# The Kerala Regime and Regional Disparities in Health Infrastructure Versus Outcomes

Suraj Jacob

Routledge
Taylor & Francis Group

# The Kerala Regime and Regional Disparities in Health Infrastructure Versus Outcomes

*SURAJ JACOB*

Kerala's development trajectory has attracted considerable attention because of the state's human development achievements.[1] A 1975 report issued under the aegis of the United Nations underlined these achievements, and a 1985 report by the Rockefeller Foundation singled out Kerala's health achievements from a global perspective.[2] The literature holds that a key aspect of the "Kerala model" was the reduction of inter-regional disparities in development infrastructure and outcomes between relatively backward Malabar in the north and relatively developed Travancore-Cochin in the south.[3] Furthermore, the reduction of regional disparity in human development outcomes is typically attributed to reduction in regional disparity in development infrastructure put in place by Kerala's social democratic policy regime from 1957 onward. V. K. Ramachandran summarized the conventional wisdom about this thusly:[4]

> A highlight of Kerala's development experience is that public action after 1957 helped close the gap in important respects between Malabar and the southern districts of Kerala. The disparities in health and education facilities in Travancore and Malabar have been usefully discussed in Kabir and Krishnan (1992).[5] In respect of literacy, it is clear that the literacy gap between Malabar and the princely states widened substantially during the period that Malabar was part of British India, and it narrowed only after mass schooling was established in Malabar after 1957. The reduction of differences between the north and south in respect of literacy, medical facilities, infant mortality, immunization, and fertility and death rates, and in infra-structural and general cultural development is a standing example of the achievement of people and governments in recent decades.

The present study revisits the argument of reduced regional disparities attributed to Kerala's social democratic regime.[6] Although the Kerala literature sometimes con-flates development outcomes and infrastructure—as seen from the aforementioned quotation—the distinction is important both from a conceptual and a policy-making perspective. A seminal report by the World Health Organization distinguishes between goal "attainment" (outcomes such as life expectancy) and "resource availability" (inputs representing health infrastructure and services).[7] Based on this distinction, I re-evaluate the empirical evidence for regional development in Kerala. I find that while there

Suraj Jacob is an Assistant Professor of Justice Studies at James Madison University.

was indeed a reduction in regional disparity in development outcomes, there was no corresponding reduction of disparity in development infrastructure. Further, since the conventional wisdom emphasizes the role of Kerala's vaunted regime in infrastructure disparity reduction, I reappraise the role of the regime on the basis of the finding that infrastructure disparity did not reduce.

In the following section, I begin by revisiting evidence presented in key studies of the relative health trajectories of Travancore-Cochin and Malabar. I show that the extant literature implicitly uses a ratio measure for disparity to show that infrastructure disparity reduced; for instance, the ratio of hospital beds (per capita) in Travancore-Cochin and Malabar became closer to unity over time. However, infrastructure disparity did not reduce if the difference measure is used instead; for instance, the raw difference between hospital beds (per capita) in the two regions did not reduce. Over time, the ratio can become closer to unity even when the difference is constant or increasing. I argue that from a welfare perspective the difference measure is more useful in understanding the comparative development trajectories of the two regions. Indeed, in the previous literature the intuition regarding regional development disparity is articulated in difference terms even though interpretation of the empirical evidence has been implicitly in ratio terms.

After establishing that health infrastructure disparity did not reduce even though health outcome disparity did reduce, I turn to two questions implied by this finding. First, what explains this puzzle? If infrastructure is an important input in determining outcomes, how is it possible that outcome disparity reduced without corresponding reduction in infrastructure disparity? I argue that a potential, simple explanation lies in the phenomenon of "diminishing returns." That is, the "production function" for health may be such that as infrastructure increases, additional infrastructure produces smaller improvements in health outcomes. I briefly survey the global literature on health production functions to show that this is indeed possible and likely. The existence of a diminishing returns production function would account for the puzzle of constant infrastructure disparity yielding reduced outcome disparity. That is, such a production function would imply that starting at different levels of both health infrastructure and outcomes, as both regions underwent similar increases in infrastructure the increase in infrastructure produced smaller improvement in outcomes in Travancore-Cochin than in Malabar, thus reducing the disparity in outcomes. As paucity of data do not currently allow for estimation of a health production function at different points in time for the regions of Kerala, I am not arguing that the diminishing returns argument definitively explains the puzzle. Instead, I simply advance the possibility, based on a reading of the larger literature, both from developed and developing countries, that this could explain the puzzle.

Second, does the Kerala regime factor hold explanatory value if in fact there was no reduction in input disparity between Travancore-Cochin and Malabar? I argue that it does, but not in the way envisaged by the Kerala literature on regional disparities. The Kerala literature focuses on the regime's ability to disproportionately favor the lagging Malabar region. However, regional disparity in inputs—including disparity in publicly provided goods—did not reduce. Instead, the argument advanced here is that the potency of the regime lay in increasing development inputs throughout the state

(albeit without favoring the lagging region), and consolidating the conditions for "public action" to effectively demand and utilize these inputs, which ultimately resulted in reduction in outcome disparity between the regions.

## The Literature on Regional Disparities in Kerala

The literature on regional disparities in Kerala consistently states that there was a reduction in disparities in both development inputs and outcomes over time, and argues that Kerala's post-1956 welfare policy regime played a major role in this. Kerala's comprehensive *Human Development Report* notes:

> At the time of Independence, there existed wide regional differences within Kerala, in terms of the broad indicators of human development. . . . These differences narrowed down in the subsequent period and within the next 30 years, Malabar caught up with Travancore in terms not only of facilities for health care and education, but also in health and educational outcomes . . . "[8]

Similarly, T. N. Krishnan notes:

> After the formation of the State, the government placed greater emphasis on the expansion of health-care facilities in the Malabar region in order to reduce the inequality in the availability of health care between the two regions. The reduction in death rate and in infant mortality in the Malabar region must be partly attributed to this factor."[9]

The literature typically cites a study by M. Kabir and T. N. Krishnan regarding the trajectory of regional disparities in Kerala.[10] This study and related work by the authors, particularly T. N. Krishnan, has been rightly seen as foundational in analyzing Kerala's development trajectory. Kabir–Krishnan explicitly focus on regional health disparities, and in turn, they draw from, and expand, the data and the insights from another foundational study published under the aegis of the United Nations.[11] In the following sections, I revisit the evidence provided by these studies.

### The Kabir–Krishnan and United Nations Studies

The quantitative data presented by Kabir–Krishnan pertain to four variables, two health outcomes and two publicly-provided health infrastructure inputs. Figure 1 plots their data for the two health outcomes (general mortality and infant mortality) and shows a dramatic reduction in the outcome disparity in the two regions over time. Although there are reasons to question the credibility of these specific outcome measures (see the Appendix), other evidence also points to a similar qualitative result.[12] Kabir–Krishnan argue that the reduction in the outcome disparity was in large part due to a reduction in the health infrastructure disparity.[13] They use two infrastructure indicators to make this argument, the number of hospital beds and patients treated (both normalized by population) in government health facilities. Figure 2 graphs their data. Surprisingly,

FIGURE 1
HEALTH OUTCOMES IN MALABAR AND TRAVANCORE (KABIR–KRISHNAN)
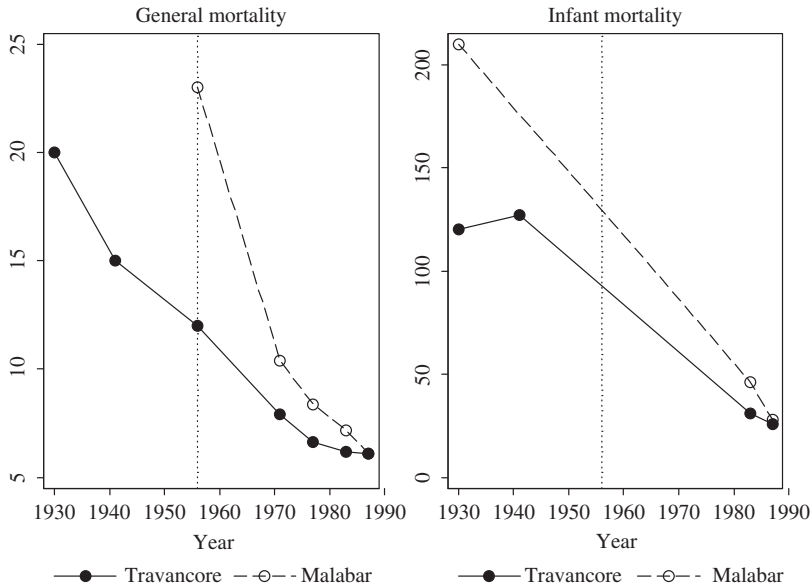


*Source:* Kabir and Krishnan, "Social Intermediation." General and infant mortality rates are calculated per 1000 population.

the regional difference in hospital beds or patients treated does *not* reduce in the post-1956 period: while each indicator increased appreciably over time, the difference was roughly constant after Kerala state formation.[14] This pattern of data interpretation is shared by another influential study, by P. G. K. Panikar and C. R. Soman. Referring to government allopathic infrastructure, they write that "[t]he inter-regional differences . . . are seen to have gradually narrowed."[15] However, according to the data they present for 1961–81, the difference between the two regions increased for three of their indicators (per capita availability of government hospitals, primary health centers, and beds in government allopathic facilities) and decreased only for one of their indicators (per capita availability of government dispensaries).[16] To my knowledge, the absence of regional convergence for health inputs in Kerala has been pointed out by only one previous work in the literature, by P. N. Mari Bhat and Irudaya Rajan.[17] In their footnote 4, they observe that Malabar accounted for 22 percent and 30 percent of the state's hospital beds in 1959 and 1988, respectively, while it also accounted for 36 percent and 40 percent of population in these years. These numbers are consistent with those used by Kabir–Krishnan and plotted in Figure 2.

*Measures of Regional Disparity*
Why did Kabir–Krishnan and Panikar-Soman conclude that their data suggest reduction in the health infrastructure disparity? It is likely that they were looking at

FIGURE 2

HEALTH INPUTS IN MALABAR AND TRAVANCORE (KABIR–KRISHNAN)
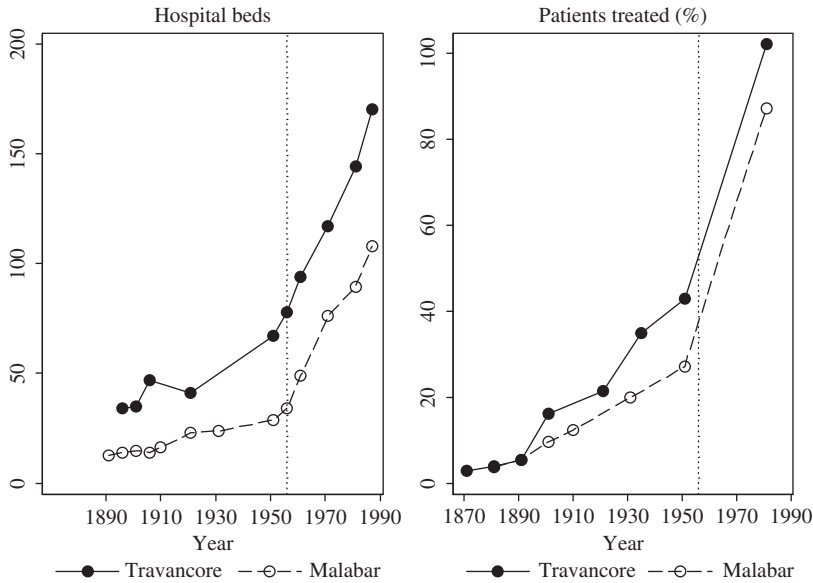


*Source:* Kabir and Krishnan, "Social Intermediation." Left graph refers to government hospital beds per 100,000 population and right graph refers to patients treated in allopathic government hospitals.

time trends in the ratio ($Y_{Travancore}$ / $Y_{Malabar}$) rather than in the level difference ($Y_{Travancore} - Y_{Malabar}$).[18] Kabir–Krishnan draw from, and expand, the data and the insights from the 1975 UN report, which explicitly uses the ratio measure to calculate health infrastructure disparity: "[i]n 1956/57 the number of beds per 100,000 population was 2.4 times greater in Travancore-Cochin than in Malabar, but this *ratio reflecting the interregional difference* declined to 1.5 in 1970/71."[19] However, when discussing literacy, the same report employs the level difference: it notes that in 1961-71 there was substantial divergence between the literacy rates in Kerala and India – the difference increased from five to thirteen percentage points.[20] It turns out that if the ratio measure were used instead, the divergence would be marginal (from 1.96 to 2.06). Similarly, T. N. Krishnan compares the population/bed ratio in Malabar and Travancore-Cochin in 1956–57 (3125 and 1282) and 1989–90 (1021 and 642) to show how "the differentials in health-care facilities between the two regions" was reduced.[21] In fact, these numbers show that the raw difference in bed availability increased (from 46 beds to 58 per 100,000 population), rather than reducing substantially.

Figure 3 graphs the two measures of regional disparity, one based on level difference and the other based on the ratio, for hospital beds and patients treated, using the Kabir–Krishnan data. In the post-1956 period the level difference for hospital beds increased but the ratio decreased. For patients treated in the post-1956 period, the level difference

FIGURE 3
CONVERGENCE MEASURES FOR HOSPITAL BEDS AND PATIENTS TREATED (KABIR–KRISHNAN DATA)
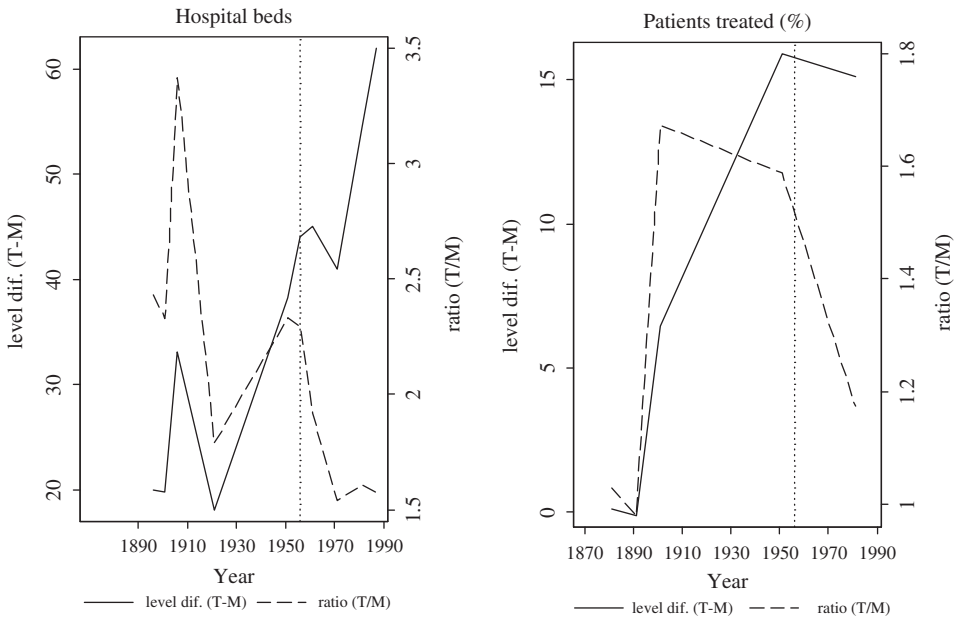


*Source:* Kabir and Krishnan, "Social Intermediation."

decreased slightly while the ratio decreased substantially. The ratio fell because the level difference stayed roughly constant in the face of rising absolute values (Figure 2).

The fact that the level difference measure yields a different interpretation of change in disparity compared to the ratio measure casts attention on the question of the best measure in this context. It turns out that the cross-national health literature also has an analogous problem: there was convergence in infant and child mortality across the world using a measure corresponding to the level difference, but divergence using a measure corresponding to the ratio.[22] Angus Deaton points out: [23]

> . . . the factual reason for the difference is that infant and child mortality rates have continued to decline in the low mortality rich countries of the North and, because the initial levels of mortality were so low, even small absolute reductions are proportionately large. In Sweden, for example, infant mortality fell from 11 per thousand in 1970 to 3.2 in 2000, while in Mali it fell from 225 to 124 per thousand. The number of lives saved in Sweden is small relative to the number in Mali, but the proportional decline is much larger. This is, of course, a general problem in the literature on health inequalities, which tends to focus on ratios of mortality rates which, in this case, show a worsening of health inequality between Sweden and Mali, from a ratio of 20.5 to 38.8, in spite of the fact that many more Malian than Swedish lives have been saved.

Deaton's argument indicates that from a welfare perspective what matters more is the number of lives saved, for which the level difference is the more appropriate measure. The difference measure is also the standard measure used in much of the recent empirical literature on development.[24]

## Other Evidence on Regional Disparities in Health Inputs Versus Outcomes

In addition to the data on mortality rates (Figure 1) and hospital beds and patients treated in government facilities (Figure 2), other data are also consistent with the notion that there was considerable reduction in health outcome disparities without a corresponding reduction in input disparities. In the following, I outline some additional evidence.

*Outcome Disparities*

As discussed in the Appendix, it is difficult to construct high-quality region-wise data on mortality rates for earlier decades. However, district-wise estimates by the Population Foundation of India for 1991 and 2001 cast some light on regional disparities in recent decades.[25] Table 1 summarizes these estimates for Malabar and Travancore-Cochin.[26] For both infant and child mortality, Travancore-Cochin had the lower rate in 1991, but by 2001 the difference reduced for both measures, and in fact Malabar had the lower rate for infant mortality. This general trend also holds for disparities across specific sub-populations in the two regions (women and men, rural, and urban). These estimates are also consistent with estimates of life expectancy from the Indian Institute of Population Studies.[27] Aggregating district-wise estimates for Malabar and Travancore-Cochin weighted by population, the life expectancy for 2001 was 73.41 and 72.58, respectively—very close, with Malabar having a slight advantage.

TABLE 1
RECENT MORTALITY ESTIMATES

| Item | 1981 | | 1991 | |
|---|---|---|---|---|
| | Travancore-Cochin | Malabar | Travancore-Cochin | Malabar |
| IMR | 34.45 | 37.22 | 17.73 | 16.82 |
| IMR, males | 30.25 | 38.93 | 16.08 | 15.40 |
| IMR, females | 38.00 | 32.63 | 19.98 | 18.87 |
| IMR, rural | 34.98 | 39.93 | 17.91 | 17.07 |
| IMR, urban | 32.50 | 29.76 | 17.72 | 17.12 |
| CMR | 41.21 | 52.16 | 18.73 | 20.17 |
| CMR, males | 38.89 | 52.00 | 17.08 | 19.17 |
| CMR, females | 45.15 | 53.04 | 21.15 | 21.35 |
| CMR, rural | 40.96 | 54.86 | 18.67 | 20.01 |
| CMR, urban | 38.69 | 45.63 | 17.89 | 19.89 |

*Notes:* Data from the Population Foundation of India, based on census data. IMR and CMR stand for infant and child mortality, respectively. As the underlying estimates are for districts, IMR and CMR figures for regions (Malabar and Travancore-Cochin) were calculated by averaging the district figures weighted by the number of births; the weights were calculated from crude birth rate figures compiled by the Civil Registration System and presented in *Administrative Reports* of the Health Department.

TABLE 2
FERTILITY ESTIMATES USING CHILD-WOMAN RATIO

| Census year | CWR1 | | | | | CWR2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Period | TC | M | Dif. (TC-M) | Ratio (TC/M) | Period | TC | M | Dif. (TC-M) | Ratio (TC/M) |
| 1951 | 1946–51 | 590 | 501 | 89 | 1.18 | 1941–46 | 576 | 481 | 95 | 1.20 |
| 1961 | 1956–61 | 647 | 622 | 25 | 1.04 | 1951–56 | 722 | 657 | 65 | 1.10 |
| 1971 | 1966–71 | 526 | 591 | −65 | 0.89 | 1961–66 | 656 | 682 | −26 | 0.96 |
| 1981 | 1976–81 | 360 | 482 | −122 | 0.75 | 1971–76 | 475 | 605 | −130 | 0.79 |
| 1991 | 1986–91 | 293 | 384 | −91 | 0.76 | 1981–86 | 423 | 599 | −176 | 0.71 |
| 2001 | 1996–01 | 281 | 333 | −52 | 0.84 | 1991–96 | 346 | 432 | −86 | 0.80 |

*Note:* Data calculated by the *Kerala Development Report* from census reports. TC and M stand for Travancore-Cochin and Malabar, respectively. CWR1 is the ratio of the number of children in the age-group 0–4 years to the number of women in the age-group 15–49; it is an estimate of fertility in the five years immediately preceding a census. CWR2 is the ratio of the number of children in the age-group 5–9 years to the number of women in the age-group 20–55; it is an estimate of fertility in the five years before that.

Consider next the child-woman ratio (CWR). The CWR calculated from census data is a commonly cited indicator of health outcomes in Kerala (in addition to mortality rates). Furthermore, both intuition and the literature suggest that it is affected by health infrastructure.[28] With the decennial census as the main data source for previous decades, demographers use two CWR measures, which I refer to as CWR1 and CWR2. CWR1 is the ratio of the number of children in the age-group 0–4 years to the number of women in the age-group 15–49; it is an estimate of fertility in the five years immediately preceding a census. CWR2 is the ratio of the number of children in the age-group 5–9 years to the number of women in the age-group 20–55; it is an estimate of fertility in the five years before that.[29] Table 2 shows CWR1 and CWR2 for the two regions over five decades using the calculations by the *Kerala Development Report* from census data.[30] Consider the entire period spanning modern Kerala (1956–2001). In the first 30 years of this period, the gap between Travancore-Cochin and Malabar increased (from +25 in 1956–61 to -176 in 1981–86) because Travancore fertility declined at a faster pace. Over the following years, the gap decreased (from -176 in 1981–86 to -52 in 1996–2001) because Malabar fertility declined at a faster pace.[31] Viewed as a whole, these data suggest that disparities in health outcomes have reduced considerably and are almost nonexistent in recent years.

*Infrastructure Disparities*

By contrast, additional data on health facilities show that regional disparities in inputs have not reduced. Figure 4 (left graph) shows government allopathic hospital beds normalized by population, extending the beds data presented by Kabir–Krishnan.[32] The graph shows evidence of a roughly constant difference. The official Pai Committee Report of 1979 had specifically recommended the creation of equal facilities in subdistrict and district hospitals across the state, particularly for beds, and the government had responded enthusiastically.[33] However, the regional trajectories for hospital beds shows that there was in fact no trend towards reduction of disparity in publicly provided hospital beds over the following two decades. Figure 4 (right graph) shows

FIGURE 4
GOVERNMENT HOSPITAL BEDS AND AYURVEDIC FACILITIES
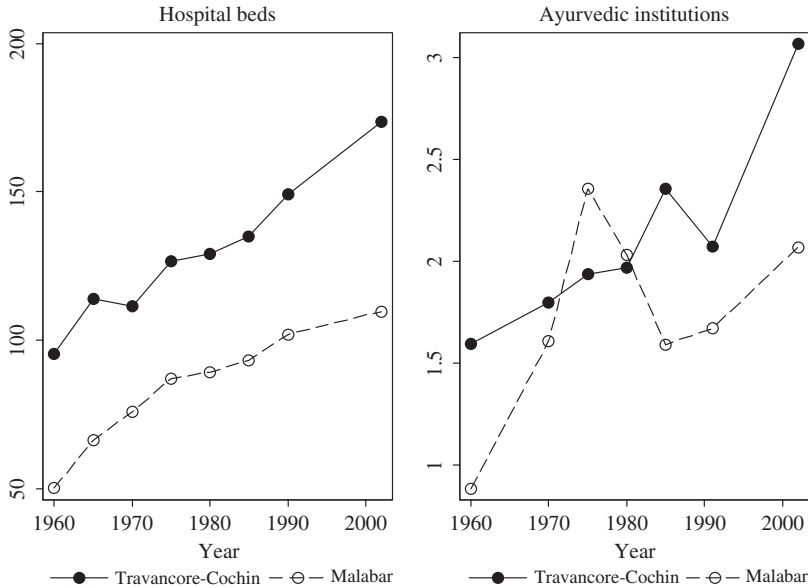


*Note:* Variables are per 100,000 population. Raw data are from the *Kerala Development Report*, which compiles them from *Administrative Reports of the Health Department* (Kerala) and *Economic Reviews* (Kerala), various years. These data were normalized by population figures interpolated from decennial censuses.

the number of government ayurvedic institutions, normalized by population. Soon after state-formation, Travancore-Cochin had almost 50 percent more government Ayurvedic institutions, and the difference had widened by 2000, although Malabar briefly overtook Travancore in the 1970s.

The data used for Figure 4 came from the Kerala government's Health Department. To see whether the overall trend holds for data from a different source, I turn to village level information from the District Census Handbooks of the decennial Census of India for 1971 and 2001.[34] Table 3 presents aggregated data on allopathic hospitals

TABLE 3
VILLAGE HOSPITALS AND DISPENSARIES

| Item | 1971 | | | 2001 | | |
|---|---|---|---|---|---|---|
| | Travancore-Cochin | Malabar | Dif. (TC-M) | Travancore-Cochin | Malabar | Dif. (TC-M) |
| Hospitals | 2.5 | 0.9 | 1.6 | 5.4 | 3.0 | 2.4 |
| Dispensaries | 6.1 | 3.7 | 2.4 | 4.9 | 2.8 | 2.1 |
| Hospitals and dispensaries | 8.6 | 4.6 | 4.0 | 10.3 | 5.8 | 4.5 |

*Note:* Data calculated from *District Census Handbooks*. TC and M stand for Travancore-Cochin and Malabar, respectively. Data refer to number of allopathic hospitals/dispensaries per 100,000 rural population.

and dispensaries (per 100,000 rural population) in the two regions. The regional difference for village hospitals increased between 1971 and 2001 while the regional difference for village dispensaries decreased. It is possible that there were changes in categorization of hospitals and dispensaries over time through upgrades or changing definitions.[35] The table also provides data for hospitals and dispensaries combined; there was a small increase in the regional difference over the three decades.[36] Overall, the data presented in Table 3 do not suggest a marked reduction in regional infrastructure differences.

## Regional Disparities and the Health Production Function

The evidence presented so far suggests an intriguing pattern that is different for health outcomes and health infrastructure inputs. The outcome disparity between the regions seems to have narrowed over time while the input disparity has not narrowed. What explains the puzzle of reduction in the mortality disparity and lack of reduction in the health infrastructure disparity?

One possibility is that the indicators of health infrastructure presented in previous sections are not the appropriate ones for operationalizing the concept of health infrastructure in Kerala.[37] While this possibility cannot be completely ruled out, the evidence I have presented is for indicators that are standard in the literature. For instance, T. N. Krishnan explicitly notes that bed availability is "a good indicator of the overall availability of health care," as does V. Raman Kutty.[38] A second possibility is that some factor other than health infrastructure caused the outcome disparity to narrow over time. For instance, the land reforms movement, and the communist movement in general—which were arguably more potent in Malabar than in Travancore-Cochin—may have had indirect positive effects on health outcomes.[39] While this possibility cannot be ruled out, the literature explicitly argues that health infrastructure was a key factor.[40]

Another possibility is that the relationship between health infrastructure and mortality—that is, improvement in health infrastructure causing reduction in mortality—was stronger in the case of Malabar. This could be the case if Malabar started out with a lower level of health inputs, and the provision of improved health infrastructure substituted for the relative absence of other health inputs there. Such a "diminishing returns" argument could explain why the outcome disparity narrowed over time despite the infrastructure disparity not doing so. Apoorva Shah speculates on the possibility of a diminishing returns mechanism producing convergence in outcomes between Malabar and Travancore.[41] To my knowledge, no other scholar has advanced this argument for these regions.[42]

Figure 5A is a graphical representation of the argument. The curved line is a hypothetical health production function relating infrastructural input to health outcome. Consider two regions starting out with infrastructural input levels A and B. If the regions exhibit the same increase ($\Delta$) in inputs over time, their new levels are A + $\Delta$ and B + $\Delta$. The thick vertical lines represent differences in outcomes over the two periods. The concave function produces a markedly smaller disparity in outcome despite an unchanging disparity in infrastructure. This result could hold even if, as is likely, the health production function itself changes over time—say, an outward shift due

FIGURE 5
REGIONAL DISPARITIES AND DIMINISHING RETURNS
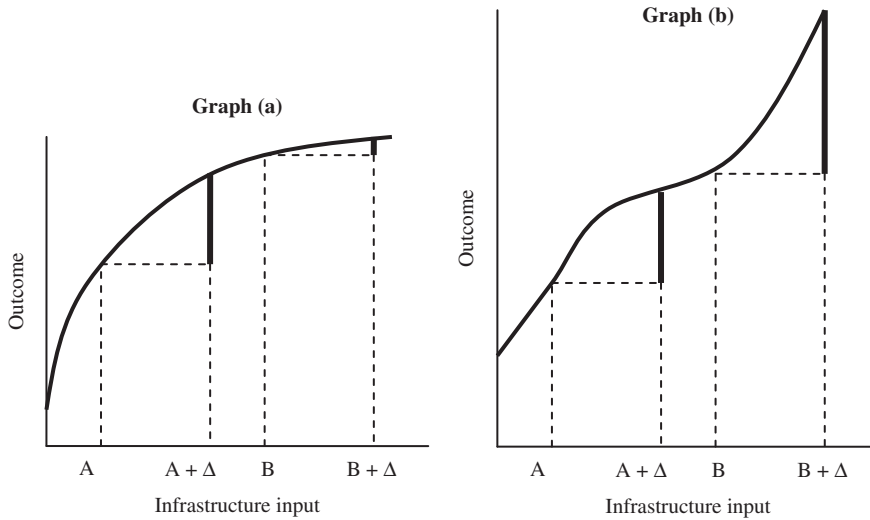


to technological and organizational improvements—if it continues to have a concave shape. As the shape of the production function determines whether outcome disparity decreases, other shapes can yield other results. For instance, Figure 5B introduces convexity for a portion of the production function such that the outcome disparity now increases for specific infrastructure distributions. The analysis of health history by Kabir and Krishnan suggests that in the second half of the nineteenth century and early twentieth century, the relationship between health infrastructure inputs and outcomes was indeed convex, but that it changed to a concave relationship in later decades.

*Related Literature*
The aforementioned argument—that diminishing returns can account for inter-temporal change in regional disparities in Kerala—is consistent with the larger literature on health inputs and outcomes. In exploring the impact of health facilities on health outcomes, economists typically estimate health production functions, which can be at the level of the individual or economy-wide. In addition to health facilities, other inputs include environmental, socioeconomic, and lifestyle factors. Using per capita health expenditure as a proxy for health inputs and denoting health outcomes by mortality rates or life expectancy, the literature (national and cross-national) finds strong diminishing returns, suggesting a situation of "flat of the curve medicine."[43] Similar results hold for the public sector component of healthcare expenditure, both for developed and developing countries.[44]

*Kerala in National and International Perspective*
The evidence for health outcomes in Kerala when compared with India and other countries is also consistent with a diminishing returns argument. Figure 6 (left graph)

FIGURE 6
DIMINISHING RETURNS: INFANT MORTALITY IN COMPARATIVE PERSPECTIVE
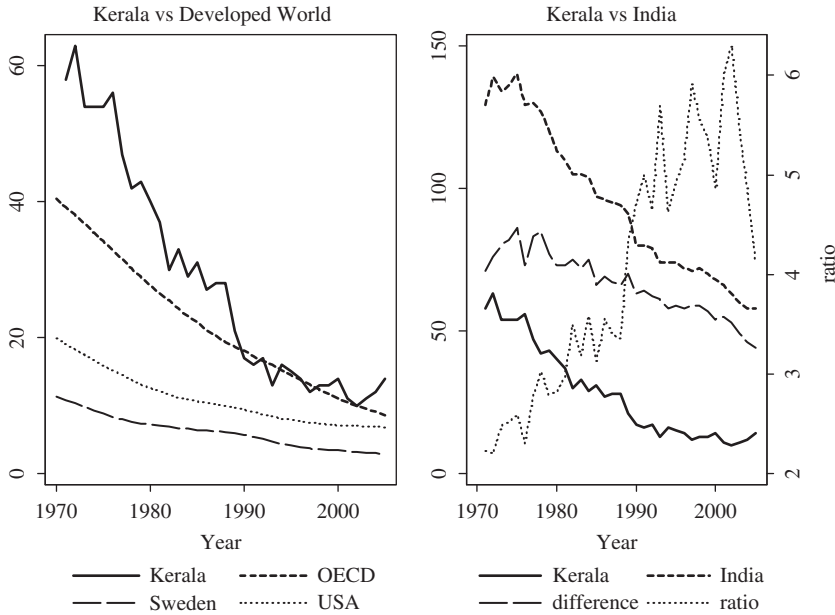


Note: Figures are for infant mortality rate (number of infant deaths per 1000 live births). Data for Kerala and India are from the *Kerala Development Report*, compiled from the Sample Registration System. Data for Sweden, USA, and OECD average are from the World Bank's *World Development Indicators*.

compares the infant mortality rate (IMR) in Kerala with the rate in Sweden, the USA, and the average for rich countries (countries belonging to the Organization for Economic Co-operation and Development, OECD).[45] The absolute reduction in Swedish and American IMR has been much less than that of Kerala, thus producing a narrowing disparity over time. The trend for the OECD average falls somewhere between the Swedish/American and Kerala trajectories. In general, the literature reports a falling of the dispersion of mortality rates across countries.[46] Figure 6 (right graph) compares the IMR in Kerala with the all-India figure. The difference has gradually reduced over time, but given that Kerala IMR seems to be leveling off in recent years whereas Indian IMR does not seem to be doing so, the disparity will likely reduce rapidly in the coming years. Overall, the graph is consistent with a diminishing returns mechanism.[47] Interestingly, in this instance the ratio measure registers a steep increase although the difference measure shows a decrease over time. While the evidence is consistent with a diminishing returns mechanism, it will fall to micro-studies to show whether this was in fact the case empirically, in the spirit of the approach advocated by Abhijit Banerjee and Esther Duflo.[48]

## The Kerala Regime and Regional Disparity

Does the Kerala regime factor hold explanatory value if in fact there was no reduction in input disparity between Travancore-Cochin and Malabar? The Kerala literature

focuses on the regime's ability to disproportionately favor the lagging Malabar region. However, regional disparity in inputs—including disparity in publicly provided goods—did not reduce. This suggests that the regime did not disproportionately favor Malabar, despite its intentions or political claims to the contrary. Instead, the potency of the regime lay in increasing development inputs throughout the state (albeit without favoring the lagging region), and consolidating the conditions for "public action" to effectively demand and utilize these inputs, which ultimately resulted in reduction in outcome disparity between the regions. I sketch out this argument as follows.

Compared to the rest of India, Kerala's policy regime was an outlier with regard to policies focused on the social sector, particularly health and education.[49] Until the 1990s, the share of health and education in total public expenditure in Kerala exceeded the Indian average by over 10 percentage points, and this can be attributed specifically to the post-1956 regime.[50] Kerala's social sector expenditures were also more efficiently utilized in providing healthcare and education facilities for underserved populations. For instance, in the early 1990s, 92 percent of births occurred in medical institutions and 89 percent of children aged 12–23 months received vaccinations, compared with 24 percent and 70 percent for India as a whole; and in 2006, Kerala's rate of child malnutrition was almost half the all-India figure.[51] Further, the greater public fiscal and policy commitment to the social sector went alongside greater public awareness and demand—described as "public action" in the Kerala context—which led to better utilization as well as improved equity.[52] Kerala's success in improving health outcomes was one of five worldwide cases to be singled out in a seminal 1985 report commissioned by the Rockefeller Foundation, *Good Health at Low Cost*.

Especially at the time, other regimes—in other parts of India and elsewhere—were less able to commit and implement healthcare and education policies, or consolidate the conditions for public action. Accompanying these developments was a reduction in regional disparities, likely through a diminishing returns mechanism. Thus, while the impact of the Kerala regime on overall development outcomes was direct, its impact on regional outcome disparity was indirect. It is even possible that the impact on outcome disparity was a largely unintended consequence of the working of the regime, despite political claims and intentions to directly favor Malabar (in terms of development inputs) over Travancore-Cochin.

## Conclusion

This study has explored the comparative health trajectories of Malabar and Travancore-Cochin. To better explore change in regional disparity over time, and the possible association with the Kerala regime, I distinguished between regional disparity in health infrastructure and health outcomes. I showed that different convergence measures—ratio versus difference—can yield different conclusions, and argued that the difference measure is more meaningful for understanding the developing world. Whereas the distinction is a technical one, it produces a significantly different implication regarding regional disparity, and in Kerala's case, the role of political and policy regimes as well. Therefore, the analysis presented here has larger methodological implications for the study of time trajectories of regional disparity.

The re-evaluation of the evidence for disparity yielded the puzzle of reducing outcome disparity without reducing infrastructure disparity. I argued that the puzzle is easily explained if the production function shows diminishing returns, and that this is in fact quite plausible. However, for lack of adequate data I did not establish conclusively that Kerala's regions actually do conform to a diminishing returns production function. More research is needed on this issue, both for Kerala and other states of India.

However, the fact that infrastructure disparity did not reduce in the manner that the extant literature has described, suggests the need for reappraising the role of Kerala's social democratic regime, which has been celebrated, among other things, for reducing infrastructure disparity. I have suggested that the success of Kerala's regime lay not in pro-actively promoting healthcare in Malabar over Travancore-Cochin, but rather in promoting healthcare equally across both regions in a more potent manner than regimes in other parts of India and much of the developing world. In the presence of diminishing returns, the potency of such a keen—but largely region-neutral—development policy regime is a plausible explanation for Kerala's impressive human development outcomes.

NOTES

1. For instance, see P. N. Mari Bhat and S. Irudaya Rajan, "Demographic Transition in Kerala Revisited," *Economic and Political Weekly* Vol. 25, No. 35/36 (1990), pp. 1957–1980; Barbara H. Chasin and Richard W. Franke, *Kerala: Radical Reform as Development in an Indian State* (San Francisco: Institute for Food and Development Policy, 1989); Manali Desai, "Indirect British Rule, State Formation, and Welfarism in Kerala, India, 1860–1957," *Social Science History* Vol. 29, No. 3 (2005), pp. 457–488; Government of Kerala, *Kerala Human Development Report* (Trivandrum: State Planning Board, Government of Kerala, 2005); Patrick Heller, "Social Capital as a Product of Class Mobilization and State Intervention: Industrial Workers in Kerala, India," *World Development* Vol. 24, No. 6 (1996), pp. 1055–1071; Ronald J. Herring, *Land to the Tiller: The Political Economy of Agrarian Reform in South Asia* (New Haven: Yale University Press, 1983); Robin Jeffrey, *Politics, Women and Well-Being: How Kerala Became a "Model"* (Houndmills, UK: Macmillan Press, 1992); M. Kabir and T. N. Krishnan, "Social Intermediation and Health Change: Lessons from Kerala," in Monica Das Gupta, Lincoln C. Chen and T. N. Krishnan, eds., *Health, Poverty and Development in India* (New Delhi: Oxford University Press, 1996), pp. 239–269; K. P. Kannan, "Public Intervention and Poverty Alleviation: A Study of the Declining Incidence of Rural Poverty in Kerala, India," *Development and Change* Vol. 26 (1995), pp. 701–727; T. N. Krishnan, "The Route to Social Development in Kerala: Social Intermediation and Public Action," in Santosh Mehrotra and Richard Jolly, eds., *Development with a Human Face: Experiences in Social Achievement and Economic Growth* (New York: Oxford University Press, 2000), pp. 204–234; Georges K. Lieten, "The Human Development Puzzle in Kerala," *Journal of Contemporary Asia* Vol. 32, No. 1 (2002), pp. 47–68; P. G. K. Panikar and C. R. Soman, *Health Status of Kerala: The Paradox of Economic Backwardness and Health Development* (Thiruvananthapuram: Centre for Development Studies, 1985); Govindan Parayil, "The 'Kerala Model' of Development: Development and Sustainability in the Third World," *Third World Quarterly* Vol. 17, No. 5 (1996), pp. 941–958; Planning Commission, *Kerala Development Report* (New Delhi: Academic Foundation for Government of India, 2008); V. K. Ramachandran, "On Kerala's Development Achievements," in Jean Dreze and Amartya Sen, eds., *Indian Development: Selected Regional Perspectives* (New Delhi: Oxford University Press, 1997), pp. 205–356; K. Ravi Raman, ed., *Development, Democracy and the State: Critiquing the Kerala Model of Development* (London: Routledge, 2010); Amartya Sen, "Radical Needs and Moderate Reforms," in Jean Dreze and Amartya Sen, eds., *Indian Development: Selected Regional Perspectives* (New Delhi: Oxford University Press, 1997), pp. 1–32; Prerna Singh, "We-Ness and Welfare: A Longitudinal Analysis of Social Development in Kerala, India," *World Development* Vol. 39, No. 2 (2011), pp. 282–293; Michael Tharakan, "History as Development Experience, Disaggregated and Deconstructed Analysis of Kerala," PhD thesis, Mahatma Gandhi University, 1998.

2. United Nations, ed., *Poverty, Unemployment and Development Policy. A Case Study of Selected Issues with Reference to Kerala* (New York: United Nations, 1975); Scott B. Halstead, Julia A. Walsh, and Kenneth S. Warren, eds. *Good Health at Low Cost* (Bellagio: Rockefeller Foundation, 1985).

3. Kabir and Krishnan, "Social Intermediation"; the *Kerala Development Report*; Ramachandran, "On Kerala's Development Achievements"; Tharakan, "History"; UN, *Poverty* (see note 1 above)

4. Ramachandran, "On Kerala's Development Achievements" (see note 1 above), p. 324.

5. Here, Ramachandran refers to an earlier version of the study by Kabir and Krishnan, but with the same title, presented at a conference in 1992, and available as a working paper (M. Kabir and T. N. Krishnan, "Social Intermediation and Health Change: Lessons from Kerala," Working Paper No. 251 (Thiruvananthapuram: Center for Development Studies, 1992)).

6. I use the term "regime" to denote a set of policies and the institutional arrangements that lend it coherence; this is in keeping with a larger literature on policy and political regimes (for instance, see Paul Pierson, *Politics in Time: History, Institutions, and Social Analysis* (Princeton: Princeton University Press, 2004); and Carter A. Wilson, "Policy Regimes and Policy Change," *Journal of Public Policy* Vol. 20, No. 3 (2000), pp. 247–274). Social democratic regimes—characterized by the Scandinavian model—emphasize social justice and welfare provision (Gøsta Esping-Anderson, *The Three Worlds of Welfare Capitalism* (Princeton: Princeton University Press, 1993)). Patrick Heller explicitly notes that Kerala's regime was social democratic in nature ("Degrees of Democracy: Some Comparative Lessons from India," *World Politics* Vol. 52, No. 4, 2000, pp. 484–519). The Kerala literature sometimes uses the term "public action" to denote, as Prabhat Patnaik summarizes Amartya Sen's use of the term, "action by the state under pressure from citizens in civil society" (Prabhat Patnaik, "Amartya Sen and the Theory of Public Action," *Economic and Political Weekly*, Vol. 33, No. 45 (1998), p. 2857). I prefer the term "regime" because it emphasizes state action, although in Kerala's case this was integrated with action from civil society.

7. WHO, *The World Health Report 2000* (Geneva: Author, 2000). The report uses the distinction between attainment and resource availability to estimate country-level "performance" in healthcare (efficiency in using inputs to produce outcomes). In a later section I briefly survey the related literature on health production functions.

8. Government of Kerala, *Kerala Human Development Report* (see note 1 above), p. 9.

9. T. N. Krishnan, "Route to Social Development" (see note 1 above), p. 200. Other studies also come to similar conclusions. The *Kerala Development Report* (see note 1 above), p. 52) notes: " . . . since the formation of the present State, the governments which came into power have pursued policies aimed at bringing a convergence of the levels of development across all the regions through a series of progressive legislations such as the one on agrarian reforms and on education, healthcare and social security. Differences in land tenure have come down, vital rates have become comparable across districts, school and college enrolment has become high in all areas and across all communities (except the outliers) and healthcare and infrastructural facilities have become widespread." Michael Tharakan writes: "The difference between Malabar in the North and Travancore-Cochin in the South in education and subsequently in other services, were bridged through deliberate post-independence policies of the government" (Tharakan,"History" (see note 1 above), p. 252). The UN report notes that "the major factor that brought about the decline in mortality rates in Kerala was the expansion and spread of health facilities [directly linked to the Kerala regime]" (UN, *Poverty* (see note 2 above), p. 138). P. G. K. Panikar and C. R. Soman note that "since the integration of the two parts in 1956, the inter-regional disparity has been considerably reduced . . . as a result of the improvement in medical care facilities in the Malabar region" (Panikar and Soman, *Health Status of Kerala* (see note 1 above), p. 37). The distinction between development inputs and outcomes, and their implications for regional disparity, is also not apparent in the work of a prominent Nobel Prize-winning scholar of Kerala's development trajectory, Amartya Sen. Jean Dreze and Amartya Sen observe (Dreze and Sen, *India* (see note 1 above), pp. 200—201): "The Malabar region, transferred from the Raj, was very much behind Travancore and Cochin in terms of literacy, life expectancy, and other achievements that make Kerala so special. But by the eighties, Malabar had 'caught up' . . . The initiatives that the state governments of Kerala took, under different 'managements' (led by the Communist Party as well as by the Congress), succeeded in bringing Malabar rather at par with the rest of Kerala over a short period of time." Amartya Sen has also mentioned this state-fueled development convergence elsewhere, although it is not clear whether the reference is to inputs or outcomes (for instance Amartya Sen, Bina Agarwal, Jane Humphries, and Ingrid Robeyns, "Continuing the Conversation," *Feminist Economics* Vol. 9, No. 2-3 (2003), pp. 319–232).

10. Kabir and Krishnan, "Social Intermediation" (see note 1 above).

11. UN, *Poverty* (see note 2 above).

12. The Appendix discusses Kabir–Krishnan's outcome measures. In the following section, I present additional outcome measures supporting their general point.

13. Kabir and Krishnan argue that by 1956 Malabar had caught up with Travancore-Cochin regarding other pre-conditions for improved health outcomes, namely sufficiently progressive "social attitudes" as well as a sufficiently conducive "social environment." The fact that social attitudes and social environment were not so conducive in the first half of the twentieth century is their key explanation for poorer health outcomes in Malabar in those earlier decades.

14. In principle, it is possible that mortality rate affects the number of patients who are treated, although the Kabir–Krishnan data suggest that this was not the case for the two regions in the time period under consideration.

15. Panikar and Soman, *Health Status of Kerala* (see note 1 above), p. 114.

16. I make this claim based on calculations using the data presented in Table IV.25 of Panikar and Soman, *Health Status of Kerala* (see note 1 above).

17. Bhat and Rajan, "Demographic Transition" (see note 1 above).

18. As Kabir–Krishnan, or indeed any other comparative work on Malabar and Travancore trajectories, do not use an explicit disparity measure, it is difficult to pin this down. They may also have been looking at a related measure, the percentage difference $(100 \times (Y_{Travancore} - Y_{Malabar})/Y_{Malabar})$, used by some scholars of Kerala demography, such as Bhat and Rajan, "Demographic Transition" (see note 1 above); and S. Irudaya Rajan and Sabu Aliyar, "Fertility Change in Kerala," in Christophe Z. Guilmoto and S. Irudaya Rajan, eds., *Fertility Transition in South India* (New Delhi: Sage Publications, 2005), pp. 239–269. This is simply a linear transformation of the ratio.

19. UN, *Poverty* (see note 2 above), p. 141. In fact, p. xi of the report notes that the chapter on health (Chapter X, "Health indicators and demographic trends") was drafted by T. N. Krishnan, who co-authored the Kabir–Krishnan study.

20. UN, *Poverty* (see note 2 above), footnote 3, p. 121

21. T. N. Krishnan, "Route to Social Development" (see note 1 above), p. 200.

22. The literature typically uses (cross-sectional) standard deviation and log standard deviation instead of level difference and ratio, respectively. The latter set of measures is convenient when there are only two regions.

23. Angus Deaton, "Global Patterns of Income and Health: Facts, Interpretations, and Policies" (Helsinki: UNU-WIDER Annual Lecture 7, 2006).

24. This literature typically uses raw values—the number of people using malaria bednets or the amount of cash delivered through a conditional cash transfer program—and looks at the program impact on these raw values, that is, the difference. For instance, see the discussion of such studies in Abhijit V. Banerjee and Esther Duflo, *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty* (New York: Public Affairs, 2011). However, to the extent that the raw values are transformed logarithmically, as is more common in studies of income, the underlying measure is the ratio.

25. S. Irudaya Rajan, P. Mohanachandran Nair, K. L. Sheela, Lalitendu Jagatdeb, and Nihar Ranjan Mishra, *Infant and Child Mortality in India: District Level Estimates* (New Delhi: Population Foundation of India, 2008).

26. I computed regional figures by aggregating the district-wise estimates for Malabar and Travancore-Cochin, weighted by the number of births using crude birth rate figures compiled by the Civil Registration System (CRS), described in the Appendix.

27. F. Ram, Chander Shekhar and S. K. Mohanty, *Human Development: Strengthening District Level Vital Statistics in India* (Bombay: Indian Institute of Population Studies, 2007).

28. For a recent study of the impact of health infrastructure on fertility rate, see Ali Hashemi and Djavad Salehi-Isfahani, "From Health Service Delivery to Family Planning: The Changing Impact of Health Clinics on Fertility in Rural Iran," *Economic Development and Cultural Change* Vol. 61, No. 2 (2013), pp. 281–309.

29. For a discussion of the CWR index, see Christophe Z. Guilmoto and S. Irudaya Rajan, "Spatial Patterns of Fertility Transition in Indian Districts," *Population and Development Review* Vol. 27, No. 4 (2001), pp. 713–738. The fertility rate is also affected by changes in mortality among children and women over time, but CWR does not incorporate this (Bhat and Rajan, "Demographic Transition"; note 1 above). The interpretations of the data in this paragraph follow Bhat and Rajan, "Demographic Transition;" others who report these data (Planning Commission, *Kerala Development Report* (note 1 above); K. C. Zachariah, S. Irudaya Rajan, P. S. Sarma, K. Navaneetham, P. S. Gopinathan Nair, and U.S. Mishra, *Demographic Transition in Kerala in the 1980s* (Thiruvananthapuram: Center for Development Studies, 1994)) do the same.

30. The CWR numbers in the *Kerala Development Report* (Table 2.5) contain mistakes in labeling some columns and rows. Table 2 corrects for these mistakes.

31. Table 2 also presents ratios for CWR in Travancore-Cochin and Malabar, which tell a similar story. After state formation in 1956, the ratio continuously fell as Travancore-Cochin underwent faster-paced fertility decline, reaching 0.71 in 1981–1986. The ratio then started increasing as Malabar went through a similar process, reaching 0.84 in 1996–2001.

32. Both sets of graphs in Figure 4 use raw data from Administrative Reports of the Health Department and annual Economic Reviews, compiled by the *Kerala Development Report* (note 1 above). Note that there are some discrepancies between the beds data in the *Kerala Development Report* and Kabir–Krishnan, particularly for Travancore-Cochin in the 1980s.

33. Government of Kerala, Subject Committee VI Social Sciences, *Report* (Trivandrum: Secretariat of the Kerala legislature, 1981); cited by the *Kerala Development Report* (see note 1 above).

34. Registrar General of India, *District Census Handbook* (New Delhi: Office of the Registrar General of India, various years).

35. Rohini Nayyar, *Rural Poverty in India: An Analysis of Inter-State Differences* (Bombay: Oxford University Press, 1991).

36. Part of the increase was likely due to the disproportionately greater growth of privately provided infrastructure in Travancore-Cochin. See T. R. Dilip, "Role of Private Hospitals in Kerala: An Exploration," Working Paper No. 400 (Thiruvananthapuram: Center for Development Studies, 2008).

37. Specifically, it is possible that the disparity in health services—such as programs for improving hygiene and vaccination—provided to the two regions reduced over time. However, lack of systematic data for such services for the two regions over time precludes the empirical analysis of such a possibility.

38. T. N. Krishnan, "Route to Social Development" (see note 1 above), p. 200; V. Raman Kutty, "Historical Analysis of the Development of Health Care Facilities in Kerala State, India," *Health Policy and Planning* Vol. 15, No. 1 (2000), pp. 103–109.

39. Tharakan, "History" (see note 1 above).

40. However, the expansion of health infrastructure could itself have been driven by these other factors such as the communist movement.

41. Apoorva Shah, "Putting the 'Kerala Model' to Rest: Lessons for a New Era of Development in India," The American Enterprise Institute Working Paper Series on Development Policy, Number 4 (Washington, DC: The American Enterprise Institute, 2010).

42. A recent popular piece on Kerala development by Arvind Panagariya ("Cracking the Kerala Myth," *The Times of India*, January 2, 2012) involves some specious reasoning because it ignores the diminishing returns argument: "Life expectancy during 1970–75 was 62 in Kerala, 50 in India and 54 in Maharashtra. By 2002–06, the three entities had added 12, 14 and 13 years, respectively, to these life expectancies. Among the large states, Tamil Nadu and UP made the most impressive gains: 17 years each. In a similar vein, whereas Kerala lowered its infant mortality rate by 46 deaths per 1,000 live births between 1971 and 2009, Gujarat achieved a reduction of 96, Tamil Nadu of 85 and Maharashtra of 74." R. Ramakumar ("Lies, Damned Lies, and Statistics: On Arvind Panagariya's Kerala Adventure," January 3, 2012, http://ramakumarr.blogspot.com/2012/01/lies-damned-lies-and-statistics-on.html) criticizes this argument effectively: "In 1971, Kerala's IMR was 61 per 1000 live births. To be on par with Gujarat in 2009, Kerala should have had an IMR of -35!"

43. Victor R. Fuchs, "More Variation in Use of Care, More Flat-of-the-Curve Medicine," *Health Affairs* Vol. 23 (2004), pp. 104–107; Shao-Hsun Keng and Yang Li, "Decomposition of Total Factor Productivity in World Health Production: A Stochastic Frontier Approach," *Applied Economics* Vol. 42, No. 23 (2010), pp. 3011–3021; James Thornton, "Does More Medical Care Improve Population Health? New Evidence for an Old Controversy," *Applied Economics* Vol. 43, No. 24 (2011), pp. 3325–3336. In the Indian context, see Vinish Kathuria and Deepa Sankar, "Inter-State Disparities in Health Outcomes in Rural India: An Analysis Using a Stochastic Production Frontier Approach," *Development Policy Review* Vol. 23, No. 2 (2005), pp. 145–163. For a critique of the health production function approach, see Jean Spinks and Bruce Hollingsworth, "Cross-Country Comparisons of Technical Efficiency of Health Production: A Demonstration of Pitfalls," *Applied Economics* Vol. 41, No. 4 (2009), pp. 417–427.

44. Sharmistha Self and Richard Grabowski, "How Effective is Public Health Expenditure in Improving Overall Health? A Cross-Country Analysis," *Applied Economics* Vol. 35, No. 7 (2003), pp. 835–845. At a broader level, these arguments are also consistent with general economy-wide arguments, such as Tyler Cowen's argument that America's "great stagnation" from the mid-1970s onward can be explained by the fact that "lowhanging fruit" (such as free land and immigrant labor) has largely been plucked (Tyler Cowen, *The Great Stagnation: How America Ate All the Low-Hanging Fruit of Modern History, Got Sick and Will (Eventually) Feel Better*, Penguin (ebook), 2011). For the case of India, separate studies by Sonia Bhalotra and Mansour Farahani et al. estimate the elasticity between state health expenditure and mortality to be –0.24 and –0.2, respectively; both estimates are consistent with a diminishing returns argument (Sonia Bhalotra, "Spending to Save? State Health Expenditure and Infant Mortality in India," *Health Economics* Vol. 16, No. 9 (2007), pp. 911–928; Mansour Farahani, S. V. Subramanian, and David Canning, "Effects of State-Level Public Spending on Health on the Mortality Probability in India," *Health Economics* Vol. 19, No. 11 (2010), pp. 1361–1376). The two studies focus on infant mortality and general mortality, respectively. However, neither study explicitly considers diminishing returns, although Bhalotra brings this up in the case of urban versus rural areas, where she identifies diminishing returns "because better-off groups can afford to protect themselves against infant mortality even when state health services are weak" (p. 926). By contrast, Anil Deolalikar estimates a statistically insignificant relationship between health expenditure and mortality rate (*Attaining the Millennium Development Goals in India: How Likely and What Will it Take to Reduce Infant Mortality, Child Malnutrition, Gender Disparities and Hunger-Poverty and to Increase School Enrollment and Completion?* (New Delhi: Oxford University Press, 2005)).

45. The Kerala figures are derived from the Sample Registration System (SRS) and the international figures are from the World Development Indicators (WDI).

46. Deaton, "Global Patterns" (see note 23 above).

47. In general, the literature reports a falling of the dispersion of mortality rates across India's regions—for instance, see Nandita Saikia, Domantas Jasilionis, Faujdar Ram, and Vladimir Shkolnikov, "Trends in Geographical Mortality Differentials in India," Working Paper WP 2009-013 (Rostock, Germany: Max Planck Institute for Demographic Research, 2010).

48. Banerjee and Duflo, *Poor Economics* (see note 24 above).

49. Two other sets of policies are of indirect relevance to the story of the Kerala policy regime. The first addressed land relations. Through a series of legislative procedures coupled with cadre involvement, tenancy was abolished and some land redistributed from the rural rich to the landless; see Herring, *Land to the Tiller*. The movement underlying these reforms is likely to have positively influenced health and education (Tharakan, "History" (see note 1 above)). A second set of policies addressed economic security. The Kerala government undertook several labor market interventions for labor welfare, for instance legislating work conditions and hiring practices, improving maternity benefits, and increasing wages more generally (Kannan, "Public

Intervention" (see note 1 above)). To address food security for the poor, a large and effective subsidized public distribution network was instituted, as were low-cost housing policies and pension funds (Chasin and Franke, *Kerala* (see note 1 above). Such measures, too, are likely to have positively influenced health and education.

50.  While the share of health in total expenditure was 5 percent in the 1920s, 1930s, and early 1940s (in Travancore), it averaged 10 percent in the years following adoption of the new policy regime in Kerala. Similarly, while the share of education in total expenditure was 15 percent in 1947 in Travancore and 21 percent in 1954 in Travancore-Cochin, it averaged 35 percent (and consistently stayed above 30 percent) from 1957 onwards. The health figures for Travancore are from Ramachandran, "On Kerala's Development Achievements" (see note 1 above), Table 29. The education figures for Travancore and Travancore-Cochin are from Jeffrey, *Politics* (see note 1 above), Table 9.1. The post-1956 figures are from various bulletins issued by the Reserve Bank of India (http://www.bulletin.rbi.org.in); see also Philip Keefer and Stuti Khemani, "Democracy, Public Expenditures, and the Poor: Understanding Political Incentives for Providing Public Services," *The World Bank Research Observer* Vol. 20, No. 1 (2005), pp. 804–821.

51.  The figures for the 1990s are from Dreze and Sen, *India* (see note 1 above), Table A.3. The figures for 2006 are from Benjamin Palafox, "Further Insights from China, Costa Rica, Kerala and Sri Lanka," in Dina Balabanova, Martin McKee and Anne Mills, eds., *'Good Health at Low Cost' 25 Years On: What Makes a Successful Health System?* (London: London School of Hygiene & Tropical Medicine, 2011), pp. 235–268.

52.  Heller, "Social Capital;" Joan Mencher, "The Lessons and Non-Lessons of Kerala: Agricultural Labourers and Poverty," *Economic and Political Weekly* Vol. 15, No. 41/43 (1980), pp. 1781–1802.

53.  Bhat and Rajan, "Demographic Transition" (see note 1 above).

54.  Further, general mortality rates are sensitive to the demographic transition (Deaton, "Global Patterns" (note 23 above)), and the literature indicates that Malabar and Travancore-Cochin were at different stages of the demographic transition during the 1970s and 1980s (Bhat and Rajan, "Demographic Transition" (see note 1 above); Zachariah et al., *Demographic Transition* (see note 28 above)). General mortality rate is a weighted average of age-specific mortality rates, where the weights are given by relative sizes of the different age-groups in the population. When two regions are at different stages in the demographic transition, the weights will be significantly different. For Kerala's regions, this makes the general mortality rate a questionable indicator of comparative health outcomes in this period. The demographic transition does not affect the infant mortality rate, making it a potentially better indicator.

## Appendix: Health Outcomes in the Kabir–Krishnan Study

Figure 1 plots the data used by Kabir–Krishnan for two health outcomes (general mortality and infant mortality) and shows a dramatic reduction in the mortality gap in the two regions over time. However, only a part of the mortality data presented by Kabir–Krishnan comes from the Sample Registration System (SRS), which is generally held to be the most reliable data source for the 1970s and 1980s. For the period prior to the 1970s, the mortality estimates are based on census data, and these estimates are sensitive to age misreporting and assumptions about infant and child mortality, and were not fully comprehensive in population coverage.[53] A second alternative data source is the Civil Registration System (CRS), the official mechanism of collecting data on all births and deaths sanctioned by the Registration of Births and Deaths Act of 1969. However, CRS mortality numbers are very different from the SRS mortality estimates, especially prior to the 1990s, and the gap varies over time, as shown in Figure 7. For these reasons, the only reliable data source for mortality data for the 1970s and 1980s is the SRS.

Unfortunately, SRS mortality data for Kerala are available only from the 1970s. Further, the SRS is geared towards state-level data, so it does not provide data for districts or regions (Malabar and Travancore-Cochin) on an annual basis. Thus, of the regional mortality data presented by Kabir–Krishnan and plotted in Figure 1, only three observations are reliable: those based on SRS for the years 1977, 1983, and 1987. For general mortality, the difference between the regions in 1977 was only 1.8 deaths per thousand population, and this gap became 0 over the ensuing ten years. While these are more credible numbers, and they show a reduction and elimination of the gap, the

FIGURE 7
DISCREPANCY BETWEEN DATA FROM CIVIL AND SAMPLE REGISTRATION SYSTEMS FOR KERALA
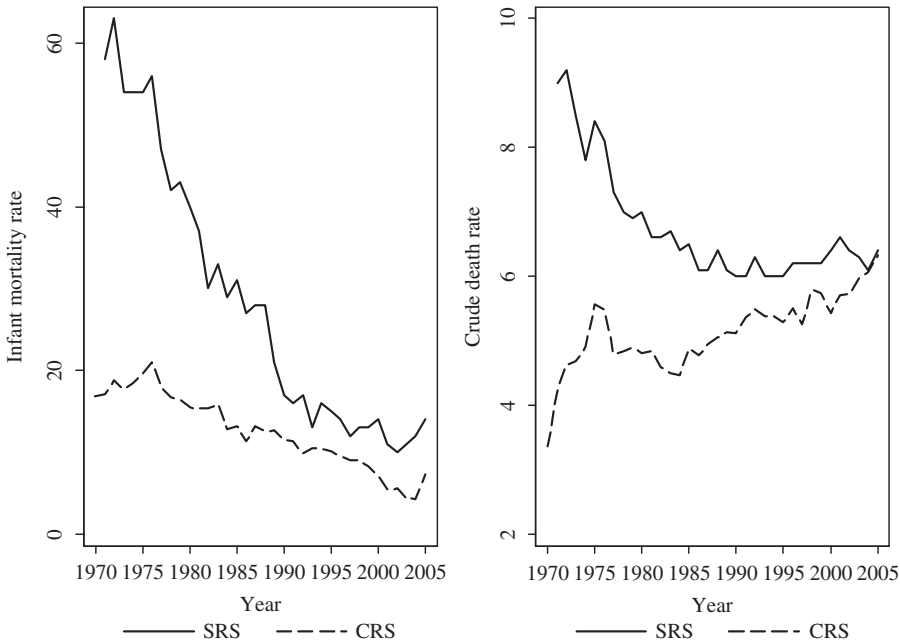


*Source:* Data for Kerala. Sample Registration System (SRS) data from the *Kerala Development Report*; Civil Registration System (SRS) data from *Administrative Reports of the Health Department*.

difference of 1.5 in 1977 was not much to begin with. This may be because much of the gap—assuming that one existed when the Kerala regime began in 1957—had been closed by 1977, but no reliable regional mortality estimates exist prior to 1977 to validate that speculation.[54] With regard to infant mortality, Kabir–Krishnan present data only for 1983 and 1987. These two data points do show a huge reduction in the gap; over the space of four years, Travancore-Cochin reduced infant mortality by five deaths per 1000 births, while Malabar reduced it by 18 deaths per 1000 births. In the case of Malabar, such a large reduction—from 46 to 28, amounting to as much as 40 percent—in the space of only four years suggests that even these data are likely to be faulty. In short, the mortality data provided by Kabir-Krishnan are inadequate in showing that a considerable regional health outcome gap existed in 1956, or that it reduced subsequently.