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Revisiting the adequacy of the economic policy narrative underpinning the Green Revolution

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Abstract
The Green Revolution still exerts an important influence on agricultural policy as a technology-centred development strategy. A main policy narrative underpinning the Green Revolution was first expounded in *Transforming Traditional Agriculture* (*TTA*), a book published in 1964 by Nobel Prize-winning economist Ted Schultz. He famously argued that traditional farmers were 'poor but efficient'. As farmers responded to economic incentives, technology-driven strategies would transform traditional agriculture into an engine of economic growth. Schultz relied on published ethnographic data and his own calculations to construct this policy narrative. My reanalysis of *TTA* focuses on its main case study, Panajachel, a village in Guatemala. I follow a narrative approach, evaluating whether Schultz's story relates a plausible account of agricultural development in Panajachel and its region. I show how Schultz deliberately tried to hide that Mayan farmers in Panajachel were not challenged in technological terms and were able to reach relatively high economic returns. His interpretation of the Guatemalan rural economy ignored ethnic tensions dominating market exchange, a main barrier for agricultural development. I evaluate Schultz's narrative further by tracing the subsequent evolution of Panajachel and its wider region. High-input strategies had to address ethnic barriers and change agents became embroiled in violent conflict along ethnic lines. Assessing the adequacy of Schultz's contribution, from a narrative approach, shows how he 'got the story wrong' and that the Green Revolution policy narrative has an excessively narrow intellectual basis. New narratives should reserve a much more important place for institutional change in agricultural development.

Keywords Agricultural development · Green Revolution · Development economics · Guatemala · Theodore Schultz

Abbreviations

ICTA	Instituto de Ciencia y Tecnología Agrícolas
TTA	*Transforming Traditional Agriculture* (Schultz 1964)

Introduction

The Green Revolution was a push towards technology-driven modernization of agriculture in the second half of the twentieth century. The Green Revolution is still relevant for current agricultural development initiatives, which are inspired by its theory and practice (Pingali 2012; Cabral et al. 2022). Globally, it was underpinned by an economic policy narrative initially developed by Theodore (Ted) William Schultz (1902–1998), who was a leading US economist and professor at the University of Chicago. He described this strategy in his book *Transforming Traditional Agriculture* (Schultz 1964). Henceforth, I will refer to the book as *TTA*.

Schultz's book had a broad and lasting global influence on development economics and policy. Its reputation was cemented shortly after it was published. Norman Borlaug played a key role in these events. Borlaug was a US plant breeder who was funded by the Rockefeller Foundation to work on the genetic improvement of wheat in Mexico, starting in the 1940s. He succeeded in developing new short-straw wheat varieties with a higher yield potential. In the second half of the 1960s, the government of India imported Borlaug's modern wheat varieties and distributed them to farmers to boost production and stem national dependency on US food aid. The Indian government acted upon the advice of David Hopper, an economist who had just left Schultz's faculty in Chicago and joined the Ford Foundation in Delhi (Kapur et al. 2011; Subramanian 2015). Schultz's book was central to these policy decisions; an Indian critic

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called *TTA* the 'Bible of the New Strategy' (Subramanian 2015, p. 151).

The result was dramatic. The introduction of the new varieties in India coincided with a surge in wheat productivity, which diminished food imports and was hailed as a resounding success for the new varieties. In 1970, Borlaug received the Nobel Peace Prize for his efforts. In the 1972–1973 season, the new wheat varieties were planted to half of all India's wheat-producing land (Perkins 1997). This experience with wheat (and rice soon thereafter) and *TTA*'s policy narrative established the model for public and philanthropic investments in international agricultural development in the following decades. This led to the creation of CGIAR, a network of agricultural research institutes in the Global South with a current annual budget of around $ 1 billion (2022). In 1979, Ted Schultz received the Nobel Prize in Economic Sciences. In its verdict, the awarding committee mentioned only one of Schultz's publications by name: *Transforming Traditional Agriculture*.

With *TTA*, Schultz contributed to the policy narrative that underpinned the Green Revolution. In Schultz's version of this narrative, entrepreneurial farmers and technological limitations played key roles. The Green Revolution policy narrative expanded in the 1970s and 1980s, especially thanks to Norman Borlaug who added population growth and food security to the mix (Sumberg et al. 2012). This policy narrative has continued to dominate until present and has diminished attention to the important social effects of the Green Revolution and stifled debate about competing approaches that emphasise the complexity and context-specificity of agricultural development (Sumberg et al. 2012; Harwood 2019).

A re-examination of *TTA* as a foundational text for the Green Revolution can help to provide insights into how this policy narrative was constructed. The book was written to support global policy decisions, yet presents its evidence in a highly concrete, empirical way. One way it provides narrative unity is by examining in detail a rural village in the western highlands of Guatemala: Panajachel. Revisiting this central case study will be my way to critically examine Schultz's pioneering contribution to development economics.

In doing so, I work within anthropology as an integrative discipline central to development studies, connected to history and geography as sister disciplines. This approach is reflected in my analysis in three ways. Firstly, an anthropological approach reserves an important place for ethnography. I critically examine Schultz's use of ethnographic data and assess his predictions using ethnographic descriptions of subsequent events. Secondly, I explore how anthropological thinking played a role in Schultz's economic analysis. Thirdly, I follow the interest in development anthropology for the construction of moral narratives (Gow 2002). I will not explore in detail how Schultz positioned himself in his own discipline, economics—for this, see especially Burnett (2021).

Following this introduction, I outline the methodological approach. Then, I place Schultz in his historical context and discuss the reception and continued importance of *TTA* in development economics. I briefly describe how Schultz built on anthropology when he wrote *TTA*, before embarking on a detailed ethnographic 'fact-checking' of Schultz's account, mainly using his own ethnographic sources. I synthesise an alternative economic interpretation of the Panajachel case study and examine how the story continued, analysing ethnographic studies from the wider area around Panajachel and tracing the anthropological understanding of agricultural development in Guatemala. I reflect on Schultz's role as a narrator in writing *TTA*. To conclude, I offer reflections on how my re-examination of *TTA* sheds light on the Green Revolution narrative and the role of values in shaping policy narrative and practice.

Approach to narrative

Critics of *TTA* have argued that Schultz got certain statistics wrong (Dandelar 1966), that his analysis missed important theoretical aspects (Lipton 1968) or that the case study of Panajachel was untypical for poor rural communities (Hill 1986). What unites these critiques is that they analyse *TTA* as if it were presenting a *theory*, criticizing its empirical foundation, completeness, or universality. In contrast with these critics, I believe that Schultz's book is best treated as the presentation of a *narrative*.

The first reason is the narrative nature of *TTA* itself: Schultz tells a story. Theory plays an ancillary role in *TTA* ; it is invoked to support the narrative rather than the other way around, as Burnett (2021) has argued. I will further elaborate on this below. A second reason for analysing *TTA* through a narrative lens is that policy narratives should be taken seriously in their own right. They are more than just seductive stories or illustrations of theoretical ideas. Narratives are necessary to help policymakers make sense of ambiguous or uncertain situations (Roe 1991). McCloskey (1990) has argued that narrative is at the core of economics and that economists should use narrative styles more often. Social anthropology has been long aware of its historical character as a discipline and started to dedicate much attention to narrative in the 1980s and 1990s (Peel 1995). Narratives can become a common ground for dialogue between economics, anthropology and other disciplines, and between researchers and policymakers.

In my analysis, I follow John Peel's (1995) approach to narrative in historical anthropology. Peel sees narrative as a necessary element of agency. Narrative is needed to make

sense of the past and to target future action. Narrative-*as-told* has a derivative status (and can be fictive), while narrative-*as-lived* is primary and inherent to all human action. Narrative empowers its narrators who can incorporate other agents into their narrative in ways that can either smother or bring out their voices. Thus, Peel (1995) is wary of anthropological analysis that elevates the narrative of some agents or suppresses the narrative of others by reducing it to non-narrative categories. Anthropologists should analyse stories and events to bring out the underlying narrative-as-lived.

Narrative-as-told has two characteristics that are important for my purposes. Firstly, narrative is a distinct way of explaining observations, following a strategy that is different from theoretical explanation. Narrative explains by connecting historical events, weaving them into a coherent, plausible story (Roth 1989). A good story does not necessarily rely on theory to explain what has occurred or is likely to occur. Also, imagination and reference to special circumstances can play a role in a rigorous explanatory account. Applying a narrative to a new situation does not mean that the narrative is translated into abstract theoretical principles first. Instead, narrative is usually transferred via analogy, which looks for similarities in the high-level relationships between story elements, thus allowing for substantial flexibility in reasoning, as it relates particular to particular (Holyoak 2005).

The limited role of theory in narrative and analogy makes these reasoning strategies somewhat elusive to theoretical critique. Since narrative is not expected to be theory, any critique of it tends to miss the target. Even so, policy narrative is not immune to critical assessment. Credibility and coherence are inherent to good narrative. This can be assessed by 'following the story' and paying attention to the story on its own terms. The analysis cannot start with abstract or general ideas but needs to be contextual and focus on the particularities of the story. For *TTA*, I do this by following Schultz's story 'back to the village', paying detailed attention to the agricultural reality of Panajachel.

A second important characteristic of narrative is that it implies a certain perspective or framing. Every story is told from a perspective. For policy narratives this means that certain political and social values shape how the story is told. Framing is unavoidable in storytelling and therefore needs to be done responsibly. Frames can have political value and storytellers cannot occupy a neutral perspective. Therefore, I will examine the values that underlie Schultz's framing of the story. For this, I draw on Kevin Elliot (2017) who argues that scientific values require researchers to connect frames to the underlying values transparently, which they can do through consultation, reflection and explicit acknowledgment of values in their writings. These activities help to maintain a healthy relationship between the narratives of (social) scientists, change agents, farmers and others.

As narrative-as-lived underpins narrative-as-told, in the next sections I briefly touch upon how Schultz's narrative is rooted in his own biographical context. After discussing the background of *TTA*, I examine if Schultz's narrative about Panajachel does justice to the ethnographic data on which his story is purportedly based. In narrative terms, the ethnographic reality of Panajachel is the start of Schultz's story. The middle and end of the story are imagined by Schultz. I evaluate the imagined parts of Schultz's story as counterfactual history, tracing the subsequent events in Panajachel and surrounding region and bringing out the perspectives of change agents and farmers in these events.

Schultz's story in *TTA*

Schultz's narrative strategy in *TTA* fit his purpose and audience (Burnett 2021). Working as a professor at the University of Chicago, Schultz wanted to reach an audience that did not consist of fellow economists, but of national and international civil servants and politicians, who needed to take decisions about agricultural development. Schultz had joined the University of Chicago from Iowa State College, where he had been under pressure from the dairy industry lobby because of economic research that had pointed to oleomargarine as a suitable replacement for butter to alleviate scarcity during the Second World War. In Chicago, Schultz intended to shape a practical style of economics without serving the narrow goals of farm interest groups, benefitting from freedom obtained through funding by the Rockefeller Foundation, among others. His aim was to provide relevant policy advice, increasingly in the international context in which the Rockefeller Foundation operated. This created the challenge of packaging information in formats that allowed it to travel beyond the confines of the academic community, to the officials taking agricultural development decisions. The form that Schultz found to achieve this is what historian Paul Burnett (2021) calls the 'statistical parable'. A parable is intended to transform people's view on reality to change their moral understanding and behaviour. The parables were statistical because Schultz used quantitative information to make the main point. Schultz challenged prevailing assumptions in development economics by wrapping numerical and moral values into easily communicable tidbits.

Schultz's statistical parables provided a response to alternative narratives. In his book, Schultz took issue with those economists who blamed the lack of agricultural economic growth on the backwardness of farmers themselves, and argued that they failed to behave in economically-rational ways and were instead driven by their desire to maintain their traditional culture. This idea was still prevalent among economists in the first half of the twentieth century (Handy 2009). Tied to this was the idea that agriculture was not a

promising sector for economic development as there was much hidden rural unemployment, that agriculture suffered from ever-decreasing prices in international trade, and that land reform and industrialization were prerequisites for economic growth (Burnett 2021). These ideas were associated with structuralist macro-economic theories of development, promoted by two economists originating from Latin America and the Caribbean: Raúl Prébisch and W. Arthur Lewis, the latter of whom shared the Nobel Prize with Ted Schultz in 1979.

Schultz saw a more active role for agriculture in economic development than these economists. To challenge the prevailing theories, he focused on the microeconomics of farming, arguing that traditional farmers were 'poor but efficient'—efficient in the sense that they were not economically irrational but optimised use of local resources.

> The fact that people are illiterate does not mean that they are therefore insensitive to the standards set by marginal costs and returns in allocating the factors they have at their disposal. […] The notion that these poor communities do not have enough competent entrepreneurs to do a satisfactory job in using the factors at hand is in all probability mistaken. (Schultz 1964, p. 49)

Schultz claimed that the issue lay with traditional farmers lacking the necessary modern technologies and knowledge to achieve higher levels of productivity. Left to their own devices, farmers only learned through trial-and-error, which made innovation too costly and too slow to stimulate growth (Schultz 1964, pp. 170–174). Schultz believed that farming productivity could be increased through agricultural science and education. He acknowledged the economic rationality of farmers, as well as their need for external knowledge to achieve economic growth. In his thinking, improved human capital and more productive techniques took precedence over the distribution of resources to drive agricultural development.

In *TTA*, Schultz was especially interested in advancing one particular statistical parable, that of the hybrid maize revolution in the US Midwest, following the discovery of the inbred-hybrid breeding process in the early twentieth century. Schultz was very familiar with the expansion of hybrid maize since the 1930s, which had been analysed by his PhD student Zvi Griliches (1957). In *TTA*, he mentioned Griliches's estimates of the rate of return to investments in the development of modern maize hybrid varieties, an astronomical 700% per year from 1955 onwards (Griliches 1958; Schultz 1964, p. 159). Therefore, plant breeding was attractive as a public investment in the US. Schultz imagined a story in which the US maize revolution, in one form or another, would reach and transform places such as Panajachel. To show how this story could be transferred outside the US context, Schultz briefly mentioned examples from reports of the Rockefeller Foundation that funded research efforts leading to increases in agricultural productivity in Mexico (Schultz 1964, pp. 147−148). But hybrid maize was the original template for the Green Revolution (cf. Byerlee 2020).

While Schultz's starting point was microeconomic, his proposal had macroeconomic dimensions, too. Entrepreneurial farmers are most efficient when markets provide them with accurate price signals. He discussed several measures to improve allocative efficiency in farming, such as a moderate land tax to force farmers to allocate land more efficiently (Schultz 1964, p. 127), market integration, capital market development and reducing price fluctuations through forward prices (Schultz 1964, p. 129). Yet in *TTA*, Schultz introduced these measures as alternatives to Soviet-style state command of agriculture and other heavy-handed agricultural policies, rather than as indispensable complements to public investment in technology and education. They were presented as a collection of options, not as a coherent policy package of interlocking measures, without which investments in technology and knowledge would not sort effect. While Schultz defended free market policies, he was less of an ideologue than his younger Chicago colleagues, including Milton Friedman (Burnett 2021). Schultz did not reject government intervention and especially promoted public investment in agricultural technology and education.

Schultz provides a key to his perspective on what policies drive agricultural development in an especially revealing passage of *TTA*. Here, he argued that the main force leading to market integration was investment. He imagines agriculture as a trading floor, where three different groups negotiate the price of agricultural factors: traditional agriculture, modern agriculture and a third group of different types of transitional agriculture.

> What matters are the economic forces that sooner or later will bring all three [groups of agriculture] together into a single well-integrated market, i.e. the market of the relevant reproducible agricultural factors. These forces can be harnessed efficiently only by means of investment. (Schultz 1964, p. 109).

Integration would make the generation of new income streams cheaper and convert traditional agriculture into an engine of economic growth, allowing it to converge with modern agriculture. The required investment consisted in public or philanthropic funding for research leading to more productive technologies and investment in human capital through agricultural education and extension, all aimed at increasing the technical efficiency of farming (Schultz, 1964, p. 206). Schultz expected that such investment would spur economic development and that institutional change

would follow this process with some lag, but not drive it (cf. Schultz 1968).

TTA's reception and continued influence

At the time of its first printing, *TTA* was hotly debated by economists (e.g. Balogh 1964; Dandelar 1966; Lipton 1968; Sen 1967). Thomas Balogh (1964) wrote an especially acerbic review and pointed out that Schultz did not engage systematically with researchers in the Global South who had much better insight into local economic dynamics. In his review, economist Mats Lundahl (1987) rates Michael Lipton's (1968) critique as the most devastating, as it addressed Schultz's position on the efficiency of traditional farming. Empirical tests of efficiency do not provide much support to Schultz, including re-analyses of the case studies provided by Schultz himself in *TTA*. The analyses in *TTA* simplify matters, ignoring issues such as risk aversion or incomplete knowledge. However, *TTA* does not promote an economic theory centred on efficiency but sets up a policy narrative. Burnett (2021) suggests that Schultz and his colleagues preferred simple analyses because these were more likely to be effective at influencing policy makers. Ball and Pounder (1996) argue that, for Schultz, farmers' efficiency was little more than an imperfect but useful indicator of the underlying economic dynamics; Schultz's main point was that farmers were *responsive* to changing prices and new opportunities. The critics were too narrowly focused on the theoretical concept of efficiency to see the larger story that Schultz wanted to convey.

For Ball and Pounder (1996), Schultz's core insight of farmer responsiveness is consistent with the subsequent literature in anthropology, geography and related disciplines, which demonstrated that poor farmers in the Global South have excellent economic foresight, perform skilled experiments and adopt new crops and technology based on a consideration of their profitability. In practice, this means that an external advisor cannot achieve much by recommending the reallocation of existing resources as farmers will likely have already converged on a near-optimal allocation. Technical advice is only useful if accompanied by better inputs or techniques. This is how the point about farmer responsiveness fits the broader policy narrative on the need for a technology-driven transformation of traditional agriculture.

Schultz's recognition of farmers' economic responsiveness influenced posterior economic theories (Ball and Pounder 1996, p. 747). Schultz's insights were incorporated into Hayami and Ruttan's (1971) influential theory of agricultural development. Their theory followed Schultz in seeking microeconomic explanations for agricultural development and investments in agricultural research. This influence is still detectable at present, half a century later. In a recent major review of the economics of agricultural research and innovation, Alston and Pardey (2021) invoke Schultz as the founder of their academic lineage in development economics. Working within this Schultzian tradition, they express concern that agricultural research organizations, especially CGIAR, are deviating from the goal of raising productivity through technology development. This shows Schultz's persisting influence on leading economists who are associated with the technology-centric Green Revolution policy narrative.

Ball and Pounder (1996) indicate as a limitation in *TTA* that norms and social organisation in rural villages were outside Schultz's purview. In the 1980s and 1990s, the attention of neoclassical economists started to address constraints that prevented farmers from achieving efficient behaviour, such as land market failures or risk aversion (Duflo 2006). More recently, empirical studies started to show the limitations of economic models to explain observations. The detailed experimental work of Esther Duflo (2006) and others found that local norms and organizational arrangements that are usually studied by anthropologists offer important explanations for observed behaviour. It seems that development economics is now ready to rethink its relationship with anthropology. This interdisciplinary relationship was central to the genesis of *TTA*.

Anthropological influence on *TTA*

Ted Schultz was strongly influenced by Sol Tax, a colleague at the University of Chicago and a leading figure in US anthropology. Tax (1953) had authored a book about Panajachel, *Penny Capitalism*, which was based on detailed field data, mostly collected in 1936 by Juan de Dios Rosales, a local schoolteacher, who later became an anthropologist himself. This ethnographic study was unique in providing high-quality, comprehensive economic data for a single village. Schultz eagerly used Tax's data and hinged his global policy narrative on this village's microcosm. In Panajachel, Maya Kaqchikel farmers grew onions and other crops in the delta of a small river and the surrounding hills. In *Penny Capitalism*, Tax had argued that the economic behaviour of the indigenous farmers was not bound by traditional beliefs—even though they were poor, they were rational from an economic perspective, hence 'penny capitalists'.

Sol Tax had an imprint on *TTA* in several ways. First, Tax influenced Schultz's core argument of the book—that cultural conservatism is not holding back traditional farmers. Although Tax is not explicitly referenced in the passage in which Schultz elaborates his idea that 'cultural traits' do not explain traditional agriculture, Chicago anthropology is evidently in the background.

> Economists generally appear to believe that farm people as a matter of course belong to a folk society. But there are many farm people who are members of an impersonal community often called an "urban" society. […] Nevertheless, a folk society and traditional agriculture are not necessarily compatibles, and by no means is all traditional agriculture to be found in folk societies. (Schultz 1964, pp. 25–26).

Although Schultz omits a bibliographic reference, he refers here to the so-called 'folk-urban continuum', an idea coined by Robert Redfield, a leading Chicago anthropologist who had recruited Tax for his fieldwork in Guatemala. Based on his own work in Yucatán, Redfield saw cultural change as a process of sliding along a continuum between a small village 'folk' society and an impersonal 'urban' society (Wilcox 2006). Tax (1941) had discovered in Panajachel that Redfield's folk-urban continuum did not apply: the village combined the two extremes without being an intermediate. In Panajachel, social relations between the Mayan inhabitants were fully 'civilised' as would be expected in an urban society, but their worldview was fully 'primitive' or 'animistic' as would be expected in a folk society. Tax's solution was to expand Redfield's model and separate the acculturation of social relations and worldview as two separate axes of change. Tax's separation meant that Schultz could concentrate on the economic aspects without worrying about worldviews. Schultz created his own bipolar scale of social change, from traditional agriculture to modern agriculture, a device not so far removed from Redfield's and Tax's conceptual tools.

In two chapters of *TTA*, Schultz made direct use of the ethnographic material in *Penny Capitalism*. Panajachel served as a statistical parable (cf. Burnett 2021, see above), but it received more attention than any of the other parables, because the village served Schultz to tie his book together rhetorically. Schultz used Panajachel to instantiate the concept of traditional agriculture (metonymy), giving the reader the feeling that traditional agriculture did not refer to an abstract construct, but to an observable reality. The village comes back in most of the chapters as a literary motif. Given its central role, Panajachel is an ideal focus to evaluate *TTA* as a policy narrative.

Technology in Panajachel

> The community is not an isolated subsistence economy, but is closely integrated into a larger market economy. Yet hoes, axes, and machetes are not replaced by better tools and equipment. There is not even a wheel. Coffee leaves used as fertilizer are not replaced by chemical fertilizers. Traditional varieties of corn are not replaced by hybrid seed. Traditional breeds of chicken are not replaced by better hens for producing eggs and broilers for producing meat. The traders and firms in the towns that serve this community are not offering for sale any of the superior factors. If one wanted to plan a community like Panajachel that would go on for decades without any change in the state of arts on which it was dependent, it would strike one as impossible within the market economy of Guatemala. Yet Panajachel has been doing the "impossible" in this respect for generations. That is the puzzle. (Schultz 1964, p. 35)

This is how Schultz introduced Panajachel—as a 'puzzle'—a technologically-stagnant rural village fully embedded in a market economy. In this passage, Schultz already provided a clue to solving this puzzle: mentioning 'hybrid seed' as a technology that was lacking in Panajachel in the 1930s. This was an anachronism, as in the US, where hybrid breeding was invented, the use of hybrid varieties only took off in 1936, the very year that Sol Tax collected most of his data in Panajachel. That Schultz mentions hybrid maize confirms that his thinking (and that of his audience) was shaped by the recent role of modern breeding in US agriculture. This thinking was behind the story Schultz wanted to narrate about Panajachel. To his mind, Panajachel's problem was the lack of a known solution: better technology. But was the state of agricultural technology in Panajachel really a sign of lacking innovation?

The use of crop seeds in Panajachel is a good example that tests Schultz's interpretation. Tax's field studies had documented several experiments with different seeds. In one case, yellow maize seed was brought over from Puerto Barrios, a harbour on the Atlantic Coast of Guatemala, 400 km from Panajachel (Tax 1953, p. 50). In a study that Tax cited, geographer Felix McBryde (1947) observed that in the 1930s almost all the vegetable seeds planted in Panajachel were being imported from California. Before the World War I, much of Panajachel's vegetable seed originated from Germany. Even though onion seed was produced locally, much of it was imported from Oaxaca, Mexico. In other words, Tax's studies paint a picture of a dynamic, internationally-connected crop seed management in Panajachel in the 1930s, contrasting with the technologically-stagnant situation presented by Schultz.

Fertiliser use was another supposedly stagnant area of innovation. Schultz referred specifically to fertiliser use in onion, Panajachel's main cash crop. Farmers used a "crude fertilizer" and could benefit from "modern chemical fertilizer mixed to meet the soil requirements of the valley", which could be expected to raise productivity (Schultz 1964, p. 90).

Sol Tax had recorded that the Panajachel horticulturalists used a fertiliser consisting mainly of litter obtained from coffee fields shaded with *Grevillea* trees. To facilitate clearing of fallen coffee berries, the fields were swept clean. The resulting mix of leaves was used as fertiliser. Farmers applied 6.7 t/ha of this fertiliser on their raised bed for onion production, mainly as mulch after seeding. *Grevillea* litter provided around 100 kg/ha of nitrogen (Anthofer et al. 1997). This is an adequate level of fertilization for onion, even by today's standards. In a neighbouring town, Sololá, farmers used a copious amount—25 to 30 t/ha—of cow or horse manure (McBryde 1947), which provided roughly the same amount of nitrogen to the crop. Panajachel's litter-based fertiliser was not inadequate. Tree litter is an important organic fertiliser in tropical agriculture; the interaction between crops and trees plays a more important role than in temperate agriculture (Young 1997). Litter from nearby coffee fields was in abundant supply. Unlike industrial fertilisers, this organic fertiliser helped to improve soils by raising soil organic matter content. Its use as mulch protected the soil against erosion and suppressed weeds.

At the same time, farmers were not unaware about industrial fertiliser. Tax recorded one farmer experiment with it (Tax 1953, p. 130). Even though it was not on sale in the village, it was available in the capital city and elsewhere. The level of technological knowledge about industrial fertilisers was not limiting their use, as Schultz erroneously implied.

The lack of sophisticated tools is another point in Schultz's mischaracterization of Panajachel's economy. Schultz stated that "specialized tools that go with carpentry and masonry" were absent (Schultz 1964, p. 90). However, Tax recorded many hammers, saws and trowels, and explicitly noted that he had missed other, more specialised tools in his inventory, including those used by carpenters (Tax 1953, p. 175). Schultz indicated the absence of the wheel as another sign of technological stagnation. In reality, Mayan farmers made use of trucks and buses, even though they did not own them (Tax 1953, p. 28). Vehicles were owned by Ladinos—non-indigenous Guatemalans who tend to follow 'western' cultural patterns and generally speak Spanish, rather than a Mayan language.

It is therefore reasonable to conclude that Schultz misrepresented the technological level of farming in Panajachel. There was far more technical sophistication and innovation than his description concedes. Even so, Schultz did recognise that farmers were responsive to new economic opportunities. He cited Tax's observation that farmers were always "on the lookout for new and better seeds, fertilizer, ways of planting". Yet, "improvements come along infrequently and their effects upon production are exceedingly small". To Schultz, this implied stagnation. "The economy has been geared to a stable, virtually stationary, routine pattern" (Schultz 1964, p. 43).

Other types of evidence are needed to show that Panajachel experienced a truly stagnant technological situation in the 1930s. There is no data to quantify technological change or yield levels in the decades just before Tax conducted his fieldwork. But there is evidence that points to a highly-dynamic situation. Tax and others recorded a major economic change that undoubtedly affected agricultural productivity. Before 1920, Mayan male adults in highland Guatemala were forced to provide labour to the coffee plantations. Those who resisted were captured and taken by force to the plantations (Tax 1953, p. 106). After 1920, labour coercion was gradually relaxed in Guatemala, allowing Mayan farmers in Panajachel more time to work their own fields. This change likely led to intensification and technological change in the 1920s, just before Tax started studying the village. Tax's informants talked about "new land" that had recently been taken into use for intensive vegetable cropping. This intensive form of land use was still expanding in 1936 (Tax, 1953, p. 40).

The question is whether in the 1930s Panajachel was already approaching the low-growth equilibrium that Schultz saw as the main characteristic of traditional agriculture. Schultz expected that a full generation or more would be needed to reach such an equilibrium (Schultz 1964, p. 31). If Panajachel were an example of traditional agriculture, this would have happened in the 16-year period between the relaxation of labour coercion in 1920 and Tax's fieldwork in 1936. In the next section, I examine whether this had indeed occurred, by taking a closer look at the economic data.

Economic returns in Panajachel

Schultz defined traditional agriculture as characterised by stagnation: an equilibrium emerging when both technology and the local preferences underlying demand remained stable over time. In this equilibrium, net savings would approach zero. According to Schultz, in traditional agriculture, low profitability was not the result of a lack of productive capital. He argued that some traditional farmers held a relatively high amount of capital in productive assets, such as land or irrigation infrastructure. The issue was that farmers would have needed to make a large investment in expensive assets to generate additional agricultural income streams. Having reached an equilibrium between supply and demand, given the technology and preferences underlying demand, the benefit–cost ratio allowed little extra profit to be gained from such investments. Saving money to invest more in production held no appeal to traditional farmers. This explained the static nature of traditional agriculture. Schultz stated what type of costs he would expect for acquiring a new income stream. Under traditional agriculture, a 1-dollar income stream could be expected to have a cost of 25 dollars, while

under a growth scenario the cost of a 1-dollar income stream would be 10 dollars (Schultz 1964, p. 82). In other words, traditional agriculture had an income to capital ratio of 1 to 25, or a 4% return rate. Modern agriculture had a ratio of 1 to 10, or a 10% return rate.

With these expectations in mind, Schultz tried to show that in Panajachel the return on capital was low. Using the quantitative data from *Penny Capitalism*, he provided several calculations. Each of his calculations can be easily traced. Schultz's indicators for the return to land were (1) the cost of renting land for one year relative to the price of land itself and (2) the profit derived from crop production relative to the price of land. For these indicators, he expected traditional agriculture to show a low return to land of 4%. He discussed different types of land uses. Table 1 shows different indicators for return to land in Panajachel. The values indicated in bold were discussed by Schultz in *TTA*.

Schultz relegated the average cash rent for delta land to a footnote, arguing that it was difficult to establish the contribution of maize—for which the rent was considerably lower—and to allocate crops across complex rotation cycles (Table 1, indicator 2a). In reality, this value, 18.6%, was much higher than he had expected, and difficult to deny. Other indicators provide independent support for the

Table 1 Return rates for agricultural land in Panajachel. In bold, values cited by Schultz in *TTA*

Indicator	Return value		Comments
	$/acre	%	
Schultz's expectations			
1a. Return traditional agriculture		**4.0**	Schultz (1964, p. 82)
1b. Return modern agriculture		**10.0**	Schultz (1964, p. 82)
Delta area (value of land: 150 dollars per acre)—Mayan farmers only			
2a. Area-weighted average of seasonal cash rental prices (Schultz)	27.90	**18.6**	Schultz (1964, p. 92, fn. 6) based on Tax (1953, Table 14). Schultz incorrectly claims this is an overestimation due to low-profit maize
2b. Area-weighted average of seasonal cash + non-cash rental prices (own calculation)	32.29	21.5	Based on Tax (1953, Table 14)
3a. Profit of one cycle of onion (Tax)	25.91	17.3	Tax (1953, p. 111). This estimation overpriced labour (Schweigert 1994)
3b. Profit of one cycle of onion (own calculation)	42.15	28.1	Corrected following Schweigert (1994, Table 7)
4a. Maximum profit of multiple cycles of onion (Tax)	40.00	26.7	Tax (1953, p. 112). This estimation overpriced labour (Schweigert 1994)
4b. Maximum profit of multiple cycles of onion (own calculation)	65.00	43.3	Assuming Tax's proportional increase from one cycle to maximum profit (4b = 3b*4a/3a)
5. Average profit of horticulture in the delta (own calculation)	35.77	23.8	Based on Schweigert (1994, Table 7) and crop proportions of Tax (1953, Table 8, 'Resident Indians'). Assuming one cycle of onion, omitting beans and minor vegetables, discounting idle land
Delta—coffee area (value of land: 175 dollars per acre)			
6a. Coffee farming—Mayan farmers (Schultz)	15.43	**8.8**	Schultz (1964, p. 92). This estimation overpriced labour (Schweigert 1994)
6b. Coffee farming—Mayan farmers (own calculation)	18.50	10.6	Corrected following Schweigert (1994, Table 7), taking into account that forward sales reduced price by 25%
Hill area (value of land: 8 dollars per acre)—Mayan farmers only			
7a. Area-weighted estimate of seasonal rental value (Schultz)	1.26	**9.8**	Schultz (1964, p. 92) miscalculates the average rental price, excluding high values (Tax 1953, Table 14), and assuming an excessively long fallow period
7b. Area-weighted estimate of seasonal rental value (own calculation)	1.41	11–18	Taking the correct rental price and lower/upper bounds for the length of the fallow period
Overall return ('Gross National Product')—Mayan farmers only			
8a. Overall return (Schultz)		**8.7**	Schultz (1964: 93) derived this from Tax. This estimation overpriced labour (Schweigert 1994)
8b. Overall return (own calculation)		19.1	Adjusting labour costs (Tax 1953, Table 37) to correct for overpricing of wages (Schweigert 1994). Reduction determined from labour contributions (Tax 1953, Table 19) and maximum wages of men, women and children (Tax 1953, p. 101)

profitability of horticulture in the delta area (Table 1, indicators 2b to 5). Rotations were complex, as Schultz claimed, but it is possible to arrive at a conservative estimate of 23.8% for the average rent (Table 1, indicator 5), which was even higher than Schultz's expectation for modern agriculture (Table 1, indicator 1b).

While Schultz buried delta horticulture in a footnote, he did focus on the return for coffee farming (Table 1, indicator 6a). Return for coffee was considerably lower. However, coffee was not the main crop for Mayan farmers in Panajachel; it provided only 4% of their revenue, while onion provided 58% (Tax 1953, Table 38). By focusing on coffee separately, but not treating horticulture in the same way, Schultz created a distorted perspective of profitability in the delta area.

Schultz also focused on the hill land, where maize was grown, intercropped with other crops (milpa). Schultz calculated a return rate for maize on the hill lands of 9.8% per year (Table 1, indicator 7a). But, on closer inspection, Schultz made two mistakes, which I can only explain as intentional miscalculations. In reality, the return was substantially higher, probably near the higher range of the estimate, around 18% (Table 1, indicator 7b).

The last way to probe into Panajachel's agriculture was to calculate the overall return to land for all crops taken together, the agricultural 'Gross National Product' of the local community. Schultz estimated an 8.7% return to land rate (Table 1, indicator 8a). I correct the labour cost as it is based on an erroneous calculation by Tax, who multiplied all labour with the daily male wage, without considering the lower wages paid to women and children (Table 1, indicators 3b, 4b, and 8b). For the overall GNP, this makes a large difference, as wages were the main production cost. The corrected return to land is 19.1% (Table 1, indicator 8b). This value is slightly under the corrected return values for delta horticulture (Table 1, indicators 2b and 5), as it also reflects the contributions from less-profitable maize and coffee (Table 1, indicators 6b and 7b).

The rates of return to land that Schultz derived from the data ranged between 8.7 and 18.6%. These were underestimated values but still higher than Schultz's expectations. Schultz argued that these were gross return rates and that the net return to land should be lower, as the rates did not account for maintenance, depreciation or management costs. He estimated that the net rate of return to land should be reduced further by 5% or so, to 4% or less (Schultz 1964, p. 93). He did not quantify how the different unaccounted costs added up to a 5% reduction, but he did enumerate some of these costs. They do not justify such a strong reduction in the return rate. Depreciation of coffee bushes and fruit trees was already included in the cost of periodic renewal of plantations and orchards. Road and irrigation system maintenance or 'business errands', are only a minor part of the total labour expenditure (around 200 dollars per year or less than 1% of total costs). Depreciation due to soil erosion mainly affected the hill lands rather than the delta, where most of the income was generated. The data suggest that the unaccounted costs may have decreased the return rate by 1%, but not much more.

We can only assume that Schultz needed to inflate the unaccounted costs to obtain the low return rate he needed to support his claims. Schultz (1964, p. 94) claimed that the cost of a 1-dollar income stream in Panajachel was expensive: 25 dollars. My own calculations give a cost between 5 and 6 dollars (reflecting an overall return around 18%). This was even lower than the cost Schultz proposed for a typical growth scenario, 10 dollars for a 1-dollar income stream (Schultz 1964, p. 82). If Schultz's own logic stands, then Panajachel farmers were actually involved in high-performing modern agriculture!

A few of Schultz's miscalculations may be unintended mistakes, especially where he accepted the erroneously high labour costs provided by Tax. However, it cannot be coincidental that Schultz buried an inconvenient but crucial number in a footnote and that all his errors led to bias in the same direction: lowering the return to land. Importantly, Schultz was aware of the high land rental prices in the delta and did no attempt to use other data to corroborate it, even though this was possible (Table 1, indicators 2b to 5). It is therefore evident that Schultz misrepresented the agricultural reality of Panajachel. The village presented an economic situation that was substantially different from what Schultz wanted to make his readers believe.

Re-examining Panajachel

The most striking aspect of this account, however, is that Schultz exclusively focused on the Maya Kaqchikel inhabitants of Panajachel and did not analyse the entire village economy, which was dominated by Ladinos. Schultz's analysis and the values in Table 1 refer only to the Mayan share of the economy of Panajachel. Schultz would have written an entirely different account if he had been committed to conducting an in-depth economic analysis of Panajachel as a whole. This is clear from a detailed reanalysis of *Penny Capitalism* by economist Thomas Schweigert (1994). In the following, I synthesise Schweigert's interpretation.

Panajachel had been affected by rapid economic change resulting in changes in land-use patterns and labour distribution. These were the effects of the 1872 Liberal reform that abolished communal land ownership in Guatemala and installed a free-land market, and the relaxation of labour coercion laws which, over time, freed male adults from forced recruitment to work on their own land. In Panajachel, profitable labour opportunities were available and it became possible to avoid migration. In 1936, Mayan families could

derive an income from land that was substantially higher than what they would obtain from paid labour. Nonetheless, the largest part of the local economy was now dominated by Ladinos who were "rich but inefficient", keeping their land largely under coffee. Ladinos grew 78% of the coffee in Panajachel (Tax 1953, Chart 7), obtaining a profit of 24.66 dollars per acre, a 14.1% return to land. This was much lower than that of Mayan farmers in Panajachel, who grew more profitable crops and very little coffee (see Table 1), for which profits were even lower than average land rent prices.

Schweigert explained this low-profit land-use pattern by pointing to the role of hired labour. Monitoring hired workers was difficult for Ladinos, who were often absentee landowners or did not themselves work their own land. Vegetable growing required close supervision of the correct execution of tasks that affect yield and product quality. In contrast, labour in coffee harvesting could be indirectly monitored by paying workers by the quantity of work performed (piece-rate wage). Coffee was therefore a suitable crop for Ladinos.

The other part of Schweigert's explanation of the economic pattern in Panajachel was that a credit market was virtually absent. Interest and discount rates were prohibitively high. In a competitive market, credit would have been made available to those who could make the most profitable use of the available resources. This would have implied that Mayan farmers could have rented land from Ladino landowners and gradually bought it all back to put to more profitable use. The opposite occurred. Ladinos had some access to capital, but Mayans hardly any—why this is the case is not clear from *Penny Capitalism*. Ladinos could buy land from Mayans who had less access to credit but not vice versa. Schultz was obviously mistaken in arguing that allocation of capital was efficient in Panajachel if the whole village's economic structure is analysed (Schultz 1964, p. 48).

Schweigert's (1994) analysis underlines that a perceptive economic analysis—of which Schultz would have been capable—was possible based on Tax's high-quality data, even if Tax himself did not conduct this analysis. Schweigert uses economic theory not only to interpret the quantitative data, but also to broaden the attentiveness to the qualitative, narrative elements in Tax's account, which say something about the social order in the local economy. He shows that an economic analysis that is sensitive to institutional dimensions can provide incisive insights into the social dynamics in Panajachel. In his reanalysis, Schweigert (1994) stays within the neoclassical paradigm, but uses more recent economic theory, which originated in the 1950s, and could therefore have been known to Schultz. Schweigert shows that Schultz's analysis of Panajachel was wholly inadequate. Panajachel was certainly not characterised by farmers suffering from low profitability, limited by rudimentary technology. Instead, farmers made profitable use of land and, although they had been recently relieved from discriminatory labour coercion, they still suffered from a lack of access to credit with reasonable interest rates to buy more land or inputs.

Agricultural development in highland Guatemala, 1960–1980

In the period during which Schultz wrote and published *TTA* (1959−1964), the Guatemalan highlands started undergoing various development initiatives. The expected result would be a Schultzian narrative of new technologies leading to agricultural development. Evaluating how this narrative played out is important, as it could still be argued that, despite Schultz's misdiagnosis of the lack of technology as a main barrier to development, his recipe might still have worked in practice, overcoming the limitations to agricultural development through investment.

In 1945, a democratically-elected government abrogated the previous legislation on forced labour but did not fully abolish or prohibit labour coercion. A subsequent government attempted a land reform but was interrupted by a CIA-supported coup d'état in 1954, which placed power in the hands of a military government. Even though the new government froze the land reform, it had a clear awareness of the social problems in the countryside. With support from the USA, the government established a rural extension service, which reached Panajachel in 1959 (Hinshaw 1975). It supported the distribution of industrial fertilisers and the use of improved agronomic practices and crop varieties. Panajachel was among the first communities in the western highlands of Guatemala to adopt the fertilisers.

Nonetheless, the introduction of new agricultural technologies failed to break the overall pattern of inequality and land use in Panajachel. Robert Hinshaw's (1975) in-depth study of Panajachel between 1963 and 1965 found that, despite the new technologies, the unequal distribution of land between Ladinos and Mayans continued, as well as the prominence of coffee cultivation. Hinshaw's study provides a comparative before–after account of social change but it does not explore the narrative underlying this change from the point of view of Panajachel's farmers. Also, this study was done very shortly after the use of fertilisers and new varieties took off.

Therefore, to obtain a narrative perspective of change over a longer period, it is useful to take a broader look at events in the wider area around Panajachel, where the history of fertiliser promotion in the 1960s reveals much about the workings of the rural economy in western Guatemala (cf. Carey 2009). An important and insightful event was the creation of a new cooperative in the Quiché department, a K'iche'-speaking area around 50 km north of Panajachel. For this area, Falla's (1978) detailed

ethnographic study and Santos's (2007) biography provide the basis for my narrative account.

In the Quiché department, farmers were not able to derive enough income from their farms, forcing them to work on the lowland plantations to supplement their incomes. Thus, despite the more relaxed labour legislation, labour migration continued as before, driven by economic necessity. Recruiters provided cash-strapped farmers with advance payments that they had to pay off with work on the plantations (debt bondage).

In 1961, Fr. Luis Gurriarán, a Sacred Heart missionary from Spain, arrived in this area (Santos 2007). Addressing poverty soon became the focus of his missionary activities. After training in cooperativism at the Coady International Institute in Canada (Fitzpatrick-Behrens and LeGrand 2017), in 1963–1964 he helped Mayan farmers establish a credit and savings cooperative in Santa Cruz del Quiché, which made fertilisers available at 30% below the existing price. Fertiliser use quickly expanded, helping to increase productivity levels and reduce the need for labour migration.

Guatemalan anthropologist Ricardo Falla (1978) has described how one Mayan community in this area, San Antonio Ilotenango, lived these events as a drama of development that affected their material conditions and their religion and ethnical identity. Until 1945, the local social order had revolved around land inheritance, traditional community institutions, and the spiritual authority of *ajq'ij*, Mayan shaman-priests. Local communal institutions had been weakened by the national government, which had privatised land ownership in the nineteenth century. Land scarcity made tensions in the community run high, which led to witchcraft accusations. Community members started to question the effectiveness of the *ajq'ij* to provide spiritual protection and hold the community together. Trade had grown as an occupation after the relaxation of labour coercion. This provided an alternative route of access to economic power, besides land, the resource around which the community had been organised so far. Community members started to reject traditional Maya religion, embracing the orthodoxy of *Acción Católica*, a lay movement promoted by the Catholic Church. The cooperative promoted by Fr. Gurriarán further reinforced this religious movement, giving it an economic dimension and accelerating its growth.

The young cooperative was soon threatened by local Ladino merchants who sold fertilisers at much higher prices. Meanwhile, for the first time, labour recruiters for the plantations found themselves dealing with organised groups of Mayan workers who had an alternative source of credit and had started demanding higher wages. An alarmed regional Ladino elite appealed to the militarised government. In 1965, the government managed to remove Fr. Gurriarán from the country amidst protests (Santos 2007).

These events foreshadowed the wider conflict that unfolded in the 1970s. The creation of cooperatives in the 1960s had contributed to the political awareness of rural Mayans (Grandin 1997). Tensions built up in the following years, amplified by the international context of the Cold War and the presence of leftist guerrilla groups in the highlands.

During the 1970s, government thinking favoured economic development as the best strategy against insurgence. It garnered support from the Rockefeller Foundation and USAID to create the Institute of Agricultural Science and Technology (Spanish acronym: ICTA) in 1975. This was an autonomous government organization modelled after Norman Borlaug's breeding programme in Mexico, with a pioneering farmer-centric approach to technology development (Ruano and Fumagalli 1988). The Guatemalan government also embarked on a Schultzian strategy to provide farmers with access to new technologies (Copeland 2012). This development programme aimed to ensure that the new cooperatives were non-confrontational and subservient to the government. Even so, their efforts were resisted by Ladino merchants and large landowners, leading the government to reverse its strategy. In 1978, the army began assassinating hundreds of the cooperative leaders, many of them recent beneficiaries of government support (Schirmer 1999). The conflict escalated in subsequent years and the Quiché department became one of the most heavily affected by the civil war, which cost around 200,000 lives.

That the Ladino merchants led the resistance to the cooperatives in the 1960s and 1970s provides us with an important clue to a broader pattern. Many social researchers have focused on land ownership to explain patterns of social inequality, following the Marxian explanation of inequality from the forces and relations of production. Anthropologist Carol A. Smith (1975) has drawn attention to Ladinos' control over economic exchange as an explanation for inequality. Ladinos administered trade, controlled the governance of most marketplaces, owned shops, storage facilities and means of transportation, and held power over roads and taxes. For the Kaqchikel town of Comalapa, historian Edgar Esquit (2010, p. 259) has documented that in the first half of the twentieth century Ladino commercial elites used violent means to prevent Mayans from establishing shops in its urban centre. Other studies have shown that Mayans perceived marketplaces as the focus of ethnic tensions (Carey 2008; McAlister 2008).

These more recent studies and developments prompt a fresh look at Panajachel. Even though ethnic tensions around economic exchange did not play a major role in Tax's own analysis, they were certainly important enough to leave some trace in his remarkably comprehensive ethnographic descriptions. Indeed, Tax had described how Ladinos controlled the main institutions of economic exchange, owning the shops, trucks and buses. He noted that competition

between Ladino and Mayan sellers was sometimes "apparently bitter", providing an example of a conflict along ethnic lines in which the Ladino party had the upper hand (Tax 1953, p. 133, fn. 114). Mayan farmers in Panajachel had some control over direct retail of vegetables, but had limited control over bulk transport and sales, as they did not own any trucks and lacked cheap sources of credit to purchase them. While Panajachel did not experience the same levels of violent conflict as other areas of the Guatemalan highlands, comparable ethnic tensions did occur and were important in shaping agricultural development.

Evaluating Schultz's narrative

What does all of this say about the adequacy of Schultz's narrative? I have approached this question from three perspectives: contrasting Schultz's account with the underlying ethnographic data, exploring an alternative economic narrative that explains the situation in Panajachel, and tracing if Schultz's predictions held up against subsequent events in Panajachel and its surrounding area. To evaluate the narrative adequacy of Schultz's account, I synthesise my findings and reflect on narrative analogy and framing.

The fact-checking against Tax's data shows that farmers were entrepreneurs, as Schultz expected, but that they were not held back by low levels of technological sophistication. They were expanding their business, recently relieved from discriminative, coercive labour legislation, which had previously led to enormous livelihood losses. Limited access to technology and credit were part of a wider problem of ethnic exclusion from economic exchange. To press his narrative onto the local situation, Schultz manipulated the data in unacceptable ways and ignored insights that contradicted his story. Mayan farmers were not limited by lack of technology or knowledge, but by a lack of access to cheap credit and land. Subsequent events show that credit indeed made a drastic difference, when it was made available, but that it also revealed the ethnic tensions that had held this situation in place.

Schultz expected that investment in technologies would lead to both increased productivity and diminished disequilibrium between different types of agriculture, and that it would drive institutional change. When credit was made available in Panajachel and its surrounding area, it was not because institutions automatically fell into place after investment, but because change agents realised that current institutions were discriminatory and impeded development. Institutional change encountered active resistance from the rural Ladino elite, which limited economic benefits to Mayan farmers and the whole rural economy. Schultz could not have foreseen that the story would end in an armed conflict, but his own imagined ending ignored the ethnic tensions that were also evident in Panajachel in 1936. Given the information available to Schultz in the late 1950s, it is difficult to justify that he completely eluded the central issue of ethnicity.

To write an imagined ending of the story Schultz used narrative analogy, linking his US experience to Guatemalan reality. The hybrid maize revolution in the US was the ideal microcosm of which Panajachel—as a deficient microcosm—was the negative mirror. But how would agricultural development in Iowa translate to Panajachel? Here a paradox becomes evident. Schultz mentioned that hybrid maize had not increased the incomes of US farmers (Schultz 1964, p. 159). Productivity growth had mainly benefitted US consumers who now paid lower prices for maize. As prices had dropped, farmers could not reinvest lower profits into subsequent rounds of innovation. This was why Schultz required governments to step in and invest in agricultural research. But the economic outcome of the hybrid maize revolution in the US also raised another obvious but unanswered question for Panajachel: how were poor farmers going to benefit from improved technologies?

Schultz did not just fail to connect the dots on a minor issue. The relation between technological progress and farmer income was a key topic of discussion among US economists. In 1959, the year that Schultz started writing *TTA*, economist Willard Cochrane was a visiting professor in Schultz's department upon his invitation; Cochrane had just published a book that discussed the problem (Cochrane 1958). Agriculture was to be an engine of economic growth but counteracting the negative consequences of this policy would either require complementary policies or generate a stream of people leaving farms to seek jobs in cities. In *TTA*, writing for an audience with an international outlook, Schultz sidestepped the issue and chose to ignore the concerns that the hybrid maize experience had already raised in the US. Schultz could have been more transparent about his own political values by discussing alternative story frames of the US hybrid maize revolution (cf. Elliott 2017).

Schultz's framing of his narrative is only partly due to the theoretical limitations of economics as a discipline. Schweigert (1994) shows that by attentively reading *Penny Capitalism*, the story can be reconstructed in a way that does justice to the underlying narrative perspective of Panajachel farmers. Even with the intellectual resources available in 1960, Schultz could have come close to producing a similar understanding.

In framing his story, Schultz drew on his own values, but he was certainly also influenced by the narrative frame inherent to his main source for ethnographic insights. In *Penny Capitalism,* Tax took the Mayan inhabitants of Panajachel as his unit of analysis and paid little attention to their history. Even so, his account reflected the pervasive role of ethnicity in the local economy, as shown above. Tax

(1953, p. 7) had anthropological reasons for his focus on the Mayan part of the village and made this limitation explicit. In contrast, Schultz did not have a good reason to ignore, in his economic analysis, the ethnic group who controlled the largest share of the local economy. He did not make his limited focus explicit in *TTA* but hid information from his readers that would have made it clear that Mayan farmers were living in a village dominated by Ladino landowners. The most evident example of this is Schultz implying that Mayans did not have wheels instead of stating that Ladinos had a monopoly on motorised transport (see above, section "Technology in Panajachel"). This shows that Schultz made a conscious choice in misrepresenting Panajachel as a Maya-only village, leaving Ladinos out of the frame.

Chicago anthropology of the 1950s also influenced Schultz on another level, through its models of socio-cultural change, which were precursors of modernisation theory, and through its highly ahistorical methodology. An important critique of this style of anthropology came from Guatemalan anthropologist Ricardo Falla (1978), based on his ethnography of San Antonio Ilotenango (discussed above), which has a strong historiographic focus. Falla showed how members of a Mayan rural community adopted aspects of modernity (Catholic orthodoxy) to strengthen their ethnic identity in other regards (economic autonomy and political opposition to regional Ladino elites). This challenges the idea of socio-cultural change as a gradual or diffusive process and challenges the split between worldviews and economics—two ideas central to the models of social change promoted by Tax and Schultz. Currently, these types of models are no longer considered acceptable in Guatemalan anthropology, as they do not reflect socio-cultural realities (Adams and Bastos 2003; Girón 1997; Paz Lemus 2017). Schulz's reliance on these now-outdated models implied that he did not provide openings for other narrative perspectives when he crafted his own narrative. His farmers were active agents in the sense that they dynamically responded to economic opportunities, but they were not allowed to tell their own story of development.

Final reflections

In *TTA*, Panajachel was indeed a statistical parable in the sense of Burnett (2021), not only because it was a quantitative story with a moral but also because it acquired a fictional quality in Schultz's hands. Schultz told his own story rather than the narrative-as-lived of the farmers he portrayed. As a result, the Panajachel statistical parable neglected the institutional and ethnic dimensions of farmers' struggles to make technological change work for them.

To explain Schultz's use of statistical parable as a strategy, Burnett (2021) points to his desire to reach across the walls of academia to development decision-makers. While this explains Schultz's penchant for simple conceptual models, it does not explain why Schultz omitted the institutional and ethnic dimensions from the Panajachel story. One explanation might be that Schultz also had to consider national boundaries to make his statistical parables travel. Parables are less transferable if they are entangled with aspects that are highly context specific. Another would be that addressing the Panajachel story would have obliged Schultz to address the theories he sought to challenge in a much more systematic way. Panajachel encapsulated, in a small geographical space, the dualism of the wider Guatemalan agricultural economy. Poor Mayan small-scale producers operated next to rich Ladino coffee growers. This kind of economic dualism was central to the prevailing structuralist macro-economic policy narratives. Schultz could have used Panajachel to examine how different policy narratives fit the situation. Instead, his statistical parables challenged assumptions in competing narratives in a piecemeal way, perhaps a pragmatic strategy given heightened Cold War tensions in the early 1960s. Schultz produced a narrative tying together different statistical parables but did not present a comprehensive system; this gave space to development decision-makers to pick and choose advice from *TTA*. This effectively happened, as governments that invested in Green Revolution strategies did not necessarily implement the market policies that Schultz recommended.

The distorted portrayal of agricultural realities in Panajachel fed into a highly influential policy narrative. With *TTA*, Schultz provided the interpretative grid through which subsequent events were read. His technology-centred explanation of agricultural change has been repeated in the economic and historical literature about the Green Revolution, including by many of the voices critical about its effects. This narrative diverted attention from institutional and policy innovations that need to accompany technological innovations in agricultural development. In a recent review, Barrett et al. (2020) indicate the urgent need to revise this technology-centred view, breaking with the Green Revolution narrative.

Better historical understanding can help to overcome the Green Revolution narrative. This study of Schultz and Guatemala feeds into a nascent revisionist literature on the Green Revolution. Recent historical research on the Green Revolution in India has shown that its impact on productivity was not only the result of new varieties but involved major infrastructural investments in rural electricity to power tube-well pumps for irrigation and strong state management of markets for inputs, credit and food grains (Baranski 2015; Stone 2019; Subramanian 2015). Likewise, in Guatemala, the development trajectory was also dependent on institutional dynamics, especially around economic exchange, including credit provision and agricultural markets, as shown above.

Historical studies expose the narrow intellectual basis of the Green Revolution policy narrative and challenge researchers to focus on the role of markets as key institutions in rural development, a topic which has only recently started to receive wider attention (Porter et al. 2007; Hebinck et al. 2014; Schoonhoven-Speijer 2021).

Another point for reflection is the role of ethical and social values in shaping policy narratives. Schultz's use of statistical parables fit his role as an international policy advisor and academic entrepreneur (Burnett 2021). His statistical parables were persuasive in communicating normative ideas and in making his ideas travel widely. Unfortunately, in his main statistical parable in *TTA*, Schultz's own entrepreneurial values prevailed over his academic and ethical values. The problem is not his use of narrative, but his impaired effort to use it responsibly (cf. Elliott 2017). In penning the landmark book that inspired the Green Revolution, Schultz knowingly misdiagnosed the economic problem and, at crucial points, hid the political values implicit in how he framed the story. The technology-centred Green Revolution policy narrative was in part shaped by a misleading story that was not verified in the next half century. This should give pause for thought today.

This analysis of a key agricultural policy narrative shows that there is a need for disciplined reflection on the way in which such narratives are generated and used. Drilling down into the particularity of policy narratives is a viable strategy to overcome their elusiveness. It can help to expose implausible or incorrectly formulated elements in the narrative and make political values explicit, positioning them specifically in the story logic and in the historical realities that the narrative refers to. Devoting attention to the narratives told by those directly involved in the change can reveal conflictual or paradoxical aspects of change. By tracing multiple perspectives, we position the narrator *within* the story and provide a starting point to construct alternative narratives. New narratives should involve a better interpretation of agricultural past realities, coupled with a much more transparent exposition of the values involved when imagining agricultural futures and that do justice to multiple voices or perspectives in shaping the narrative.

To explore this in forward-looking terms, I briefly return to highland Guatemala, where development indicators are still dire several decades after the end of the civil war (1996). Although Guatemala now considers itself a pluricultural state, it is characterised by factionalised politics and clientelism, which continue to drive social exclusion. Guatemalan historian Edgar Esquit (2010, pp. 462–464) concludes, from his detailed study of local interethnic social and political dynamics, that building alliances across ethnic and urban–rural boundaries will be crucial for inclusive development. Past agricultural development strategies were explicitly aimed at cultural assimilation of Mayan Guatemalans (Taracena 2004). At present, development strategies are often sensitive to Mayan culture and support economic autonomy and endogenous development, but still struggle to overcome local factionalism (Porcuna-Ferrer et al. 2020). Despite many challenges, some initiatives have remarkable success in engaging different religious factions within the community and reconciling different worldviews (Einbinder and Morales 2020). Alliance building requires generating the right settings for people to weave their different voices into a coherent development narrative. Fresh approaches are needed to make more explicit attempts to catalyse endogenous processes of institutional transformation.

An inspiring example that addresses this issue comes from another post-conflict context, Sierra Leone. Archibald and Richards (2002) have shown how the distribution of crop seeds can be used as an opportunity to engage in community dialogue, making abstract notions of rights and social inclusion tangible in the principles of seed distribution and using this to spark community conversation. The narrators are *in* the story—they make a normative commitment to human rights (as opposed to a charity or a needs-based approach) and at the same time allow their own perspective to be informed by local narratives. They follow Schultz's insight in recognising the power of crop seeds as an entry point to mobilise farmers' responsiveness. But they do the opposite in many other regards: they have an ethnographic interest in local narrative and link technological change with local institutional transformation.

Finally, a key issue that needs to be addressed is the relation between development economics and integrative disciplines, including anthropology, history, and geography. Interdisciplinary collaboration made a false start with Schultz and Tax, and there is still a dearth of robust interdisciplinary research on markets and other economic institutions in rural development, as noted above. There are signs of change, however. In development economics, Bulte et al. (2018) sketch how the discipline can engage with anthropological theory of institutions and ethnography to study agricultural development. There is much to be gained when development economists work more like anthropologists and pursue both statistical and ethnographic vigour. Such efforts should build on and strengthen the capacity of social scientists in the Global South. As the case study on highland Guatemala shows, local scholarly communities with contextual ethnographic and historiographic knowledge have an indispensable corrective and constructive role to play in understanding rural economies. Existing and new developments in both practice and theory should start to provide viable alternatives that finally overcome the deficiencies in Ted Schultz's inaugural version of the Green Revolution policy narrative and its lingering effects.

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