

Discounted Agricultural Growth in South Africa

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Abstract This paper examines impacts of appropriate resource allocation on subsistence level output. This study uses a stylized Coase Bargaining model and data from the South African Reserve bank to support the second welfare theorem. Back of the envelope calculations indicate the opportunity cost of manufacturing output has been the 20% discount in agricultural output in South Africa since 1968. This paper offers an exercise that can be implemented in developing nations having institutions resulting in two-sector economies. Moreover, the methods used here will help policy makers to estimate an appropriate value for wealth transfers.

Keywords Distribution · Land · Property rights · Wealth distribution · Welfare · Contracts · Institutions · Policy · Colonialism · Apartheid · Development · Tax · Collective bargaining · Labor mobility · Africa · South Africa · Agriculture · Manufacturing

JEL Classification D3 · D31 · D6 · D7 · E02 · E6 · E61 · F5 · F54 · F6 · H21 · H22 · J5 · J52 · J6 · N17 · N57 · N67 · O11 · O55 · Q19

Introduction

Using theory from “The Problem of Social Cost” (Coase 1960) and following the leading analogy from Hornbeck (2010), suppose there is the farmer and the plant worker. If farmland is not fenced in and more manufacturing plants are to be built, then there will be more manufacturing job prospects for the plant worker and less arable land for farming. Efficient use of land will occur if the encroachment in land is properly identified, property rights are thoroughly researched and enforced, and costless exchange occurs between incumbent land users and new land users. Otherwise, new land use imposes negative externality on farmers, their investment levels and their

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productivity levels. Those costs can, however, be eliminated if the externality is channeled into net gain. For example, in the instance where building new manufacturing plants becomes complementary to farming and helping farmers produce at efficient levels, growth and productivity can increase in manufacturing and farming sectors.

Now, according to Coase (1960) when new manufacturing plants encroach on farmland the decision of how to restrain new manufacturing plants from encroachment and rent seeking behavior needs to be made. The problem with this consideration, according to Coase, is restraining the existence of new manufacturing plants would be helpful to farmers at the expense of the plant worker. The opportunity cost of forgone farm productivity considered alongside gains from manufacturing productivity will provide the best assessment of the problem at hand. If the cost of manufacturing encroachments exceeds the amount farmers would pay to use the land, then the marginal benefit from increases in, say, farmland investment will exceed the total net benefit to manufacturing firms. Under this consideration the following corollary from Coase apply:

1. If farmers can relocate to another farm, then it will be difficult to assess productivity; whereas, manufacturing productivity will be over stated and farming productivity will be understated.
2. Even if the farmer is granted land on which to farm in the short run, manufacturers might begin to expect farmers to be non-competitive in land and labor markets. No reallocation of resources would occur in the long run.
3. If the manufacturing plants pay farmers to leave the land or compensate farmers to rent the land, then production could be maximized. To achieve this one would need to compare total product yielded by different social arrangements.

Seemingly, in some developing or emerging economies the problem mentioned in the former is commonplace and the most appropriate way to approach it is to assess social efficacy in those countries and determine the most Pareto efficient outcome. Under the auspices of the Second Welfare Theorem: if an appropriate allocation of resources can be made, then efficiency can be reached. One interpretation of this theorem is an optimal allocation, or reallocation, of resources arises due to the failure of the social structure to achieve the primary welfare goal. Specifically, conditions of the First Welfare Theorem-if competition exist *ex ante*, then resource allocations are efficient- are not perfectly achieved. So, this situation where indigenous farmers and rising manufacturers need to optimally coexist should be one in which each party is made as best off as possible.

Therefore, the purpose of this study is to show reallocating resources in developing or emerging economies, such as South Africa, can effectively help to revive the subsistence level of output; whereas, according to Coase, is appropriate and will lead to an efficient outcome. That is, this paper will answer the question: What is the impact of appropriate resource allocation on the subsistence level of output. One contribution of this paper is its two-sector bargaining model to address the question. The stylized model identifies the subsistent level of production in one sector and proposes methodological restoration resembling wealth transfers. Another contribution is the use of sectoral data from the South African Reserve bank to study this problem in a way as it has not arisen in preceding literature. The final contribution of this paper is the use of

the line of best fit to determine the gains in welfare resulting from low-cost exchange of resources.

Consequently, this study sheds light on the agricultural industry, which, can reduce social costs arising from the world's food crises and underemployment of the farming poor (De Janvry and Sadoulet 2008). This can also improve international trade prospects; whereas, countries that can benefit from “natural” food exchange are those countries where less natural food (and perhaps costlier) production processes have taken place in the world. In addition, terms of trade should point to many developing nations as geological and geographical havens for farming since they are rich in natural resources. These contributions and prospects for employment and trade will be helpful for informing policy makers on how to advise and revive the subsistence level of production.

This paper estimates the deviations in fairness between economic agents based on the present value of excessive productivity in the manufacturing sector which is directly related to wage. Specifically, consider the dual sector macroeconomy (as suggested by Lewis 1954) and the following conditions:

$$W^M(Q^M) > W^A(Q^A)$$

where W^M and W^A are manufacturing and agricultural wages, respectively and Q^M and Q^A are manufacturing and agricultural output, respectively. Further, $\frac{\partial W}{\partial Q} > 0$ for the manufacturing and agriculture sectors and $Q^M > Q^A$. Thus, unjust enrichment to manufacturers can be approximated as follows:

$$PDVQ^M - PDVQ^A$$

Estimating the present discounted value of each sector's output allows for an approximate discount factor that is necessary to restore agricultural productivity to the levels of manufacturing productivity over time. By doing so this paper illustrates this context is one in which businesses have gained excessive returns where the farming poor have perpetually experienced loss.

Literature

Rightfully, assertions in the former related to policy improvement rest primarily on the hypothesis the social climate in developing nations reflect residual impacts from colonialism and capitalism. For example, incumbent farmers in South Africa were forced to protect their land from colonists during the period of colonialism and from businesses during the period of apartheid, but did not necessarily prevail. If resources are allocated, or reallocated, so that resources were forced to flow to, say, agriculture in South Africa, more equitable growth patterns should arise. This resource allocation, therefore, can be established through the appropriate bargain between economic agents as proposed by Coase (1960). Current problems resulting from policies securing property rights have not presently been satisfactory. This is primarily because of South African history.

To begin, when effective property rights are not considered, the role of competitive markets in allocating resources becomes limited (Besley and Ghatak 2010). To more appropriately assess the problem between incumbent farmers and new manufacturing firms, began in the colonial era, policy makers need cost and benefit analyses (Coase 1960; Ghatak and Karaiyanov 2014). Economic modeling emphasizing *modest* levels of inequality resulting from bargaining should maximize efficiency for economic agents contributing to public good consumption (Bardhan et al. 2007). In this context, economic growth in all sectors will be encouraged as it is the “public good” in question.

Hence, application of the first corollary from Coase (1960) as it relates it relates to this context can be evaluated as follows. Until now, non-farm productivity has been overvalued and farming productivity in South Africa has been remanded to “reserves” or “townships” known as Bantustans (Legassick 1975). Fertile land was generally expropriated by government or taken using coercive measure (Wolpe 1972; Besley and Ghatak 2010) Further, this type of decentralization policy (that created reserves) arising in the 1950’s and revised in 1982 moved South African societies farther away from the goal of labor equality (Wellings and Black 1986). Since the first best solution did not occur with government intervention in securing effective property rights for the farming poor in the post-colonial era, then the second-best solution of decentralization will not be effectively enforced by the government (Ward 1980). Too, these instances were exacerbated because of the failure of capitalists to hire low skilled labor into the manufacturing industry during periods of decentralization and apartheid (Wellings and Black 1986). This has likely encouraged extreme undervaluation of farming productivity and overvaluation of manufacturing productivity.

Also, as with the second corollary, providing townships for former peasant farmers in lieu of lost farmland in South Africa has reduced the job prospects for peasant farmers and the availability of arable land for farming. Since the colonial era, no real reallocation of resources has occurred, as establishing property rights and compensating wealth loss among poor farmers in South Africa has been cumbersome. This is because the relative use of land in developing countries lead to disputes (Fenske 2014). Moreover, little is gained in consumption when farmland is inherited (Lambert et al. 2014). In this instance, wealth transfers may be more beneficial to the underdeveloped economies (Hamilton and Darity 2010); whereas, redistribution policies should ensure disenfranchised economic agents use their productive possibilities effectively. On the contrary, the Land Redistribution and Development Act in South Africa has not redistributed land to its rightful owners. Instead, it only assists those acting as farmers and tenants to purchase land (Keswell and Carter 2014).

Finally, as with the third corollary, optimal production might be reached in South Africa if manufacturing plants are made to compensate farmers in lieu of faulty social arrangements arising from historical contexts. Varying expectations regarding land tenure security can improve farmers’ investment and land conservation efforts; however, tenure security alone does not affect farmer productivity (Abdulai et al. 2011). This is likely because landlord won’t always commit to securing land tenants because of the implicit cost of supervising (Jacoby and Mansuri 2009). Most efficient land use, in this case, will come from appropriate compensation (Ghatak and Mookherjee 2014). Although empiricists provide evidence land reform reduces inequality and improve agricultural wages (Besley et al. 2016) cultural complexities stemming from colonization are omitted. Further, increasing land tenure security

has the unintended consequence of encouraging labor migration (Do and Iyer 2008; Field 2007; Valsecchi 2014).

All in all, the history of South Africa makes its economy ideal for the assessment strategy used in this study. Due to the lasting effects of colonization agrarian consumption possibilities can now only be improved through non-farm activity (Lambert et al. 2014). Land can neither be bequeathed since effective property rights for “the best” farmland has not been restored to poor farmers (ibid). Due to coercive and socially destructive behaviors, agrarian culture has not been sufficiently supported, thus leading to less than optimal outcome in agricultural growth patterns (Besley and Ghatak 2010; Deininger and Feder 2009). This induces lack of trust in the government and property insecurity that is directly related to the high cost of retaining/procuring property (Besley and Ghatak 2010; Valsecchi 2014).

To address issues discussed in the former this paper is outlined as follows. The adaption of Schwab (1986) Coase Theorem bargaining model is posited. An approximate size of unjust enrichments resulting from industrialization or capitalism in South Africa is determined using “reparations” in the model. “Back of the envelope” calculations are then given using South African Reserve bank data. Finally, brief discussion is presented.

Theory

In South Africa, an aggregative conglomerate of manufacturing sectors and an aggregative conglomerate of agricultural sectors (This second group is also called agri-workers in this context.) have decided to negotiate on reparations. The manufacturing sectors seek the lowest possible payout, but will continue to be workable with the minimum one-time payout of po dollars per agri-worker. South African governments want to retain the right to transfer work to the manufacturing sector in the event of market rigidities. They want to be able to leverage economic productivity through their more “productive” manufacturing sector. The manufacturing sector is willing to pay up to PO dollars for all persons working in or descendants of persons working in the agricultural sector. Essentially, this payout should be reflective of the 400 years of suffering leading up to, during, and the aftermath of apartheid. Manufacturers, however, will not allow the payouts to unduly present a hold-up problem for their productivity.

The persons working in or descendants of persons working in the agricultural sector seek the highest payment possible. To remain viable, however, peasant farmers must secure negotiations to provide themselves and their offspring with better living conditions. That is, the payment pm must be better than the lifetime benefit received from working in the manufacturing sector. Also, they would like the agricultural sector to be protected and “recognized” by the government as a valuable sector. Indeed, agri-workers would be willing to give up as much as p ($p < pm$ and PM for all agri-workers) to obtain sector security and notoriety. On these assumptions, the agri-workers value “staying” in their respective sector (e.g. “stay” clause) more than the government values the right to relocate production (e.g. “go” clause) to its more “productive” sector.

The “stay” clause and the “go” clause must be satisfied by both bargaining parties and an appropriate payout/payment must be agreed upon. The costless Coase Theorem

predicts that rational bargainers will resolve the issue and include a clause in their agreement regarding the highest valued po /lowest valued pm , although no individual might ever receive that value. The Coase Theorem does not, however, procure for surpluses arising from the agreement.

To better understand the scenario and the agreements that arise see Fig. 1. The figure graphically depicts contractual outcomes between aforementioned parties. In the graphical representation, the agri-worker demands reparations payment (pm) that is relatively elastic because of the agri-worker’s sensitivity to the value of that payment as it relates to current hours spent working in agriculture. The law of demand arises because when the quantity of payments increases, the payment to each agri-worker necessarily declines. Manufacturers’, though, have the relatively inelastic supply of payouts (po) because they have an ability to pool resources and derive an appropriate lump sum of payments. The law of supply arises because as their ability to pool resources increase, the size of each individualized payment can increase as well.

At equilibrium, the Coase Theorem bargain reveals that a contractual agreement can be reached for appropriate quantity of payments/payouts. At that point of equilibrium, producer surplus exceeds consumer surplus even though the individual payout proposed by the manufacturers is exactly equal to the individual payment received by each agri-worker. Consumer surplus is even smaller when both parties realize some agri-workers will have difficulty proving their status/involvement in the agricultural sector and, thus, become ineligible. This drives a wedge between the manufacturing firm’s maximum willingness to provide payout and the agri-workers minimum payment or reservation payment. The government must intervene to “fundraise” the difference as tax where the manufacturing sector bears the burden.

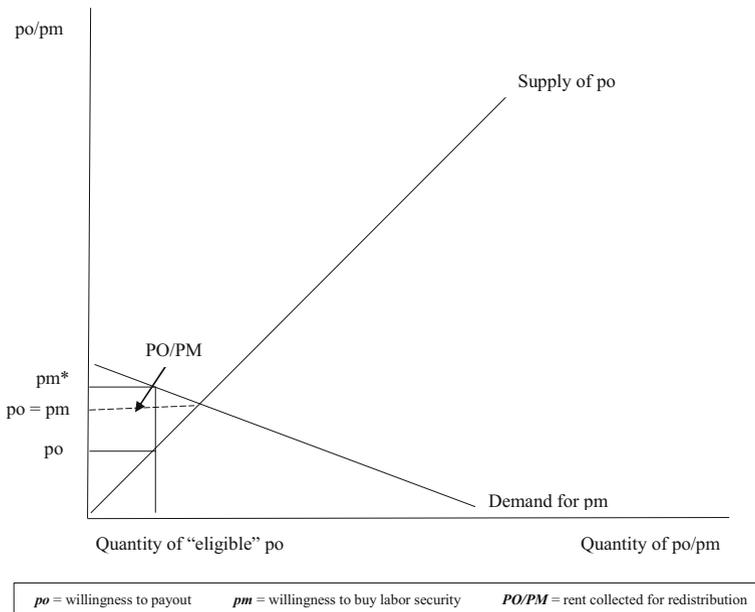


Fig. 1 Coase Theorem Bargain Graph

Application and estimation of total reparations

In a perfect world where about 400 years of data was available one could provide substantive value for payment or payout. Given the nature of the second-best solution and the availability of data, *PO* or *PM* is calculated using quarterly value-added data from the South African Reserve Bank. Value added for agriculture, forestry and fishing and value added for manufacturing are expressed in millions of dollars and are based in 2010 prices. The data ranges from 1968 quarter 1 to 2016 quarter 1.

To calculate the lump sum payout or payment, the government must look at the relative size of productivity in each sector. That is, governments can inspect different productivity levels quarterly. In terms of productivity, these differences should make agricultural laborers indifferent between working in agriculture or manufacturing. Plotting the historic productivity series together indicates that the manufacturing sector has always been about 5 times as productive as the agricultural sector (See the trend line in Fig. 2.). That is, 20% of the agricultural productivity ought to be restored to agriculture or each quarters’ agricultural productivity has been discounted by 20%. Therefore, one can calculate the discounted value (DV) of agricultural productivity as follows:

$$DV \text{ Agricultural Productivity} = \sum_1^T \frac{Y_t^{AGR}}{(.2)} \cong \sum_1^T Y_t^{AGR} 5 \tag{1}$$

In eq. (1), Y_t^{AGR} is the level of agricultural output in each quarter of a series of data, and T is the final quarter in that data.

This derivation is like that of the simple expenditure multiplier derivation found in many foundational macroeconomic text books and can be considered a productivity multiplier of sorts. This multiplier is indicative, though, of the numerical factor by which each period of productivity should be multiplied to make one sector of output in agriculture comparable to sectors of output in manufacturing. Here, that multiplier is 5. This should diminish the average productive disparity between sectors in each quarter. In order to calculate the value of total governments’ fundraising that needs to occur for the appropriate *PO* or *PM* amount, the difference between the sum total of agricultural output needs to be compared to the DV of agricultural productivity. That difference

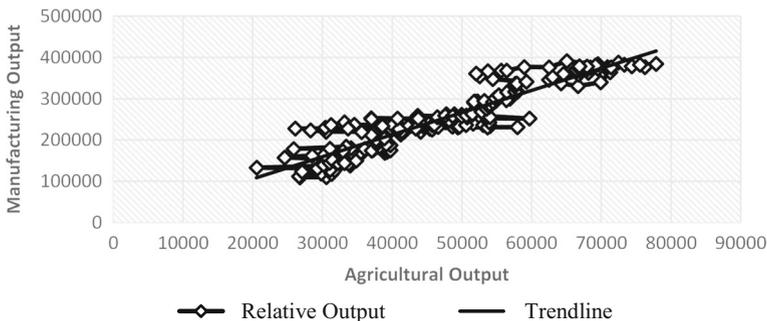


Fig. 2 Agricultural v. Manufacturing Output Scatter Plot in Millions of Dollars

could then be divided among “eligible” agri-workers as follows:

$$pm^* = \frac{\sum_1^T Y_t^{AGR} 5 - \sum_1^T Y_t^{AGR}}{L} = \frac{PO \text{ or } PM}{L} \quad (2)$$

In eq. 2, L is the number of eligible workers in agriculture. The numerator should be roughly equivalent to a/the lump sum payout/payment amount. It is the difference between discounted productivity in agriculture since 1968 (using the formula provided above) and actual agricultural productivity since 1968 (this is a simple summation of productivity overall years).

Using the given data, the appropriate lump sum payout or payment amount between 1968 and 2016 is \$36,993,264 million dollars (e.g. almost 37 trillion dollars). This would be the amount calculated in the numerator of eq. 2. This amount is indicative of the amount of money owed to those incurring losses in the agricultural sector (due to underpayment) that can be collected, by the government, as revenues from the industrial sector. After collection, the money could then be redistributed to those ancestral earning capacities (i.e. ancestors of peasant agriculturalists) who have been negatively impacted leading to a less than favorable, present-day existence in South Africa. Dividing the 37 trillion-dollar outcome by the total number of eligible individuals gives one some idea for an individual payment/payout amount.

Figure 3 provides evidence this method of calculation achieves some level of equity as the trend line in the scatter plot now reflects relationship in the data that is one to one. That is the discounted agricultural productivity is compared to manufacturing productivity and the line of best fit among the points in this graph appears to symmetric about the origin. This is more equitable distribution as compared to the relationship between agricultural productivity (before it is discounted) and manufacturing productivity in Fig. 2.

Discussion

The stylized model makes a few assumptions that may be difficult to reconcile. The first assumption is the manufacturer or capitalist is benevolent, and has some incentive to pay the peasant farmer. This incidence will not arise naturally, but will need to be cultivated by laws and encouraged through social engagement. Secondly, peasant farmers and their descendants will need to be incentivized so that the marginal benefit of farming exceeds the marginal cost of migrating to the capitalist sector. This can possibly be addressed by advertising the wealth transfer discussed in the former as an alternative to increased wages from labor migration. Third, implementation of the study’s contract model can inadvertently discourage skill diversity. This will need to be addressed by law makers. Finally, manufacturers are clear losers in this paper. Governments may be hesitant to implement the restorative policy in fear of redirected investment from multinationals. One might argue, however, input costs in developing countries are sufficiently low so MNC’s won’t be driven out by incremental tax increases over time. Still governments should assess how beneficial (or costly) a program of this nature could be in respective macro-economies.

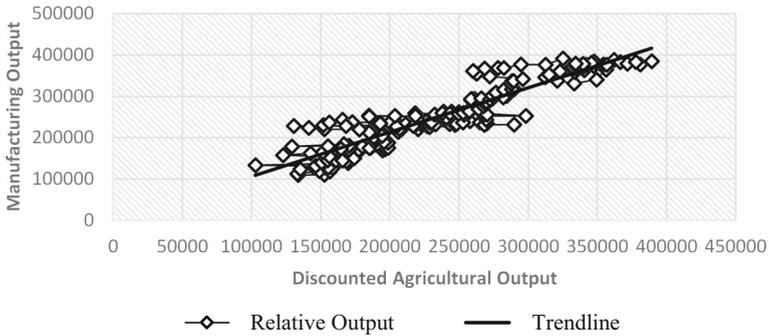


Fig. 3 Discounted Agricultural v. Manufacturing Output Scatter Plot in Millions of Dollars

Conclusion

All in all, this paper examines the impact of appropriate resource allocation on the subsistence level of output. Findings indicate the opportunity cost of manufacturing output has been the 20% discount in agricultural output in South Africa since 1968. Further explorations should be implemented to decide whether this is due to investment. Additionally, replicating this exercise in other developing nations impacted by colonization or capitalistic incentives may be useful.

Also, policy makers should be advised formal recognition and support of the agricultural industry has the potential to be beneficial domestically and internationally for food security world-wide. Geologically rich nations can exploit their comparative advantage in the production of food, but incentivizing these efforts will certainly require policy makers to be smart. That is, at the very least, policy makers will need to resolve land ownership issues enough as not to obstruct incentives of those specializing in farming. One caveat is, of course, as the world becomes more technically and globally efficient, government support of agriculture can be impeded as peasant farmers follow wage induced incentives and migrate to more capitalistic sectors (Field 2007).

Finally, implementing these policy measures will undoubtedly be met with uncertainty arising from existing institutions (Goldstein and Udry 2008). Authors Deininger and Feder (2009) prescribe the following steps developing governments should take in policy implementation:

1. Identify channels for optimal socio-economic outcomes.
2. Recognize the impacts of certain institutions, such as the poor distribution of resources resulting from colonization and apartheid in South Africa.
3. Identify potential costs and benefits of new policy.
4. Support community and traditional infrastructures by, say, providing information to farmers in South Africa at low costs and allow them to self-govern without the threat of nepotism from government connected community members.

Adhering to these steps ought to allow policy makers to help agricultural productivity grow as optimally as possible.

References

- Abdulai A, Owusu V, Goetz R. Land tenure differences and investment in land improvement measures: Theoretical and empirical analyses. *J Dev Econ.* 2011;96(1):66–78.
- Bardhan P, Ghatak M, Karaivanov A. Wealth inequality and collective action. *J Public Econ.* 2007;91(9): 1843–74.
- Besley T, Ghatak M. Property Rights and Economic Development. *Handb Dev Econ.* 2010;5:4525–95.
- Besley T, Leight J, Pande R, Rao V. Long-run impacts of land regulation: Evidence from tenancy reform in India. *J Dev Econ.* 2016;118:72–87.
- Coase RH. The problem of social cost. *J Law Econ.* 1960;3:1–44.
- De Janvry A, Sadoulet E. "The global food crisis: Identification of the vulnerable and policy responses." *Agricultural and Research Economics Update, Special Issue: Causes and Consequences of the Food Price Crisis* 2008;12(2):18–21.
- Deininger K, Feder G. Land registration, governance, and development: Evidence and implications for policy. *World Bank Res Observer.* 2009;24(2):233–66.
- Do QT, Iyer L. Land titling and rural transition in Vietnam. *Econ Dev Cult Chang.* 2008;56(3):531–79.
- Fenske J. Trees, tenure and conflict: Rubber in colonial Benin. *J Dev Econ.* 2014;110:226–38.
- Field E. Entitled to Work: Urban Property Rights and Labor Supply in Peru. *Q J Econ.* 2007;122(4):1561–602.
- Ghatak M, Karaivanov A. Contractual structure in agriculture with endogenous matching. *J Dev Econ.* 2014;110:239–49.
- Ghatak M, Mookherjee D. Land acquisition for industrialization and compensation of displaced farmers. *J Dev Econ.* 2014;110:303–12.
- Goldstein M, Udry C. The profits of power: Land rights and agricultural investment in Ghana. *J Polit Econ.* 2008;116(6):981–1022.
- Hamilton D, Darity W. Can 'baby bonds' eliminate the racial wealth gap in putative post-racial America? *Rev Black Political Econ.* 2010;37(3–4):207–16.
- Hornbeck R. Barbed wire: Property rights and agricultural development. *Q J Econ.* 2010;125(2):767–810.
- Jacoby HG, Mansuri G. Incentives, supervision, and sharecropper productivity. *J Dev Econ.* 2009;88(2):232–41.
- Keswell M, Carter MR. Poverty and land redistribution. *J Dev Econ.* 2014;110:250–61.
- Lambert S, Ravallion M, Van de Walle D. "Intergenerational mobility and interpersonal inequality in an African economy." *J Dev Econ.* 2014;110:327–344.
- Legassick M. South Africa: forced labour, industrialisation and racial differentiation. In: *The political economy of Africa.* 1975. p. 229–270.
- Lewis WA. Economic development with unlimited supplies of labour. *Manch Sch.* 1954;22(2):139–91.
- Schwab SJ. Collective Bargaining and the Coase Theorem. *Cornell L Rev.* 1986;72:245. Chicago
- Valsecchi M. Land property rights and international migration: Evidence from Mexico. *J Dev Econ.* 2014;110: 276–90.
- Ward M. 'Homeland' Development? Planning in the Ciskei. *IDS Bull.* 1980;11(4):15–8.
- Wellings P, Black A. Industrial decentralization under apartheid: The relocation of industry to the South African periphery. *World Dev.* 1986;14(1):1–38.
- Wolpe H. Capitalism and cheap labour-power in South Africa: from segregation to apartheid 1. *Econ Soc.* 1972;1(4):425–56.