explained by their recent growth accelerations. Within Bihar, we see that districts with initially greater lending in KCC continue to to pull further away from other districts while in terms of account holders there is evidence of convergence. Finally, we do not see any evidence of KCC lending on state or district level agricultural productivity.

JEL Classification: Q14, Q0, O41, O47

Keywords: Agricultural Growth, Financial Markets, Short Term Credit, India.

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1 Introduction

In the study of economic growth, the role of financial intermediation has been always at centre stage. Well functioning financial markets, by lowering costs of conducting transactions, ensure capital is allocated to projects that yield the highest returns and therefore enhances growth rates. In the context of new growth theory, early contributions such as Jovanovic and Greenwood (1990), Galor and Zeira (1993), and Banerjee and Newman (1993) have laid down the theoretical foundations of the role of credit market imperfections on growth via various channels. The empirical importance of financial markets in economic growth was further solidified in a series of papers including, but not limited to, King and Levine (1993), Levine, Loayza, and Beck (2000) and Beck, Loayza and Levine (2000). Since the beginning of independence, the importance of access to adequate credit has also been at the center piece of policy making in India. The country has been characterized by a large agricultural sector as well as a large small-scale industrial sector, taken together which continue to form the bulk of employment. Providing access to credit for these sectors has been a key driver of banking sector policy and formed the intellectual basis for bank nationalization and various priority sector lending schemes.

This paper examines the impact of one important financial policy intervention aimed at addressing this problem- the Kisan (farmer) Credit Card (KCC) scheme on state level per capita incomes and agricultural productivity. The KCC scheme was introduced by the government of India in the 1998-99 budget to displace a tangled web of other short term agricultural credit schemes that had become increasingly burdensome and inadequate. Samantara (2010) notes that the earlier system was characterized by a "multiple-product, multiple agency system" that varied based on the particular crop, input needs, season, size of borrowing, etc. What may have seemed like an array of choices, essentially involved a farmer having to make multiple loan applications for different stages and needs of the farming process..The KCC scheme was introduced to move away from the maze of inefficiency towards a more consolidated system where the borrowers were subject to fewer parameters and given more freedom to use the credit. It is in essence, a revolving credit line as opposed to the older system of "demand loans".

By 2004, the Reserve Bank of India, noting the increasing popularity of the KCC scheme, expanded its ambit to cover investment needs of the farmers as well as consumption credit needs in addition to traditional crop

loans.[1] The KCC scheme has now been around for more than a decade and has become a core element of the government of India's recent push for financial inclusion, especially in rural areas. By March 2011, cumulatively more than a 100 million KCC accounts had been issued. Indeed, annual targets by commercial, rural and cooperative banks are set so that eventually 100% of eligible farmers are covered by the scheme. Given the dominant role that this scheme has come to play, it makes sense to ask whether this has had any effect on agricultural growth. That is precisely what we try to do in this paper. In the first half of the paper, we focus on inter-state effects of the KCC scheme and the achievement of Bihar relative to other states. This part of the study can be divided into two parts, a) an examination of the determinants of kcc adoption rates across states, and b) the effects on state level agricultural productivity, food grain yields and also overall state GDP per capita. We undertake both ordinary least squares to gauge the medium term effects and fixed effects to estimate more short term effects. Furthermore, since the paper is concerned with Bihar, we ask whether Bihar was any different compared to other states in terms of adoption of the KCC scheme.

In the second half of the paper, we move the focus to districts in Bihar where we repeat the two exercises. At the district level it is more difficult to obtain reliable measures of sectoral output or even total value added. Though we do use some limited data at our disposal, most of the analysis examines the impact on agricultural yields. We also share some thoughts on the scheme based on our discussions with government officials and bankers we met with during the research project.

Before describing the data and our findings, we first discuss the KCC scheme in a little bit more detail and the relevant literature. We also briefly survey the already large literature on financial development and economic growth in India.

1.1 Background on the Kisan Credit Card Scheme

As noted the KCC scheme was introduced in 1998-99. While the scheme centers around a revolving credit line facility, it is not really a credit card in the traditional sense While some banks in other states do issue credit cards, we are not aware of any bank in Bihar that actually issues one[2] The

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[1] See RBI (2004)

[2] While the government of India forges ahead with plans for introducing ATM facilities for these non-existent cards, most of the facilities, at least in Bihar, are still very much based on the concept of "branch-banking".

key features that are supposed to make the scheme user friendly include a) no collateral requirements, b) less stringent monitoring of actual use of loans, and c) easy renewal after three years for borrowers in good standing. We expand on these briefly. One of the key advantages (and a stated goal) is to make credit available without burdensome requirements. In keeping with this, farmers do not need to provide a security deposit to qualify for the loan. They can qualify for the minimum amount upon producing documentation of land possession (in Bihar, this is usually the "Land Posession Certificate"). The amount varies from bank to bank, and also depends on the scale of finance - a formula based on the crop and size of landholding. Nevertheless for comercial banks, the amount usually stands at INR 50,0000. Cooperative banks and regional rural banks will usually lend at lower amounts. Borrowers are eligible to borrow larger amounts but need to provide collateral. Once the loan is approved, the borrower is free to borrow up to the maximum amount at an annual interest rate, currently at seven percent (fixed by the Reserve Bank of India). However, timely repayment is rewarded by lowering the interest rate by two percentage points. Even though there is no compulsion to borrow the entire amount lump sum, Samantara (2010) notes that it is the norm. Once the money is borrowed there is no monitoring of the actual use. This is a major difference between the KCC scheme and all other previous crop loans where farmers had to produce receipts to actually get the loans and the bank made payments directly to the supplier instead. Nevertheless, it opens up the possibility of using the funds for purely consumption purposes, and also for arbitrage gains. Indeed, discussions with bank officials indicate there is anecdotal evidence that this is the case. The low interest rate (lower than recent inflation rates in India) create ample opportunity for such abuse. If this were indeed the case, then one should not be surprised to see higher consumption growth rates instead of higher agricultural productivity. Finally, if a borrower is in good standing, then the loan can be renewed for another three years. Some banks have now raised the validity to five years and have raised the minimum non-collateral amount to 100,000 rupees.[3] The scheme is implemented by commercial banks, regional rural banks and cooperative banks. Commercial banks are the largest lenders though regional rural banks and cooperative banks play an important role in many states. Nationally, cooperative banks have become less important over time and tend to lend lower amounts.

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[3]What we have listed is a brief overview of the scheme. Specific details can be viewed on the NABARD website at http://nabard.org/development&promotional/kisancreditcardmore.asp#.

There is hardly any doubt that, KCC is the single largest government scheme to introduce short term unsecured credit across the agricultural sector. In fact, our perception is that as far as short term unsecured credit is concerned, this is probably the most ambitious scheme introduced by the Indian government. Despite the KCC scheme having become the dominant source of short term agricultural credit over the past decade, there has been little or no research studying its impact on agricultural productivity and other outcomes.[4] There have been three important micro-level surveys over the past twelve years. In 2000, a study was commissioned by the Planning Commission to get a sense of the progress of the scheme in its early stages.[5] Though the scheme was introduced nationally, different states have shown remarkably different degrees of enthusiasm. The survey noted that by the end of 2000, Andhra Pradesh had already achieved a card to landholding ratio of thirty percent while Bihar stood at a little more than one percent. As we shall see, Bihar has shown tremendous growth over the past five to six years. The next major survey was conducted by National Council of Applied Economic Research (NCAER) in 2005 which spanned several states and surveyed both banks and borrowers.[6] Bihar however was not included in that survey. Most recently, in 2010, the National Bank of Agriculture and Rural Development (NABARD) released the results of another survey which again spanned several states but also excluded Bihar.[7] All three surveys provide an excellent chronological narrative on the evolution of the scheme and its failures and strengths. The NABARD report, being the most recent, highlights some continuing challenges. Perhaps the main challenge, both from a policy perspective as well as for any empirical work such as this is the problem of multiple cards per borrower. From discussion with Bank officials in Patna, it is obvious that this is commonplace. Banks have tried to address this problem by requiring borrowers to produce no-dues certificate from neighboring branches of other banks. However, that increases the burden on the borrower and it is not difficult to produce counterfeits.[8].The report also highlights some other problems such as inadequate credit limits (particularly with cooperative and regional rural banks) and the need for

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[4]This is not to suggest that other schemes are not important. In fact a quick look at the agricultural banking section of the State Bank of India's website suggests at least another thirty lending schemes in operation.

[5]See Planning Commission (2002).

[6]See Sharma (2005)

[7]See Samantara (2010)

[8]Indeed, one bank manager himself admitted that it was easy to create counterfeit no dues certificates.

a longer validity period. On a positive note, the report notes that eighty percent of holders tend to renew their accounts, obviously signalling strong satisfaction with the scheme. Unfortunately, none of the surveys report data on default rates.[9] The fact that default rates are not systematically collected implies that much of the results in this paper have to be interpreted cautiously. Finally, while all of these surveys are an excellent source of information on the success and failures of the scheme at the individual level, they were not undertaken to study the impact of the scheme on the agricultural sector in India.

1.1.1 Research on Agricultural and Rural Credit in India

While the regional effects of the KCC scheme have not been studied, there is an extensive literature on the effects of financial development on agricultural and rural growth. This is not surprising in itself, since most of the major policy developments, particularly the history of bank nationalization in post-Independent India have been structured keeping agricultural and small scale industry in mind. Without going into excessive detail about this large literature, we quickly summarize some of the more recent findings. At the core of the research lies a more or less uniform set of questions-did changes in banking sector policies targetted to agriculture achieve their objectives in terms of increasing access to finance, lowering poverty and increasing productivity growth? In a well known paper Burgess and Pande (2005), exploit an important event in Indian policy making, the enactment of the branch expansion program in 1977, to show that increased access to banking in rural areas reduced poverty and increased output. Moreover, they show that an increase in bank branches also increased non-agricultural output implying increased diversification of the eocnomy. Furthermore, they note that since the program was abandoned with liberalization in 1990, the number of branches per capita has not increased. In similar vein, Cole (2009) uses the nationalization of private banks in 1980 to examine the effects on access to credit and output growth. However, he finds that while nationalization indeed increased access to credit to priority sectors of the economy, and lowered interest rates, there is no evidence that it increased agricultural output and might have even slowed the growth of non-agricultural sectors. Kendall (2009) uses an innovative, but publicly restricted data on district level GDP to examine the effect of financial development on growth. He

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[9]Most bank officials we met insisted that default rate was near zero. On pressing the issue a little more, at least one official suggested that the rate was higher than that of private loans but lower than that of other priority sector loans.

finds a strong nonlinear effect on financial development on output. Guha (2009), looks at state level data over a three decades (1973-2004). While his findings are supportive of Burgess and Pande, he also finds that the relationship between financial sector access and growth has become fragile during the post liberalization period. a consistent feature of all these studies is the use of commercial bank credit. While it is true that commercial banks are the predominant source of credit, at least for KCC, regional rural banks also play a sizeable role nationally.[10] Fortunately, for KCC, we have data on all sources.

Finally, Ramakumar and Chavan (2007) look at the composition of agricultural credit over the long run. More particularly, they examine the pattern of direct credit to agriculture vs indirect credit. While the KCC scheme was originally introduced in 1998-99, it was only in 2004, that the government of India made a concerted push at doubling agricultural credit. Growth in agricultural credit had slowed down to a crawl in the post liberalization period. They observe that agricultural credit increased at the rate of about two percent annually between 1990 and 2000. However, between 2000-2006 credit has been increasing at the rate of twenty percent annually with growth in indirect credit outpacing growth in direct credit. Indirect credit as the name suggests are loans not given directly to farmers. The usual beneficiaries are input suppliers, agro-food processing units, state electricity boards, and even NGO's. Direct credit is given directly to farmers and includes short term crop loans (which KCC has displaced) as well as other direct medium term and long term loans. For our period of study which spans the years 2004-05 to 2009-10, we find that indirect credit mildly outpaced direct credit. The former grew at the rate of 32% while the latter grew annually at 27%. Nevertheless this suggests that there has a substantial increase in credit in agriculture over this period and not just KCC credit.[11] Clearly this makes it more difficult to disentangle the effect of the effects of KCC scheme from other sources of agricultural credit. In our econometric work, we include a separate variable to cover overall trends in agricultural credit.[12]

Other than broad based trends in credit, one also needs to be aware of

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[10]However, while RRB's are distinct entities, they are ultimately owned by commercial banks.

[11]Over the same period direct credit which, in 2004-05 was 2.7 times that of indirect credit, had declined to 2.2 by 2009-10.

[12]We should note here that there is some difficulty in comparing overall agricultural credit with KCC credit. RBI provides data for these two variables in separate publications. The agricultural credit numbers that we have quoted above refer to "outstanding" credit while the KCC data is the amount loaned in a particular year. See appendix 1 for the data sources.

other major credit interventions during this time period. Our reading of agriculture and rural credit policy suggests that there might be at least two other interventions that might confound the effects of KCC. One involves the bank credit linkage program given to Self Help Groups (SHG). As the name suggests this is a microfinanced based initiative which involves nationalized banks. Technically, this is not a program for the agricultural sector but given that its rural in scope, it can conceivably have important general equilibrium effects. However in terms of magnitude, its far less than KCC. In the year 2009-10, KCC lending was at around 55,000 crores while SHG lending was much less at 15000 crores. A second important credit initiative is the Rural Infrastructure Development Fund (RIDF) introduced in 1995. This involves long term indirect credit to the agricultural sector (i.e. not directly to farmers). However, this scheme too is of a much smaller magnitude recording a cumulative credit of 120000 crores until 2009-10.[13] Thus clearly both schemes are much smaller in scale compared to the KCC scheme.

2 Data and Methodology

Our study covers the period 2005–06 to 2009-10. Even though the KCC scheme has been in effect much longer, earlier state level data remains elusive. For the state level analysis, the data on KCC comes from the Reserve Bank of India's annual *Trends and Progress of Banking in India.* Unfortunately, the data goes back only until 2004.[14] The data itself is fairly detailed in that for each state we know what amount was issued by bank type - commercial, regional rural, or cooperative. We also know the number of account holders.[15] In addition to KCC credit, we also have data on commercial bank credit to agriculture and other sectors of the economy on an annual basis. This provides a useful control for our econometric exercises.

To measure outcomes, we look at three major indicators of development-real state net domestic product per capita, agricultural gdp per worker, and foodgrain yield. The data on state domestic product and agricultural gdp

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[13] Numbers for both schemes are compiled from the NABARD website.

[14] The data portal, Indiastat.com provides data on KCC for earlier years but these are based on questions answered in the parliament and often are not for a complete year. Hence, we avoided the data there. The RBI mentions NABARD as its source of data. Repeated requests to NABARD officials were met with no response.

[15] However, even for the years for which data is available, it switches from flows to stocks and back to flows. Since we are interested in the flow of credit, the stock data for 2007-08 needs to be dropped form the analysis. We tried some back of the envelope corrections supplementing the data with numbers from Indiastat but it led to unusually high values.

can be obtained from the Reserve Bank of India website. Foodgrain yield statistics were collected from the data portal, Indiastat.[16] For population and workers, we used data from the 2001 and 2011 census and interpolated numbers for the intervening years.[17]

For the section of the paper devoted to district variation within Bihar, the KCC data comes from the State Level Banking Committee (SLBC) reports for various years. The SLBC is an apex bank committee in each state, and under RBI guidelines, is required to meet every quarter. The reports provide a wealth of information on lending and deposit activity by nationalized banks (including rural and cooperative banks). The report for the meeting in the summer (usually held in May or June every year) summarizes annual information for the financial year ending on March 31st. One table in the report includes lending by banks in the various priority sectors, crop loans, and loans under various other schemes as well as the number of KCC cards issued in the preceding year. Another table includes credit and deposit by district. Data from these tables form the basis for measures of KCC credit and financial development. It is important to highlight here the fact that KCC loan amounts are actually not available by district only until recently (starting with the 2008-09 report). However, as we mentioned earlier, as early as in 2004, the RBI noted that almost all crop loans were being routed through KCC. Hence, we use the crop loan value from 2004 onwards as a measure of KCC lending for the district level analysis. On the other hand, the number of KCC accounts issued in a given year is explicitly listed. Since account holders are eligible to borrow every year for three years (i.e. until the account is up for renewal), instead of using a particular year's measure of new accounts, we use the sum of that year and the preceding two years accounts. This gives us a more accurate measure of account numbers against which lending activity can take place. For both the inter-state and inter-district analysis we look at the amount loaned as well as the account holders. At the district level, we do not have value added data for sufficient number of years, so we primarily rely on the yield of foodgrain crops as a

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[16]Indiastat cites Ministry of Agriculture as their sources. For some overlapping years, we confirmed that the data matches those published in the annual Agricultural Statistics at a Glance published by the government. Unfortunately only selected volumes of the official publication were available online.

[17]Rural population numbers are available for both census years. However, agricultural workers is only available for 2001 census. We need agricultural workers to calculate agricultural productivity. To extrapolate agricultural worker numbers for the remaining years, we assumed that the ratio of agricultural workers relative to the rural population is unchanged. Needless to mention, this is a substantial assumption since the rural population tends to become increasingly "non-farm" with economic growth.

dependent variable.

For the state level analysis, we ask three different questions a) What are the determinants of growth in KCC lending over the period 2005-09, b) Did Bihar do better or worse during this period relative to other states? In other words, is there a "Bihar" effect? In particular, we look at Bihar's performance relative to other BIMARU states as well,[18] and finally, c) whether higher KCC lending led to higher growth rates of overall state GDP per capita, agricultural GDP per worker, and yield. At the district level, we revisit question (a) and (c) though the latter can only be done for a limited time span which unfortunately does not overlap with the bulk of the period of high KCC growth in Bihar.[19]

To examine question (a) and (b), we run both ordinary least squares (OLS) and fixed effect (FE) regressions. The main aim of this section is simply to identify any patterns on credit growth. The OLS specification is,

$$
\ln(KCC \text{ variable}_{i,t}) = \alpha + \beta \ln(KCC \text{ variable}_{i,t-j}) + \gamma \ln(FINDEV_i) \quad (1)
$$
$$
+ \theta_1 BIHAR_i + \theta_2 BIMARUXBR_i + \Theta' X_{it} + \varepsilon_{it}
$$

In this specification, the dependent variable is a measure of KCC (amount relative to GDP or account holders relative to rural population). The independent variables include a lagged value of KCC to control for path dependency, a control for financial market development (usually commercial bank credit to the agricultural sector relative to agricultural GDP) and some additional controls such as the lagged share of agriculture and literacy rates. We run an OLS version of the regression using values of the dependent variable from 2009-10, the latest year for which we have the necessary data. To test if Bihar's achievement was any different from other states, we include two variables, a dummy variable for Bihar and a second dummy variable for other BIMARU states. The latter is done to rule out the possibility that the Bihar effect might pick up a more general effect that is applicable for all BIMARU states. For this specification, we also run regressions including an average growth rate for the intervening period as a control to ensure that the Bihar effect does not simply reflect the high growth Bihar has experienced. Given that we use dummy variables for some states, obviously we cannot run fixed effect regressions under this specification. For the fixed effects version, instead of averaging we examine annual values. However, given

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[18] Other BIMARU states include Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Uttarakhand, Rajasthan and Odisha.

[19] This is because the district level GDP data is available only for the years 2004-5 to 2007-08.

the small number of states, usually twenty eight, and the small number of years, three, the fixed effect regressions should be taken with a degree of skepticism. Furthermore, it is well known that with lagged dependent variables, estimated coefficients are biased and it is more advisable to use an Arellano-Bond GMM estimator. However, such GMM estimators are valid only for large samples and small time periods which is not applicable in this setting. Moreover, one usually needs at least 4 time periods to undertake such estimates which we do not have.[20] Our fixed effects equation is,

$$\ln(KCC \text{ variable}_{i,t}) = \alpha_i + \beta \ln(KCC \text{ variable}_{i,t-j}) + \gamma \ln(FINDEV_{it}) + \Theta' X_{it} + \varepsilon_{it}$$

Moving on to (c), where we examine the impact of KCC on more macro aggregates, our specification is broadly in line with standard growth regressions going back to Mankiw, Romer and Weil (1992) and King and Levine (1993). Therefore, we include a lagged initial value and additional controls particularly to control for education and investment. Therefore, we have,

$$\ln(\text{Growth}_{i,t,t-j}) = \alpha + \beta \ln(\text{Initial GDP}) + \gamma_1 \ln(KCC \text{ variable}_{i,t,t-j}) \quad (2)$$
$$+ \gamma_2 \ln(FINDEV_{it,t-j}) + \Theta' X_{it} + \varepsilon_{it}$$

For these exercises we look at the effect on growth rate of GDP per capita, growth rate of agricultural GDP per worker, and the growth rate of yield per hectare over the period 2005-2009. We run OLS regressions with measures of KCC lending relative to GDP over this time period or KCC Account holders relative to the rural population over this time period. To control for human capital, we included literacy rates. Capital formation data is not available for states. As a proxy, we used the average annual outlay for each state from the eleventh planning commission relative to state output. However, we should mention here that neither literacy rates nor plan outlays were significant in any of our regressions and given the small sample, we have not included them in the estimates presented here. To control for the growth of overall credit, we include the commercial bank credit to GDP ratio as an additional control. We use all commercial bank credit relative to state GDP per capita when the dependent variable is state GDP per capita growth, and agricultural credit relative to agricultural GDP when we look at the impact

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[20] Also, since the 2008-09 KCC data is unreliable for the state level analysis, we cannot do fixed effects for KCC account holders (since that requires use of lagged values in the construction of account holders, as described above.)

on the agricultural sector. Finally, to the extent that the overall output composition of the state can explain difference in economic growth, we also include the initial share of state output in agriculture.

In addition to estimating direct effects, we also examined whether there were non-linear effects. In particular, it has been repeatedly shown that states that did better during the pre-liberalization period did even better during the post liberalization era.[21] To check if this is also true with the KCC scheme, we also add an interaction term, KCC variable$_{i,t,t-j}\times$Initial Agricultural Productivity$_{i,t-j}$. Finally the growth exercise is also repeated using fixed effects rather than OLS. When examining the district level variation within Bihar, we conduct exercises in more or less the same spirit. We do not have as many variables but we do have a larger sample (Bihar has 38 districts, while for Indian states, by the time one adds all the controls, we are down to only 28 observations). However, because of the fewer number of variables, we did not conduct fixed effect regressions for Bihar.

3 Results

3.1 State Level Analysis

3.1.1 Trends and Patterns

Before we discuss the regression results, it is useful to look at some data patterns and trends for the KCC measures, overall financial development and overall state growth. The summary statistics for these variables are presented in Table 1.[22] Growth rates in GDP show considerable variation ranging from 3.3% (Jammu and Kashmir) to 11.8% (Uttarakhand). Bihar's average growth during this period is half a percentage point higher than India's. When we look at the two measures of agricultural growth we some interesting contrasts. Looking at agricultural output per worker, we see that growth for India as a whole at 3.7% was almost half of overall GDP per capita. Thus even though the denominators are different (workers vs population), it is clear that agriculture was a drag on growth. However states like Maharashtra grew at 10% while for Bihar, it seems that the "growth miracle" happened despite zero agricultural growth. However, when we look at yield growth which is measured in terms of kilos per hectare of foodgrain

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[21] On more evidence on divergence across Indian states, see .Kocchar et al (2006), Ghani et al (2010) and Kumar and Subramanian (2011).

[22] For all regressions, we exclude Chandigarh and Delhi since one is a union territory cum city and the second is a city state.

production, we see Bihar looks much better with 3.8% High yield growth in agriculture accompanied by poor labor productivity growth need not be a contradiction. In fact it might be a sign that growth in output has been due to a rising labor-land ratio. This could be worrying to the extent that it implies an unbalanced growth of factor inputs have largely driven output growth as opposed to technological improvements. This is something we leave for future research.

The commercial bank credit variables also provide some interesting insights. The Commercial bank credit ratio to overall GDP for India is at 60%. If one looks instead at agricultural commercial bank credit to agricultural output, the average for India is 50%. These numbers are very close and seem to indicate the the financial sector penetration in the agricultural sector is almost as good as that of the economy overall. It is unlikely that this reflects a composition effect, i.e. the former number being high because the agricultural sector is a large part of the economy. In fact the share of agricultural sector, in nominal terms was around sixteen to seventeen percent, hardly enough to create a large composition effect. For Bihar, both these ratios are less than half of that of India's. Next we look at commercial bank KCC credit relative to overall commercial bank credit and commercial bank agricultural credit. For these ratios its useful to keep in mind that the numerator is the amount of KCC credit issued in a given year. One problem with the data is that it is not clear how much of the approved credit line was actually borrowed as opposed to being left unused. The denominator, commercial bank credit, is on the other hand a stock variable since it captures all outstanding credit. As a result the ratios might be smaller than what we would have seen if we had a flow measure for the denominator.[23] Keeping these in mind, we can see that KCC lending relative to commercial bank credit even for the agricultural sector is relatively small at ten percent for all of India. Indeed for Bihar it is actually higher at fifteen percent. This may reflect the possibility that in Bihar, almost all agricultural credit by commercial banks is short term and not long term (or what we earlier referred to as indirect finance). Hence, it is not entirely a good sign.

Finally, we summarize the two variables that we actually use as our measure of KCC penetration- the amount of credit relative to agricultural output and the number of account holders relative to the rural population.

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[23] One strategy is to take the difference in outstanding credit between one year and the next to proxy for a flow. However this reflects net new credit (new amounts issued less old loans repaid). This can exaggerate the magnitude of KCC lending relative to other types of lending. We did try it, but did not pursue it further since some states recorded negative values of net new credit.

KCC credit here includes credit issued through all three bank types. While the Indian average for the former is at around 8%, Bihar is actually not too far behind at 6%. Also, the mean value of all states is similar to that of Bihar. Not shown on the table is also the fact that Bihar's value is also the median value. When it comes to KCC relative to the rural population, we see much lower numbers in terms of reach- for India as a whole this is at three percent while that for Bihar it is much lower at less than two percent. KCC credit is usually given on the production of land certificates. Therefore, in theory, only cultivators are eligible for KCC credit. This can cause our second variable to be low for possibly two reasons - a) if the share of agricultural workers in the rural population is low, and b) if the share of cultivators within the agricultural workforce is low. Therefore, it is plausible to argue that one should look at KCC account holders relative to the number of cultivators. Unfortunately, such numbers are not available since information on cultivators versus wage laborers is only available from the 2001 census. We tried extrapolating the data by assuming that agricultural workforce share of the rural population has not changed. We did not get substantially different results. We chose not to present them here since these values can contain large measurement error specially for fast growing states such as Bihar since, with rapid growth, workers tend to migrate to non-farm rural jobs.

Having discussed the overall patterns, we briefly look at pairwise correlations next. The results for these are displayed in Table 2. Gleaning the table, one of the first striking features is how little the three outcome variables are correlated with each other. The correlation between overall state gdp per capita and agricultural productivity is weak and the former is uncorrelated with yield growth. Moreover, yield growth itself is uncorrelated with agricultural productivity growth. Both measures of commercial bank credit are correlated with overall state output growth but have little relation with agricultural growth. More surprisingly agricultural credit from commercial banks is weakly correlated with both measures of agricultural outcomes. The KCC variables themselves are more strongly correlated with output growth rather than agricultural growth. It is perhaps premature to read too much into the simple correlations but nevertheless, it is somewhat disappointing to see no strong effects between any of the agricultural credit measures and agricultural growth.

Moving on from five year averages, we now depict some over trends with respect to KCC credit. Figures 1 and 2 do precisely that. In figure 1, we plot the KCC credit to Agricultural GDP ratio for 2005-09 to 2009-10. This covers less than half the time KCC has been in existence but also coincides

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with the period which the national government has made a strong push for financial inclusion. It is apparent that KCC credit relative to agricultural GDP has not necesarilly increased for all states. In fact Karnataka (which was a leading state in KCC adoption initially) has seen its credit share fall. On the other hand, Bihar has shown significant progress and by 2009 was actually among the top three large states.[24] In fact, India (IN) as a whole has seen the ratio decline. Figure 2 captures the trend for account holders instead of credit flows. As discussed before, account holders are aggregated over the current year and the two previous years keeping in mind that the KCC accounts have a three year validity. Hence aggregating over a three year period provides a better measure of the number of potential borrowers. Relative to the rural population it does not seem as though states have made huge gains in KCC account holders. This is true for India as a whole. However Bihar and Himachal Pradesh are obvious exceptions.

Before we wrap up the discussion on stylized facts, we also draw attention to the variation in source of KCC lending. While commercial banks are usually the largest lender, regional rural banks play an important role as well. Table 3 highlights the patterns based on some selected states. For India, as a whole, the role of commercial banks has increased remarkably form 40% to about 70%. However, underlying this is remarkable variation. Andhra Pradesh, one of the states with stong KCC penetration, reflects the national pattern with commercial banks cementing their dominance during this five year period. Bihar on the other hand, shows zero cooperative bank participation initially but has seen this increase a little over the years. Overall, commercial banks and regional rural banks tend to dominate. In Kerala, we see something entirely different where commercial banks and cooperative banks have an almost equal share. This is fairly stable over the five year period. These statistics reflect back to our earlier concern that most of the research literature on financial development in India uses commercial bank data. However, when it comes to short term agricultural credit ignoring the regional rural banks and cooperative banks not only implies leaving out thiry percent of credit activity but also some of the variation that might play an important role in productivity growth.

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[24]For the abbreviation codes, please see appendix 3.

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3.2   Regression Results

3.2.1   Determinants of KCC lending

Table 4 displays ordinary least squares estimates based on the specification in equation (1). The dependent variable in columns (1) and (2) are the KCC credit amounts relative to agricultural GDP in year 2009-10. In columns (3) and (4) it is the No. of KCC Accounts issued in 2009 and the preceding two years relative to the rural population. For columns (1) and (3) the dependent variables include the four year lagged value of the independent variable, a lagged measure of agricultural gdp per worker, a lagged value of the share of agriculture in state GDP, average of commercial bank lending to the agricultural sector relative to agricultural GDP during this period. The dummy variable BIHAR is meant to capture Bihar's relative performance while BIMARUXBR is an added control to ensure that any Bihar effect does not reflect an overall effect from Bimaru states. Finally, we also have a measure of rural literacy based on the National Family and Health Survey reports for 2005.

We can see from the results that the lagged initial value of KCC credit is not significant in explaining KCC credit lending in 2009. In other words, there was very little relation between states who received high levels of credit in 2005 and those that received credit in 2009.[25] The lagged agricultural productivity measure is present to check whether states that were more productive initially were more likely to gain access to KCC credit. Again, we see no evidence that this is true. Of course, it is possible that these states had by 2005 had already received a lot of credit and hence their was very little growth between 2005 and 2009. As a check, we dropped the lagged initial value of KCC credit to see if that was indeed the case, and found it did not alter the insignificance of initial agricultural productivity. The lagged nominal agricultural share of output was included to see if states with high agricultural output received better access to the KCC scheme during the subsequent five years. Indeed, we find that is the case. This is a positive development. Rural literacy does not seem to play a significant role in explaining which states gained more credit during this time period. Finally, if we look at the dummy variables, then we see that both BIHAR and BIMARUXBR are significant in explaining the credit share in 2009. A comparison of the coefficient size and the significance suggests that

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[25] Looking back at figure 1, one might wonder whether this week relationship is because of Pondicherry. However, Pondicherry ends up being excluded from the regressions anyways, because we do not have rural literacy rates for 2005.

this result be taken with cautious optimism as far as Bihar is concerned. Clearly, Bihar has done well during this time period. However, it seems that other BIMARU states as a group have done better in implementing the KCC scheme. In column (3), we modify the regression in two ways. First we replace the lagged productivity variable by looking at yield instead of output per worker. Second, we also add the average growth rate of GDP per capita in states to control for the possibility that the strong Bihar and BIMARU effects are simply not picking up the high growth rates that these states experienced during this period. In other words, were the gains in KCC simply a byproduct of high growth or did the states actually achieve improvements that were orthogonal to the high growth rates? Column (2) shows clearly that this is not a concern. The growth rate during that time period is not significant in explaining KCC credit in 2009, and both the Bihar and BIMARU effects remain. A possible reason for this strong effect might be that these states were late to adopt the KCC scheme. We know that southern states as well as some others like Maharasthra implemented the KCC scheme enthusiastically soon after its inception. On the other hand the Bimaru states lagged in their adoption of the scheme. Thus, the strong effect might simply be a proxy of being a late adopter. Finally, from columns (1) and (2) it is patently clear that overall commercial bank credit to agriculture is an important explanation for KCC credit in 2009. This is not surprising since, from table 2, we have already seen that KCC credit and commercial bank agricultural credit are strongly correlated.

In columns (3) and (4) we replace KCC amounts by the number of KCC account holders. These regressions present some interesting contrasts. First of all, the lagged values are extremely significant in explaining current values. It is important to remember that we are now talking about shorter time periods, (2005-07 vs 2007-09) with at least one year of overlap. Figure (2) already highlights the strong persistence across these two periods. Moreover, the significance of commercial bank credit now goes away, even though table 2 suggests a strong association between our measure of KCC account holders and commercial bank credit. The role of initial productivity continues to be unimportant and so does literacy. However, when it comes to Bihar and other BIMARU states, we see something entirely different. Clearly Bihar has made strong gains while other BIMARU states do not seem to have made equivalent gains. Finally, in column (4) when we add the growth rate as an additional control, Bihar's strong gains continue to hold up.

Overall, the table seems to send a mixed message. When it comes to actual credit amounts, the relative size of the agricultural sector and the extent of agricultural credit seems to matter. However, when it comes to

the actual number of account holders, there is strong persistence. Taken together this might imply that the reach of credit in terms of people being included has not changed substantially. However the amount of credit has changed over time. Finally, Bihar is an exception to both trends.

In Table 5, we redo the regressions with fixed effects instead of ordinary least squares. Instead of five year averages, we now use annual data. Since we have only a limited number of years, and many variables are lagged values, we cannot undertake estimates for KCC account holders. Also, it is not possible to control for Bihar or other Bimaru states. Finally, it is well known that dynamic panel data models can produce biased estimates when using fixed effects. Therefore the results have to be interpreted with a sufficient level of caution. Looking at the table, we can see two important differences compared to the OLS results. First, the initial agricultural output share is no longer important. Secondly, in column (2), with the previous year's growth rate thrown in, we see that yield becomes significant at the five percent level. Overall, the fixed effects regressions do not convey much information beyond the role of commercial bank credit.

3.2.2 Growth Effects of KCC lending

The effects on GDP growth are shown in the next four tables. First, we present some OLS results based on a standard cross section growth framework as presented in equation (2). The first three columns of table 6 present the results when the KCC amount loaned is the independent variable, and the next three columns present results when the account numbers are used as a control. The other independent variables are the logarithm of the inital value of the dependent variable, initial value of the share of agriculture in total output, the average value of the relevant KCC variable during that time period, and the average value of commericial bank credit relative to output during that time period. For commercial bank credit, we use the agricultural credit relative to agricultural output when the dependent variables are agricultural productivity and yield. We use total commercial bank credit relative to state domestic product when the dependent variable is state domestic product per capita growth. We also controlled for literacy rates and plan expenditures as a share of state output in our initial estimations, but since they were never significant and we are already restricted to twenty eight observations, we dropped them from the exercise.

Overall, the results are mostly disappointing. - neither KCC amount loaned nor KCC accounts issued have any significant effect whatsoever. This is true irrespective of the dependent variable of interest. Furthermore, we

can also see that during this period there was no convergence dynamics at play either. However, it is too short a period of time to make any realistic inference regarding convergence. It is only with yield growth that we see some signs of convergence. The only interesting result here is the role of agriculture shares on subsequent economic growth. States that have had low initial shares of agriculture have done well both in terms of subsequent growth in overall GDP per capita and agricultural productivity. However, this is not the case for yield. Normally, states with low initial shares of agriculture would also be states with high initial levels of income. Therefore this would be indicative of a "divergence" dynamic. However, since initial income is already controlled for, it suggests that some other divergence dynamics might have been in play which are related to the structure of the economy that is orthogonal to initial productivity.

In table 7, we ask a slightly different question. Going back to Nelson and Phelps (1966), it has been argued that the ability for countries to play catchup is largely dependent on its level of human capital. Since then this literature has extended this concept to a wider set of variables applying the phrase, absorptive capacities. These variables include property rights, instituttions, financial markets, trade policy, etc.[26] A natural extension for this paper is to see if such non-linearities are also present in the case of KCC. More specifically, it would be interesting to know if the growth effects of KCC lending have been asymmetrical across states. The literature on growth in Indian states has highlighted the fact that states which were already rich in the pre liberalization period did even better during the post liberalization period. Given this background, we check whether the KCC scheme was more beneficial to states with higher initial levels of productivity. Since the scheme was designed to benefit the agricultural sector, we look at the non linear effects on the agricultural productivity variables (and not overall state output growth). Perusing through table 7, we can see there no obvious role for such non linearities here. Neither KCC interacted with agricultural output per worker, nor KCC interacted with initial yield is significant. The message from tables 6 and 7 clearly indicate that at least during this phase KCC credit did not have any major growth effect.[27]

In table 8, we revisit the BIMARU effect. Having already seen that the BIMARU states outperformed other states in KCC penetration during this period, we check to see if that is true for economic growth in general. The results reflect what we already know and also the correlations we have seen

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[26] See World Bank (2001).

[27] We also did fixed effect regressions but found no role for KCC there either.

in table 2. Clearly Bihar's growth performance has been different from that of other states. It is interesting to see that other BIMARU states have not outperformed other states even though they did better with KCC lending. In all fairness, since we have grouped all the other BIMARU states as one dummy variable it is likely we are missing out on above average performance for a subset of them. Interesting, Bihar is also a significant underperformer when it comes to agricultural gdp per worker growth while on yield, it weakly overperforms. Thus for Bihar we have a troika of results that require more research - significant overperformance in KCC credit accompanied, by average performance in yield but underperformance in agricultural labor productivity.[28]

Reverse Causation So far we have remained silent on the issue of reverse causation. Needless to mention, ex-ante the potential of high agricultural growth can increase the incentive for farmers to borrow from KCC or for that matter any other lending vehicle. The problem of reverse causation is well known in the finance and growth literature where this has largely been handled by relying on exogenous variations in legal systems. Obviously, we do not have that option for a very specific credit policy tool such as the KCC. To address this issue, we constructed an instrument based on landholding. A reading of the KCC documents such as the planning commission's 2002 report indicates that the success of the KCC scheme can be evaluated by comparing the number of account holders to the number of eligible landholdings.[29] Thus, using data from the agricultural census, we constructed a measure of landholdings relative to the rural population. A few clarifications are in order. First of all, one household may own more than one landholding and hence this might be an overestimate. Secondly, the same landholding might be subject to a number of distinct tracts that are owned by various members of an extended family. In that case each of these households would be eligible for a card. The number of landholdings would then underestimate potential borrowers. Thus measurement error might lead to too high or too low a value. Secondly, even if we can use landholdings as an

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[28]One possibility that might be explored further is the role of the National Rural Employment Guarantee Act (NREGA). It is possible that by encouraging rural populations to not migrate for better opportunities, it could have reduced agricultural productivity and offset the positive effects of better credit. On the other hand easier access to short term credit and more abundant supply of labor could have complementary effects on agricultural productivity. We plan to investigate this further in future research.

[29]In the 2002 report, the authors divide the total number of landholdings by two to evaluate the target penetration of KCC accounts. See Planning Commission (2002), section 3.3.2.

instrument, it may also affect agricultural growth directly and therefore one would need to test its validity as an instrument. While landholdings can be potentially used as an instrument for KCC account holders, we need a different strategy if we wish to instrument KCC amounts being loaned. As a crude proxy, we took the number of landholdings and multiplied that by the all India average KCC amount being loaned. This gets rid of potential state effects in calculating the amount. One of the advantages of using landholding data is that the last agricultural census took place in 2005, which is right at the beginning of our period of analysis.

In addition to instrumenting KCC lending, we also need an instrument for commercial bank credit. Burgess and Pande (2005) note that since liberalization, in 1991, rural branch expansion had more or less stalled. We exploit this stagnation and use branches per capita as an instrument for commercial bank credit. For agricultural credit, we use rural branches per rural person and for aggregate credit, we use total branches per person in the state. We use numbers for 2005. It should be noted that 2005 was the last year of stagnation. In fact in 2005, rural branches per capita was less than what it was in 2001. With the renewed push for agricultural credit, the data suggests a clear increase in branches per capita after 2006. For all branches, rural and urban there is no such decline and hence the instrument is likely to be less valid.

Unfortunately, just as in the OLS regressions, the instrumental variable regressions also do not indicate any growth effect for KCC. Given the insignificance, we do not present the results here but quickly make a couple of observations. First, table 9 lists some simple correlations between our two instruments for KCC and some of the other key dependent and independent variables. While the instruments themselves are strongly correlated, it is clear that the imputed amount is not correlated with the actual amounts being loaned. However, landholdings do exhibit a stronger correlation of 0.38 with KCC account holders. It is also positively correlated with the growth variables and negatively correlated with initial productivity measures. Finally, it also exhibits a positive correlation with the credit variables. While our second stage regressions were insignificant, we should mention that landholdings per rural person was invariably positive and significant in the first stage. Nevertheless the test statistics indicated that our instruments were only weakly identified. Of course, the problem is compounded by the fact that we have only 27 observations.

3.3 District Level Analysis for Bihar

So far we have examined the relative performance of Bihar in the context of other states. However, across the thirty eight districts of Bihar, there is sufficient variation in economic activity that it is worthwhile to examine the same effects. Further, from a policy perspective, drilling down to a district level allows us to uncover local differences after controlling for both national and state policies.

As discussed earlier in section 2, the data for KCC lending at the district level comes primarily from SLBC documents. We use crop loans as a measure of amount loaned via the scheme and account holders as before. One of the advantages of relying on SLBC documents, is that we have a slightly longer span of data.[30] Unfortunately, at the district level we have much less reliable data on value added and more so at the sectoral level. While the government of Bihar has created data at the district level equivalent of net domestic product, this is only available from 2004-05 to 2007-08. Furthermore, sectoral value added data is only available for 2004-05. We extrapolate sectoral data up to 2007-08 based on the 2004-05 shares but obviously one should be cautious given the fast pace of economic growth which usually translates into rapid structural shifts. Therefore, we mostly rely on food-grain productivity for which we have data from 2005-06 to 2009-10 from the government of Bihar's economic surveys. For measures of overall credit, we have data on "all loans" from SLBC documents as well as "advances". It's not clear from the documents what the differences are, but since the latter is usually a larger number, we use that as our broad measure of credit.[31] We first begin, by looking at the evolution of the two variables, crop loans (as a share of all advances) and accounts issued (relative to rural population) for Bihar over as many years as possible. This is displayed in table 10. The first two columns are self explanatory. The third and fourth columns uses our strategy of adding up KCC accounts issued over three years to get a better sense of total number of account holders in existence. The third column divides the number by rural population while the fourth divides it instead by agricultural workers. As the numbers indicate, Bihar has made considerable progress over the decade. A major jump in the amount that was being loaned seems to have happened between 2006-07 and 2007-08. Looking at

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[30]In principle, we have data going back to 2001 but since there is a danger that going back that far might increase measurement error if we rely on crop loans. However, there is no such danger for data on account holders.

[31] "Advances" is used in the calculation of the credit-deposit ratio. During our period of study it exceeded all loans by almost 50 to 100%.

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the rest of the figures it is clear that this jump is based on an increase in the credit limits rather than an increase in the number of people acquiring accounts. Moreover, this is Bihar specific since there is no apparent jump for India as a whole.[32] It is only in the next year, 2008-09, that we also see a huge jump in the number of account holders relative to the rural population.

Figures (3) and (4) provide an overview of districtwise achievements of crop loans relative to advances and account holders relative to the rural population.[33] Using both measures, we see uniformly large gains across the board. From figure (3) we can observe that the only districts with declines are Kaimur, Munger and Purnea. Purnea and Kaimur had large shares to begin with but did not make further gains. Munger is the only district that experienced a sizeable decline from ten percent to six percent. Significant gains were achieved by a number of district but clearly Jehanabad and Saharsa made noticeable strides. The former went from seven percent to forty percent while the latter went from a measly three percent to thirty two percent. Supaul also recorded similar gains. Finally, it should be obvious that, Patna not being a rural district, did not show much gains. This applies to Gaya as well. Figure (4) shows trends in KCC account holders. We see similar across the board gains. Interestingly Kaimur which did not experience an increase in the amount being loaned relative to all advances, experienced a doubling in the population share of account holders.

As in the state level analysis, we first visit the question of determinants of KCC lending. We use two dependent variables - crop loans as a share of district agricultural NDP and KCC accounts as a a share of the rural population. Both are similar to the measures used in the state level regressions. However, as we mentioned earlier district level NDP stops with 2007-2008 and hence we the period of study is limited to three years. This is not the case with KCC account holders for which we have longer data and hence the span is longer at six years. Like earlier we control for differences in initial values of the dependent variable, initial agricultural share of output, initial agricultural productivity, and initial credit to district GDP ratio. The results are displayed in table 11. In the state level analysis, we saw that whether we use agricultural output per worker and foodgrain yield seems to have asymmetric effects on econometric estimattes. Hence we alternate between the two as our initial measure of productivity. From the table we can see that with both dependent variables, their initial values are mostly

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[32]We have also checked to rule out the possibility that advances might have gone down. The actual amount of crop loans doubled between these two years.

[33]The district codes are provided in appendix 4.

significant. However, there are some important differences. If we look at the size of the coefficient, then we can see from column (3) that the initial value of KCC account holders is less than one. In other words, when it comes to account holders there is evidence of conditional convergence. However, when it comes to crop loan shares, the coefficient size is greater than 1. Therefore, the latter exhibits divergence. In other words, while district level inequalities in the number of people with access to credit was declining, inequality in the amount of credit was increasing. However, the crop loan to output ratio data ends with 2007-08 so it is difficult to know whether this was just a temporary development. Other than initial values, we can see from the tables, that low initial agricultural output shares and low initial yield were associated with larger crop loan shares three years later. Finally, from the R-squares, one can see that we do much a better job of explaining loan to GDP ratios than account holders.

One of the more sensitive issues about KCC lending has been the blame game between the state government of Bihar and the commercial banks. State leaders are often vocal about the lack of enthusiasm showed by commercial bank lenders. There is no doubt that some of the reluctance on the part of the commercial bank lenders is the fear of default which they believe to be very high. From our conversations with many bank officials it was clear that borrowers often consider the money to be a grant. This feeling of entitlement is further accentuated by the fact that borrowers often have to pay a bribe to get the loan approved.and hence believe that the money does not have to be returned.[34] The second problem as we discussed already is the fact that multiple accounts are held by the same borrower through different banks. Bihar is also different even from neighboring Uttar Pradesh as the land records have not been digitized. As a result it is easy to bribe the local official and claim multiple ownerships of the same piece of family land. This is particularly true in extended families all of which claim rights to different but also overlapping portions of the same swathe of inherited land. One of the constant gripes of the government has been the fact that commercial bank officials do not show up at government organized camps. These government organized camps are held to implement mass enrollment in the KCC scheme. Commercial bank officials counter this allegation by indicating that these camps are held in the late morning hours when it is

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[34]The fact that bribes are charged for KCC loan approval is indicative of the desirability of these loans. Indeed, it was found that it was easier to pay a field officer (who approves the land certificate), five thousand rupees to handle the paper work. Furthermore, because of KCC's low rates of interest, those who could borrow money were becoming the new money lenders to those ineligible for the account. See Singh (2008).

difficult to send a loan officer away from branch banking duties and it is easier to do this in the afternoon. Obviously underlying this blame game is the fact that there is a fear of default given that it is easy to provide counterfeit documents.

In this context, we decided to check if certain banks were better at giving KCC loans than others. One of the key features of the Indian nationalized banking system is the appointment of a lead bank in every district. Usually this bank will have the largest number of branches within that district. For any econometric exercise this has an added benefit that the lead banks in Bihar are large national banks that were allocated their districts back during the nationalization era. Therefore, their location is not a consequence of the KCC scheme. In Bihar, the largest lead banks are Punjab National Bank, Central Bank of India, State Bank of India,and UCO bank with responsibilities for 12, 10, 7 and 4 districts respectively.[35] To test if the lead bank matters in the rate of KCC adoption, we created dummy variables for each of these four banks and reestimated the regressions in table 11. The results are presented in table 12. Adding four more variables obviously reduces the degree of freedom and hence one needs to be cautious in interpreting the results. Looking at both measures of KCC adoption, the evidence is weakly supportive of Punjab National Bank having a positive effect. And while the other three banks have a negative coefficient, it is not significant.

3.3.1 KCC and Growth Across Districts

Finally, we revisit the question of agricultural growth and KCC lending. Our dependent variable is foodgrain productivity and we examine the period 2005-06 to 2009-10 (ie the same as that for the state level analysis). As independent variables, we use KCC accounts issued issued over three years relative to the rural population, and the share of crop loans in advances (even though ideally we would like to use crop loans as a share of net domestic product). As control variables, we use initial value of foodgrain productivity, initial share of agricultural output in district NDP, the credit-deposit ratio and logarithm of average rainfall over the period and rainfall squared. The last two variables were chosen since agricultural production in Bihar is still very dependent on rainfall. However excess rainfall means floods, and hence we also included the square term. We first look at the pairwise correlations for these variables in table 13. The simple correlation between foodgrain yield growth and the KCC variables is negative for account holders, and near

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[35] Other banks with one or two branches each are Bank of Baroda, Canara Bank, and Union Bank.

zero for crop loans. This is obviously discouraging. The two KCC variables themselves are correlated at 0.35 which is not too high itself. Finally, and contrary to what one might expect, initial share of agriculture in output and the cd-ratio are positively correlated. One would have expected this correlation to be negative. Finally, the rain variables are strongly correlated between themselves and are also strongly correlated with the cd-ratio and of course the share of agriculture.

The regression results are reported in table 14. Irrespective of our choice of KCC measure, there is no evidence again that it had any effect on agricultural productivity. Moreover, coefficients of both KCC variables appear with a negative sign. This is not surprising in itself since we saw at least the KCC accounts relative to rural population ratio was negatively correlated with the growth rate. As a double check, we ran an additional regression using growth in agriucltural productivity for the 2004-05 to 2006-07 time period despite the shorter time span. Here too, we saw no effect of KCC account holders. Returning to the negative insignificant effects of KCC on yield growth, we created some scatter plots to get a sense of the relationship. These are shown in figures (5) and (6) respectively. The negative relationship between KCC accounts per rural person and yield growth during this time period is quite apparent and so is the lack of any correlation between crop loans and yield At least based on these regressions, we are yet to see any strong benefit of the KCC Scheme on agricultural productivity growth.

4   Conclusion

The KCC scheme has been in effect now for around thirteen years. Over this period it has become the main, if not only vehicle of short term credit to agriculture and also increasingly as a source of investment and consumption needs of farmers. Given the long period of its existence and the push by the government at various levels, one would have expected to see some real effects by now. Unfortunately, we do not find any indication that the scheme has increased either agricultural labor productivity or land productivity. While this result is disappointing, it needs to be placed in context. First of all, despite the length of the scheme, we have been handicapped in our data for several reasons. First of all, at the state level , we do not have KCC data preceding 2005. As a result we miss out on the initial surge of accounts that some early adopters experienced. Secondly, in dealing with a sample of only twenty eight states, any result would be necessarilly fragile. Third, since the credit is for short term needs and does not reflect long

term investments, it is possible that it may have lead to reduced volatility in growth rates. Unfortunately we do not have enough observations to undertake this analysis. Moreover, it is possible that given the low interest rate that is offered for these loans, and the anecdotal evidence on borrowers making arbitrage gains, that these loans are being used to finance consumption mroe than actual agricultural needs. To get a better answer to these questions, it would be ideal to combine district level lending data with district level consumption data available from sources such as the National Sample Survey, and also district level yield data that should be available with various states. Needless to mention this would be a much more ambitous research agenda that is beyond the scope of this project. Nevertheless given the amount of resources that the central and state governments have devoted to this scheme, it is important to know whether there have been actual payoffs.[36] Also, it is important to know whether this scheme has actually reduced transaction costs for banks, and their default rates.

Returning to the results here, we can summarize, two overall themes. First, there is very little systematic relationship between the extent of KCC lending and characteristics of the agricultural sector at the state level. In otherwords, initial agricultural productivity, share of agricultural output etc do not provide any indicator of the extent of KCC implementation. The only strong correlation is the extent of financial sector development however this might reflect some inbuilt double-counting. Looking at the strong effect of Bihar and other BIMARU states, the main conclusion that one can draw, is that the degree of KCC adoption largely depends on state specific factors that are uncorrelated to their agricultural sector. Though difficult to test statistically, one can conjecture that this reflects a political will than any economic variable. At the district level, we find that over the five year period in Bihar, the only strong predictor of KCC growth, is initial KCC. There has been convergence in terms of accounts issued across districts- a positive outcome but divergence in terms of actual amount of crop loans, a potentially worrying outcome. The results nevertheless needs to be treated with caution since the sample is only of thirty eight districts.

Finally, we reflect briefly on some of the discussions that we have had with bank and government officials regarding KCC adoption in Bihar. The sense that one got from both parties is the willingness and desire to adopt the scheme mainly because of its simplicity and potential benefits to the

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[36]Surveys which show that farmers are happy with the scheme are useful. However, presumable any borrower would be happy with a loan with such low interest rates. Therefore, one needs more objective data to evaluate the success of the scheme.

farmers. Nevertheless the same simplicity and attractive features creates the possibility of fraud and hence some obvious inertia by commercial banks. As with any market with information asymmetry, it is likely that borrowers who either have strong ties with their banks or can easilly prove their ability to repay the loans are already participating in the scheme. Hence most of the remaining borrowers are ones that are likely to have difficulty in proving their creditworthiness. One possibility at this time, is to start digitizing land records to reduce the chance of fraud. However, it is not clear to what extent the state government has the capacity to accelerate this process. Perhaps a more reasonable route might be to accelerate the issuance of unique identification cards (Adhar). Since the central government too is more investted in this scheme, it might be faster to implement. Once such cards are available banks can potentially use them to cross check with local banks to rule out the possibility of multiple accounts for one person.

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Figure 1: Growth in KCC Credit Relative to Agricultural GDP (2005-06 to 2009-10)
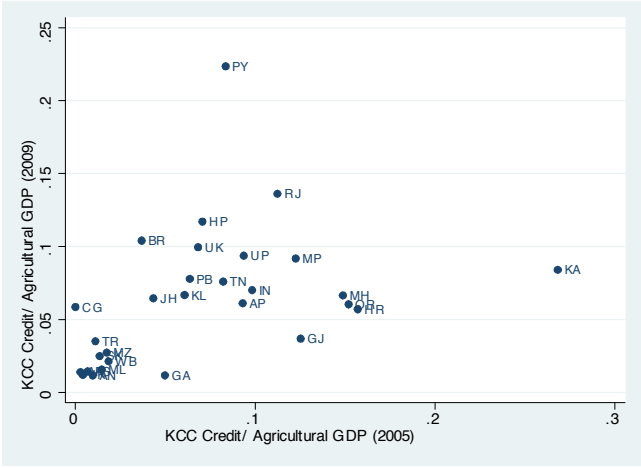
Figure 2: KCC Account Holders Relative to Rural Population
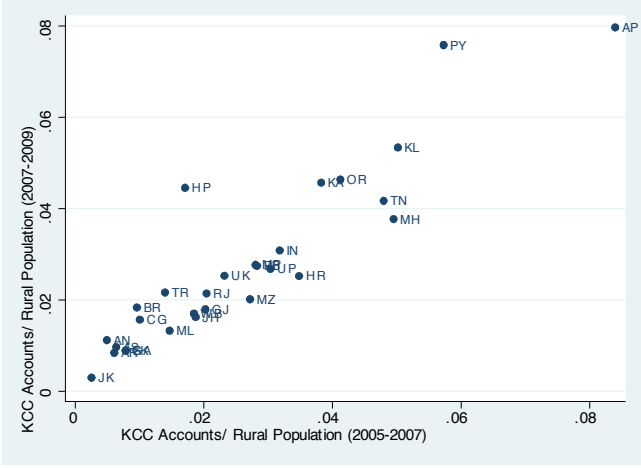
Figure 3: District Level Progress in KCC Lending (Crop Loans, 2004-05 vs 2010-11)

Figure 4: District Level Progress in KCC Lending (Account Holders, 2004-05 vs 2010-11)
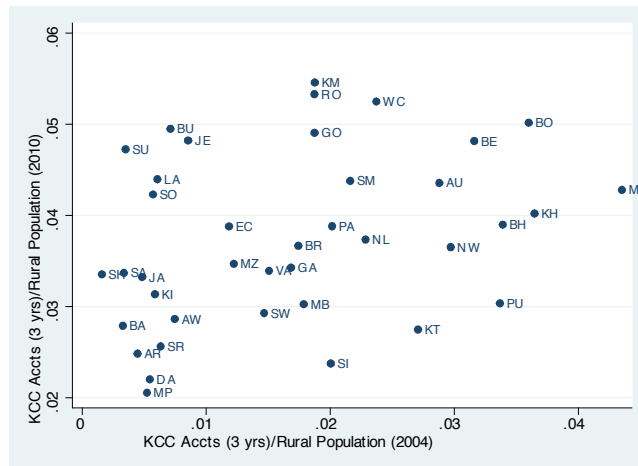
Figure 5: Growth in Foodgrain Yield vs KCC Accounts (2005-06 to 2009-10)
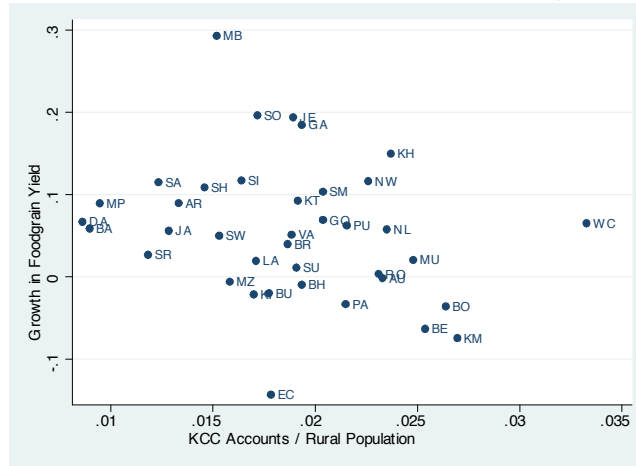
Figure 6: Growth in Foodgrain Yield vs Crop Loan Share, 2005-06 to 2009-10
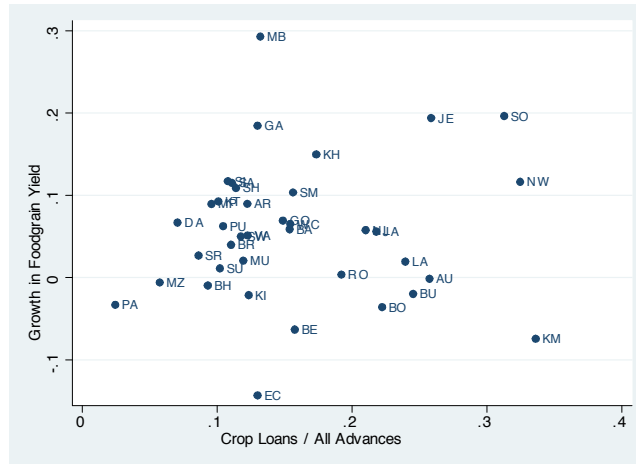
Appendix 1	
Data Sources for Inter-State Analysis	
Variable	**Data Source**
State Net Domestic Product (SNDP) and Population	Reserve Bank of India, Handbook of Statistics on the Indian Economy
State Net Domestic Product in Agriculture	Reserve Bank of India, Handbook of Statistics on the Indian Economy
Agricultural Labor Force (to calculate Agr. SNDP per worker)	Agricultural Work Force as a share of Rural Population based on 2001 Census applied to subsequent years
Foodgrain Yield per Hectare	Agricultural Statistics at a Glance (Ministry of Agriculture) and Indiastat.com
All Outstanding Credit of Scheduled Commercial Banks	Reserve Bank of India, Basic Statistical Returns, Table 4.9
Agricultural Outstanding Credit of Scheduled Commercial Banks	Reserve Bank of India, Statistical Tables Related to Banking in India, Table 6.2
Kisan Credit Card - Amount and Number of Account	Reserve Bank of India, Trend and Progress of Banking in India, Appendix Table V.10 (also includes data by bank type- Commercial, Regional Rural and Cooperative)
Literacy Rate, 2005	National Family and Health Survey, 2005.

Appendix 2	
Data Sources for Bihar Inter-District Analysis	
Variable	**Data Source**
Crop Loans (KCC)	State Level Banker Committee Reports (Bihar)
KCC Accounts	State level Banker Committee Reports (Bihar)
Advances (Credit)	State Level Banker Committee Reports (Bihar)
Credit-Deposit Ratio	State Level Banker Committee Reports (Bihar)
District-wise NDP	Directorate of Statistics and Evaluation, Government of Bihar
District-wise NDP in Agriculture	Directorate of Statistics and Evaluation, Government of Bihar
Foodgrain Yield	Bihar Economic Survey, Govt of Bihar
Rainfall	Directorate of Statistics and Evaluation, Government of Bihar

Appendix 3 State Codes		
State/Union Territory Name	Two Letter Code	2011 Census Code
Andaman & Nicobar	AN	35
Andhra Pradesh	AP	28
Arunachal Pradesh	AR	12
Assam	AS	18
Bihar	BR	10
Chandigarh	CH	04
Chattisgarh	CG	22
Dadra and Nagar Haveli	DN	26
Daman & Diu	DD	25
Delhi	DL	07
Goa	GA	30
Gujarat	GJ	24
Haryana	HR	06
Himachal Pradesh	HP	02
India	IN	0
Jammu & Kashmir	JK	01
Jharkhand	JH	20
Karnataka	KA	29
Kerala	KL	32
Lakshadweep	LD	31
Madhya Pradesh	MP	23
Maharashtra	MH	27
Manipur	MN	14
Meghalaya	ML	17
Mizoram	MZ	15
Nagaland	NL	13
Orissa	OR	21
Pondicherry	PY	34
Punjab	PB	03
Rajasthan	RJ	08
Sikkim	SK	11
Tamil Nadu	TN	33
Tripura	TR	16
Uttar Pradesh	UP	09
Uttarakhand	UK	05
West Bengal	WB	19

	Appendix 4				
	Bihar District Codes				
District No.	**District Name**	**Two Letter Code**	**District No.**	**District Name**	**Two Letter Code**
37	Araria	AR	34	Madhepura	MP
9	Arwal	AW	22	Madhubani	MB
11	Aurangabad	AU	25	Munger	MU
31	Banka	BA	17	Muzaffarpur	MZ
24	Begusarai	BE	2	Nalanda	NL
30	Bhagalpur	BH	10	Nawada	NW
3	Bhojpur	BO	1	Patna	PA
4	Buxar	BU	35	Purnia	PU
21	Darbhanga	DA	5	Rohtas	RO
16	East Champaran	EC	32	Saharsa	SA
7	Gaya	GA	23	Samstipur	SM
14	Gopalganj	GO	12	Saran	SR
28	Jamui	JA	26	Sheikhpura	SH
8	Jehanabad	JE	19	Sheohar	SO
6	Kaimur	KM	18	Sitamarhi	SI
38	Katihar	KT	13	Siwan	SW
29	Khagaria	KH	33	Supaul	SU
36	Kishanganj	KI	20	Vaishali	VA
27	Lakhisarai	LA	15	West Champaran	WC
			0	Bihar	BR

Table 1: Summary Statistics for Selected Variables
(2005-06 to 2009-10 Averages)

Variables	Mean	Std. Dev.	Min	Max	India	Bihar
RNSDP pc Growth	0.07	0.022	0.0336	0.118	0.069	0.074
Agr. NSDP pw Growth	0.037	0.039	-0.033	0.100	0.037	0.00
Yield Growth	0.006	0.046	-0.129	0.073	0.012	0.038
Comm. Bank Credit /GDP	0.394	0.187	0.154	1.002	0.6	0.25
Comm. Bank Agr Credit / Agr. NSDP	0.381	0.315	0.054	1.46	0.5	0.23
KCC Credit /Comm Bank Credit	0.015	0.0124	0.001	0.043	0.012	0.03
KCC Credit / Comm Bank Agr Credit	0.099	0.042	0.011	0.175	0.09	0.15
KCC Credit/ Agr NSDP Ratio	0.063	0.042	0.008	0.136	0.084	0.059
KCC Accts/ Rural Popn	0.027	0.019	0.003	0.080	0.031	0.018

Table 2: Correlations Between Selected Variables
(2005-06 to 2009-10 Averages)

	RNSDP pc Growth	Agr. NSDP pw Growth	Yield Growth	Comm. Bank Credit / GDP	Comm. Bank Agr Credit /Agr. NSDP	KCC Credit/ Comm Bank Credit	KCC Credit /Comm Bank Agr Credit	KCC Credit/ Agr NSDP Ratio	KCC Accts/ Rural Popn
RNSDP pc Growth	1.00								
Agr. NSDP pw Growth	0.36	1.00							
Yield Growth	0.00	-0.01	1.00						
Comm. Bank Credit/GDP	0.40	0.14	-0.03	1.00					
Comm. Bank Agr Credit/ Agr. NSDP	0.49	0.14	0.04	0.49	1.00				
KCC Credit/ Comm Bank Credit	-0.07	-0.44	0.17	-0.10	0.05	1.00			
KCC Credit/ Comm Bank Agr Credit	-0.10	-0.26	0.21	-0.28	-0.22	0.79	1.00		
KCC Credit/ Agr NSDP	0.38	0.10	-0.03	0.34	0.74	0.26	0.07	1.00	
KCC Accts/ Rural Popn	0.39	-0.04	0.06	0.48	0.68	0.53	0.24	0.71	1.00

Table 3: KCC by Source of Credit (2005-06 vs 2009-10)

	Commercial Bank Share	Rural Regional Bank Share	Cooperative Bank Share	Commercial Bank Share	Rural Regional Bank Share	Cooperative Bank Share
	2005-06			2009-10		
India	0.39	0.18	0.43	0.69	0.18	0.13
Bihar	0.68	0.32	0	0.63	0.35	0.02
Andhra Pradesh	0.78	0.19	0.03	0.88	0.12	0.00
Kerala	0.46	0.10	0.42	0.41	0.15	0.44

Table 4: Determinants of KCC lending
OLS Regressions

	Dependent Variables			
	KCC Credit/Agri. NSDP, 2009		KCC Accts/Rural Population (2007-2009 aggregate)	
	1	2	3	4
Independent Variables				
KCC Credit/ Agri. NSDP, 2005	0.122 (0.075)	0.119 (0.078)		
KCC Accts/ Rural Pop. (2007-09)			0.871*** (0.109)	0.901*** (0.104)
Log Agri. NSDP / Worker, 2005	-0.008 (0.009)		-0.001 (0.004)	
Log Yield, 2005		-0.016 (0.018)		-0.004 (0.006)
Agri NSDP/ State NSDP, 2005	0.218** (0.079)	0.235** (0.1)	0.036 (0.03)	0.04 (0.027)
Literacy Rate, 2005	0.001 (0.001)	0.001 (0.001)	0.000 (0.000)	0.000 (0.000)
RNSDP pc Growth (2005-09)		-0.027 (0.268)		-0.021 (0.062)
Comm. Bank Agr Credit/ Agr. NSDP, 2005	0.076*** (0.018)	0.079*** (0.021)	0.001 (0.009)	0.001 (0.009)
BIHAR	0.023* (0.011)	0.029** (0.014)	0.007** (0.002)	0.009** (0.004)
BIMARUXBR	0.04*** (0.011)	0.039*** (0.011)	0.002 (0.003)	0.001 (0.003)
Constant	-0.127 (0.116)	0.041 (0.1)	-0.033 (0.046)	0.006 (0.034)
R-squared	0.716	0.718	0.864	0.867
Number of observations	26	26	26	26

Table 5: Determinants of KCC lending
Fixed Effect Regressions (2005-06 to 2009-10)
Dependent Variable: KCC Credit/Agri. NSDP

	1	2
KCC Credit/ Agri. NSDP, (t-1)	-0.501 (0.333)	-0.487 (0.306)
Log Agri. NSDP / Worker, (t-1)	0.007 (0.055)	
Log Yield, (t-1)		0.069** (0.03)
Agri NSDP/ State NSDP, (t-1)	-0.221 (0.684)	-0.22 (0.55)
RNSDP pc Growth (t-1)		-0.068 (0.076)
Comm. Bank Agr Credit/ Agr. NSDP, (t-1)	0.116** (0.054)	0.15*** (0.036)
Constant	0.14 (0.419)	-0.426 (0.278)
R-squared		
within:	0.196	0.264
between:	0.003	0.021
overall:	0.024	0.047
Number of observation	86	86

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Table 6: Growth Effects of KCC
OLS Regressions (2005-06 to 2009-10 averages)

	Dependent Variables					
	RNSDP pc Growth	**Agr. NSDP pw Growth**	**Yield Growth**	**RNSDP pc Growth**	**Agr. NSDP pw Growth**	**Yield Growth**
	1	2	3	4	5	6
Log RSNDP pc , 2005-06	0.004 (0.01)			0.001 (0.009)		
Log Agr. NSDP pw, 2005-06		-0.015 (0.01)			-0.013 (0.01)	
Log Yield, 2005-06			-0.041* (0.022)			-0.034* (0.017)
Comm. Bank Credit/GDP 2005-06 to 09-10	0.012 (0.019)			0.03** (0.014)		
Comm. Bank Agr Credit/ Agr. NSDP, 2005-06 to 09-10		0.005 (0.029)	0.057 (0.047)		-0.023 (0.036)	0.05 (0.045)
KCC Credit/Agri. NSDP	0.158 (0.105)	-0.106 (0.237)	-0.2 (0.319)			
KCC Accts/Rural Population				0.233 (0.149)	0.303 (0.547)	-0.33 (0.556)
Share of Agri. in NSDP, 2005-06	-0.14** (0.059)	-0.252* (0.123)	0.202 (0.149)	-0.137** (0.058)	-0.295** (0.111)	0.169 (0.127)
Constant	0.103* (0.051)	-0.008 (0.066)	0.264 (0.155)	0.087* (0.049)	0.006 (0.064)	0.219* (0.124)
R-squared	0.457	0.243	0.111	0.425	0.247	0.107
Number of observations	28	28	29	28	28	29

Table 7: Interaction Effects of KCC
OLS Regressions (2005-06 to 2009-10 averages)

	Dependent Variables							
	Agr. NSDP pw Growth		Yield Growth		Agr. NSDP pw Growth		Yield Growth	
	1	2	3	4	5	6	7	8
Log Agr. NSDP pw, 2005-06	-0.015 (0.01)	-0.032 (0.019)			-0.013 (0.01)	-0.01 (0.018)		
Log Yield, 2005-06			-0.041* (0.022)	-0.076* (0.042)			-0.034* (0.017)	-0.091* (0.044)
Comm. Bank Agr Credit/ Agr. NSDP	0.005 (0.029)	-0.007 (0.029)	0.057 (0.047)	0.04 (0.056)	-0.023 (0.036)	-0.023 (0.036)	0.05 (0.045)	0.052 (0.047)
KCC Credit /Agri. NSDP, 2005/6-09/10	-0.106 (0.237)	2.166 (2.329)	-0.2 (0.319)	-4.292 (3.898)				
KCC Accts/ Rural Popn. 2005/6-09/10					0.303 (0.547)	-0.433 (3.582)	-0.33 (0.556)	-18.62 (12.107)
KCC Credit/ Agri. NSDP x Log Agr. NSDP pw		0.355 (.0365)						
KCC Accts / Rural Popn x Log Agr. NSDP pw						-0.122 (0.607)		
KCC Credit/ Agri. NSDP x log yield				0.566 (0.548)				
KCC Accts/ Rural Popn x log yield								2.401 (1.56)
Share of Agri. in NSDP, 2005-06	-0.252* (0.123)	-0.292** (0.126)	0.202 (0.149)	0.155 (0.171)	-0.295** (0.111)	-0.292** (0.116)	0.169 (0.127)	0.145 (0.129)
Constant	-0.008 (0.066)	-0.105 (0.107)	0.264 (0.155)	0.534 (0.322)	0.006 (0.064)	0.023 (0.107)	0.219* (0.124)	0.655* (0.34)
R-squared	0.243	0.265	0.111	0.134	0.247	0.248	0.107	0.157
Number of observations	28	28	29	29	28	28	29	29

Table 8: KCC and Economic Growth- Is Bihar Different?
OLS Regressions (2005-06 to 2009-10 averages)

	Dependent Variables					
	RNSDP pc Growth	**Agr. NSDP pw Growth**	**Yield Growth**	**RNSDP pc Growth**	**Agr. NSDP pw Growth**	**Yield Growth**
	1	2	3	4	5	6
Log RSNDP pc , 2005-06	0.035** (0.016)			0.035** (0.014)		
Log Agr. NSDP pw, 2005-06		-0.033*** (0.011)			-0.033*** (0.011)	
Log Yield, 2005-06			-0.02 (0.022)			-0.019 (0.023)
Comm. Bank Credit/GDP 2005-06 to 09-10	0.033* (0.018)			0.036** (0.014)		
Comm. Bank Agr Credit/ Agr. NSDP, 2005-06 to 09-10		0.03 (0.029)	0.03 (0.041)		0.02 (0.033)	0.027 (0.04)
KCC Credit/Agri. NSDP, 2005/6-09/10	0.072 (0.119)	-0.167 (0.282)	-0.111 (0.341)			
KCC Accts/Rural Population 2005/6-09/10				0.192 (0.164)	-0.134 (0.583)	-0.173 (0.586)
BIHAR	0.042*** (0.013)	-0.049** (0.019)	0.021 (0.014)	0.042*** (0.012)	-0.047** (0.018)	0.022* (0.011)
BIMARUXBR	0.016 (0.017)	-0.032 (0.025)	0.019 (0.025)	0.019 (0.014)	-0.038* (0.02)	0.015 (0.02)
constant	0.252** (0.093)	-0.154** (0.063)	0.015 (0.176)	0.249*** (0.086)	-0.016** (0.064)	0.136 (0.18)
R-squared	0.478	0.27	0.095	0.49	0.26	0.094
Number of observations	28	28	29	28	28	29

Table 9: Instrumental Variables and Pairwise Correlations

	Landholdings/ Rural Population (2005-06)	Imputed KCC Amt/ Agricultural GDP (2005-06)
Imputed KCC Amt/ Agricultural GDP	0.64	-
KCC Accts /Rural Population 2005/6-09/10	0.38	0.26
KCC Credit /Agri. NSDP, 2005/6-09/10	0.26	0.12
RNSDP pc Growth 2005/6-09/10	0.26	0.13
Log RSNDP pc, 2005-06	-0.20	-0.64
Agr. NSDP pw Growth, 2005/6-09/10	0.18	0.02
Log Agr. NSDP pw, 2005-06	-0.25	-0.61
Yield Growth, 2005/6-09/10	0.01	0.22
Log Yield, 2005-06	-0.26	-0.48
Comm. Bank Credit/GDP 2005/06 – 09/10	0.40	0.05
Comm. Bank Agr Credit/ Agr. NSDP, 2005/06 – 09/10	0.27	0.04

Table 10: KCC Progress in Bihar

Year	Crop Loans/ Advances	KCC Accts/ Rural Population	KCC Acct (3 yr)/ Rural Population	KCC Acct (3 yr)/ Agr. Workers
2001-02	-	0.006	-	-
2002-03	-	0.004	-	-
2003-04	-	0.008	0.017	0.059
2004-05	0.085	0.006	0.017	0.060
2005-06	0.068	0.004	0.017	0.059
2006-07	0.065	0.005	0.014	0.049
2007-08	0.118	0.006	0.014	0.048
2008-09	0.138	0.010	0.020	0.070
2009-10	0.162	0.012	0.027	0.094
2010-11	0.175	0.015	0.037	0.126

Table 11: Determinants of KCC Lending
Bihar Districts

	Dependent Variable			
	KCC Accts/ Rural Population (2010-11)		Crop Loans/ Agricultural NDDP (2007-08)	
	1	2	3	4
KCC Accts/ Rural Population (2004-05)	0.197 (0.12)	0.214* (0.126)		
Crop Loans / Agricultural NDDP (2004-05)			1.391*** (0.389)	1.319*** (0.379)
Log Agr. NDDP pw, 2004-05	0.009 (0.006)			-0.075** (0.034)
Log Foodgrain Yield, 2005-06		0.008 (0.005)	-0.055* (0.027)	
Share of Agri. in NDDP, 2004-05	-0.006 (0.015)	0.007 (0.014)	-0.14* (0.071)	-0.059 (0.094)
Credit/NDDP 2004-05	0.021 (0.048)	-0.02 (0.05)	0.128* (0.209)	-0.133 (0.186)
Constant	-0.052 (0.049)	-0.025 (0.039)	0.469** (0.176)	0.775** (0.287)
R-squared	0.167	0.171	0.541	0.532
Number of observations	38	37	37	38

Table 12: Determinants of KCC Lending – Does the Lead Bank Matter?
Bihar Districts

	KCC Accts/ Rural Population (2010-11)		Crop Loans / Agricultural NDDP (2007-08)	
Dependent Variable				
	1	2	3	4
KCC Accts/ Rural Popn. (2004-05)	0.082 (0.113)	0.144 (0.132)		
Crop Loans / Agri. NDDP (2004-05)			0.935** (0.369)	0.844** (0.361)
Log Agr. NDDP pw, 2004-05	0.017*** (0.005)			-0.039 (0.031)
Log Foodgrain Yield, 2005-06		0.008 (0.005)	-0.059** (0.026)	
Share of Agri.in DDP, 2004-05	0.001 (0.016)	0.023 (0.014)	-0.111 (0.07)	-0.056 (0.092)
Credit/NDDP 2004-05	0.032 (0.039)	-0.016 (0.051)	0.316 (0.284)	-0.024 (0.222)
Central Bank Of India	-0.008 (0.005)	-0.003 (0.004)	-0.035** (0.015)	-0.026 (0.019)
State Bank of India	-0.007 (0.004)	-0.008 (0.004)	-0.026 (0.027)	-0.039 (0.027)
Punjab National Bank	0.006* (0.003)	0.007 (0.004)	0.033* (0.019)	0.027 (0.019)
UCO Bank	-0.002 (0.006)	-0.000 (0.007)	-0.006 (0.027)	-0.018 (0.03)
Constant	-0.126*** (0.04)	-0.024 (0.032)	0.484*** (0.152)	0.465* (0.243)
R-squared	0.469	0.41	0.701	0.658
Number of Observations	38	37	37	38

Table 13: Bihar Districts – Correlation Between Selected Variables (2005-06 to 2009-10)

	Foodgrain Yield Growth (2005/06-09/10)	Log Foodgrain Yield, 2005-6	KCC Accts/ Rural Popn (2005/6-09/10)	Crop Loans/ Advances (2005/6-09/10)	Log of Rainfall (2005/6-09/10)	Log of Rainfall Squared (2005/6-09/10)	Share of Agr in NDDP, 2005	CD- Ratio (2005/6-09/10)
Foodgrain Yield Growth (2005/06-09/10)	1							
Log Foodgrain Yield, 2005-6	-0.71	1						
KCC Accts/ Rural Popn (2005/6-09/10)	-0.24	0.2716	1					
Crop Loans/ Advances (2005/6-09/10)	0.05	-0.06	0.35	1				
Log of Rainfall (2005/6-09/10)	-0.08	-0.12	-0.06	-0.37	1			
Log of Rainfall Squared (2005/6-09/10)	-0.08	-0.12	-0.05	-0.36	0.99	1		
Share of Agr in NDDP, 2005	0.17	-0.20	-0.17	0.17	0.28	0.28	1	
CD- Ratio (2005/6-09/10)	-0.14	0.031	0.14	-0.14	0.50	0.51	0.5156	1

Table 14: Effect of KCC Lending on Productivity Growth
Dependent Variable: Growth in Foodgrain Yield (2005-06 to 09-10)

	1	2
Log Foodgrain Yield, 2005-06	-0.168*** (0.02)	-0.17*** (0.02)
KCC Accts/ Rural Popn. (2005-06 to 2009-10)	-0.298 (1.362)	
Crop Loans/ Total Credit (2005-06 to 2009-10)		-0.062 (0.094)
Log of Rainfall (2005-06 to 2009-10)	9.755*** (3.128)	9.331*** (3.108)
Log of Rainfall Sq. (2005-06 to 2009-10)	-0.707*** (0.223)	-0.677*** (0.221)
Share of Agri.in DDP, 2004-05	0.091 (0.093)	0.109 (0.093)
CD- Ratio (2005-06 to 2009-10)	0.000 (0.001)	-0.000 (0.001)
Constant	-32.41*** (10.99)	-30.883*** (10.936)
R-squared	0.605	0.607
Number of observations	37	37

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