Punjab's Agricultural Innovation Challenge

Singh, Nirvikar

University of California, Santa Cruz

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Nirvikar Singh
University of California, Santa Cruz

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Abstract

Fifty years ago, Punjab embarked on its famous Green Revolution, leading the rest of India in that innovation, and becoming the country's breadbasket. Now its economy and society are struggling by relative, and sometimes even absolute, measures. Using the original Green Revolution as a benchmark, this paper discusses five areas of challenge and promise for a new round of agricultural innovation in Punjab. These are: complexity of the agricultural economy, complementary inputs such as infrastructure, switching costs (including risks), balancing frontier innovation and adaptation, and the relative roles of the public and private sectors.

Keywords: Punjab, agriculture, innovation, switching costs, infrastructure

JEL Codes: O30, Q10, P16, P26

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Nirvikar Singh
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Introduction

In the 1960s, the state of Punjab led in the adoption of new high-yielding varieties of wheat and rice. Production of these new varieties required innovations in the use of fertilizer and water, which occurred in a complementary manner to the innovation in seed choices. Mechanization of several aspects of farming also became a supporting innovation. Agricultural extension services based in Punjab's public universities guided farmers in their transition to the new modes of production. Furthermore, an infrastructure of local roads and market towns had been developed by the state government: these, along with central government procurement guarantees, gave farmers access and security in earning income from their produce. In the private sector, new providers of seeds and fertilizer, as well as farm equipment and equipment maintenance services also arose. All of these conditions together created what has been known as the Green Revolution economy.

With the Green Revolution, Punjab quickly became the state with the highest per capita income. This ranking persisted into the 1990s, but underlying conditions became less favorable well before then. Gains in agricultural yields and productivity slowed, due to diminishing returns. While India began to grow faster after trade and industrial policy liberalization of 1991 and subsequent creeping reforms in other sectors, agriculture remained locked into the old policies, and Punjab mostly into the old equilibrium. The relative failure of Punjab to transition from agriculture to industry or to modern services means that the state still faces a major challenge in effecting this classical structural transformation needed for growth. This failure has been a major reason in the state's decline toward the middle of the per capita income rankings of India's major states. However, agriculture also desperately needs attention, even if it cannot be the only sector that must change to address Punjab's economic problems.

The reasons for not neglecting agriculture are several. First, there is the immediate problem of economic distress in the sector, concentrated among small farmers and agricultural laborers. Second, the current pattern of cropping and water use is leading to a rapid decline in the groundwater table, threatening complete ecological collapse of much of the state's agriculture. Third, the Green Revolution economy has little or no room for further innovation that would enhance productivity and rural incomes. Any one of these reasons is significant, but put together, they imply a compelling case for considering how innovation in Punjab agriculture can be spurred.

This paper considers five challenges to effecting meaningful innovation in Punjab's agricultural economy. It does not present solutions, but it is hoped that an analysis of obstacles to change can provide fundamental inputs into the process of seeking positive change. The first challenge to innovation is that, in contrast to the 1960s Green Revolution, a post-innovation agricultural economy will be much more complex, with a wider range of crops, requiring more sophisticated production technologies, as well as greater complexity in the entire supply chain.

The second challenge is that this more complex agriculture will need more sophisticated infrastructure, since fruits and vegetables are much more perishable than grains such as wheat and rice (though even those currently rot in government storage facilities). Other complementary inputs, such as water, fertilizer, farm equipment and management, will also need to be provided in innovative ways.

A third challenge flows from the first two characteristics of complexity and complementarity: the costs of switching to new products and modes of production will entail significant one-time switching costs, as well as new and ongoing risks. Future risks, even if partly covered by insurance, represent a kind of switching cost, albeit less direct than explicit expenditures on shifting farm operations from one set of routines and activities to another.

The fourth challenge considered here is more subtle, in that it concerns questions of appropriate balance, rather than movement to a well-defined post-innovation future. Indeed, the challenge is to assess what kinds of innovations can best be implemented in which contexts or situations: in some cases, incremental innovations or adaptation of existing frontier techniques from elsewhere may work, while in other cases, frontier innovations spurred by fundamental research may be required.

A fifth and final challenge is also a question of balance, in this case, of identifying the relative roles of the public and private sectors in enabling appropriate innovation. Fundamental research in seed varieties can be done by either the public or private sector, with the latter having more resources, but with incentives that may not lead to optimal diffusion. Innovations in infrastructure may require public-private partnerships, something India has been struggling with on many fronts. The issue of constraints imposed by current public foodgrains procurement policies also looms large.

The five challenges just listed provide the framework for this paper, with each receiving attention in the next five sections. A conclusion then briefly examines an overarching challenge, one that affects all aspects of Punjab's economy and society. Arguably, Punjab currently has a governance deficit that is severe even in comparison to other Indian states. This governance problem is partly due to structural factors (geography, social composition, position within India, and so on), and partly due to the state's recent history of political and social conflict – itself partly, but not entirely, driven by the underlying structural factors. Punjab's political economy also acts as an obstacle to innovation, much more broadly than just in the case of agricultural

innovation. It may be noted, however, that achieving some tangible innovations in agriculture may be the first step in overcoming some of the political economy barriers to broader structural transformation. Essentially, those with a stake in the status quo – the main beneficiaries of the Green Revolution economic system – may find that they can support broader changes, if they are among the first to benefit from innovation and change.

Complexity of the agricultural economy

Crop diversification has been part of Punjab's supposed agricultural policy for several decades, but progress has been well below targets. For example, the second Johl committee on crop diversification in 2002 suggested that one million hectares be shifted from wheat and rice to other crops, especially pulses and oilseeds. The Punjab Agro Foodgrains Corporation (PAFC) planned to achieve this goal by 2007, but its web site (http://www.punjabagro.gov.in/pafc.html) reports only one-tenth of this area with alternative crops through contract farming. One potential issue is simply that diversification covers a wide range of possibilities. Pulses and oilseeds are each broad categories, and diversification also includes vegetables, fruits and flowers. Until other pieces of the supply chain are in place, diversification may have to take place at the farm level, rather than just at the aggregate level, requiring farmers to master production techniques for several crops at once.

Aside from this basic complexity, the relative fragility, compared to foodgrains, of many fruits, vegetables and flowers during growing as well as post-production increases farming challenges. In these cases, specialization, while reducing complexity of production operations, may increase risks beyond what is experienced with foodgrains. Again, the different nature of markets is relevant here, with wheat and rice having an elaborate public procurement system that diminishes some aspects of risk.

Sukhpal Singh (2004) describes a couple of examples of the challenges of alternatives to wheat and rice. Drawing on Singh, Kaur and Arora (1997), he notes that sunflowers had become a significant oilseed crop in Punjab by the early 1990s, but subsequently declined because of factors such as high water requirements, non-availability of quality seeds, and sensitivity to adverse weather conditions. Further, he reports (p. 174) on a study of floriculture by Garg and Sharma (1999), which lists every possible challenge in production, namely, "high risk of production, lack of weed control, high incidence of insects and pests, non-availability of good quality planting material and problems of seed collection." It is certainly the case that some of these issues are due to lack of the kind of infrastructure that has grown to support wheat and rice cultivation, but it is likely that flowers (and many fruits and vegetables) simply have more complex and uncertain growing processes, especially for market sale versus home consumption, with the former requiring higher quality standards.

Sidhu, Kumar and Singh (2009) make similar points in considering vegetable cultivation. They note the greater perishability and production risks associated with vegetable cultivation, and based on a study by Birthal et al. (2006), they emphasize that high value vegetable crops may require high quality inputs, and greater knowledge of production technologies to be successfully grown. In some cases, more capital may be required, and in others, labor-intensive precision farming. These can be severe limiting factors on diversification, which has tended to be restricted in Punjab to larger farmers.

Munjal Institute for Global Manufacturing (2013a) highlights some of the challenges in growing kinnows in Punjab: "During 1990s Punjab used to export kinnows to distant markets like the UK, Mauritius, Sri Lanka, Netherlands, Dubai but since then export to these markets has not taken place on account of substandard quality of the produce." Problems of post-harvest infrastructure and marketing are discussed later in this paper, but the relevant point here is that farmers do not have access to the requisite knowledge for growing new seedless varieties, and achieving quality standards for export markets. Another aspect of complexity that this study highlights is the long growth cycles for tree crops such as kinnows. The study also notes problems of availability of the right kinds of seeds and appropriate resistance to disease for crops such as maize, moong and turmeric. These are not necessarily all problems that are inherent to these kinds of crops, but partly reflect the relative backwardness of research, as compared to the main foodgrains such as wheat and rice.

Govil (2013) has elucidated many of the reasons for Indian (not just Punjabi) farmers not growing more pulses, fruits and vegetables, and these, echoing earlier studies, include the following characteristics of production of these alternatives to wheat and rice:

- greater vulnerability to adverse weather, leading to higher risk of failure;
- greater care and effort required for growing;
- greater perishability and uncertainty with respect to quality and market needs.

This last point is a complex one, since production decisions are tied up with market demand – farmers must deal with much greater challenges in deciding not only on what crops to grow, but also choosing varieties, and achieving minimum quality standards for varied markets. These challenges are not absent in the case of grains such as wheat and rice – ITC, for example, works with farmers in Madhya Pradesh to educate them on quality gradations in wheat that it purchases for making bread and biscuits – but the public procurement system tends to suppress such issues for the two major foodgrains.

To summarize, innovation through diversification of agricultural production places demands on the knowledge base of farmers, as well as their risk-bearing capacities, that act as barriers to such innovation. Innovation requires dealing with complexity that can be an order of magnitude higher for farmers, in aspects of their production ranging from obtaining inputs, to operations decisions, to selling their produce.

Infrastructure and complementary inputs

At a generic level, the problem of providing new infrastructure for agricultural diversification and innovation is well-recognized. There is a particular emphasis on the "cold-chain" for preserving fruits, vegetables and flowers that are almost without exception more perishable than the current staple crops of wheat and rice. The absence of adequate processing facilities is another major deficit in the farm-to-fork chain for many food crops. Physical infrastructure is not the only problem, and many studies highlight the poor quality of the institutions needed to channel alternative crops from the farm to the next stage of the value chain. From an innovation perspective, the problem is that individual farmers do not have the scale or resources to create all of this new infrastructure, without which innovation in crop choices may not make economic sense. There is a coordination problem, which can potentially be solved by large actors, whether public or private. The public-private issue is taken up later in this paper, but the coordination problem is worth noting at this stage.

In practice, "contract farming," which relies on large downstream private actors, has been the de facto institutional arrangement for providing the needed new infrastructure. Case studies illustrate the problems that have arisen for farmers, which have hampered further innovation and scaling up of new and alternative crop choices. Sukhpal Singh (2002, 2006) begins with a relatively positive account of the early 1990s entry of Pepsi into Punjab for crops such as tomatoes for processing. In this account (2006, pp. 175-177), Pepsi introduced new varieties, new production methods and increased yields as well as reduced costs of production for its contract farmers. The company invested heavily in food processing, and other companies such as Hindustan Lever also became part of this value chain. On the other hand, there were problems with managing the contractual relationships with farmers. These included inadequate technical advice, poor coordination, delayed payments, and even cheating. Many of these problems seemed to be associated with the use of intermediaries, such as large farmers or local companies. Farmers found themselves bearing greater risks than they had anticipated, and even faced competition from non-contract farmers who could purchase Pepsi's seeds. This account also implies that shifts in the multinational firm's strategy, along with political economy factors wherein government actors and other political entities did not see gains accruing to themselves, hampered the consolidation and spread of the initial innovations.

Kumar (2006) provides a similar account of inadequate provision of complementary technical and marketing services, and inputs such as seeds, to farmers in the Punjab contract farming experience. His discussion covers a variety of crops, including maize and sunflowers, though it does not go into the same detail as Sukhpal Singh's case study. Kumar also highlights the relative failure of government and quasi-government institutions such as the PAFC to provide their share of the soft infrastructure needed. Dhillon and Singh (2006) echo the need for better

government regulation in dealings between individual farmers and large agribusiness, with the implicit understanding that the pure market solution does not maximize social welfare – this would appear to be a combination of imperfect competition and externalities as a source of market failure.

Recent studies (Munjal Institute for Global Manufacturing, 2013a,b) simply emphasize the continued failure to develop adequate infrastructure to complement and support innovation at the level of individual farmers. These studies document numerous deficiencies in hard and soft infrastructure for alternative crops. For kinnows, one study (Munjal Institute for Global Manufacturing, 2013a) notes the lack of adequate facilities for storage, grading and waxing, and for refrigerated transport. A case study of failures in processing infrastructure highlights the government's complete dysfunction in building and operating juicing plants: while Pepsi in this case could just shift to alternative locations, local farmers were left in the lurch, and the government's large investment was mostly wasted. Again, there is an undercurrent of government failure tied to political economy factors in this story. There are yet other inadequacies in the case of infrastructure for kinnows, including lack of local aggregation facilities for different grades and types of crops, inefficiencies associated with intermediaries, and lack of access for smaller farmers. In this context, Govil (2013) makes the point that even larger farmers who are trying to diversify into non-foodgrain crops can feel poorly treated when they participate in new value chains, since they bring in relatively small quantities for sale.

Inadequate drying, treatment, and processing facilities, inefficient and uncompetitive intermediation, and inadequate storage and transport facilities all appear as deficiencies in the infrastructure, for crops as diverse as maize, moong and turmeric (Munjal Institute for Global Manufacturing, 2013a). Lack of adequate provision of inputs and technical advice, already discussed in the previous section, are another deficiency in the supply chains for multiple alternative crops. A second Munjal Institute for Global Manufacturing study (2013b) documents similar deficiencies in relative success stories such as wheat and dairy production, as well as for a range of vegetables. An additional deficiency brought out in this study is the asymmetries in information that pervade the value chain, contributing to coordination failures, greater uncertainty for farmers, price volatility, and inefficiencies in market clearing. All of these contribute to deterring farmers from innovating in their crop choices. The Munjal Institute for Global Manufacturing study discusses information technology solutions as ways of overcoming some of the pervasive inefficiencies, but these solutions also require significant up-front investments.

To summarize, Punjab has not developed the physical and institutional infrastructure required for crop choice innovation and diversification. Individual farmers cannot create this infrastructure, which requires large economic actors – typically a mix of public and private – to participate. Connecting to the theme of the last section, the infrastructure needed is also more complex, sophisticated and expensive than what was created in the 1950s and 1960s, at that time largely

by the state government, but with the underpinning of a national food security policy (Singh and Kohli, 2005; Nirvikar Singh, 2016).

Switching costs and risks

Switching costs were first analyzed systematically by Klemperer (1987), in the context of imperfect competition. The term includes learning costs, transaction costs, physical investment costs (e.g., poly houses or drip irrigation: see Gill, 2015) and artificial costs created by oligopolistic firms, such as rewards for loyalty. In all these cases, the focus is on consumer switching costs, although the customers may also be firms that are purchasing equipment or other inputs from supplier firms. The latter case is most relevant for considering the case of farmers as potential innovators. Beggs (1989) and Salies (2011) consider innovation in the presence of switching costs, but their focus is on the incentives of sellers to innovate, rather than of buyers to adopt innovations – although the latter affects the former.

In the context of farmers in a state such as Punjab, there are challenges for the providers of technology (new varieties of seeds, new production techniques) as well as for the potential adopters (the farmers), and furthermore for the buyers of the farmers' output. As discussed in the last two sections, there appears to be insufficient investment in various aspects of the agricultural value chain, both upstream and downstream from the core production process of growing the crops. To the extent that farmers face switching costs, such as those associated with learning new production techniques (which can be more complex as well as unfamiliar) as well as those associated with learning how to market and sell new kinds of produce (again, typically more complex and difficult than the public procurement of foodgrains), this can inhibit adoption of innovation by farmers. That, in turn, can reduce investment by suppliers of farmers and their buyers, and do so in ways that lead to suboptimal outcomes. The idea here is that switching costs interact with market imperfections to create inefficiencies. It is useful to clarify here that switching costs are one-time costs, whereas many of the challenges discussed in the previous two sections involve ongoing costs associated with alternative crops, such as cold chain infrastructure, which will be costlier to build and maintain than the existing infrastructure for foodgrains.

The uncertainties associated with new technologies and new crops are one source of switching costs, since these uncertainties attenuate and ultimately disappear with experience and learning. However, there are also ongoing risks associated with alternative crops. Some of these risks are inherent in the differential susceptibility and response of these crops to weather variation, insects and disease. Other risks are a product of government policies. In particular, it is well-known that the Public Distribution System and associated Minimum Support Price reduce price risks for farmers, and bias their production choices towards wheat and rice. However, removing price risk does not remove production risk, and a potentially better alternative would be some kind of crop

insurance, which addresses production risk, and which could be extended to a range of different crops. For example crop insurance tied to publicly observable rainfall levels can be customized for different crop choices by adjusting contract terms. Such insurance can also potentially reduce the risks associated with switching to new crops, by adjusting premia based on experience, perhaps with government subsidies (which are typical even in rich countries such as the US).

In the case of Punjab farmers, some of the problems associated with crop insurance experiments in other parts of India, including unaffordable premia and high transaction costs, would still be present, but might actually be less significant, given the higher income levels in Punjab. What is important to recognize is that there is enough specificity and sufficient market size to create crop insurance products at the state or regional level, and Punjab seems to be behind the curve in this respect (Kumar, 2015). States such as Andhra Pradesh and Gujarat seem to be among the leading sites for crop insurance experiments, but the Punjab government could pilot insurance schemes for alternative crops rather than relying on the national government as it seems to be doing (Perneet Singh, 2015). Experience from other states (e.g., Cole et al., 2012; Clarke et al., 2012) can help in this respect.

Balancing frontier innovation and adaptation

The Green Revolution involved the implementation of what might be termed frontier innovations: the development of new high-yielding varieties of wheat and rice. Complementary innovations were required in terms of fertilizer and water use, cropping patterns, sowing and harvesting techniques, and so on. None of those complementary changes represented fundamental technological or even organizational innovations, in the sense that they represented pushing out the global knowledge frontier. This phenomenon of multiple adaptations or incremental changes surrounding a more basic kind of technological innovation is typical. A good example of this process has been the productivity of different generations of microprocessors, where there is a learning curve for each new major advance in technology, as a result of many small adjustments in the complex manufacturing process.

In the case of Punjab agriculture, dominated as it is by wheat and rice, with cotton and sugarcane also being significant crops, the innovation process currently appears to consist of attempts to continue developing new varieties of these crops, through conventional hybridization experiments, as well as genetic modification trials. Some of this innovation is required simply to deal with new diseases, or pests that have become resistant to methods of chemical control. In other cases, it seems that frontier technological innovation is subject to diminishing returns. For innovators, such as scientists at agricultural universities, the kinds of research they pursue may be driven by risk-reward tradeoffs that favor these directions of potential innovation, despite the problem of diminishing returns. These directions are safer in terms of probabilities of success, and more directly of value since they provide improvements in areas that can benefit a large

number of cultivators. This argument has considerable overlap with the ideas in Christensen (1997), in which he argues that successful firms may under-invest in disruptive innovations. One can extend this possibility to include research in other organizations, such as universities or government laboratories.

There is an additional aspect of this problem. The previous paragraphs highlighted the incentives of researchers, in terms of where they focus their efforts, with respect to crops and types of innovation. The status quo will favor incremental (but frontier) innovation in crops that are currently grown most commonly. However, there is the additional problem that research in crops that are not widely grown, whether it leads to incremental or discontinuous innovation, will require a multitude of changes at the farm level, in detailed adaptations of growing techniques, as well as innovations in other parts of the agricultural economy's infrastructure and value chain, as has been highlighted in earlier sections of this paper. In other words, alternative choices of innovation effort by researchers may have uncertain payoffs, with that uncertainty depending on institutional factors beyond their control. In the Green Revolution case, some of the physical infrastructure (e.g., market towns and connecting roads) had been established in the decade preceding the actual introduction of high-yielding varieties.

Yet another problem is that some of the adaptive innovations and adjustments in growing techniques for alternative crops are not rewarded within the scientific establishment. Compared to the Green Revolution era, there is a stronger indigenous scientific base, but it is arguably the case that the level of detailed understanding of complementary adjustments in farming practices that are needed to make a the core technological innovation successful – that is, the range of activities captured under the broad heading of "agricultural extension" – has not progressed in the same way as the core scientific research, and in some ways has even regressed. This issue is a controversial one, of course, and it is not restricted to Punjab, but is India-wide (e.g., Raabe, 2008; Ferroni and Zhou, 2011, 2012; Babu et al., 2013).[1] Furthermore, it is just one example of the deeper problems of delivery of public services – health and education are commonly discussed as examples of public sector failure in India – and public agricultural extension is in some ways doing better than those cases, especially given its unique challenges in the context of implementing complex sets of technological and behavioral innovation.

The issues raised in this section are somewhat different than more traditional economic analyses of adjustment costs as barriers to adoption of innovations.[2] The argument here is based on problems with incentives within organizations that produce innovations, and related issues of externalities resulting from the need to have coordinated efforts across different aspects of the

[1] Yet another issue, quite different from the problem of distortions in directions of innovation, is the claim that innovation takes a back seat to pushing the interests of input providers, such as manufacturers of agricultural machinery: see, for example, Sandhu (2015).

[2] There is a large literature on the challenges of agricultural innovation in developing economies. For example, see Feder et al. (1985), Nirvikar Singh (1994), and Sunding and Zilberman (2001). A Punjab-specific analysis that takes a traditional adjustment-cost approach is McGuirk and Mundlak (1991).

production process, in order to have successful innovation. This suggests that the policy response is perforce going to be challenging to implement, since it will require higher-level interventions to overcome externalities and coordination failures. This raises the difficult question of how appropriate incentives for these higher-level policy interventions can be created, and this problem is taken up in the conclusion.

Relative roles of the public and private sectors

The Green Revolution in India was led by the public sector. National priorities for food security shaped policies and institutions for public procurement. The state government played a crucial role by providing physical infrastructure such as market towns and connecting roads. Research and other support for innovation came from public universities, and public sector financial institutions played a role in provision of credit. Finally, the public sector has been heavily involved in the production or provision of key inputs such as water, electric power and fertilizer, typically with significant subsidies.

Despite all of this public sector involvement, the role of the private sector in Punjab's agriculture has obviously not been negligible. This statement includes, but extends beyond, the crucial role played by private sector enterprise, in the form of efforts by individual farmers, large and small. It is difficult to quantify the relative entrepreneurial abilities of Punjabi farmers, but there is some formal analysis of their entrepreneurship (Sukhpal Singh, 2013), and plenty of indirect evidence of Punjabi farmers' ability to succeed in widely varying locations, including traditional destinations such as Australia (*Times of India*, 2010) and California (La Brack, 1988), as well as newer ones such as Italy (Povoledo, 2011) and Madagascar (Sharma, 2011).

The other aspect of private sector involvement is perhaps more mixed in its consequences, compared to individual farmers' efforts. Indian agriculture has long been heavily influenced by powerful intermediaries, who may combine participation in credit and input, and even output and land markets, to earn economic rents associated with market power, in a phenomenon well-studied as interlinkage (see Gill, 2015 and Indervir Singh, 2015 and the references therein). Market intermediaries and other private actors in the agricultural supply chain certainly provide essential products and services for the success of Punjab's present agricultural system, but it is not clear that their incentives for enabling innovation are aligned with maximizing social welfare, just as, with imperfect competition, static resource allocation may not satisfy that optimality property.

Given the foregoing discussion, as well as the issues highlighted in previous sections, it is reasonable to suggest that beneficial innovation in Punjab agriculture will not occur solely through the private sector. At an abstract level, the problems of asymmetric information, externalities, the public good nature of innovations and imperfect competition in various markets

along the agricultural value chain all point towards some public sector involvement in facilitating greater innovation, especially that which incorporates crop diversification. It is arguably the case that the state government can make targeted interventions that provide effective nudges towards innovation, as well as adoption and diffusion of innovations, even in the face of the severe constraints imposed by the state's own fiscal situation, and the conduct of national food procurement policy. Some of the barriers to innovation have to be overcome by relatively large financial investments in physical infrastructure, but the state government can catalyze the private sector to undertake these investments by improving the ease of doing business in the state. The public sector's focus can and should be on improving the knowledge available to farmers, finding ways to overcome their switching costs, and providing them with better insurance as they move towards activities that involve greater risk and uncertainty.

Conclusion

If there is a clear case for government action in the face of a suboptimal current equilibrium, and the pace and irreversibility of environmental degradation creates extreme urgency, why is change not taking place? In the introduction, the ultimate underlying cause of Punjab's economic problems was described as a governance deficit. This is an India-wide (and perhaps even worldwide) problem, but Punjab faces it particularly acutely, compared to many other states in India. Arguably, this is due to its recent history of conflict, which has attenuated effective political competition. Without such competition, politicians do not have incentives to maximize the welfare of voters, versus that of interest groups. These kinds of rent-seeking equilibria are well-understood and extensively analyzed and researched (e.g., Kohli and Singh, 1999 and the references therein).[3]

The outcome in Punjab of the 2014 national elections, where the Aam Aadmi Party (AAP) won its only parliamentary seats nationwide in four constituencies in Punjab, illustrated the dissatisfaction of voters, but this expression was only effective so far in urban contexts. In the State Assembly elections in 2017, there was a transfer of power from the Akali-BJP coalition, but the AAP, which had been hopeful of winning, was ultimately shut out by the other component of the political "old guard," namely, the Congress party. Transforming the Punjab economy into one where modern manufacturing and services have a greater role is ultimately what is needed, but that will be a difficult and time-consuming process, and dealing with the agriculture sector has to be an important part of that larger transformation, aside from its direct impact within the sector (Nirvikar Singh, 2016).

As suggested in the introduction, the political economy argument is that those who benefit the most from the current economic structures in the state, which includes large farmers as well as

[3] For a more detailed discussion of governance in India, and the importance of comparing Indian states, see Nirvikar Singh (2019).

business interests, must perceive that they have something to gain from agricultural innovation. At the same time, the state's politicians have to manage the gains from innovation so that they are not inordinately skewed. Whether they wish to do this depends on the relative influence of voters and interest groups. To the extent that farmers as voters have to be convinced that agricultural innovation will benefit them so that they exert pressure on politicians to respond, disrupting the current suboptimal equilibrium may require external influences, from academics as well as multilateral agencies.[4]

Past experience does not suggest that the national government is likely to play a leading role in providing the needed nudges for the beginnings of transformation, so Punjab is unlikely to derive any benefits in this respect from its place in India's federal structure. Indeed, with the current state government being in effective opposition to the ruling national coalition, negotiations between the state and the Centre are once again fraught, as several news reports on GST payments and debt ceilings illustrate.[5]

A more promising external source for catalyzing innovation in Punjab, albeit one that will face its own challenges and dilemmas in attempting to influence the state's direction, might be the Punjabi diaspora. In the context of India as a whole, Kapur (2010), in his comprehensive and definitive study has observed that international migration has been an important mechanism for "the diffusion of ideas that have shaped India's institutions and policies." Kapur argues that these ideas have had very positive influences, on balance. Arguably, though, Punjab has not derived these kinds of benefits to the same degree from its regional diaspora, partly because of the dysfunctional politics of the state, and, connected to that, a focus by many in the diaspora on righting past wrongs in the form of human rights violations.[6] While that is a worthy and necessary objective, a greater focus on the future development of the state may ultimately be what helps on all fronts.

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[4] An example of a model in which a political economic equilibrium leads to a "stable" inefficient outcome is Acemoglu et al. (2011).
[5] See, for example, Sharma (2017), Vasdev (2017), Bharti (2018).
[6] See, for example, the collection of essays on these issues in Chima and Singh (2015).

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