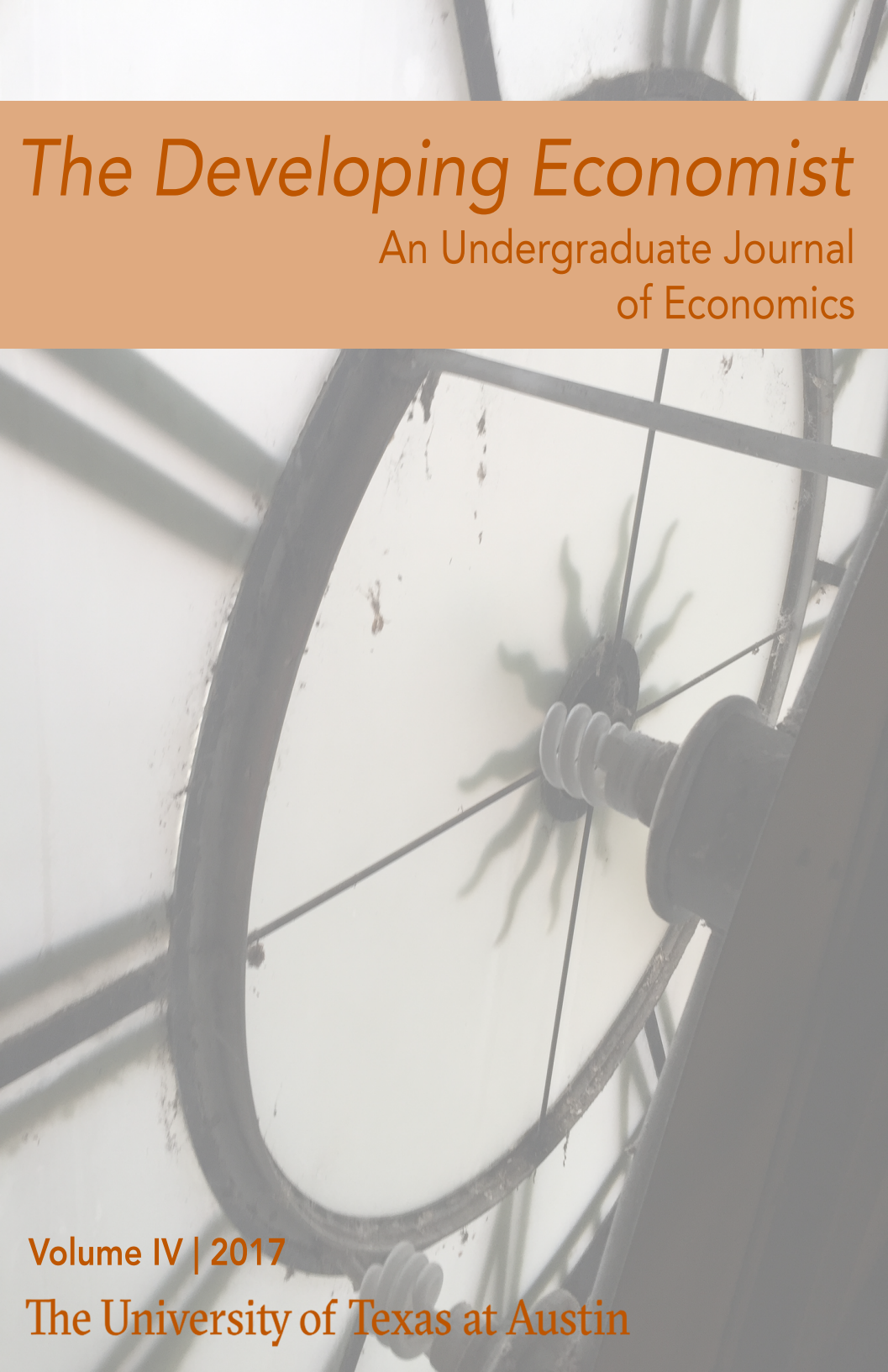
The Developing Economist

An Undergraduate Journal of Economics



Volume IV | 2017

The University of Texas at Austin

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Volume 4

2017

The Developing Economist, An Undergraduate Journal of Economics at The University of Texas at Austin.

Photo by Drew Orland. Photograph of the interior of The University of Texas at Austin's tower. Drew Orland is a current Junior Editor for *The Developing Economist* and a member of The Guild of Carillonneurs, who play the Knicker Carillon atop the tower.

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Volume 4, 2017

Acknowledgements

The Developing Economist was published this year with the help and guidance of many professors, administrators, and graduate students here at The University of Texas at Austin.

The editorial team is deeply appreciative of the time and dedicated effort of the following faculty members for assisting us in reviewing papers this year: Thomas Wiseman, Gerald Oettinger, Wayne Hickenbottom, Valerie Bencivenga, Brian Trinque, Andrea Civelli, and Helen Schneider, as well as graduate students Garrett Hagemann, and Randeep Kaur.

The journal staff always receives significant support and encouragement from the Department of Economics at The University of Texas and we would like to thank Dr. Jason Abrevaya, Department Chair, and Economics Advising Coordinator Jana Cole for their help and advice throughout the year.

We would also like to thank the College of Liberal Arts, Omicron Delta Epsilon, and the generous donors who provide us with significant funding for this project each year.

Thank You,

Editorial Team

The Developing Economist

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Dear Reader:

Publishing *The Developing Economist* is always an exciting and very rewarding experience. Each edition poses unique challenges that the editorial team must creatively approach and solve throughout the year. This requires our staff to constantly learn new skills and expose themselves to areas of academic research that often lie in unfamiliar territories. This was particularly true this year, as this was the first year of publication without any founding members on the editorial team. As always, our staff rose to the occasion. I am deeply thankful to our predecessors for establishing such a fine outlet for undergraduate economic research, and I look forward to continuing to grow *The Developing Economist* with our current staff.

I am proud to present the following three exemplary displays of undergraduate research that were chosen for this year's edition of *The Developing Economist*. The authors put in countless hours of work into bringing their ideas to life and we are thankful for their dedication and perseverance. Undergraduate research is the strongest that it has ever been, and I look forward to continuing to promote and encourage undergrads to pursue their research interests.

Thank You,

Hayden Sand
Editor-in-Chief

A Note From The Academic Advising Coordinator

In spring of 2013, a group of undergraduates at the University of Texas at Austin conceived the idea to establish an undergraduate research journal in Economics. The individuals involved were each concluding their own independent research for an Economics honors thesis and were leaders in the University's chapter of the Economics Honor Society, Omicron Delta Epsilon. Inspired by their own research experience and motivated by the honor society's mission to promote scholarly endeavor; they worked to create a platform by which outstanding undergraduate research papers could be showcased in a peer reviewed publication. Very few such journals existed– a fact that compelled them to fill the void.

That initial group of students, the driving force in getting the journal off the ground, have moved on to careers or graduate school, as the next generation continues the tradition with the production of this fourth edition of *The Developing Economist.* The journal is staffed entirely by a team of undergraduates who manage every step and detail of the process— from soliciting funding and paper submissions, to organizing peer-review, to publicity, publication, and distribution of the journal. As early as freshman year the journal gives students the opportunity to become involved in the research process in a meaningful way and build valuable practical skills.

It has been a sincere pleasure to watch as *The Developing Economist* evolved from an idea to a fully formed and prominent member of the small contingency of undergraduate Economics research journals across the country. It is equally gratifying to see students involved with the journal grow and develop into confident and capable adults, eagerly anticipating and successfully pursuing their post-undergraduate goals.

The Developing Economist is one of the crown jewels of our undergraduate program, for the value it produces for our own students and for undergraduate researchers throughout the country. I congratulate *The Developing Economist* on the publication of a fourth edition, and I firmly hope that an endowment will be established so that this asset will continue for years to come.

Jana Cole
Academic Advising Coordinator
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Linking Colonial Peasant Revolts and Indian Agrarian Policy: The Role of History in Reform

Sanchit Shorewala[†]

Abstract

What is the role of history in determining the outcomes of present-day reforms? In this study peasant revolts during India's colonial period are used to account for regional variations in land tenure reform after Independence. Revolts were common in particular regions throughout the colonial period and marked the most desperate attempts by cultivators to resist disruptions in agrarian social relations caused by British policies. That parliamentary Communist parties in independent India were able to implement land reforms successfully in precisely these areas indicates the relevance of history in accounting for these disparities. To empirically verify the relationship between colonial peasant revolts, Communist mobilization and land reform outcomes a simple OLS and a Two Stage Least Square Model is fitted to panel data for 1950-1980. The coefficients estimated for the land operated and owned by sub-acre holdings are highly significant, indicating that tenancy legislation, which improved the proprietary rights and access to land for tenants, was the major driver of reform. This finding is supported by a positive but insignificant effect on reduced landlessness. Overall, these results are free from simultaneous causality, time and entity variant effects and suggest that the historical development of a class-conscious peasantry through the means of spontaneously organized resistance was crucial for the success of Communist-led mobilization in improving the rural land structure.

[†]I am grateful to Prof. Gérard Roland for advising this Honors Thesis and to Profs. Pranab Bardhan, Ronald J. Herring and Alain de Janvry for their valuable advice.

I. Introduction

Democracies, by enabling popular participation in decision-making, present both unique opportunities for and obstacles to improving the wellbeing of their citizens. The efforts at reform in developing democracies are often characterized by good intentions and poor results. Why do well-intentioned policies with desirable outcomes often fail and even produce adverse results? Under what conditions can meaningful reform be undertaken through democratic institutions? These are the questions that motivate this study.

Democracy in India, although relatively young, has survived periods of major upheaval to become firmly embedded in the socio-economic fabric of the country. However, concomitant to this stabilization is the development of sustained skepticism in the ability of the state to deliver on its promises. This lack of faith finds its justification in the state's continued struggle to achieve its constitutional and programmatic purpose: to confer upon all its citizens an equitable, rising standard of living. Although the twenty-first century has witnessed the emergence of a rapidly growing and richly diverse Indian economy, the widening of social and economic inequities continues to pose a formidable challenge to the country's political elite. Increased prosperity may even sharpen rather than blunt these inequalities and there are serious concerns of the rising tide lifting some boats much more than others (Corbridge 2009).

It is in this context that the study of Indian land reforms finds relevance. Since 1947, the Indian state has pursued a developmental agenda motivated by the ideals of its own leadership and the Constitution and not by perceived existential threats that encouraged large-scale state-led mobilizations in the Soviet Union or Japan. Especially in the aftermath of Independence the policies of the political elite reflected an inherent belief in the superior ability of a strong, centralized democratic state to improve the lot of its people (Weiner 1962). Chief among these measures was the initiation of a land reform program through which the administration hoped to overhaul

an economically and socially exploitative land tenure system. However, more than four decades of reform efforts have returned meager results at the national level, reflecting what Herring identifies as a "general pattern in poor countries", namely: "the absence of effective mobilization of underclasses in rural areas, the lack of linkages to committed political parties with serious redistributive programs, the structural and electoral power of landholders and their propertied allies, and the multiple connections between bureaucracy and society at the local level" (Herring 1991: 170).

The overall failure of the Indian land reforms has been widely recognized and extensively documented by both state and non-state observers but, as is often the case with India, the national picture rarely tells the entire story. Since policy was implemented at the level of the State, there have been important variations in State-level outcomes due to inherent differences in historical development and institutional configurations. In particular the States of Kerala and West Bengal have been significantly more successful at reforming their land tenures than their counterparts. These exceptional cases have emerged as a puzzle and prompted numerous attempts to answer the basic question: how and why did land reform succeed in these States and not elsewhere?

Any explanation for the performance of Kerala and West Bengal must account for the role of the Communist Party, which has been the "engine of agrarian reform" in India (Herring 1991: 171). The Communists were the only major political actors both ideologically and tactically committed to a program of peasant mobilization, which they used to circumvent many of the administrative and institutional constraints that hamstrung the implementation of policy elsewhere. The key tenancy legislations under Communist administrations in Kerala in 1970 and West Bengal in 1979 were predicated on years of successful organization and articulation of the lower peasants' class interests. Although the Communist reforms fell short of a genuine "land to the tiller" program - defined as the transfer of land to those who actually perform labor on it

- they constitute the most radical achievement possible under the constraints of Indian political economy.

However, while the tactic of organizing the peasantry as a rival interest group to the landed classes explains the mechanism of Communist success, it does not tell us why it was limited to the two States of Kerala and West Bengal. One possible explanation is linked to the benefits of shared geographical and institutional factors that failed to emerge elsewhere. From an ecological point of view, Zagoria (1971) found that high man-to-land ratio, landlessness and sharecropping are the factors that correlate highest with the Communist vote in rural areas. On the other hand, Banerjee and Iyer (2002) highlight the role of institutions in suggesting that greater initial inequalities in landlord-dominated areas could have lead to greater demand for redistribution through the democratic process. While these ecological and institutional factors did interact over time to create favorable conditions for the politicization of the peasantry in some places and not others, they cannot wholly account for the concrete historical developments that bridged the gap between these favorable conditions and actual action. Hart and Herring (1977) emphasize the relevance of particular, even exceptional, historical circumstances in their comparison of the trajectories of land reform in Kerala and Maharashtra. While such studies benefit from being able to encompass a wide range of possible explanatory factors - social, ecological, political, and historical - they are restricted in the range of their coverage. What is needed, therefore, is a general framework that facilitates comparison of these factors on a wider scale; this paper constitutes a humble step towards this goal.

Much of the empirical literature on land reforms, such as Besley and Burgess (2000), Bardhan and Mookherjee (2006), and Deininger, Songqing, and Nagarajan (2008), focuses on the developmental impact of land reforms on a scale ranging from all-India to the village. These studies consistently find that redistributive agrarian policy, even in its severely attenuated form, has had positive outcomes on rural development

indicators. On the other hand, empirical studies on the political economy of land reform have been carried out in the Latin American context by Albertus (2015) and in the Pakistani setting by Beg (2014); these emphasize the importance of regime types, elite influence, and other institutional configurations. The picture of reform that emerges is that of a complex, multi-faceted process that is critically dependent on the power structure and requires more than simply political will or legislative fiat to succeed. Thus, any explanation for the regional disparities in agrarian policy outcomes in India must go beyond the heuristic of political will and consider how it came about that in some areas the interests of those who are normally far removed from the levers of power were articulated and even addressed.

To answer this question, this paper traces the evolution of peasant radicalization in those States that have emerged as the stronghold of Communist power today. The assumptions driving this study are: first, that Communist electoral strength had a significant positive impact on land reform outcomes between 1950 and 1980 and second, that the Communist tactic of peasant mobilization was predicated on the historical development of a class consciousness in the peasantry through its spontaneous resistance to exploitation. These assumptions are tested by first performing an OLS fixed effect regression of land reform outcomes on Communist electoral strength and then estimating a Two Stage Least Squares model by obtaining fitted values of electoral strength as a function of the proportion of districts in each State that experienced at least one revolt between 1793 and 1920. This approach has the advantage of addressing simultaneous causality issues in the simple OLS regression, namely, that high incidence of landlessness/inequality could lead to greater Communist sympathy, which would then lead to improved outcomes. A more detailed description of data and methodology is deferred to Sections 4 and 5.

The estimated OLS coefficients indicate a significant and positive effect of Communist support on improved access to

operating land for the landless but no significant improvement in terms of ownership. The effect for submarginal holdings is much less ambiguous, with each measure of electoral strength associated highly significantly with improved access to both operation and ownership of land for plots under 1 acre in area. Thus, despite simultaneous causality concerns, the OLS model allows us to reject at high levels of significance the hypothesis that Communist electoral strength had no effect on the agrarian structure. These results are robust to the inclusion of one-period-lagged measures of agrarian structure variables and year effects, indicating that exceptionally high concentrations of landholdings needed the mechanism of Communist "intervention" to be addressed. The 2 SLS coefficients, while retaining the signs of their OLS counterparts, cease to be significant for the incidence of landlessness. However, they remain highly significant and positive for the area under submarginal holdings, indicating a strong causal link between peasant revolts, Communist support, and more equitable land distribution through the implementation of tenancy reform. These findings serve as an empirical confirmation of the link between colonial peasant radicalization and left-wing mobilization that has been articulated in much of the sociological and historical literature on this subject.

The paper is organized as follows: Section 2 provides a brief history of India's land reforms along with a general overview of the challenges faced in legislation and implementation at various stages of the program; Section 3 outlines the political economy of land reform and the link between Communist electoral strength, rural mobilization and peasant revolts; Sections 4 and 5 describe the data and methodology used in this study and discuss the empirical results thus obtained and Section 6 concludes.

II. Land Reforms in India - A Brief History

Independent India's colonial legacy was a predominantly agrarian society characterized by three broad systems of tenures - *zamindari*, *ryotwari* and *mahalwari* - encompassing 57 per

cent, 38 per cent and 5 per cent of cultivated area respectively (Sharma 1994). Although these systems were qualitatively different with respect to the method of revenue procurement, they were all characterized by a "semi-feudal" mode of production that placed absentee landowners at the top and the vast mass of cultivators at the bottom of the rural hierarchy. This institution had been declared morally untenable and economically regressive by several political figures belonging to various parties well prior to the formal achievement of independence. Peasant movements organized under the auspices of the All India Kisan Sabha, the Communist Party, and the left-wing of the Congress Party along with agrarian rebellions in Malabar Presidency and Telangana had succeeded in establishing land reform as a necessary condition for the emancipation of the countryside in the early twentieth century. Thus, it was among the first tasks of the newly constituted state to dismantle this system which, in a progressive parliamentary democracy with universal suffrage, had lost any claim to legitimacy.

The Indian strategy for land reforms followed a classic three-pronged approach: it aimed to abolish intermediaries, legislate ceilings on land, and secure the right of tenants. Temporally the progress of these policies can be divided into two distinct periods: Phase I and Phase II. Phase I reforms occurred in the immediate aftermath of Independence and were characterized by "the largest body of agrarian legislation to have been passed in so brief a span of years in any country whose history has been recorded" (Thorner 1956). The measure that met with most success in this period was the abolition of intermediaries. These intermediaries were the erstwhile feudal lords - *zamindars*, *talukdars*, *malguzars*, etc. - who had retained their power and privilege as landlords in exchange for loyalty to the colonial regime. Consequently, they were held responsible for the malaise in Indian agriculture by Congress nationalists, making them easy political targets for the land reform efforts of the Congress regime after Independence. However, while intermediary abolition succeeded in bringing twenty million tenants in direct relations with the

state, it did little to alter the structure of agrarian relations. Owing to the onerous legislation process, administrative incompetency and a plethora of creative circumventive measures employed by intermediaries, the actual cultivators and lower peasantry saw no material or structural improvements in their conditions (Thorner 1956; Appu 1996).

Rather than being a springboard for subsequent reforms, the limited success of intermediary abolition proved to be the apogee of the Indian state's efforts in Phase I. The legislation of land ceilings was fraught with ideological ambivalence and political inaction, owing largely to its potentially radical nature vis-à-vis tenancy reform and intermediary abolition. The ceilings legislated across all States, except Jammu and Kashmir, were exceedingly generous and came into effect slowly enough for those affected to evade them by engaging in legal and illegal transfers of land to relatives and fictitious persons (Ladejinsky 1972). While the States lacked the political will for an uncompromising stance on the land ceiling program, the Center was too agnostic on the issue to make up the deficit. Thus, the Phase I of ceiling reform was dead on arrival and had little, if any, impact on the pattern of land ownership in the countryside. These tendencies were reflected all the more in the program of tenancy reform as vague suggestions from the Center in the Five-Year Plans together with large-scale eviction of tenants by landlords left leasing cultivators worse off than before.

Phase II of the reform effort was a product of two climactic events in 1967-1970: first, the 1967 violent uprising of cultivators in the Naxalbari subdivision of Darjeeling, West Bengal organized by a radical offshoot of the CPI(Marxist) and second, the adoption of a populist line by the Prime Minister, Indira Gandhi, prior to the 1971 general elections. Given the appalling outcomes of the ceiling laws in particular, a Central Land Reforms Committee was appointed that recommended standardized ceilings across all States, below-market compensation to erstwhile holders of surplus land and inclusion of the amended State laws in the Ninth Schedule of the Constitution

among other provisions. The onset of Emergency immediately after the advent of Phase II did not aid the implementation of the amended laws and overall, less than 1.5 per cent of agricultural land was redistributed as of 1996 (Appu 1996). Thus, redistribution of land under ceiling laws in India has failed entirely, foreclosing the possibility of a genuine "land to the tiller" program. Tenancy reform, on the other hand, fared relatively better in the post-1970 era. This period saw the major successes of Kerala and West Bengal - the abolition of landlordism in the former and the registration and protection of sharecroppers (*bargadars*) in the latter. It is these States, along with Assam, Gujarat, Himachal Pradesh, Karnataka, and Maharashtra, that have accounted for 97% of the beneficiaries of tenancy reform (Appu 1996).

In sum, the four-decade-long Indian land reform effort has succeeded primarily in the negative sense of preventing the worsening of concentration of land holding in the rural areas. The leisurely pace of legislation and indifferent administration that characterized the process resulted largely from the absence of both an external motivating factor and a genuine internal revolutionary threat. These outcomes highlight the limitations of legislative or "political" will as sufficient endogenous motivating factors for reform - the feeble waves of benevolent intentions are no match for the rocks of political and economic resistance. However, while it is tempting to view the few bright spots of Kerala and West Bengal as exceptions that prove the rule, the emergence of such exceptionalism within the same national institutional and political setting demands explanation. The political economy of land reform and its successful manipulation by Communist political actors in these States is covered in the following section.

III. The Political Economy of Land Reform

A. Democratic Institutions and Land Reform

Land reform, although a "combination of a great many things", can be broadly defined as securing the rights over land of those

who cultivate it in order to enhance agricultural productivity, obtain economic security for the cultivator and preclude social unrest (Ladejinsky 1977). Although seemingly straightforward, this definition lies at the intersection of numerous schools of thought - from peasant folk justice to Marxist to economic rationalist - and implies a radical restructuring of rural agrarian relations (Hart and Herring 1977, Ladejinsky 1977). However, while the normative basis of land reform is relatively uncontroversial and well-defined, the mechanism of its implementation is less so. A fundamental obstacle is presented by the ascension to political power of middle- to upper-class elites - often drawn from rich rural households - in predominantly agrarian countries. The lopsided distribution of power between a small landed elite and a large body of rural peasantry enables the capture of democratic institutions by the former to the exclusion of the latter - leading to a situation in which "government is recognized as institutionalized against land reform" (Hart and Herring 1977: 235). Thus, even if legislators ideologically committed to land reforms succeed in passing a meaningful law, its implementation remains at the mercy of an incompetent and compromised administrative apparatus.

The framework advanced by Albertus (2015) in his recent definitive study of Latin American land reforms helps explain why, despite near-total political hegemony and good intentions, Congress party elites failed to enact a comprehensive land reform program. The crux of Albertus' findings is that a "coalitional split" between the political and landed elite and minimal institutional constraints to action are necessary prerequisites for redistributive land reform. While the coalitional split can occur in both autocracies and democracies, the former by their very nature are able to bypass democratic institutions that impede swift action even as they provide a system of checks and balances (Albertus 2015). In the Indian context, there was no coalitional split as the dominance of the Congress in politics translated directly to the dominance of rural landed interests. The Congress Party's ties to the prosperous elements of the countryside were forged in the pre-Independence

decades through a doctrine of village harmony, class conciliation and a policy of moral suasion instead of expropriation. These ties held after Independence and the middle to upper peasantry came to constitute an important source of electoral and financial support for State Congress governments. This electoral calculus exacerbated an emerging distance between the Center and the State, with the former fashioning policy that the latter had no intention of implementing in fear of alienating its power base (Weiner 1962). Nothing illustrates this Center-State divide better than the 1935 report of the Congress Agrarian Reforms Committee, whose policy recommendations were rejected by State Congress administrations but co-opted by none other than the Kerala Communists for their own 1957 Agrarian Relations Bill (Herring 1983).

The futility of concentrated political power in the absence of a split from the landed elite was further compounded by the States' use of the professional, centralized bureaucracy inherited from colonial times. In a comparative study of the different administrative mechanisms used by developing states to undertake land reform, Montgomery observed that due to its "inherent pro-landlord character, conservative nature and susceptibility to corruption" the professional elite bureaucracy was least equipped to produce pro-beneficiary outcomes (Montgomery 1972). On the judicial front, the liberal right to private property and the possibility of legal recourse through which landlords could contest the constitutional validity of state appropriation of above-ceiling land were used extensively to delay or halt entirely the process of implementation. The only way to overcome this roadblock was to introduce a constitutional amendment that abrogated the right to private property in the case of land ceilings - a process even more onerous than legislating land reform in the first place. The final barrier to implementation was the landlords' use of the police as a personal enforcing agency to evict tenants and generally enforce their property rights which had in theory been curtailed by the law. It was only when the United Front governments in Kerala and West Bengal under the leadership of the Commu-

nist parties prohibited police involvement in agrarian disputes that this form of resistance to reform was somewhat negated (Herring 1983). Thus, in this case it is evident that liberal democratic institutions including the bureaucracy, judiciary and police functioned more effectively as tools of reactionary forces than instruments of benevolent legislators. Left to their own devices, they tended to impede and not facilitate the passage of radical reform.

B. The Need for Peasant Mobilization

The key, then, to the successful implementation of land reforms lies not in the concentration of political power in a single dominant party or the legislative actions of a sympathetic political elite but in some other factor that can effectively counteract the systemic counter-reform tendencies of elite-dominated state institutions - the organization of the lower peasantry, i.e., peasant proprietors, smallholders, tenants, sharecroppers and laborers, into a vigilant political interest group to rival the rural landed interests. It was the effective Communist mobilization of this strata of peasantry in Kerala and West Bengal, the absence of which was pegged as the primary cause of land reform failure by Myron Weiner in 1962, that lead to a modicum of success in these States. The importance of mobilization vis-à-vis the formal democratic process is borne out in the fact that the "radical" Kerala Communists held power for a total of four discontiguous years between 1957 and 1971[1], but were still able to get the most comprehensive tenancy legislation in the country implemented. Realizing that the parliamentary legislative process is only one side of the democratic coin, the Communists used their time in opposition to lead militant movements (Oommen 1975). The necessary linking of formal and informal democracy is evident in Oommen's observation

[1] As the unitary CPI in 1957-1959 and, following the 1964 split of the party into the CPI and CPI(Marxist), as the CPI(Marxist) in 1967-69. Although the bill was introduced by the CPI(Marxist) administration in 1969, it was implemented under a CPI-led front ministry in 1970 with the CPI(Marxist) in opposition.

that popular change must precede legislation for the latter to institutionalize reform successfully. In serving as both an articulator and enforcer of reform, successful mobilization can overcome to some degree the very real inertia imposed by the institutions of parliamentary democracy and expand the scope of redistribution.

Ideological differences suffice in explaining why the Communists, not the Congress, emerged as the political vanguard of the lower peasantry. Initially, it was the latter that became an ideological battleground in the s over the agrarian question (Hauser 1963). The Gandhian Right argued for class conciliation in the broad interest of the nationalist struggle while an emerging Left advocated for a radical restructuring of tenurial relations in favor of the suffering peasantry. The subsequent emergence of a distinct Congress Socialist Party and a dedicated peasant organization in the All-India Kisan Congress brought the agrarian question within the framework of formal politics; the organization and leadership of both these peasant bodies would eventually be taken over by the Communists. The Communist stranglehold on local Congress organization was strongest in Kerala, West Bengal, Telangana region of Andhra, and Tripura, where historical factors had favored the alignment of peasants along class lines. Various events, including Communist support for the British war effort against the fascist threat, the ascendancy of the Gandhian Congress leadership over the leftist faction, and ill-considered insurrectionary violence against the new Indian state lead the CPI to embrace electoral tactics to expose what they regarded as a "regime run by landlords, prince and the reactionary bourgeoisie in collaboration with British imperialism" (Nossiter 1988: 17). It was a falling out over the degree of this "Anti-Congressism" that lead to the 1964 split of the CPI and the formation of the new but immediately more dominant CPI(Marxist).

Thus at the onset of Independence, the Communist Party of India was both ideologically and tactically committed to a pro-peasant program. However, the areas where they were

strongest had a long history of peasant resistance to exploitative land tenures, rigid social hierarchies and market penetration. That Communist influence in the countryside remains restricted to these areas indicates that a class-based peasant consciousness, however inchoate and scattered, must have existed prior to its transformation into a means for intentional political action. Thus the development of this consciousness over the course of colonial rule, evidenced in the numerous, largely spontaneous peasant revolts that occurred during this period, is the crucial historical factor underlying peasant mobilization in the post-Independence era.

C. Peasant Revolts and Class Consciousness

A large literature has emerged on the sources of peasant radicalism in agrarian societies, with little consensus on which, if any, category of peasants is the most "revolutionary". The categories of the lower peasantry tend to be fluid and overlap in a way that makes such generalizations empirically unsound (Bouton 1985). Evading the neat traditional Marxist association of the worker with the means of production, a peasant can simultaneously be a smallholder, a leasing tenant and an agricultural laborer. The symbolic and cultural importance of land in agrarian societies transcends its functional definition as an "asset" or even "means of production", further muddying the waters. Thus, it is hard to ascertain the peasant's "class character" in any general circumstance. However, while the peasantry may evade a neat class-based characterization during normal times, it often splits along class lines when participating in agrarian movements, overcoming traditional caste-based vertical linkages in the process.

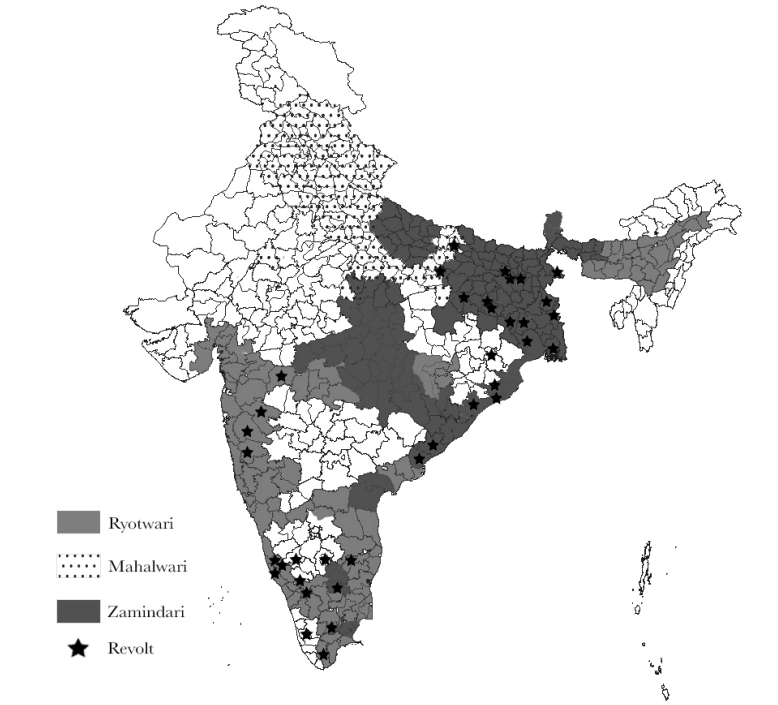
Peasant radicalism in colonial India developed as a response to the imposition, often by force, of an entirely foreign mode of production and restructuring of rural social relations under the British. Although revolts occurred frequently in the countryside throughout the two centuries of colonial rule, their character often varied with the form of exploitation. So for instance, pre-1857 peasant uprisings were usually in opposition

to zamindari excesses and British revenue demands whereas post-1857 uprisings encompassed grievances against market fluctuations, famines and rent exactions. Since in India commercial agriculture did not usher in any "significant changes in the rural social structure or in the social outlook of the landed upper classes" (Dhanagre 1991: 224), static measures of agrarian structure fail to account for historical differences in the development of peasant consciousness across regions with comparatively similar rural societies. In fact, colonial policies in response to rural unrest only succeeded in validating the concerns of the revolting peasantry without actually addressing them, creating a situation where peasants continued their existence under the same conditions while becoming increasingly aware of their exploitation. Neither commercialization nor agrarian legislation fundamentally altered the structural relations between the various rural cultivating classes.

From the map of British land tenures and peasant revolts (see Figure 1 below), it is clear that radicalization was not restricted to any particular type of tenure. Although the famous Permanent Settlement of Bengal in 1793 and the *zamindari* tenure in general has been associated with the most egregious aspects of British agrarian policy, it is important to note that exploitative tenure systems are one of several factors that triggered rural unrest. These other factors were more dynamic and often interrelated and self-reinforcing, including: the penetration of market forces and the subsequent impact of global price fluctations in the rural economy; the cultivation of cash crops and development of a cash-based economy; famines and food shortages alongside high rent/revenue demands; high levels of indebtedness among the peasantry due to the interlinkage of moneylending and landlordism and the convergence of caste, class and religious inequities (Dhanagre 1991). Revolts, as the most desperate and visible form of resistance to these events by the afflicted, capture valuable information about the dynamics that drive the spontaneous development of class consciousness in a peasantry that otherwise had little reason to break traditional hierarchies or face brutal suppression by the authorities.

In their revolts against the colonial state, peasants demonstrated a level of consciousness of their situation that did not require Communist mobilization to develop. Ranajit Guha, in his classic study on peasant uprisings, notes that by directing their anger against the entire triad of state, moneylender and landlord, irrespective of which one had provoked the response, the peasant "displayed a certain understanding of the mutuality of [his] interests and the power on which this is predicated" (Guha 1983: 27). Although these revolts were "pre-political" in the sense that they were not directed towards realizing a specific vision of a modern nation-state, they were not retrograde in their objectives either. They aimed not to revert to some sort of idyllic pre-colonial past but to rid the countryside of alien rule whilst harnessing the benefits of modern technology and self-governance (Gough 1976). Gough further notes that the latter-day Communist mobilizations bore many of the hallmarks of these uprisings, especially in the case of mass insurrections aimed at redressing specific class-based grievances. That regions with a tradition of agrarian unrest came to be dominated by Communist regimes is indicative of their favorability to an ideology based on class-based mobilization.

Figure 1:District Map of India with Colonial Land Tenures and Revolts



Sources: Tenurial geography digitally reproduced from Banerjee and Iyer (2002) and Baden-Powell (1894). Revolt data including district information taken from Chaudhuri (1955), Dhanagre (1991), Gough (1976) and Desai (1979).

As political opposition to British rule gained momentum, the transition from "pre-political" to "political" movements allowed for a difference in tactics that further sharpened the tentative class differences amongst the peasantry. Dhanagre, in his comprehensive study of early-twentieth century peasant movements, observes that these movements took on different characteristics depending on the class of peasantry involved. It was the lower peasantry - poor tenants, smallholders, share-croppers etc. - that was most associated with violent, revolutionary struggles whereas the middle and upper peasantry put its support largely behind "liberal-reformist struggles on peripheral issues" of the Gandhian nature (Dhanagre 1991: 220).

It was this divergence over the question of tactics that would manifest as the primary source of antagonism between the CPI and the Congress, and later the CPI and CPI(Marxist). Thus, the militant mobilization undertaken by the more radical, or left, faction of the Communists was more in line with the forms of resistance associated with the lower peasants than their landed counterparts. Thus, the role of the Communist Party can be understood as organizing the lower strata of the peasantry into a politically significant interest group in those areas where such class-based alignment was likely to overcome competing forms of vertical and horizontal association. The ability of the radical left to link the historical militancy of rural labor and smallholders in these areas with modern interest group politics is a fundamental reason for their agrarian policy success. In doing so, the Communists did not create a "class conscious" peasantry so much as they harnessed it effectively for political ends. However, politicization has thus far failed to entirely suppress this pre-political character, the latter having manifested vividly in the Naxalite movement that is now active in large parts of the rural North- East. The resurgence of Naxalism, abandonment of land reform as a serious policy issue and the fall of the Bengal CPI(Marxist) regime on the back of farmer revolt in Nandigram suggests that the limits of peasant advocacy through the parliamentary process might have been reached.

IV. Data and Methodology

A. Sources of Data

The data for this study was drawn from a wide variety of both qualitative and quantitative sources. These are described as follows:

Land Reform Outcomes: To quantify the extent of land reforms data on ownership and operational handholdings in rural India is used. The following variables are treated as dependent in the regression models:

1. Incidence of Landlessness: This is measured

through a) Proportion of Households not Operating Land and b)Proportion of Households not Owning Land. A decrease in the value of both these variables, ceterus paribus, is taken to be a positive outcome, i.e., an improvement in the access to land of the landless.

2. Proportion for Area Cultivated under Submarginal Holdings: Holdings cultivating area between 0.01-0.99 are classified as Submarginal and represent the smallest feasible plots of land cultivated in the countryside. For each State and decade, the observations denote the proportion of the State's area that is cultivated under plots of this size for that decade. An increase in the area cultivated under Submarginal Holdings indicates a more equitable agrarian structure and a positive outcome in terms of agrarian structure. This is measured through a) Proportion of Land Operated by Submarginal Holdings and b) Proportion of Land Owned by Submarginal Holdings.[2]

3. Area Cultivated under Marginal Holdings: This is the same as above with the difference being that the size of the holdings is between 1.00-2.49 acres.

Data on these variables, indexed by decade for the years 1950-1980 and by sixteen States, is taken from Sharma (1994). This yields a balanced panel on which entity and time fixed effects regressions can be performed. A list of the averages of agrarian structure variables over the period 1950-1980 for each

[2]A brief note on the distinction between the terms "ownership" and "operation": an "ownership" holding is defined as a plot of land either under permanent heritable possession or owner-like possession (such as long-term lease or assignment) of a member or members of a household; an "operational" holding is defined as a "techno-economic" unit used wholly or partly for agricultural production and directed or managed by one person alone, or in assistance with others. In general, ownership does not imply operation, and operation does not imply ownership.

state can be found in Table 1A.

Communist Electoral Strength: To obtain a measure of Communist electoral strength, electoral data on State Assembly elections between 1950 and 1980 from Singh and Bose (1987-88) is arranged into the following three variables:

> 1. Communist Vote Share: The average share of popular vote taken by Communist candidates for all electoral constituencies in a particular State.
>
> 2. Communist Seats Contested: The total number of electoral constituencies contested by Communist candidates of both CPI and CPI(Marxist) for a particular State.
>
> 3. Communist Seats Won: The total number of electoral constituencies won by Communist candidates of both CPI and CPI(Marxist) for a particular State.

These three variables provide a comprehensive picture of both Communist electoral success and organizational strength for each State. Since successful land reform is as much a product of organization and mobilization as it is of formal electoral success, a simple measure of votes or seats won does not properly account for what should more appropriately be called Communist "intervention". Thus, measures of vote share and the number of seats contested serve as good proxies for the relative strength of the Communist organization in each State, even if these don't necessarily translate into electoral success or formal political power.

Although State Elections in India are normally held once every five years, in practice they often occur more frequently. Additionally, depending on political conditions, elections can be held in different years for different States and sometimes not at all. Since data on agrarian structure is reported at the end of every decade, electoral data from the State Elections held

in the five years preceding the end of the decade have been used. If multiple elections took place in some States during these five years, outcomes across all elections were averaged to facilitate cross-State comparisons. Decade-wise values of these variables are listed by State in Table 1B.

Peasant Revolt: Incidences of peasant revolts were taken from sources largely belonging to the sizeable secondary literature on peasant radicalization in colonial India, such as Chaudhuri (1955), Desai (1979), Dhanagre (1991), Gough (1976), and Guha (1983). Table 2 lists all such revolts that occurred in the period 1793-1920 chronologically.[3] Since revolts usually occurred at the district-level, the district is the natural unit of analysis. A revolt dummy was coded for each district with the value "1" entered for those that had experienced at least one revolt in the 1793-1920 period, and "0" otherwise. Of the 372 districts coded this way, only about 44 turned out to have a history of pre-political peasant revolt.

For the Two-Stage Least Squares regression, a crude measure of revolt proportion was calculated by adding up the number of "revolt districts" and dividing by the total number of districts for each State. This measure was then interacted with the time-varying "Year" variable. Although many "revolt districts" experienced multiple revolts over time, this is not reflected in the revolt dummy. Thus, the coefficient on the revolt variable represents a lower bound of its effect on land reform outcomes. The revolt proportion for each State is listed in Table 3, from which it is evident that the Communist strongholds of West Bengal and Kerala had a uniquely rich history of radicalization, with the highest percentage of "revolt districts" at 50% and 42% respectively.

[3]Although the Indian mutiny of 1857 witnessed significant peasant participation in the resistance against British rule, it does not fit the narrow definition of a "pre-political" peasant revolt and thus, hasn't been included in the dataset.

B. Models and Methodology

First, to estimate the impact of Communist intervention on land reform outcomes, the following regression is fitted:

$$Y_{it}^{k} = \beta_{1i}^{kj} K_{it}^{j} + \alpha_i + \gamma_i + \beta_{2i} Y_{i(t-1)}^{k} + \mu_{it} + \epsilon_i$$

Here, t represents one of three time indices - 1960, 1970, 1980; Y_{it} represents one of $k = 6$ land reform outcomes at time t; K_{it}^{j} represents one of $j = 3$ measures of Communist electoral strength in the state elections between $t-1$ and t; $Y_{i(t-1)}$ is the same land reform outcome lagged by one time period; α_i and γ_i are State and Year Fixed Effects; μ_i is a vector of control variables such as Rural Agriculture Labor Force and Agriculture's Proportion in State GDP and finally, ϵ_i is an error term. β_{1j}^{kj}, the coefficient of interest, is a vector of length eighteen.

Since agrarian structure in India varies considerably from State to State and has its own dynamics that impart on it a particular temporal trend, this specification has the benefit of empirically estimating the effect of Communist intervention by isolating the impact of these elements. However, even after accounting for the lagged land reform variable, there is a nontrivial possibility of simultaneous causality through the mechanism of high landlessness or inequality of landholding creating both Communist sympathy in the countryside and creating the conditions for mobilizing the countryside due to the existence of a large rural proletariat.

To address the simultaneous causality problem, a Two Stage Least Squares regression is estimated for each specification obtained from the OLS regression. In the first stage, the following equation is estimated:

$$\hat{K}_{it}^{j} = \theta_i^{j} R_{it} + \alpha_i + \gamma_i + \beta_{2i} Y_{i(t-1)}^{k} + \mu_{it} + \epsilon_i$$

where R_{it} is a time-variant measure of the revolt proportion obtained from interacting the revolt proportion with the time-varying Year variable.

Then, the fitted values from the intermediate regression, $\hat{K}_{it}^{j}$ are used to get the 2SLS estimates:

$$Y_{it}^{k} = \hat{\beta}_{1i}^{kj}\hat{K}_{it}^{j} + \alpha_i + \gamma_i + \beta_{2i}Y_{i(t-1)}^{k} + \mu_{it} + \epsilon_i$$

The vector of estimated coefficients $\hat{\beta}_{1i}^{kj}$ here thus obtained negates the reverse causality since the primary regressor $\hat{K}_{it}^{j}$ represents only that part of Communist electoral strength that derives from its association with peasant revolts, a phenomenon that is temporally disjoint with the time interval considered for the regression. $\hat{\beta}_{1i}^{kj}$ can be interpreted as the effect of colonial peasant radicalization, through the mechanism of Communist support, on agrarian outcomes. If $\hat{\beta}_{1i}^{kj}$ is statistically significant at conventional levels, we can reject that historical factors - spontaneous peasant revolts in particular - had no impact on Communist support. The results of the OLS and 2SLS regressions are discussed below.

V. Results

A. Ordinary Least Squares

Incidence of Landlessness

For the proportion of Households Not Operating Land, we obtain highly significant (at the 0.05 level) negative coefficients for Communist Vote Share and Seats Contested (-0.385 and -0.0415 respectively - see Table 4A) and a negative but statistically insignificant coefficient for the Seats Won (-0.0354). Thus, for two out of three measures of electoral strength it is possible to reject the null that Communist intervention had no effect on landlessness at highly significant levels.

However, for the proportion of Households Not Owning Land, the results are somewhat inverted, with insignificant positive coefficients obtained for Vote Share and Seats Contested, and a highly significant positive coefficient obtained for Seats Won. The reason for this inversion is most likely due to the fact that land reform under Communist regimes did not bestow ownership of land to the actual cultivators, particularly

landless laborers, but improved the access to the land of the hitherto landless and secured the conditions of sharecroppers and tenants. In both Kerala and West Bengal, due to the previous delay in ceiling implementation and extremely high man-to-land ratio, there was little land available for redistribution at the time reform was undertaken under Communist auspices (Herring 1991; Nossiter 1988). Thus, landless laborers were not expected to be the primary beneficiaries of the reform effort in the sense of being granted proprietorship over redistributed parcels of land. However the significant positive effect of Communist support on access to land in the operational sense (same as the negative association with land *not* operated) suggests that the strategy, particularly in Kerala, of replacing *rentier* landlords with more productive proprietors has lead to more rural labor being hired to work the land.

Area Under Submarginal Holdings

For both Area Operated and Area Owned, we obtain highly statistically significant result for all three measures of electoral strength (See Table 4B). On average, a one percentage point increase in the Communist Vote Share led to an increase of 0.17% increase in the proportion of area operated by submarginal holdings and a 0.1% increase in proportion of area owned. The respective coefficients for Seats Won (0.0336 and 0.0181) are much smaller but significant at the 0.01 level, indicating that both electoral popularity and electoral success matter but in different ways. Due to India's first past-the-post electoral system, constituencies can be won despite low vote shares, and vice versa, making formal electoral success an incomplete indicator of overall Communist support and organization. An increase in vote share does not necessarily translate into electoral victory, but does indicate greater public support for the Party. Finally, it is reassuring that these results - that in areas where the Communist Party was strong, submarginal holdings saw a significant increase in both area operated and owned - is in accord with the literature on this topic.

Area Under Marginal Holdings

While we obtain positive coefficients for the three regressors, only one is statistically significant at the conventional levels (Column 4 in Table 4C). The ambiguity of these results reflects the fact that in fertile regions with high population density and high man-to-land ratio, marginal holdings may be much higher up on the land hierarchy than in regions where land is abundant. Since Communists took power in exactly those States that are characterized by these ecological features, holders of marginal plots would not have been the primary beneficiaries of an intentional downward redistribution or tenancy reform scheme. The OLS estimates of the coefficients for Landlessness and area under Marginal Holdings confirm that most of the benefits of reform accrued to the holders of sub-acre plots. Marginal Holdings are dropped as dependent variables for the Two Stage Least Squares model since they have little bearing on the results of this analysis.

B. Two Stage Least Squares

Although from the OLS regression it is evident that regions with strong and electorally successful Communist Parties experienced significantly better land reform outcomes - evidenced especially in the downward redistribution of land operation and ownership - there remains the problem of simultaneous causality. Did disproportionately bad inequalities in land access and ownership themselves create the conditions for Communist support? This is a plausible question, even though places with similar ecological and tenurial conditions, such as Bihar and West Bengal or Tamil Nadu and Kerala, experienced very different political and land reform outcomes. It is noteworthy, however, that the reverse causality problem is a little ambiguous with regards to the bias it might induce in the OLS estimates. If exceptionally bad initial inequality (say in 1950) did bring Communists to power, then for each decade that followed, a positive feedback would require the access to land to continuously improve. This would induce a positive

bias on the coefficients estimated above. However, if owing to lack of organization or strong Communist presence pre-1950, exceptionally bad access to land did not increase Communist support, then access to land would have to *worsen* for Communist support to increase over the following decades. This would induce a negative bias. Regardless of the sign of bias it is clear that initial conditions are important and this is where peasant revolts come in.

To address the problem of simultaneous causality, we use each State's history of peasant revolt - modeled as the proportion of its districts in which a revolt took place - to obtain fitted values of Communist electoral strength that are independent of agrarian structure since 1950. Since the measure of revolt is cross-sectional in nature and the regression is performed on panel data, the revolt proportion is interacted with the time-varying Year variable in order to get each decade's Communist electoral strength as a function of the former. A similar strategy is used by Bruszt et al. (2009) in their study of the impact of pre-transition political opposition events by civil society actors on the liberalization policies implemented in the former Soviet Union and Eastern European countries.

The benefits of this strategy derive primarily from the fact that revolts capture information about historical dynamics such as market penetration, famines, cash-crop cultivation etc. that differentiate areas with similar tenurial conditions (as discussed in Section 3.3). For this analysis, the multifarious causes of revolt matter only insofar as they lead the peasantry to resist exploitation along class lines in some regions and not others. If the amelioration of agrarian conditions through the means of Communist mobilization was predicated on the existence of a class-conscious peasantry - as this analysis assumes - then this regional variation in peasant radicalization would be a significant factor in explaining the outcomes observed in the OLS regression. The results of the second stage are discussed in detail below.

Incidence of Landlessness

In contrast to the OLS coefficients the 2SLS coefficients for both the proportion of land not operated and not owned by households are negative but statistically insignificant (see Table 5A). The implied result is that we can not reject the hypothesis that Communist support as a function of peasant revolt did not have any impact on reducing the incidence of landlessness at the conventional levels of significance. This is in keeping with fact that it was tenancy legislation, not redistribution of ceiling surplus land, that constituted the major reform effort undertaken by Communist administrations when in power.

The R-squared remains above the 80% level, indicating that the model specification accounts for the lion's share of variation in the agrarian structure variables. That the coefficients on the State fixed effects (omitted from the table) are the only ones significantly different than zero suggests that landlessness depends primarily on State-level factors that operate independently of their effect on peasant radicalization and Communist support. These could be geographical, ecological and cultural factors such as caste hierarchies, man-to-land ratio, cropping patterns, etc.

Area Under Submarginal Holdings

In this case, all six second-stage regressions yield highly significant positive coefficients for the fitted values of Communist electoral strength (see Table 5B). Furthermore, the coefficients show a significant increase in value across the board: for Area Operated, the coefficient on Vote Share has increased from 0.17 to 0.27; the coefficient on Seats Contested has more than doubled from 0.0167 to 0.0357 and the coefficient on Seats Won has increased from 0.0336 to 0.0463. The coefficients for Area Owned also show a near 100% increase for all three cases. The R-Squared is greater than 98%, which indicates that nearly all the variation in agrarian structure is explained by the regressors included in this specification.

These results allow us to unambiguously reject the null that peasant revolts had no land reform impact and draw a causal link between Communist support as a function of revolt and improved access to land, both in the operational and ownership sense, for sub-marginal or sub-acre holdings. Since the primary regressor here is constructed using peasant revolts that occurred at least thirty years prior to 1950, the coefficients are free from the effect of simultaneous causality. The resulting dramatic increase in the value of coefficients suggests that if simultaneous causality did exist, it worked in the negative sense to improve Communist electoral support, i.e., things had to get worse for them to get better. Another plausible source of negative bias is measurement error because of the need to average over multiple elections in order to facilitate cross-State comparisons.

Do the 2SLS estimate make interpretative sense? The formal interpretation of these results is that an increase in Communist electoral strength, all else constant, has led to an increase in the availability of land for cultivation in plots of size 0.01 - 0.99 acre. At the same time it is somewhat unwieldy to make cross-state comparisons of the sort that if only seven more districts in Maharashtra had experienced revolts the State would have had a land distribution pattern similar to Kerala. The distinctive groupings of landholdings for each state are first and foremost dependent on ecological factors and so the idea is not to equalize the pattern across all States to match some Platonic ideal. It is simpler to restrict the interpretation of the coefficients to their sign and statistical significance and infer that in States where radicalization was more widespread, Communist organization was stronger and subsequently, land reform outcomes were better.

VI. Conclusion

The puzzle of the emergence and consolidation of strong parliamentary Communist parties in the states of West Bengal and Kerala has elicited several explanations ranging from high levels of literacy to ecological determinism to historical excep-

tionalism. This paper has sort to root the regionally disparate support for Communism in the unevenness of peasant radicalization as a response to the vicissitudes of British agrarian policy since 1793. For the cultivator and smallholder, the road from revolt to Communism was far from straightforward: it involved the rise of a mass-based nationalist movement under Gandhi, the repudiation of Gandhian ideology and tactics by an organized left wing opposition and the sharpening of Congress-Communist antagonism over otherwise blurry class lines in the countryside. As far removed from access to the formal corridors of power in independent India as they were in the colonial period, the peasantry could only resort to informally articulating its conditions through passive resistance and active revolt. The great success of the Communist party was its willingness and ability to link these informal and formal aspects of democracy and restore the balance of power that had been decidedly in the favor of the landed classes ever since the Congress took power. While these efforts do inevitably run up against the institutional constraints posed by parliamentary democracy, this paper has shown that history plays an important role in opening up possibilities for mass mobilization and vigorous political competition. To this end, it is more useful for the democratic state to take on the role of a facilitator of popular collective action rather than that of an omniscient and benevolent benefactor of the masses as has been the case with India.

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Appendix

Table 1A: Summary Statistics of Agrarian Variables, 1950-1980

State	HHs Not Operating Land		HHs Not Owning Land		Area Operated SM Holdings		Area Owned SM Holdings		Area Operated Marginal Holdings		Area Owned Marginal Holdings	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Andhra Pradesh	32.50	11.47	14.01	11.13	1.44	0.36	1.94	0.33	6.77	1.61	7.41	1.31
Assam	19.22	12.15	25.14	13.93	3.09	1.47	3.80	1.58	12.83	6.06	13.62	5.88
Bihar	16.03	8.42	8.41	5.82	4.38	0.91	4.57	1.24	12.88	3.58	12.57	3.90
Gujarat	29.46	6.52	18.87	7.86	0.48	0.19	0.54	0.21	3.45	2.04	3.46	1.93
Haryana	39.07	11.01	16.14	14.03	0.49	0.29	0.85	0.18	2.20	0.70	3.41	0.81
J&K	9.17	2.61	9.01	6.88	3.37	1.94	3.46	1.27	20.41	6.05	19.62	4.76
Karnataka	23.06	8.15	16.91	4.77	0.46	0.19	0.66	0.15	3.84	1.35	4.15	1.24
Kerala	14.88	3.01	23.92	11.44	14.40	4.75	14.91	5.00	20.75	3.33	20.90	4.13
Madhya Pradesh	19.18	3.32	15.73	9.69	0.45	0.08	0.49	0.13	2.83	0.94	2.97	1.09
Maharashtra	29.59	8.97	20.42	5.97	0.41	0.06	0.54	0.15	2.52	0.42	2.93	0.77
Orissa	22.50	12.37	9.59	2.24	2.18	0.53	2.90	0.78	11.91	4.73	12.54	4.90
Punjab	39.07	11.01	16.14	14.03	0.49	0.29	0.85	0.18	2.20	0.70	3.41	0.81
Rajasthan	11.30	2.38	11.71	9.37	0.23	0.10	0.27	0.10	2.04	1.00	1.96	0.87
Tamil Nadu	30.97	17.60	23.48	7.37	4.10	0.99	4.63	1.33	15.12	3.22	14.71	3.05
Uttar Pradesh	17.54	8.47	5.38	2.81	2.90	0.82	3.09	0.79	11.95	1.78	12.33	2.82
West Bengal	21.96	14.91	15.02	4.79	4.80	2.71	6.16	2.50	15.91	5.66	16.60	4.77

Source: Sharma (1994). Note that data for Haryana and Punjab is identical because they were presented together in the source.

Table 1B: Summary Statistics of Communist Electoral Strength, 1950-1980

	Communist Vote Share			Communist Seats Contested			Communist Seats Won		
State	1950-1960	1960-1970	1970-1980	1950-1960	1960-1970	1970-1980	1950-1960	1960-1970	1970-1980
Andhra Pradesh	22.00	15.40	5.20	169	187	53	15	20	14
Assam	8.10	7.20	9.70	22	36	62	4	7	16
Bihar	5.20	8.20	9.40	60	129	125	7	28	27
Gujarat	NA	0.00	0.60	NA	0	11	NA	0	0
Haryana	NA	0.90	1.40	NA	12	18	NA	0	0
J&K	NA	0.50	0.10	NA	3	6	NA	0	0
Karnataka	1.90	1.60	1.70	20	16	16	1	2	3
Kerala	35.00	30.05	32.10	99	116	95	60	62	40
Madhya Pradesh	1.60	1.30	1.10	25	42	52	2	1	0
Maharashtra	3.60	6.00	2.70	32	52	43	13	11	7
Orissa	8.40	6.50	5.80	43	41	35	9	8	3
Punjab	13.60	8.20	10.35	69	35	28	6	7	14
Rajasthan	3.00	2.20	2.10	23	42	32	1	1	2
Tamil Nadu	7.40	2.70	5.70	55	54	52	4	13	17
Uttar Pradesh	3.80	4.05	3.60	90	141	118	9	10	9
West Bengal	17.80	25.80	38.10	103	165	287	46	85	180

Note: In case of multiple elections in the five years preceding each decade, outcomes are unweighted averages.

Table 2: List of Revolts, 1793-1920

Date(s)	**Revolt**	**Sub-region/State**	**District**
1794	Revolt of Vizieram Rauze	Andhra Pradesh	Vizianagaram
1796-1805	Cotiote Wars	Kerala	Wynad, Coorg, Cannanore, Kottayam, Nilgiris, Kozhikode
1799	Revolt of Wazir Ali	Oudh	Banaras, Gorakhpur and surrounding areas
1799-1805	Poligar Wars	Tamil Nadu	Madurai/Dindigul, Salem, North Arcot
1799	Chuar Rebellions	West Bengal/Bengal Presidency	Hazaribagh, Manbhum, Purulia, Bankura, Paschim Midnapore
1799	Sylhet Rebellion	Assam/Bangladesh	Sylhet/Karimganj
1808-1809	Travancore Rebellion	Travancore - Cochin	
1817	Paik Revolt	Odisha	Cuttack, Puri
1825-1833	Pagalpanthi Movement	Bengal Presidency	Mymensingh, Sherpur
1829-1832	Anglo-Khasi Wars	Assam/Present-day Meghalaya	Khasi hills
1830-31	Mysore Revolt	Mysore	Shimoga, Bangalore
1831	Wahabi Movement	Bengal Presidency	Barasat, Nadia, 24-Parganas, Faridpur
1832	Kol Rebellion	Jharkhand, Bihar	Ranchi, Hazaribagh, Palamau, Manbhum, Singhbhum

Table 2: List of Revolts, 1793-1920 [Continued]

Date(s)	**Revolt**	**Sub-region/State**	**District**
1832	Revolt of Ganga-narayan	Bengal Presidency	Purulia
1838-1847	Faraizi/ Ferazi Movement	Bengal Presidency	Faridpur, Dhaka, Bakharganj, Noakhali, Pabna
1846	Khond Uprising	Odisha	
1852	Khandesh Survey Riots	Maharashtra/Bombay Presidency	Jalgaon
1855-1856	Santal Hool	Bengal-Bihar border	Bhagalpur, Singhbhum, Monghyr, Hazaribagh, Birbhum, Bankura, Murshidabad
1859-1860	Indigo revolt	Bengal Presidency	Pabna
1875	Deccan Riots	Maharashtra	Pune, Satara, Nagar
1921	Moplah Revolt	Malabar Presidency	Kozhikode, Wynad, Mallapuram

Table 3: "Revolt" Districts Proportion by State

State	Proportion of "Revolt"Districts
Andhra Pradesh	0.17
Assam	0.00
Bihar	0.23
Gujarat	0.00
Haryana	0.00
J&K	0.00
Karnataka	0.21
Kerala	0.42
Madhya Pradesh	0.00
Maharashtra	0.15
Orissa	0.15
Punjab	0.00
Rajasthan	0.00
Tamil Nadu	0.31
Uttar Pradesh	0.04
West Bengal	0.50

Table 4A: Incidence of Landlessness OLS Regression

VARIABLES	(1) HHs Not Operating Land	(2) HHs Not Operating Land	(3) HHs Not Operating Land	(4) HHs Not Owning Land	(5) HHs Not Owning Land	(6) HHs Not Owning Land
Communist Vote Share	-0.385**			0.0158		
	(0.155)			(0.329)		
Communist Seats Contested		-0.0415**			0.00654	
		(0.0148)			(0.0349)	
Communist Seats Won			-0.0612			0.0476*
			(0.042)			(0.0261)
Constant	101.6	102.0*	79.01	83.01	82.66	87.11
	(57.47)	(52.73)	(73.26)	(74.31)	(74.23)	(67.94)
Observations	40	40	40	40	40	40
R-squared	0.884	0.883	0.875	0.813	0.814	0.826
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Lagged Regressand	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4B: Area under Submarginal Holdings OLS Regression

VARIABLES	(1) Area Operated SM Holdings	(2) Area Operated SM Holdings	(3) Area Operated SM Holdings	(4) Area Owned SM Holdings	(5) Area Owned SM Holdings	(6) Area Owned SM Holdings
Communist Vote Share	0.170**			0.105**		
	(0.0693)			(0.0404)		
Communist Seats Contested		0.0167*			0.0112**	
		(0.00814)			(0.00409)	
Communist Seats Won			0.0336***			0.0181***
			(0.00551)			(0.00338)
Constant	-18.26	-19.22	-10.20	-14.48	-14.15	-8.28
	(10.81)	(13.88)	(14.14)	(12.28)	(11.90)	(13.56)
Observations	40	40	40	40	40	40
R-squared	0.989	0.986	0.987	0.990	0.990	0.989
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Lagged Regressand	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4C: Area under Marginal Holdings OLS Regression

VARIABLES	(1) Area Operated Marginal Holdings	(2) Area Operated Marginal Holdings	(3) Area Operated Marginal Holdings	(4) Area Owned Marginal Holdings	(5) Area Owned Marginal Holdings	(6) Area Owned Marginal Holdings
Communist Vote Share	0.152			0.120*		
	(0.102)			(0.0625)		
Communist Seats Contested		0.0123			0.0127	
		(0.0102)			(0.00878)	
Communist Seats Won			0.0169			0.0118
			(0.0231)			(0.01123)
Constant	-25.58	-24.22	-20.73	-26.43	-26.16	-21.48
	(25.49)	(24.88)	(27.66)	(22.44)	(21.46)	(24.21)
Observations	40	40	40	40	40	40
R-squared	0.971	0.969	0.968	0.976	0.976	0.974
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Lagged Regressand	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5A: Incidence of Landlessness 2SLS Output

VARIABLES	(1) HHs Not Operating Land	(2) HHs Not Operating Land	(3) HHs Not Operating Land	(4) HHs Not Owning Land	(5) HHs Not Owning Land	(6) HHs Not Owning Land
Fitted Vote Share	-0.316					
	(0.373)					
Fitted Seats Contested		-0.0386				
		(0.0456)				
Fitted Seats Won			-0.0620			
			(0.0733)			
Fitted Vote Share				-0.204		
				(0.546)		
Fitted Seats Contested					-0.0259	
					(0.0695)	
Fitted Seats Won						-0.0357
						(0.0960)
Constant	115.8**	116.9**	102.5***	57.99	57.77	52.79
	(40.02)	(40.81)	(33.74)	(63.45)	(63.15)	(57.48)
Observations	42	42	42	42	42	42
R-squared	0.874	0.874	0.874	0.802	0.802	0.802
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Lagged Regressand	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5B: Area under Submarginal Holdings 2SLS Output

VARIABLES	(1) Area Operated SM Holdings	(2) Area Operated SM Holdings	(3) Area Operated SM Holdings	(4) Area Owned SM Holdings	(5) Area Owned SM Holdings	(6) Area Owned SM Holdings
Fitted Vote Share	0.271**					
	(0.0914)					
Fitted Seats Contested		0.0357**				
		(0.0121)				
Fitted Seats Won			0.0463**			
			(0.0156)			
Fitted Vote Share				0.229***		
				(0.0501)		
Fitted Seats Contested					0.0295***	
					(0.00645)	
Fitted Seats Won						0.0334***
						(0.00730)
Constant	-17.62**	-22.45**	-5.40	-21.28***	-23.51***	-7.39
	(7.231)	(7.957)	(6.940)	(6.949)	(7.045)	(7.117)
Observations	42	42	42	42	42	42
R-squared	0.988	0.988	0.988	0.992	0.992	0.992
State FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Lagged Regressand	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Crowdfunding Viability in Low-Income Nations: An Experimental Study

Justin Schweitzer[†]

Abstract

It can be very difficult for individuals without long credit histories to raise capital for their idea or businesses nowadays. This has led to the growth of two important methods of procuring funds: crowdfunding and microfinance. Crowdfunding is mainly used for causes, artists, and entrepreneurs in wealthier nations and has taken off due to the advent of the Internet. Meanwhile, microfinance was designed to combat extreme poverty in poorer countries by not relying on collateral to back up the loans. A combination of the two has been developed called prosocial lending, in which people, typically from rich nations, send funds to those seeking help from microfinance institutions. While this is beneficial, studies have shown that people are less likely to trust borrowers who are significantly different from them. This paper discusses the possibility of setting up a crowdfunded prosocial lending organization in a poorer nation, where the funders and borrowers are all citizens of the same state. This study experimentally investigates if such an institution could be effective in a place where all average income is significantly lower. The theory of diminishing marginal utility of income says that changes in wealth are less meaningful to the rich than they are to the poor. The results show that wealthier participants contribute significantly more to crowdfunding campaigns. More money was also given when

[†]I am extremely grateful to Dr. Gregory Lilly of Elon University, who was my advisor and mentor for this paper and made significant contributions to the ideas discussed and the editing involved. In addition, Dr. Stephen DeLoach and the rest of the Economics department at Elon were extraordinarily helpful when it came to preparing me to write this thesis and allocating the resources necessary to conduct the experiment it entailed. I also thank Dr. Charles Holt of the University of Virginia for creating the Veconlab platform on which this experiment was run. Funding, which allowed for the proper incentivizing of participants, came from Elon University and is very much appreciated as well.

the campaign used a Money Back funding model and had a lower funding goal. Furthermore, the risk that is eliminated by the Money Back model is far more impactful for poor individuals than rich ones. Ultimately, this research finds that it will be very difficult to see any kind of substantial money flow for crowdfunding in low-income nations and verifies the diminishing marginal utility of income.

I. Introduction

These days, it can be very hard to raise capital. Since the Great Recession, banks have resisted giving credit to anyone because of higher regulations and smaller profit margins due to historically low interest rates. One method of obtaining money for a small business that has taken off recently is crowdfunding. This is particularly because of the exponential expansion of the Internet and the global connectivity it allows. Budding entrepreneurs can get publicity for their ideas to reach further and can receive funding from interested parties all over the world.

Crowdfunding websites offer a platform for entrepreneurs to promote their ideas and try to gain support. Every crowdfunding campaign has a stated funding goal and an end date. Some of the main crowdfunding websites are Kickstarter, Indiegogo, GoFundMe, Kiva, RocketHub, ProFounder, and Prosper. Each one simply acts as an intermediary for creators and contributors. They all, however, have different methods of doing this and are geared toward different kinds of projects, such as art or technology or even scientific research. For example, Kickstarter is designed for artistic endeavors, while Indiegogo and ProFounder deal more with entrepreneurs hoping to launch a startup. Kiva and Prosper offer loans to impoverished people all around the globe.

With the passing of the JOBS Act of 2012, and within it the CROWDFUND Act, the U.S. government recognized the importance that crowdfunding plays in the economy and its ability to create jobs through small businesses. Having the option

of crowdfunding, where anyone can get their foot in the door, has given creative-types the confidence to do just that; create. Possibly more than anywhere else, this has been reflected in the technology sector, with a large amount of the booths at the 2013 Consumer Electronic Show displaying crowdfunded products (Jeffries, 2013). Although not every project is successful in reaching its goal, crowdfunding offers an alternative, and often times cheaper, method of getting credit for people who cannot afford or are otherwise unable to go a more traditional route.

Microfinance also offers capital to those who otherwise would not be able to get it. But, it is more directed at the extremely poor, who need the money to escape from poverty. These people make and live off of a daily intake far below the minimum wage of a wealthy nation. For many, the American dream is to start a successful company and work for oneself. For those in much more impoverished countries though, self-employment is more of a necessity, as highlighted in Mohammed Yunus' book *Banker to the Poor.*

Microfinance institutions task themselves with providing funds to the un-fundable. The people receiving the loans need very little yet have even less. The plan that Dr. Yunus originally laid out, the one that many microfinance banks have followed, provides credit to those who would be turned down by everywhere else, except for maybe loan sharks, who charge obscenely high interest rates that just trap people in poverty forever. Most importantly, microfinance borrowers are not asked to put up collateral on the loan. As Dr. Yunus explained, these people know this is their only chance to improve their lives, so they do not need the threat of losing their homes and possessions, which are essentially worthless, as motivation. Furthermore, participants were required to borrow in groups, adding a social incentive for avoiding default. These measures have resulted in incredibly high repayment rates (Yunus & Jolis, 1999).

One of the biggest aspects of microfinance is that it generally focuses on women. By giving extremely poor women

access to money for probably the first time in their lives, microfinance empowers them and allows them the chance to become independent, taking care of both themselves and their families. The countries where microfinance is making the biggest impact tend to be the ones with the most prominent gender roles and discrimination, especially in the impoverished villages. Often, women in these places are not culturally allowed to hold money. Hashemi, Schuler, & Riley (1996) found that microfinance institutions in Bangladesh increase "women's mobility, their ability to make purchases and major household decisions, their ownership of productive assets, their legal and political awareness and participation in public campaigns and protests. . . negotiate gender barriers, increase their control over their own lives, and improve their relative positions in their households." Grameen Bank in particular has been very successful in empowering women because of its "strong, central focus on credit, and its skillful use of rules and rituals to make the loan program function."

Since the introduction of microfinance, global poverty has reduced considerably. Ultimately, the extra wealth coming in from microfinance into the impoverished villages and countries results in greater consumption by everyone. Those heightened levels of consumption both increase microfinance participants' chances of escaping poverty and boost local income, benefiting everyone in the community (Yunus & Jolis, 1999).

Crowdfunding is serving the same function as microfinance, but in a different way. They both offer an alternative form of credit that is more attainable by the masses. There is a key demographic difference between the two. Microfinance was designed to operate amongst the extremely poor, primarily in developing nations, while crowdfunding is more geared towards people in wealthier countries. There does exist a combination of the two called prosocial lending. Kiva and Prosper are great examples of this. They allow people in rich nations to fund loans made by microfinance institutions to people in impoverished ones.

The goal of this research is to see if it is viable for the

relatively wealthier people within a poorer country to be the crowdfunders for those microfinance loans. This would have the advantage of keeping the profits in the country to help lift it up as a whole. These funders would also likely care more about the well-being of their home state than foreigners who are more interested in the story of individuals they helped. This may lead to more repeat lenders and a greater amount wealth being spread to those who truly need it. Most importantly, there will be more trust between borrowers and funders from the same country than there will be between people from opposite sides of the world. Hopefully, that will lead to more money flowing in these capacities and more wealth being spread. None of this is to say that organizations like Kiva should not continue what they are doing, as they take advantage of disparities in purchasing power for relatively small amounts of money between wealthier lenders and poorer borrowers. But, the more options and opportunities there are for impoverished people to get credit, the more likely they will be to actually get it.

II. Literature Review

A. Reward System

A big decision that creators have to make is how to reward their contributors. Typically, a crowdfunding campaign will offer some sort of reward to its contributors, or at least to those who pledged above a certain amount. There are many different ways that project creators go about this. Specifically, Hemer (2011) described five: donations, sponsoring, pre-selling, lending, and equity. Donations are more charitable giving, playing to the contributors' altruistic sides. Those projects may also give something to their backers that is meaningful but costs nothing, such as sending a thank you card, a signature, or putting their names in the credits. Sponsoring is when the creator offers to help generate publicity for the contributors, like tweeting about them or their projects. Pre-selling, or pre-ordering, is often used when the creator is making a

specific product. In exchange for their contributions, backers who pledge enough money receive that product once it is made. Lending is essentially a microloan made by each contributor that the creator promises to pay back with interest. Many times, this is known as peer-to-peer lending rather than crowdfunding. Finally, equity is generally used when the creator is seeking to start a business and offers shares of that business to the backers.

Belleflamme, Lambert, & Schwienbacher (2013) examined the difference between a gift-based reward system, otherwise known as preordering, and a monetary-based one, also called profit sharing. They explained how preordering acts as a form of price discrimination. When a campaign only needs a small amount of capital to reach its goal, preordering is better because it allows the creator to collect big donations from just a few funders whose willingness to pay for the product is much higher than everyone else's. The market price of the finished product will ultimately be lower than what these people give because the consumers who wait until it is released are not willing to pay as much as those who helped fund it. As the needs of the campaign increase, the minimum donation required to receive the product must decrease in order to attract more funders who are willing to give. At a certain point, that has been lowered so much that it is optimal for the entrepreneur to use a profit sharing system so as not commit too much money to repaying funders.

B. Threshold Public Good

At its core, any research done on crowdfunding, specifically the funders in the market, is studying a threshold public good. The product or business being created is funded by a small portion of the population and then becomes available to everyone. This is very similar to the original public goods experiments, where a group of subjects had to contribute to a public good and they each received a return for however much was given overall—regardless of whether or not they contributed themselves. The key difference in the two fields is that a threshold is

added to the public goods game, meaning no one receives anything unless the total funds contributed reach a certain level. This is equivalent to the set funding goal that all crowdfunding campaigns have.

Qiu (2013) claimed that the funding stage of a crowdfunding campaign acts as a public good, while the reward stage can be a public or private good. Successful projects with a public good reward system should expect to only barely surpass their funding goal because there is no benefit to additional funders after that point.

One of the more obvious experimental results found dealt with the return for successfully funding a threshold public good. Croson & Marks (2000) determined that a higher reward, "from either stronger preferences or lower project cost," leads to more contributions and a higher probability that the project gets fully funded. This is because each person can give more without their cost surpassing their return, so fewer are needed to contribute.

Having participants choose between multiple public goods, as funders do on crowdfunding websites, creates problems. Coordination between participants becomes harder, meaning contributions are more spread out and fewer public goods reach their threshold. This results in a smaller amount of successfully funded projects, discouraged funders and decreasing total donations. The more options that participant have, the more pronounced these effects become (Corazzini, Cotton, & Valbonesi, 2015).

C. Funding Model

One of the most important decisions a crowdfunding platform has to make is what to do with funds that do not reach the target level. There are essentially two options in that scenario, and they play a significant role in how funders decide whether or not to invest. The funds can be returned to each person who contributed them—often known as an "all-or-nothing" platform—or the creator of the project can simply keep anything already raised when the deadline passes—usually dubbed as

an "all-and-more" platform. All crowdfunding websites seem to have chosen one of these options as their funding model. To avoid confusion, from here on the all-or-nothing platforms that return seed money to their contributors if the threshold is not reached will be referred to as "Money Back". The all-and-more platforms that do not return any contributions will be called "No Refund".

In a study performed by Niemeyer et al., funders on a Money Back model invested all of their funds, while those on a No Refund model still gave most of theirs (always more than 90% after round 1). The Money Back model resulted in more projects being fully funded, more money invested, and significantly higher overall welfare. The No Refund model stemmed fewer successful campaigns but tended to overfund the ones that did reach their goal less often. Overfunding is bad because it does not lead to more return than just meeting the goal, so it indicates poor coordination on the part of the contributors. Thus, No Refund funders in the experiment were less careless and risky with their money and had better coordination with each other. Money Back funders learned after the initial rounds to coordinate better and not overfund.

Cumming et al. (2014) also discussed the difference between the two funding models. According to them, Money Back campaigns tend to have much higher funding goals because they offer a guarantee that the creator will not start the project with insufficient funds. Additionally, the No Refund model is better for creators who can scale their business or have lower fixed costs. It represents less risk, but also less return, for creators because of a heightened risk for funders. Meanwhile, Money Back campaigns come with less risk for funders and more risk, but more return, for creators.

Based on three years of data from Indiegogo, Cumming et al. (2013) determined that 34% of Money Back campaigns were successful with 189 funders on average. 17% of No Refund campaigns were successful with an average of 76 funders. And, controlling for the size of the funding goal, Money Back campaigns were still more successful. Furthermore, the marginal

effects of information from Money Back campaigns were more pronounced than from No Refund ones. Revealing more about the quality of the project will have a greater impact when it is being done on a Money Back model.

Allowing the creators to choose their funding model may be the best way to go for crowdfunding websites (Cumming et al., 2013). This is the strategy of Indiegogo and it has been very successful. Giving creators that choice magnifies the signaling effect of opting for the Money Back model. A high funding goal under the Money Back model signals to potential funders that the project is high quality.

Clearly, the further away a project is from reaching its goal, the more risky it is. It is much harder to rely on a lot of people to contribute and not free ride than it is when only a couple funders are necessary. As such, during the experiments conducted by Cadsby & Maynes (1999), having a higher threshold level decreased contributions and provisions, but only when the funding model was No Refund. They also found that a Money Back model increased contributions and the total number of projects meeting their goal. The effects of the Money Back model were greater when the reward was low and the threshold high. It had little or no impact if the threshold would have been achieved without it.

Wash & Solomon (2014) showed that a crowdfunding site is likely to get more total contributions using a Money Back model instead of a No Refund one. However, those funds are more spread out among projects because people feel safer giving a little money to every project rather than a lot to just one, which would result in less efficiency (fewer projects being fully funded). Funders on a No Refund model did a better job of coordinating which projects should receive all of their contributions, learning to only give to low risk projects.

The Money Back funding model eliminates the risk of a person ending up with less money than they started with. Thus, they cannot lose and may as well offer something. The only reason not to give becomes the free riding dilemma. If everyone else contributes enough so that a project reaches its

goal, and one person abstains, that person stands to make even more than the others because they will not have to pay anything to get the reward. Still though, using a Money Back model removes the risk influence that different funding goals have on a contribution decision.

D. Trust

Herzenstein et al. (2008) found that demographic features such as gender and race played a small but significant role in determining the success of a crowdfunding campaign. However, the financial strength of the creator and the effort they put into promoting their project are much bigger factors. According to Herzenstein et al., "these results are substantially different from the documented discriminatory practices of US financial institutions." So, crowdfunding contributors have shown less bias against people who are different from them than the more traditional lending practitioners in the U.S., but there is still some distrust.

Funders do prefer to give to creators who are more similar to them in terms of social distance. This has held true for gender, occupation, and even the first letter of their first name. Funders also prefer lending money to individual creators as opposed to groups, akin to the victim effect (Galak, Small, & Stephen, 2011). At the end of the day, though, the campaign that is best able to signal to potential funders that it is a quality project, one that will use its funds properly and successfully, is the one that is going to get funded (Mollick, 2013).

Niemeyer et al. (2016) also discussed what they called "sense of agency." That is a feeling of control over the situation, which promotes trust. The authors found that Money Back funders took an average of 8 seconds longer. This was not conclusive at all but implied a higher sense of implicit agency among them. The authors theorized, though, that No Refund funders had higher explicit agency, therefore higher motivation, because they trusted the campaigners fully with the money they did give. However, results were insignificant

for that hypothesis.

Endowment inequality in a public goods game led to less cooperation between participants, especially as the spread between participants' initial incomes grew. However, this only held true when the endowments were symmetrically heterogeneous. When the difference was asymmetrical, meaning one person had most of the initial income and the others had very little, the wealthy individual was still inclined to contribute (Fung & Au, 2014). In addition, Cherry, Kroll, & Shogren (2005) found that there were far fewer contributions in a public goods game when endowments were heterogeneously distributed among participants as opposed to being completely equal.

Creators will undoubtedly know more about their projects than funders, so there is always a chance that someone will cheat the system to get funding when their idea is not of a high enough quality to deserve it. In order to reduce the risk of market failure, Agrawal, Catalini, & Goldfarb (2013) recommended decreasing the information asymmetry through better reputation signaling and refined rules and regulations and lessening free rider issues by having the platforms use a Money Back funding model. There will inevitably be some social loss due to market failures. However, there will also be social benefits coming from the trade that creators and funders are involved in, as well as the externalities for those who are not engaged during the funding stage but do become involved with the product once it is made.

III. Theory

Based on previous studies and general intuition about human nature, a few predictions can be made for the results of this experiment. First, the three key variables that will be examined—funding model, size of funding goal (risk), and wealth—will all be significant factors in determining the success and amount contributed to each crowdfunding project.

The funding model best suited to encourage contributions should be Money Back, as it transfers the risk of losing money

from the funders, who bear it all on the No Refund model, to the creator. It will also promote more trust of the creator in the funders' minds, which will reassure them that their investment is wise.

The effect of the risk level will vary a bit, based on the other conditions. It will most likely be the case, though, that a higher funding goal equates to a lower success rate but greater contributions. Participants may be inclined to free ride under either instance, but they will know that it will take more tokens from everyone in order to reach the higher goal, resulting in less free riding. However, they will still probably be reluctant to contribute fully, so there should be fewer rounds with successfully funded projects, since the lower threshold can be much more easily met.

The wealthier participants are expected give more in general because of the diminishing marginal utility of income. Having a few extra dollars would mean a lot to a poor person, who has so little to begin with. When the cost to give each token is higher, as it will be for the low endowment group, it can be anticipated that fewer will be given up. Meanwhile, a rich person is already set financially, so having those few extra dollars will not change much of anything in their life. Thus, they will value the same amount of money less than a poor person and will be less risk-averse in how they spend or invest it. This should mean more contributions and successfully funded projects.

Finally, being rich or poor should influence the size of the effects of the other variables. Because it represents less risk to the funders, being on a Money Back platform will mean a lot more to poor people. By that same logic, low risk projects—ones with small funding goals—will be much more important to poor contributors than to rich ones. Therefore, the impact of those other two variables should be magnified when the participants have low endowments compared to their high endowment counterparts.

IV. Experiment Design

The experiment was performed in a computer lab on the VeconLab software as a threshold public goods game. The subjects were seated throughout the room, so they could not see each other's screens. They were told to login using the information provided to them.

The subjects were randomly assigned to groups of 5 based on where they sat, however no one sat next to any other member of their group. The instructions told them that they were being presented a crowdfunding project and had to decide whether or not to contribute and how much so. Each group was designated a low or a high endowment; a Money Back or a No Return funding model; and a small or a large funding goal (risk).

The subjects viewed a screen that told them how much total funding was needed for the project to reach its goal. They also saw their own endowment of tokens, which funding model they were on, and what their payoff would be for a successfully funded project. Each round started with the same endowment and platform, and the subjects entered what amount of tokens, if any, they wanted to contribute to the project. Once everyone in the group had entered their choice, the screens showed whether or not the project reached its goal. This was repeated for 10 rounds and then the subjects switched to a different project with the other size risk for 10 rounds. On each combination of endowment size and funding model, two sets of experiments were run; one with the subjects starting on a small risk project and then moving to a large risk project and the other going from large risk to small risk.

On the Money Back platform, any tokens contributed were returned if the project did not reach its goal. On the No Return platform, those tokens were lost. The low endowment condition gave every subject 10 tokens to start each round. The high endowment condition started them with 50 tokens. Finally, the small risk project had a funding goal of 20 tokens for the low endowment group and 100 tokens for the high endowment group. The large risk project had a funding goal of

40 tokens for the low endowment group and 200 tokens for the high endowment group.

If the project reached its funding goal in the round, every subject in the group received their previously designated payoff, regardless of whether or not they contributed. The payoffs for both endowment sizes were \$0.30 for the small risk games and \$0.54 for the large risk games.

The subjects were incentivized to put forth their full effort through monetary compensation based on their final token count. The number of tokens that they had at the end of each round was added up and exchanged for cash at a rate of \$0.05 per token for the low endowment group and \$0.01 per token for the high endowment group, rounded to the nearest whole dollar. This resulted in the subjects all receiving about the same compensation on average but the less endowed valuing each one of their fewer tokens more than the high endowed, as they would in real life. In full, the experiment lasted about 30-45 minutes and each subject came away with about \$10 on average, depending on what conditions they were put in and how well performed. There were 40 subjects, all undergraduate students from introductory economics classes.

Below are charts of each set of conditions the subjects could be placed into:

Rich	Money Back	No Refund
Low Risk	Success ContEnd ContGoal	Success ContEnd ContGoal
High Risk	Success ContEnd ContGoal	Success ContEnd ContGoal

Poor	Money Back	No Refund
Low Risk	Success ContEnd ContGoal	Success ContEnd ContGoal
High Risk	Success ContEnd ContGoal	Success ContEnd ContGoal

V. Results

There were three different dependent variables that were measured and analyzed for this experiment. Those were the successful funding of the project (reaching or surpassing its goal), the amount contributed as a percentage of total endowment, and the amount contributed as a percentage of the funding goal. As it pertains to the rest of this paper, those will be

referred to as SUCCESS, CONTEND, and CONTGOAL, respectively. For the group and individual data, SUCCESS was a dummy variable that was marked as a one if the project reached its funding goal that round and as a zero if it came up short. All regressions run were linear and structured as one of the following:

$$Y_i = \beta_0 + \beta_1(ROUND) + \beta_2(MB) + \beta_3(RICH) + \beta_4(HIGHRISK) + \mu \quad (1)$$

$$Y_i = \beta_0 + \beta_1(ROUND) + \beta_2(MB) + \beta_3(HIGHRISK) + \mu if RICH = j \quad (2)$$

Y_i represented the dependent variable being measured. Every set or manipulation of data was tested against SUCCESS, CONTEND, and CONTGOAL for each individual participant. The three main independent variables—funding model (labeled "MB"), initial endowment ("RICH"), and risk level ("HIGHRISK")—were all recorded as dummy variables. For funding model, a one meant it was Money Back and a zero meant No Refund. Later in this paper, when it is said that the funding model had a positive effect, it means that a Money Back model would result in a higher value for the dependent variable than a No Refund model would. For endowment, a one represented the rich group and a zero was the poor group. And for risk level, a one translated to high risk (higher funding goal) and a zero to low risk. The round was used as an independent variable as well. Equation 2 signifies when the regressions were run under the assumption that the endowment variable was set specifically to either rich or poor (j).

The data produced from the regressions in the form of Equation 1, as well as when SUCCESS was the dependent variable, can be viewed in the Appendix (Table 10). They showed the exact same results in terms of significance as the regressions that will be discussed. The F-scores for every regression were significant. On the following table, one asterisk denotes significance at the 10% level, two asterisks at the 5% level, and three asterisks at the 1% level. The t-values for each variable can be found in the Appendix (Table 10).

	ContEnd		ContGoal	
	Rich	Poor	Rich	Poor
round	0.005**	-0.011***	0.001	-0.003***
mb	0.096***	0.411***	0.03***	0.149***
highrisk	0.213***	0.173***	-0.031***	-0.009
constant	0.308***	0.163***	0.175***	0.086***

Table 9 Regression Results, Equation 2, CONTEND & CONTGOAL

The regressions for CONTEND for the rich and poor, respectively, suggested that rich participants contributed 0.5 percentage points of their endowment more each subsequent round, while poor participants actually gave 1.1 percentage points less. Based on the constants, the rich gave 14.5 percentage points more than the poor, which was consistent with the results of the Equation 1 regression. Highly endowed people contributed 9.6 percentage points more when on the Money Back model than No Refund. Those with a low endowment gave 41.1 percentage points more to Money Back projects. Having a higher funding goal dropped contributions by 21.3 percentage points for the rich participants and 17.3 percentage points for the poor ones.

The CONTGOAL regressions for the rich and poor, respectively, showed that rich individuals did not significantly change their contributions in relation to the funding goal as the rounds passed, but poor people decreased them by 0.3 percentage points per round. Also, rich participants contributed 8.9 percentage points more than poor ones, which was consistent with the results of the Equation 1 regression. Rich funders each on the Money Back model gave 3 percentage points more, while poor funders on Money Back gave 14.9 percentage points more. In addition, rich participants contributed 3.1 percentage points more individually to projects with a lower threshold, whereas poor participants were not influenced by risk.

As this was a carefully designed experiment with very few

variables, there were no problems with multicollinearity. There was a lot of heteroskedasticity—only a couple of regressions did not have significant chi squared values on the Breusch-Pagan/Cook-Weisberg test. This was corrected for by using robust standard errors whenever necessary. The lone variable that heteroskedasticity actually affected was ROUND, and even then it never changed the standard error enough to alter its significance. There were certainly omitted variables that would have influenced the equations. However, this experiment controlled for as much as was feasible and it is not expected that the results would have been considerably different. No serious questions were raised by the participants during the experiment, and when asked afterwards whether they had any trouble understanding the game, the answer was a resounding no.

VI. Discussion

The most important takeaway from this experiment is the fact that funding model and wealth were always significant and always had the same impact. Money Back users and rich participants contributed substantially more and had considerably more success. Moreover, the coefficients for funding model were much larger for the poor than the rich in every regression run. This says that people with a lower endowment valued the tokens they did have much more highly. They were far more willing to give those tokens to the crowdfunding project when they were assured by the Money Back model's guarantee that they would, at the very least, get back what they had started with. Furthermore, the 95% confidence intervals for the funding model variable in each of the rich/poor regressions did not come even close to overlapping. Thus, the effect of funding model on the participants was significantly different for the rich and the poor.

Another interesting note from the results was the tendency for risk level to have a positive effect on CONTEND yet a negative one on SUCCESS and CONTGOAL. This was most likely due to the way the dependent variables were measured. The

participants knew they would have to contribute more in order to reach the higher threshold, despite not being given any more tokens in their endowment. This would be reflected in CONTEND, but would not necessarily mean the projects were more successful. If the funding goal was lower, the participants could have contributed roughly the same amount of tokens, or close to it, and still had a higher CONTGOAL, since the denominator would be smaller. The implications of this outcome are that at the higher threshold people gave nominally more but not enough to make up for the increased funding goal. Thus, while the actual amount contributed was higher, it was less in real terms. Overall, it can be inferred that a low funding goal induces a more efficient use of contributions than a high one. This effect was stronger for the rich participants, but not by a lot.

The ROUND variable was included to see if the participants learned to manipulate the game in an advantageous way, either for the group or themselves, as they got more acquainted with it. If they contributed less as time went on, it would mean they were learning to act selfishly and free ride. If they gave more each round, it would mean they were learning to cooperate and work together for the common good. The coefficients were always much smaller than those of other variables; suggesting that the success rate or amount contributed only changed marginally because the participants were simply more experienced with the game compared to other factors.

VII. Conclusion

Four hypotheses were made about the findings of this experiment. The first was that the Money Back funding model would generate far more contributions and successfully funded projects than the No Refund model. Next, it was theorized that a higher funding goal would result in more total contributions but fewer successes. The third prediction was that wealthier individuals would be more willing to contribute and would see more success. Finally, it was postulated that the less endowed participants would be more influenced by the funding

model and risk level.

Every one of these theories turned out to be true, most notably the last of them. The difference between the coefficients for the rich and poor regressions perfectly reflected this, especially for the funding model. The poor participants were always about three to five times more impacted by the Money Back model than the rich were. That is quite a large amount. In general, those with lower incomes are much less inclined to give their money to a crowdfunding project, but that difference can be largely made up if the creators decide to use a Money Back model and set low funding goals.

As this applies to the world, crowdfunding platforms hoping to serve as the connection between creators and funders who are all citizens of a low-income nation will most likely have a tough go of it. The poor in the experiment were more risk averse. They appeared to be less trusting of others with their money, be it the creator of the project or even the other members of the group. The crowdfunding platform managers would need to be much more careful than those in high-income countries about the projects they allow on their site. They would have to make sure that only top-quality projects are listed, none of them set too high of a funding goal, and all use the Money Back model. Under those specific conditions, they could potentially see a flow of money close to what they desire. Still though, it would probably be much lower proportionally than the amount being funneled into crowdfunding sites in rich nations.

This study was mostly theoretical. Further research in this field should look more into the direct applicability of crowdfunding in poor countries. This experiment only used economics students at one university who already at least somewhat knew each other, whereas the actual use of this research deals with people in the real world who are most likely strangers. This study also completely controlled for the quality of the crowdfunding project and the general trustworthiness of the creator's description. However, those will obviously be vital influences over whether or not a person contributes to a real

crowdfunding campaign. In addition, people in the real world have a plethora of options for where they invest their money. It was simply too difficult and complicated to implement the wide-ranging choices and opportunity costs presented by all possible investment opportunities in the experiment structure.

There have been experiments done in recent years where the researchers looked into the level of trust that people from different countries or cultures have. Henrich et al. (2001) tested the Ultimatum Game (a type of trust game) on people from several different cultures. They found that there was "substantial variability in experimental behaviors across groups" due to differences in the way their social interactions and everyday lives were structured. Various cultures will have distinct reactions to situations where they have to display some form of trust. Different types of projects, what specific ventures are being funded, would also have a huge impact on people's willingness to contribute as well. Some endeavors, such as businesses and physical products, will always have higher chances of producing a proper return for funders than others, like independent movies or video game production. It is important that every aspect of innate human trust is explored in order to truly understand the most effective conditions for crowdfunding and prosocial lending.

This study assumed that the technology and capital required to allow widespread access to crowdfunding in countries where most of the citizens do not have computers or internet would already be in place. Obviously, it would not be that simple, but some combination of foreign aid and private charities could potentially enable this sort of thing. This research was concerned less with the implementation of crowdfunding in low-income nations and more with the application and effectiveness of it all. More than anything else, this paper reaffirmed the theory and concept of diminishing marginal utility of income. The key for the future will be finding even more ways to promote trust between the funders, the creators, and the system itself.

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Appendix

Table 1: Summary Statistics

Dependent Variable	Mean
Success	44%
ContEnd	43%
ContGoal Round	78%
ContGoal Individual	16%

Table 2 Summary: Funding Model

Funding Model	Success?	Contributed/Endowed	Contributed/Goal
Money Back	52	0.555	1.003
No Refund	18	0.301	0.555

Table 3 Summary: Wealth

Wealth	Success?	Contributed/Endowed	Contributed/Goal
Rich	45	0.512	0.937
Poor	25	0.344	0.621

Table 4 Summary: Risk

Risk	Success?	Contributed/Endowed	Contributed/Goal
Low	38	0.332	0.830
High	32	0.525	0.729

Table 5 Summary: Funding Model and Wealth Interaction

Funding Model	Wealth	Success?	Contributed/Endowed	Contributed/Goal
Money Back	Rich	27	0.561	1.011
Money Back	Poor	25	0.550	0.995
No Refund	Rich	18	0.464	0.864
No Refund	Poor	0	0.139	0.247

Table 6 Summary: Funding Model and Risk Interaction

Funding Model	Wealth	Success?	Contributed/Endowed	Contributed/Goal
Money Back	Rich	27	0.561	1.011
Money Back	Poor	25	0.550	0.995
No Refund	Rich	18	0.464	0.864
No Refund	Poor	0	0.139	0.247

Table 7 Summary: Wealth and Risk Interaction

Wealth	Risk	Success?	Contributed/Endowed	Contributed/Goal
Rich	Low	26	0.406	1.015
Rich	High	19	0.619	0.859
Poor	Low	12	0.258	0.644
Poor	High	13	0.431	0.598

Table 8 Summary: Three-Way Interaction

Funding Model	Wealth	Risk	Success?	Contributed/Endowed	Contributed/Goal
Money Back	Rich	Low	3	0.370	0.926
Money Back	Rich	Low	10	0.466	1.165
Money Back	Rich	High	8	0.730	1.013
Money Back	Rich	High	6	0.676	0.939
Money Back	Poor	Low	8	0.450	1.125
Money Back	Poor	Low	4	0.384	0.960
Money Back	Poor	High	8	0.716	0.994
Money Back	Poor	High	5	0.648	0.900
No Refund	Rich	Low	5	0.362	0.906
No Refund	Rich	Low	8	0.426	1.064
No Refund	Rich	High	1	0.470	0.653
No Refund	Rich	High	4	0.599	0.832
No Refund	Poor	Low	0	0.148	0.370
No Refund	Poor	Low	0	0.048	0.120
No Refund	Poor	High	0	0.022	0.031
No Refund	Poor	High	0	0.336	0.467

Table 10 Regression Results, Full

	Success			ContEnd			ContGoal		
		Rich	Poor		Rich	Poor		Rich	Poor
round	0.016*** (6.41)	0.034*** (10.72)	-0.002 (-0.65)	-0.003* (-1.73)	0.005** (1.97)	-0.011*** (-4.76)	-0.001 (-1.5)	0.001 (1.54)	-0.003*** (-3.78)
mb	0.425*** (14.3)	0.225*** (5.16)	0.625*** (18.19)	0.254*** (13.21)	0.096*** (3.78)	0.411*** (15.96)	0.089*** (12.64)	0.03*** (3.19)	0.149*** (15.46)
rich	0.25*** (8.41)			0.168*** (8.77)			0.063*** (8.97)		
highrisk	-0.075** (-2.52)	-0.175*** (-4.01)	0.025 (0.73)	0.193*** (10.04)	0.213*** (8.33)	0.173*** (6.72)	-0.02*** (-2.86)	-0.031*** (-3.35)	-0.009 (-0.97)
constant	-0.028 (-0.92)	0.184*** (3.61)	0.009 (0.27)	0.152*** (6.49)	0.308 (10.11)	0.163*** (5.34)	0.099*** (10.78)	0.175 (14.36)	0.086*** (7.64)

Forecasting Crisis Periods in the Russian Economy

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Abstract

Following the Global Financial Crisis, Russia's GDP declined by more than that of any other nation. The crisis coincided with a sudden crash in oil prices and Russia's energy-dependent economy collapsed. Using vector autoregressive techniques, I estimate long-run cointegrating equations for Russia's GDP, import expenditure, the Urals crude oil price, and the ruble's real effective exchange rate. With these long-run conintegrating equations, I develop a structural vector error-correction model for Russian output and forecast the effects of alternative oil price scenarios. In order to generate a contraction in output of similar magnitude to the 2008-2009 recession, excess uncertainty must increase as the oil price simultaneously collapses. I find that a ruble-based index, representing private-sector uncertainty, and the Economic Policy Uncertainty index, a measure of policy-related buzzwords in Russian media, should both be included. Together these indices present a diverse measure of economic sentiment.

I. Introduction

The Russian Federation was once an economic superpower that battled on the world's stage. Russia's unique history has made its decline in economic fortitude over the past 25 years particularly painful. Numerous financial crises, shocks on the energy market, and rampant inflation have plagued the Russian economy. Today Russia ranks tenth in terms of GDP.[1] It has struggled to make up for what it lost in the 2008-2009 recession when its GDP contracted more steeply than that of

[1]"Gross Domestic Product Ranking Table." *GDP Ranking.* World Bank 2014.

any other nation.[2] Recovery was slow immediately following the crisis and GDP declined again in 2014 when the ruble fell to its lowest levels since the early 2000s. Despite this dismal, unpredictable economic performance, Russia has still asserted its geopolitical relevance, first by invading Ukraine and then Syria in 2015. Recent sanctions levied by Western nations in response have further complicated Russia's economic state. With Russia's global jostling, understanding its economic structure has become increasingly important.

Russia's economy is heavily reliant on its energy sector, with 70.5% of its exports in "mineral products," including oil and gas, and with energy revenue accounting for 50% of the federal budget.[3][4] Any sort of analysis of Russian economic performance must take into account trends in international energy prices. The price of Urals crude oil fell from around $140/bbl in late 2008 to $35.49/bbl in 2009. Later, after recovering to around $110/bbl, the price again collapsed to around $50/bbl.[5] Russian GDP has mirrored these radical swings, collapsing in 2008-2009 and beginning a decline again in 2014. In both periods, the ruble fell significantly, yet in 2014 it collapsed completely as inflation jumped to around 11.4% and the Russian Central bank stepped in to raise interest rates by 6.5%.[6][7] This chaos heralded the contraction of Russian GDP for the first time since the 2008 crisis and has not yet been analyzed in depth.

This paper capitalizes on the well-established relationship between Russian economic performance and trends in inter-

[2] Rautava, Jouko. "Oil Prices, Excess Uncertainty, and Trend Growth." *Focus on European Economic Integration.* Austrian Central Bank, Q3 2013, 77

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[4] Negi, Pushpa. "Impact of Oil Price on Growth: A Study of BRIC Nations." *Indian Journal of Accounting* 47 (2015), 114

[5] Crude Oil-CIS Urals MED. OILURAL. Datastream International

[6] "Russia Annual Inflation Jumps to 11.4% as Rouble Falls." *BBC News.* BBC News, 31 Dec. 2014.

[7] "Going over the Edge." *The Economist.* The Economist Newspaper, 20 Dec. 2014.

national energy prices to develop a forecasting model for the Russian economy in 2016 and potential crisis scenarios. With OPEC's announcement that it will keep production high for the foreseeable future[8] and with Iran likely to reenter the market at full capacity once 2012 sanctions lift,[9] there seems to be great possibility for a low oil price in 2016 and for even deeper shocks. Given this potential, this paper presents three forecasting scenarios, ultimately generating an economic crisis that replicates the 2008-2009 recession by shocking the price of oil and instigating spikes in excess uncertainty.

Where previous analyses of Russian output use data through 2013, my data runs through Q3 2015 in order to capture the 2014 ruble crisis and any recent shifts in fundamentals. I use fluctuations in the nominal ruble rate to capture uncertainty in the Russian private sector. I measure uncertainty generated by, and in anticipation of, policy decisions with the Economic Policy Uncertainty Index, a measure of buzzwords in Russian newspapers. Together, these variables convey uncertainty in Russia's economic atmosphere and I enter them into a vector autoregressive model with oil price to forecast Russian crisis scenarios in 2016 through 2018.

I follow Rautava's (2013) methodology, presented in "Oil Prices, Excess Uncertainty, and Trend Growth," to ultimately build a short-run forecasting model using vector autoregressive and vector error correction modeling. Along the way, I estimate the long-run trends between Russian GDP, imports, the real effective exchange rate, and oil price. Like Rautava (2013), I include an excess uncertainty component to instigate a recessionary contraction of similar magnitude to 2008-2009. Yet, I decompose uncertainty into two components: private sector uncertainty, captured by the ruble currency market, and economic policy uncertainty, measured by an index of buzzwords in the Russian media.

[8] Jahn, George. "Unable to push up prices, OPEC ministers agree to keep production at current, high level." *US News.* Dec. 4 2015.

[9] Johnson, Christopher. "Reuters Summit-OPEC will keep oil output high, traders say." *Reuters.* Oct. 21 2015.

This paper develops and presents a model for deep recessions in Russia's economy. First I discuss recent findings in the literature and the necessary considerations for modeling Russia's economy in crisis periods. I present the data used and an outline of the methodology driving my analysis. Using cointegration techniques, I estimate long-run trends among Russian GDP, the Urals crude oil price, import expenditure, and the real effective exchange rate of the ruble. I incorporate these cointegrating vectors as error-correction terms in a short-run forecasting model that takes into account measures of excess uncertainty in the economy.

Using measures of excess uncertainty grants insight into the driving factors behind consumer trends and preferences. How are Russian consumers behaving? Are they anticipating any changes in government policy? By incorporating excess uncertainty into a forecasting model, I estimate the conditions necessary for a future economic collapse in Russia. Forecasting allows me to predict a severe Russian recession might unfold and how the subsequent recovery would progress.

In formulating the short-run forecasting model, I estimate a number of key coefficients, but most importantly I find Russian trend growth to be 2.88% and that a 10% increase in oil price results in a 1.8% increase in GDP. This estimate of trend growth is close to the consensus mean presented in Rautava's (2013) study.[10] My estimate of the long-run role of the oil price is slightly below older findings. This was initially puzzling, but given the naturally lower oil prices since 2013, my model may have revealed some resiliency to oil price shocks following erosion in the price level. By generating three different forecast scenarios according to varying oil price and excess uncertainty shocks, I reveal that a lone shock to the oil price, once the price level has already diminished, does not generate a noticeable change in Russian output. It takes large spikes in excess uncertainty in addition to this oil price shock to instigate a contraction. In splitting excess uncertainty into two parts, I find that both the policy and private sector measurements are

[10]Rautava, 85

statistically significant. This suggests that there are viable alternatives to currency-based measures of economic uncertainty and that there is a method for directly analyzing the impacts of the economic atmosphere and responses to policy changes on output.

II. Literature Review

The relationship between Russian GDP and international oil price is well studied and confirmed. Negi (2015), in examining the relationship between the GDP of Brazil, Russia, India, and China (BRIC) and the oil price proves the existence of a positive relationship in the Russian economy.[11] Kuboniwa (2012) labels this relationship a trademark symptom of Russia's seemingly cursed slow growth, the so-called "Russian Disease."[12] Both Kuboniwa (2012) and Rautava (2013), find that a 10% increase in the price of crude oil will result in a 2% increase in the level of Russian GDP.[13] Rautava (2013) goes on to build a forecasting model for the Russian economy in crisis periods by incorporating uncertainty on the ruble market. Deryugina and Ponomarenko (2014) perform a similar analysis. Despite focusing on a number of macroeconomic variables, they confirm a reliance on oil price –and then use a variable capturing European Union GDP elasticity to forecast Russian GDP.[14] Both Rautava (2013) and Deryugina (2014) recognize the positive relationship between oil price and GDP, but also use a secondary, exogenous variable to generate accurate forecasts for crisis scenarios. None of the above studies use data after 2013.

Rautava (2013) builds a forecasting model for Russian GDP that relies on similar cointegrating equations as presented by

[11]Negi, 154

[12]Kuboniwa, Masaaki. "Diagnosing the Russian Disease: Growth and Structure of the Russian Economy." *Comparative Economic Studies* 54 (2012), 121

[13]Rautava, 81

[14]Deryugina, Elena, and Alexey Ponomarenko. "A large bayesian vector autoregression model for Russia." *BOFIT Discussion Papers* 22 (2014), 4

Kuboniwa (2012). Rautava (2013), like Kuboniwa (2012), finds that a 10% increase in the oil price leads to a 2% increase in GDP and that the real exchange rate does not play a role in determining long-run GDP, but that it does play a significant role in determining import levels. Rautava (2013) estimates that annual Russian trend growth is around 2%. He finds that a 10% increase in the real effective exchange rate will boost imports by 7%.[15] [16]

After establishing these long-run conditions, Rautava (2013) builds a forecasting model for crisis periods and includes a variable, *crisis*, which is the square of the first difference of a nominal ruble basket. *Crisis* reflects shocks to the ruble: capturing excess uncertainty that has a "negative impact on all endogenous variables" in the short term.[17] Rautava (2013) notes that this variable, if included in the long-run model around 2008-2009 would have significantly improved GDP predictions. He then presents three scenarios for the period from Q2 2013 to Q4 2016. The first scenario fixes oil price at $110/bbl, the second at $53/bbl, and the third also fixes the price at $53/bbl but also includes the crisis variable. The results of this third scenario mimic the steep GDP contraction of 2008-2009, suggesting that the price of oil alone cannot accurately forecast Russian GDP in short-run crisis periods.

The assumptions relevant to Rautava's (2013) work, and thus mine, have been established by a series of studies in the last few years. Negi (2015) provides a recent calculation of the relationship between oil price and the GDP of Brazil, Russia, India, and China. Negi (2015) uses annual data from 1987 through 2013 with oil price values from the Energy Information Administration and GDP levels from the United Nations Conference on Trade and Development. He applies different methods of regression, ignoring temporal changes, and finds positive coefficients for oil price for Russia and Brazil and negative values for China and India. These findings corroborate

[15] $gdp = 0.2oil + 0.005t$, where t is a time trend. Rautava, 81

[16] $imp = 2.0gdp + 0.7reer$, Rautava, 81

[17] Rautava, 82

Negi's (2015) hypothesis that there should be a positive relationship between an increase in the oil price and GDP for oil exporters and a negative relationship for oil importers.[18]

Kuboniwa (2012) takes this basic assumption a step further in building an analysis of the "Russian Disease" by including temporal changes and the real effective exchange rate.[19] Using quarterly data from 1995Q1 to 2010Q4 GDP, a span long enough to include the 1998 crisis and the 2008 recession, Kuboniwa (2012) finds that a 10% increase in oil price causes a 2% increase in Russian GDP. Moreover, he finds annual Russian trend growth to be approximately 2.4%.[20] He finds that given a 10% increase in the real effective exchange rate, imports will increase by 8.7%. He also proves that the real exchange rate does not have any direct long-run effect on GDP, but that it instead influences import levels, altering GDP via this channel in the short-run.[21] In his analysis, Kuboniwa (2012) asserts that since natural gas prices are "determined based on oil prices and they are well correlated" it is not necessary to explicitly consider gas prices.[22] I make this assumption in my analysis and opt to only include Russian-sourced crude oil prices.

Deryugina and Ponomarenko (2014) build a large Bayesian vector autoregression model for Russia using 14 "domestic real, price, and monetary macroeconomic indicators" all in logarithmic form from Q1 2000 to Q2 2013.[23] They then build a forecasting model conditioned only on the oil price, finding that while it does cause a slight contraction, it does not predict the magnitude of the 2009 recession. For this reason, they include the actual GDP of the European Union and find that, when conditioned on both variables, the 2009 contraction in GDP can be accurately forecast. This corroborates the underlying claim made by Rautava (2013), that it is necessary

[18] Negi, 154

[19] Kuboniwa, 121

[20] $gdp = 0.203oil + 0.006032t$, where t is a time trend. Kuboniwa, 131.

[21] $imp = 1.612gdp + 0.871reer$. Kuboniwa, 136.

[22] Ibid. 125

[23] Deryugina, 4

to include some variable capturing externally induced shocks when forecasting Russian GDP.

Kuboniwa (2012) and Rautava's (2013) work build a framework for the interaction between these variables. They both find similar long-run relationships between the oil price and GDP, establishing good baselines for any further analysis. The cointegrating equations found by Rautava (2013) and Kuboniwa (2012) are used as rough guidelines in the estimation process of my own model. Both find that a 10% increase in the oil price results in roughly a 2% increase in GDP. Moreover, both Kuboniwa (2012) and Rautava (2013) demonstrate how the real exchange rate affects import levels, finding that a 10% increase in the real exchange rate leads to an 8.7% and 7% increase in imports, respectively. Rautava (2013) and Deryugina and Ponomarenko's (2014) analyses prove that crisis GDP levels cannot be predicted from oil price alone; that some exogenous variable capturing the external economic atmosphere must be included.

Because Rautava's (2013) analysis is completed in two stages, first considering long-run trends and then developing a short-run forecasting model, following Rautava's (2013) methodology allows me to be similarly thorough in my own analysis. Moreover, Rautava (2013) includes measures of excess uncertainty that fully allow him to generate significant recessions in forecasted periods, where Deryugina and Ponomarkeno (2014) fail. I follow Rautava's methodology closely and base my model on his. I include the same key variables: GDP, imports, the real effective exchange rate, and the oil price, but include two measurements of excess uncertainty. Additionally, I replicate similar forecasting scenarios to those Rautava (2013) uses to generate a Russian recession.

However, the analysis by Deryugina and Ponomarenko (2014) and Rautava (2013) was completed over a year ago and do not include data on the recent crashes in international oil prices and the Russian ruble. While Rautava (2013) analyzed only two crisis periods, the collapses of 1998 and 2008, I include the more recent 2014 Ruble Crisis. Replicating Rautava's (2013)

proven methodology with data through Q3 2015 generates a contemporary forecasting model for Russian output in crisis periods. Additionally, by decomposing excess uncertainty into ruble-generated uncertainty and policy-generated uncertainty, I prove that a measure of economic policy stability should be included when forecasting Russian crisis periods.

III. Data

Table 1: Key Variables

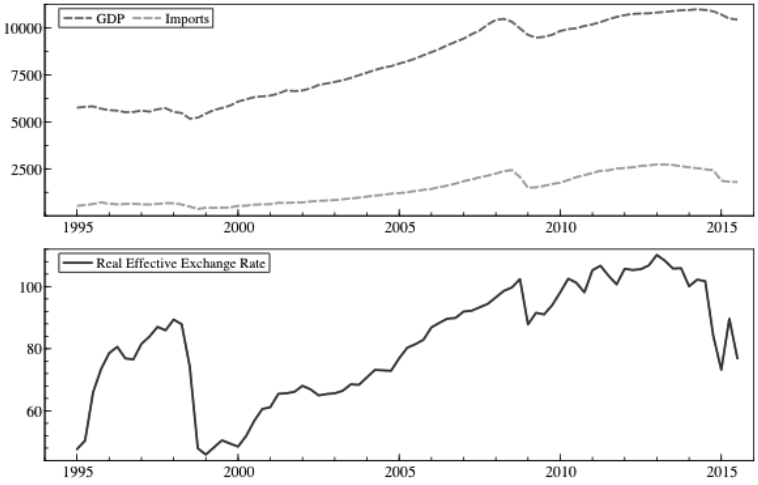
Variable	Mean	Minimum	Maximum
GDP (2008 Rubles, billions)	8219.6	5171.8	10996.7
Imports (2008 Rubles, billions)	1402.8	369.4	2730.6
REER (Index, 2010=100)	81.81	45.9	110.2
Urals Oil (USD/bbl)	52.52	9.73	130.23

This paper uses quarterly data from Q1 1995 through Q2 2015 and will include Q3 and Q4 of 2015 once they have been reported. All data, except for the Economic Policy Index, come from *Datastream International*. In following Rautava (2013), the endogenous variables are Russian GDP, imports, and the real effective exchange rate of the ruble. The price of Urals crude oil is exogenous because international energy markets determine commodity prices. The historical levels of the endogenous variables, seen in Figure 1 on the following page, suggest that there are significant long-run trends and relationships between the variables. Historical values for the Urals oil price are shown later in Figure 2 when alternative forecasting scenarios are considered.

In Figure 1 note the three recessionary periods: 1998, 2008-2009, and 2014-present. The 2008-2009 financial crisis hit Russia's GDP levels harder than that of any other nation. As

output was greatly affected, the contractions in imports seem to respond accordingly. The oil price, shown in Figure 2, and the real effective exchange rate both seem to correspond with these contractions in output and imports. As these variables seem to be nonstationary, cointegration analysis should reveal the underlying trends.

Figure 1: Endogenous Variables



Source: *Datastream International*

To capture private sector uncertainty, I build an index based on fluctuations in the ruble's exchange rate. Rautava (2013) uses a "ruble basket," some weighted average agglomeration of ruble exchange rates.[24] As Rautava (2013) does not provide details of the ruble basket he uses, I use a trade-based weighted average of the RUB/USD and RUB/EUR exchange rates. As commodities are generally priced in US dollars, the RUB/USD rate is given a weight of 68.56% in the basket. This is the averaged percentage of commodities in Russia's exports

[24]Rautava, 79

and imports.[25] As the EU is Russia's largest trading partner by a substantial margin, the RUB/EUR rate is the next important indicator to consider and is given the remaining 31.44% weight.[26] Using these together, I generate a basket according to Russian trade patterns and overweight the US dollar for its international significance in commodity markets.

To create the final private sector uncertainty variable, shown later in Figure 3, the first difference of the ruble basket is squared and then smoothed using the Almon distributed lag model, as used in Rautava (2013).[27] With this distribution, a shock holds for at least three quarters, replicating Rautava's (2013) assumption about the duration of uncertainty spikes.[28] This variable is then mostly dormant, but still reflects the immediacy and magnitude of violent shocks to the ruble.

To capture policy uncertainty, I use the Economic Policy Uncertainty Index for Russia. The index is built by counting the frequency of policy terms in the Russian economic newspaper *Kommersant*. They search for the Russian language equivalents of "'policy', 'tax', 'spending', 'regulation', 'central bank', 'law', terms relating to political institutions like the Duma," and "budget."[29] This index is then a numerical representation of Russia's political and economic atmosphere. To fit this variable into the data set like the ruble basket, where I am concerned with *excess* uncertainty, I square the first difference of the index and then scale the remainder out of 100. This removes trends in the data so that the index reflects shocks to the uncertainty level. Again, there are no negative values for this index. Shown later in Figure 4, this index is much more tumultuous than the ruble rate-based index, suggesting more rampant uncertainty related to policy decisions. With

[25]Simoes, AJG and CA Hidalgo. The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. (2011)

[26]Simoes and Hidalgo.

[27]Like Rautava, I employ the Almon model with lags=3 and power=1

[28]Rautava, 79.

[29]"Russia Monthly Index." Economic Policy Uncertainty

frequent periodic shocks, the policy index reveals an anxious, tense economic atmosphere.

IV. Methodology

This paper follows Rautava's (2013) methodology. Data for Russian GDP, import expenditure, and the ruble's real effective exchange rate are considered endogenous. The price of Urals crude oil, the ruble-based uncertainty index, and economic policy uncertainty index are exogenous in the system. In following Rautava's (2013) work, I include dummy variables for Russian crises in 1998, 2008, and 2014 as well as a dummy variable to account for Russia's poor growth since 2009. I use a vector autoregressive (VAR) model with cointegrating equations with general structure:

$$\Delta y_{i,t} = \Pi_0 y_{i,t-1} + \Gamma_1 \Delta y_{i,t-1} + \Gamma_2 \Delta y_{i,t-2} + \Pi_u \Delta y_{n,t-1} + \Gamma_3 \Delta z_{i,t} + \Gamma_4 \Delta z_{i,t-1} + \Psi D_t + \epsilon_t$$

This shows how the first difference of the endogenous variables, y_i , depend on their own lagged values, the lagged values of other endogenous variables, where Π_u contains each coefficient for the other first-differenced variables, $\Delta y_{n,t-1}$, the first difference and lagged first difference values of the exogenous variables, $\Delta z_{i,t}$ and $\Delta z_{i,t-1}$, some predetermined dummy variables D_t, and a residual error term. Π_0 is a matrix computed as $\alpha\beta'$ that presents the adjusted long-run coefficients, where the α matrix contains the speed-of-adjustment coefficients and β, the long-run cointegrating equations.

First I estimate the cointegrating relationships for GDP, imports, the real effective exchange rate, and the oil price. I include a time trend in the GDP equation, as Rautava (2013) does. The estimated cointegrating equations represent the long-run trends in the data and are used as error-correction terms in the short-run forecasting model. I explicitly identify these cointegrating relationships in the modeling space so that they can be extended past the horizon line in the forecasting

model. I use this model to forecast Russian GDP through 2018 conditioned on the exogenous oil price and two constructed uncertainty variables.

While Rautava (2013) uses only a ruble-based measure of excess uncertainty, I include a secondary uncertainty variable: the economic policy uncertainty index, which measures policy-related buzzwords in Russian media publications. Together, these two indices portray a more diverse measure of uncertainty within the Russian economy. The ruble-based index conveys market-specific and primarily private sector uncertainty. With its basis in news media, the economic policy uncertainty index captures the complete economic atmosphere. The private sector uncertainty variable, *private*, and the policy-based uncertainty variable, *policy*, are used with a one period lead in the estimation process to capture the effect of expectations about uncertainty. I implement a number of time dummies in the modeling process that account for explicit recessionary periods.

V. Long-Run Estimation Results

Rautava (2013) uses a model with 2 lags and 2 cointegrating equations. Using Stata for preliminary analysis, I confirm that the lag order selection test, *varsoc*, selects two lags according to the sequential-likelihood ratio (LR), Hannan-Quinn information criterion (HQIC), and Schwarz Bayesian information criterion (SBIC) tests. Next, I use Stata's command, *vecrank*, to implement the Johansen tests for cointegration and confirm that there are two cointegrating equations within my data.

With data imported into OxMetrics, I add a restricted trend variable and a number of time dummies that account for the shocks in 1998, 1999, 2009, and 2015. Additionally, and in accordance with Rautava's (2013) work, I include a step dummy for Russia's poor growth since 2008. With data in logarithmic form, I use OxMetrics multiple-equation dynamic modeling function in the PcGive module to estimate a cointegrated VAR model of rank 2. PcGive produces a series of matrices.

The β matrix presents the cointegrating equations as vectors with coefficients for *gdp*, *imp*, *reer*, *oil*, and *trend*. According to Kuboniwa (2012) and Rautava's (2013) estimations, I impose β restrictions on to return equations for *gdp* and *imp*. Upon initial estimation I found that *reer* enters into the vector normalized for *gdp*, but with a large standard error, so I too find that it may be removed from the system. Additionally, I restrict the coefficients on *trend* and *oil* to 0 in the *imp* vector.

$$\beta = \begin{pmatrix} gdp \\ imp \\ reer \\ oil \\ trend \end{pmatrix} \begin{pmatrix} 1.000 & -1.8903 \\ 0.0000 & 1.0000 \\ 0.0000 & -0.80229 \\ -0.17988 & 0.0000 \\ -0.0071913 & 0.0000 \end{pmatrix}$$

These two vectors in β capture the following long-run cointegrating equations:

$$gdp = 0.17988oil + 0.0071913trend \tag{1}$$

$$imp = 1.8903gdp + 0.80229reer \tag{2}$$

Equation (1) suggests that a 10% increase in the price of oil will result in a 1.8% increase in GDP and that trend growth of Russian GDP is roughly 2.88% annually. My estimate of the long-run role of the oil price may be a slight underestimation given Rautava (2013) and Kuboniwa's (2012) approximations at 2%. Yet, my model extends the analysis period through Q3 2015, so a shift of 0.2% may be plausible and have a reasonable explanation given more recent data.

Rautava (2013) found annual trend growth to be closer to 2%, noting that he found this value to halve from 4% to 2% after the 2008 crisis.[30] Rautava (2013) also presents a number of trend growth estimates made by other economists. The consensus mean of these estimates is 2.6%.[31] My estimate of

[30] Rautava, 85

[31] Rautava, Ibid.

current trend growth is close to this mean and well within the range of studies presented by Rautava (2013). Given my use of more current data, there may be cause for a difference in the trend growth estimate. However, as Russia's output levels do not suggest a notable increase in growth rate, this may be evidence of some misspecification or error.

The coefficients in Equation (2) suggest that imports will rise by 1.9% given a 1% increase in GDP and that a 10% appreciation in the value of the ruble will lift imports by an additional 8%. Where Rautava (2013) found that this same increase in GDP would raise imports by a full 2%, Kuboniwa (2012) estimated the same increase in GDP to raise imports by only 1.6%. My estimate of 1.9% is then well within the established margin. Similarly, they both find that a 10% increase in the real effective exchange causes 7% and 8.7% increases in imports, so my estimate of an 8% increase also seems to be reasonable.

The most surprising result from the above equations is the coefficient for *oil* in Equation (1). Given Russia's energy dependence I had expected to find a value greater than or equal to the 2% found by Rautava (2013) and Kuboniwa (2012). The explanation may partially be due to differences in the datasets and length of estimation periods. My use of pre-seasonally adjusted data versus, Rautava's (2013) seasonal adjustments may cause slight differences in our datasets for Q1 1996 through Q4 2011, the period he uses to estimate these long-run equations. As I estimate the long-run conditions from Q1 1996 through Q3 2015, I had expected some deviation from Rautava (2013) and Kuboniwa's (2012) findings. Since they completed their studies, the Russian ruble soared with inflation, output began to contract, and the oil price, by Q4 2015, has hit lows that were not even seen during the 2008-2009 crisis. I had expected these swings to indicate a greater impact on oil price.

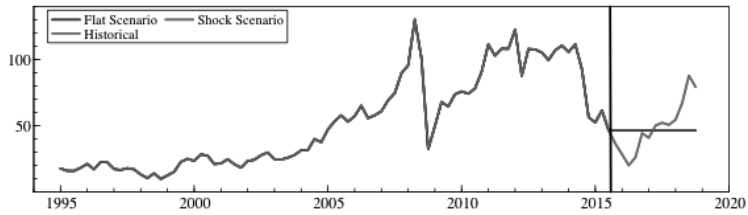
Yet, the record low oil prices of 2015 may have revealed some resiliency in Russian output oil price. At first, the decline in price of oil that began in 2014 seemed to be paced similarly to the fall in 2008, but by late 2014 the price of oil

rose again, then fell more slowly in early 2015. This is to say that the recent decline in oil price has been much more drawn out than that which coincided with the 2008 financial crisis. While output has declined since late 2014, the ruble run and low oil prices have not caused the dramatic collapse in Russian GDP that they did in 2009. I use the short-run forecasting scenarios to evaluate the how the contemporary Russian economy responds to shifts in the oil price.

VI. Forecasting Scenarios

The exogenous variables are the price of Urals crude oil (Figure 2), an uncertainty variable compiled from the nominal ruble basket (Figure 3), and a transformation of the Economic Policy Uncertainty Index (Figure 4). Their exogenous nature allows me to input values according to different scenarios. I present three scenarios: I hold the oil price flat, I generate a negative shock in the oil price, and I combine a negative shock in the oil price with excess uncertainty.

Figure 2: Historical Oil Price and Forecast Scenarios



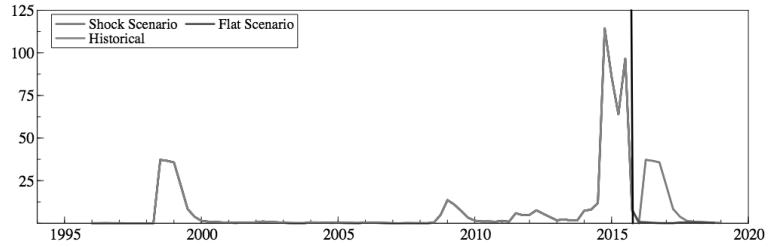
Source: *Datastream International* and Author's Calculations

Figure 2 displays the historical oil price until the end of Q3 2015 where a horizon line indicates the price level in the two scenarios. In the flat scenario, the price of a barrel of Urals crude oil holds at $46.36, the final value of Q3 2015, through Q4 2018. In the shock scenario, the price per barrel falls in a similar fashion to the collapse in oil prices in 2008-2009. As international oil prices were already on the decline in Q3

2015, I carry the current descent on down to a lower estimate of \$20/bbl. The peak to trough difference from Q4 2014 to Q2 2016 is then \$91.62, comparable to the \$97.85 shock from Q2 2008 to Q4 Q 2008. This collapse presents the model with a set of inputs similar to those from the 2008-2009 Global Financial Crisis.

In the flat scenario, by removing the role of a changing oil price in the first differences model, output should grow according to the established trend growth rates seen in Equation (1). GDP should step forward purely according to its underlying trend growth rate. In the shock scenarios, the impact of the collapse in the oil price must overcome the upwards push of the trend growth rate to ultimately drag output downwards.

Figure 3: Historical Private Sector Uncertainty Index and Forecast Scenarios



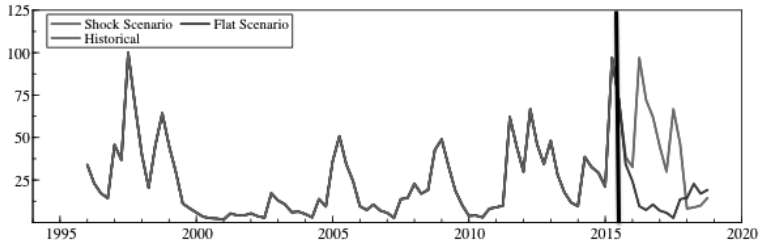
Source: *Datastream International* and Author's Calculations

I present the alternative forecast scenarios for the ruble-based uncertainty index above in Figure 3. In the flat scenario, I maintain a near-zero level for private sector uncertainty that reflects the period from 2001-2008. During this period GDP levels grew steadily. Presenting the model with low private sector uncertainty, should allow GDP to grow.

For the shock scenario, I contend that the ruble run of 2014 and 2015, shown above as the large, two pronged spike in my index, is relatively rare. Rather than use 2008-2009's low uncertainty spike, or the recent shock, I replicate the private sector uncertainty generated in the late 1990s as its duration matches the periods of increased uncertainty in both 2008-

2009 and 2014-2015, but its magnitude is between the two. This increase in uncertainty follows Rautava's (2013) surge in excess uncertainty in his bearish forecasting scenario and should induce contraction in GDP.

Figure 4: Historical Economic Policy Uncertainty Index and Forecast Scenarios



Source: *policyuncertainty.com* and Author's Calculations

Alternative forecasting scenarios for the Economic Policy Uncertainty Index are shown above in Figure 4. I present two scenarios: one holds policy-based uncertainty dormant while the other presents a significant positive injection of uncertainty. In constructing a "flat" scenario for the policy index in early 2016, I use the moderate uncertainty levels for 2006 and early 2008, following a similarly low set of ruble-based uncertainty levels. This replicates an expectation of some constant policy based uncertainty, but without including any positive spikes and by lowering uncertainty levels from their 2015 peak.

In the shock scenario, I follow the late 2015 shock with a similar spike carrying over into 2016 with second and third aftershocks of similar magnitude to those of the late 1990s. This creates a similar policy-based uncertainty response to the crises of 1998 and 2008. The shock scenario presents the corresponding levels of policy-based uncertainty for the ruble-based uncertainty shocks discussed earlier. In combination, the positive shocks in excess uncertainty generated by the ruble and a potential policy response, should present the model with enough negative stimulus to generate a significant recession when combined with a collapse in oil prices.

VII. Short-Run Error Correction Model Results

I include the long-run cointegrating equations (1 & 2) as error-correction terms in a vector autoregressive model of the first differences of the variables by using the simultaneous equations modeling feature of PcGive. These error-correction terms are explicitly identified as equations within the model and are regressed on *Dgdp* and *Dimp*, respectively. I then include a series of time dummies: *dumm1998*, *dumm1999*, *dumm2009*, *dumm2015* and *dummgrowth*, a dummy variable accounting for Russia's poor output growth following the 2008 crisis. At this stage I allow the uncertainty variables to enter the model with a one-period lead. This produces an over-identified model for the endogenous variables, *Dgdp*, *Dimp*, and *Dreer*. My reduction of insignificant coefficients partially follows Rautava's (2013) results, but I explicitly state included time dummies in the appendix, as some of their values are greatly significant. The estimated equations for GDP, imports, and the REER are also found in the appendix.

In following Rautava's (2013) techniques, I prioritized those coefficients that he found to be statistically significant as I reduced my model. I pared down the regressors for each equation until I was left with equations using roughly the same lags as Rautava (2013). Rautava (2013) does not explicitly state the dummy variables implemented in each regression, but I include those that were statistically significant in my model. By closely following his model reduction strategy, I had expected the lagged error-correction terms, $CIgdp\_1$ and $CIimp\_1$ to be more significant in their respective equations, as Rautava (2013) found the t-values of the lags of error correction terms as -2.66 and -7.09.[32] As these error correction terms are derived from the long-run relationships using the cointegration analysis already described, their lessened significance might be explained by the minute departures from the established and expected findings I described in the long-run results section.

Despite some misspecification in my model, I may have

[32]Rautava, 83.

revealed some role for a policy index in modeling short-run changes in the levels of GDP and imports. In both the equations for the first difference of GDP and imports, *Dgdp* and *Dimp*, the coefficients for the lead of the economic policy index, *policy_*−1, and the lead of the private sector uncertainty index, *private_*−1, display the most significant t-values in their equations, following Rautava's (2013) estimates of the significance of his *crisis* variable. The coefficient for *policy_*−1, however, has a greater t-value than that of the private sector index in both equations. While I expected to find that the policy index might play a statistically significant role in my model, I did not expect its significance level to be markedly greater than the private sector index.

Certainly, official government agency announcements and citizen speculation shape the economic atmosphere, but their impact is often difficult to measure. Considering economic policy's role in contributing to excess uncertainty is more easily done. In Rautava's (2013) model, policy announcements and media activity can only impact the ruble's exchange rate. Yet by including the policy index, this model captures a wholesome economic environment with both hard currency changes in the private sector index and the atmospheric drivers of economic change in the policy index.

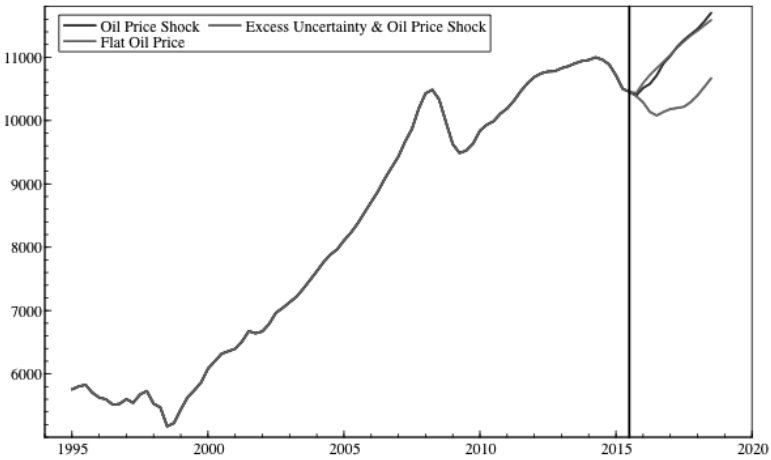
VIII. Forecast Scenario Results

The results of three different forecast scenarios are presented in Figure 5. The three scenarios build off of one another to incrementally add levels of recession-generating activity. As the model steps out over the forecasting horizon, the values and effects of the two error-correction equations, copies of the cointegrating relationships in the data, are also forecasted to correct for insignificant departures from the trend. The first scenario keeps the price of a barrel of Urals crude flat and GDP, imports, and the real effective exchange rate adjust accordingly, this is a baseline scenario that limits the change in exogenous variables in the model. The second scenario imposes a shock to the oil price and eventual recovery to normal

pre-2015 levels. The third adds spikes in the *policy* and *private* uncertainty variables to the shock in oil price levels described in the second scenario.

At this stage, the effect of a further drop followed by a typical rebound in oil price does not have the same stark effect on GDP that Rautava (2013) finds. He shows that a large shock to the oil price alone can cause a contraction roughly half of the size of the 2008-2009 recession. Here, the flat and shock scenarios for oil price return essentially the same forecasted values for GDP, with the shock scenario only causing slightly diminished growth rate for 6 quarters, shown by the minute gap between the two upper forecasts for GDP, but no contraction. This weaker impact may partially be due to where I have imposed the shock scenario.

Figure 5: Forecasts for Russian Output Levels



Source: *Datastream International* and Author's Calculations

In Q3 2015, where my historical data ends, the oil price was already in decline and at a relatively low level. Yet in his flat oil price scenario, Rautava (2013) holds the price for his forecast scenarios at what would be peak levels before the 2014 decline. There is no way he could have known that the

price level he chose would be a relative peak, but these values are also some of the absolute highest, even when compared with the levels prior to the 2008 financial crisis. In Rautava's (2013) shock scenario he mimics oil prices during the financial crisis exactly, with oil price falling from around $120/bbl to near $30/bbl. My scenarios pick up and carry on trends in the current data by cutting off the descent at its value for Q3 2015 in the flat scenario and following the descending trajectory further downwards for the shock scenario. Where Rautava's (2013) flat scenario was a relative peak, mine puts a stop to the 2015 decline. Similarly, my shock scenario carries the price shock down until the full magnitude of the shock is similar to that of 2008-2009.

The timing of imposing these scenarios might be why I did not observe contraction in GDP given a shock in oil price alone, but I may have revealed some resiliency in Russian GDP levels. As the oil price was falling quickly from late 2014 and on, historical Russian GDP levels did contract, shown above in the historical portion of Figure 5. When I carried the price of oil further down, in the forecasting scenario, this additional change had very little additional impact on GDP when compared with the flat oil price scenario. This suggests that much of the effect of this price swing had already been realized in GDP levels before Q3 2015. To generate a recession of the same magnitude as 2008-2009, it takes an additional uncertainty spike. This next step follows Rautava's (2013) findings. Another explanation may be an underestimation of the long-term impact of oil price on GDP.

In the crisis scenario, where excess uncertainty is rampant in both the policy and private sector indices and the oil price continues its fall, I forecast a recessionary period of similar magnitude to that of 2008-2009. This matches Rautava's (2013) findings about the necessity of including an uncertainty shock along with the decreased oil price. Moreover, if we consider Q3 Russian output to be resilient to further decreases in the price of oil, as evidenced by the second forecast scenario, we see that the Russian economy is still contraction-prone, but

less vulnerable to a shock to a relatively low oil price.

IX. Conclusion

I set out to develop a forecasting model for crisis periods in the Russian economy that used a more accurate and nuanced representation of excess uncertainty. Along the way I estimated the long-run relationships between GDP, imports, the real effective exchange rate, and the oil price and estimated the trend growth rate of Russian output with data through Q3 2015. I used established techniques coupled with recent data in order to create an up-to-date analysis of these macroeconomic indicators.

I presented three different forecast scenarios for Russian GDP given the most recent fundamentals. In generating a contraction of similar magnitude to the 2008-2009 recession, my results match established findings about the magnitude of shocks and inclusion of uncertainty variables to create a sizeable recession: it takes both a large drop in the oil price and a bout of excessive uncertainty to generate a large recession.

Given the studies I reference, the consensus suggests that large oil price based shocks trigger small contractions in output. I may have revealed some limitations to this assertion. Instead, Russian output seems to respond most to the early phase of an oil price shock. In 2014, once the oil price begins to fall, output follows. Yet once the price passes a certain threshold, output doesn't respond with the same alacrity seen in 2008-2009. Rautava (2013) forecasts a minor recession due to a similar negative shock. My work in this paper does not explain the underlying causes of this limited response.

While there are likely discrepancies between the data and implementation decisions I use in my work and Rautava's (2013) studies, my estimates for the long-run relationships between the system's key variables, are plausible. I estimate Russian trend growth to be 2.88% per annum, in line with other estimates. More importantly, however, is my estimate regarding the role of the oil price in determining GDP. I find that a 10% in the oil price results in a 1.79% increase in the

level of GDP. This is lower than Rautava's (2013) estimate, but may be due to the aforementioned resiliency that my forecasting models suggest. A diminished impact of oil price on GDP would suggest more diversity in the sources of Russian output.

Future analysis might pinpoint important policy decisions and announcements in relation to the ruble rate and the policy uncertainty index to decipher their individual affect on GDP and the precise effect they have on each other; there is likely interaction and crossover between the information that affects the ruble rate and policy decisions. However, both have the potential to generate uncertainty and the variable indices I derive correct for departures from the normal levels of economic uncertainty.

Additionally, including Chinese exchange rate into the ruble-based index may add more detail, as China is a significant trading partner. Future work might also take into account where flat and negative shock scenarios are imposed and present a greater variety of shocks to the oil price in order to reveal how Russian GDP responds to negative shocks of small and large magnitudes and whether they are imposed at a relative high or low starting price. Furthermore, given sanctions episodes against Russia for annexing Crimea and with the potential for more sanctions depending on future conduct in Syria, analysis might consider the economic impact of sanctions. Russia's poor recovery since the Global Financial Crisis may be compounded by the imposition of sanctions by Western nations.

This paper demonstrates a role for a measure of economic policy-related uncertainty. By decomposing excess uncertainty into uncertainty generated by the international ruble market and uncertainty related to economic policy decisions, I am able to incorporate the general economic atmosphere into the modeling process through an objective measurement. The Economic Policy Uncertainty Index is a direct representation of sentiments regarding economic policy in the Russian media. Incorporating the policy index into an analysis of Russian output presents a lens to view decisions made by firms and

investors in anticipation of policy changes.

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Appendix

Table 2

Final Short-Run Model		
	Coefficient	**t-value**
Equation for Dgdp		
Constant	0.0114	0.32
DLgdp_1	0.234	2.16
DLreer_1	-0.0264	-1.29
DLreer_2	-0.0494	-2.51
DLoil	0.0136	2
CIgdp_1	0.000217	0.0587
private_-1	0.000149	-1.78
policy_-1	0.000167	-2.34
dumm1998	-0.0155	-1.5
dumm2009	-0.0476	-3.49
dummgrowth	-0.00425	-0.983
Equation for Dimp		
Constant	-0.0927	-0.844
DLgdp_1	1.901	4.55
DLimp_1	-0.297	-3.4
DLimp_2	-0.0986	-1.64
DLreer_1	0.227	2.37
DLoil	0.0446	1.86
CIimp_1	0.00537	1.15
private_-1	0.000721	-2.67
policy_-1	0.000836	-3.49
dumm1998	-0.163	-4.75
dumm1999	0.128	2.25
dumm2009	-0.323	-6.99
Equation for Dreer		
DLgdp_1	1.033	2.76
DLreer_2	-0.0173	-0.198
private_-1	0.000267	-0.745
policy_-1	0.000127	0.528
dumm1998	-0.266	-5.96

Notes

Notes

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