The Structural Transformation and the Changing Role of Agriculture in Economic Development: Empirics and Implications

C. Peter Timmer[1]

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[1] The author is Visiting Professor in the Program on Food Security and Environment, Stanford University, and Non-Resident Fellow at the Center for Global Development, Washington, DC. This essay relies heavily on my own teaching and research over the past several decades. Two CGD Working Papers provide more extensive discussion of the data and statistical details of the new empirical evidence (Timmer and Akkus, 2008a and 2008b). I thank Ms. Selvin Akkus, research assistant *extradordinaire* at the Center for Global Development, for all her help and insights.

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A World without Agriculture:
The Structural Transformation in Historical Perspective

C. Peter Timmer

I. Overview

This is the story of a powerful historical pathway of structural transformation that is experienced by all successful developing countries; of highly important and diverse approaches to coping with the political pressures generated along that pathway; and of policy mechanisms available to keep the poor from falling off the pathway altogether. This structural transformation involves four main features: a falling share of agriculture in economic output and employment, a rising share of urban economic activity in industry and modern services, migration of rural workers to urban settings, and a demographic transition in birth and death rates that always leads to a spurt in population growth before a new equilibrium is reached.

At one level, the story is easy to tell because the statistical picture presented, both graphically and econometrically, is, well, telling. In their broad sweep and relevance, these are very robust results that have very deep historical roots. Challenging them is like challenging the tides.

At another level, the complexity of national diversity asserts itself in very important ways. This finding does not alter the *pathways* themselves, but rather their consequences for income distribution and the gap in labor productivity between urban and rural economies. We learn a lot about the possibilities for narrowing this gap during the process of structural transformation by comparing the historical experience of rapidly growing Asia with the rest of the world. Individual country experience is revealing as well. The stress placed on this productivity gap, how it changes during the structural transformation, and potential policy interventions to narrow it, is the major contribution of this monograph.

Making sure the poor are connected to both the structural transformation and to the policy initiatives designed to ameliorate the distributional consequences of rapid transformation has turned out to be a major challenge for policy makers over the past half century. There are successes and failures, and the historical record illuminates what works and what does not. Trying to stop the structural transformation does not work, at least for the poor. Investing in the capacity of the poor to cope with change and to participate in its benefits through better education and health does seem to work. Such investments typically require significant public sector resources and policy support, and thus depend on political processes that are themselves conditioned by the pressures generated by the structural transformation.

II. The Structural Transformation in Historical Perspective

In early 18th century France, the Physiocrats argued that all real income originated in agriculture. In rebutting that view in the early 19th century, David Ricardo's model of comparative advantage still relied on two agriculturally based products (wine and cloth) to demonstrate the gains from trade. In the early 20th century, the co-inventor of modern national income accounts, Colin Clark (1940), made agriculture the "primary" industry.

From a historical perspective, it is impossible to imagine a world without agriculture. Just a hundred years ago, four out of five households in the world would have been engaged primarily in farming. Now, in rich countries, farmers are a tiny shore of the workforce. As an extreme example, there are more lawyers in the United States than farmers, more dry cleaning establishments than farms. The structural transformation is truly a radical force, and it is propelling the global economy toward "a world without agriculture" in an apparently inexorable manner. In Figure 1, the share of employment in agriculture and the share of agriculture in GDP are converging to zero. Based on simple extrapolation of historical trends, the world's last farmer will sell her final crop sometime in the next century.

This juxtaposition of historical importance and modern irrelevance presents a conundrum. The simple extrapolation of agriculture's declining share in national income is obviously wrong. Indeed, the world produces more agricultural output than ever before. Farmers will still be growing food, fiber and industrial raw materials centuries from now. But where? And how many? At what value? These are the questions that modern development economists—and politicians in rich countries—must address if the world's poor countries are to transform themselves into their richer potential.

A "world without agriculture" would actually make life much easier for development agencies and for politicians in rich countries. "Getting agriculture moving" in poor countries still dependent on the sector is a complicated, long-run process that requires close, but changing, relationships between the public and private sectors. Donor agencies are not good at managing such a process. Even more problematic, the process of agricultural development needs good economic governance in poor countries themselves if it is to work rapidly and efficiently.

At the other end of the spectrum, the *economies* of rich countries really do look like agriculture has disappeared. But no external observer—the proverbial visitor from Mars, for example—would believe that agriculture has disappeared based on the *politics* of rich countries. Politicians in nearly all OECD countries find it prudent to invest huge sums in subsidizing and protecting their farmers, often to the direct detriment of farmers in poor countries, and always to the detriment of their own taxpayers and consumers. Ending agriculture's special claim on public resources and policy attention in rich countries would help rich and poor countries alike.

Of course, a world without agriculture would make the lives of the 1.2 billion people who live on less than a dollar a day much more difficult. Three quarters of them depend directly or indirectly on agriculture for their livelihoods, and will for decades to come. The paradox, of course, is the people who most need public investments to raise agricultural productivity are precisely the ones

being left out. The paradox has not gone unnoticed, but the development profession has been remarkably reluctant to face the issue squarely for more than two decades.

Indeed, since the mid-1980s there has been serious discussion that major regions should pursue a development strategy that explicitly rejects a role for agriculture. Ironically, these regions are still poor and depend in relative terms far more heavily on agriculture as a source of income than richer countries. But in a truly global economy with free trade, such a strategy seems like a theoretical possibility. Consider, for example, a region of the world where all food and agricultural products were sourced from international markets, and domestic agricultural sectors disappeared. This "world without agriculture" is not a vision of Singapore and Hong Kong, or the oil-rich countries in the Middle East.

For many of the world's *poorest* countries, especially in Africa, a future without agriculture has been urged as the efficient path to development. Mark Rosenzweig, then the Director of Harvard's Center for International Development, asked "Should Africa do any agriculture at all?" (*Harvard Magazine*, 2004, p. 57). Adrian Wood, Chief Economist for DfID at the time, envisioned a "hollowed out" Africa, with most of the population on the coasts where they could more effectively produce manufactured exports (Wood, 2003). Many macro economists, convinced of the power of rapid economic growth to lift populations out of poverty, see resources devoted to slow-growing agriculture as wasted. A "pessimistic school" of agricultural development specialists thinks that for both technical and economic reasons, Africa cannot rely on agriculture as a source of growth or poverty reduction (Maxwell, 2004).

In a world of ample food supplies in world markets (some of it free as food aid) and increasingly open borders for trade, what is the role of agriculture in pro-poor growth?[2] The answer to this question will determine whether a failure of the Doha Round of trade negotiations will actually matter to poor countries. The answer will also determine the reception in the development community to *The World Development Report 2008*, which is on "Agriculture for Development" (World Bank, 2007). For the first time since 1982, the World Bank has focused its "flagship" publication on the successes and failures in agricultural development over the past half century and on the challenges to reviving the role of agriculture in those countries that still suffer from massive poverty and hunger. The early message is guardedly optimistic, but the complexity of "getting agriculture moving" in Africa—in political, economic, and technical terms—presented a daunting task to the authors.[3]

[2] The question remains relevant even with the high (by recent standards, but not historically) prices for staple agricultural commodities seen in world markets early in 2008. If these prices were driven solely by market forces, one could say with confidence that they will decline, again, over time. But the strong political forces behind these high prices, especially in the form of bio-fuel mandates without regard to cost, may mean the high agricultural prices last considerably longer than the historical record would suggest. The potential of demand for bio-fuels to reverse the historical process of structural transformation is discussed later in the monograph.

[3] As fair warning to readers, I served as an advisor to the team that drafted the *WDR2008*.

A. The historical perspective

Historically, the answer to the question about the role of agriculture is clear. No country has been able to sustain a rapid transition out of poverty without raising productivity in its agricultural sector (if it had one to start—Singapore and Hong Kong are exceptions). The process involves *a successful structural transformation* where agriculture, through higher productivity, provides food, labor, and even savings to the process of urbanization and industrialization. A dynamic agriculture raises labor productivity in the rural economy, pulls up wages, and gradually eliminates the worst dimensions of absolute poverty. Somewhat paradoxically, the process also leads to a decline in the relative importance of agriculture to the overall economy, as the industrial and service sectors grow even more rapidly, partly through stimulus from a modernizing agriculture and migration of rural workers to urban jobs.

Despite this historical role of agriculture in economic development, both the academic and donor communities lost interest in the sector, starting in the mid-1980s, mostly because of low prices in world markets for basic agricultural commodities. Low prices, while a boon to poor consumers and a major reason why agricultural growth specifically, and economic growth more generally, was so pro-poor for the general population, made it hard to justify policy support for the agricultural sector or new funding for agricultural research or commodity-oriented projects (World Bank, 2004d). Historical lessons are a frail reed in the face of market realities and general equilibrium models that show a sharply declining role for agriculture in economic growth. The current realities of the structural transformation stare policymakers in the face, not its underlying mechanisms that actually require rising productivity in agriculture.

Still, historical lessons have a way of returning to haunt those who ignore them. This is especially true when the lessons are robust, have been observed for very long periods of time, and fit within mainstream models of how farmers, consumers (and politicians) behave. The lessons from the structural transformation fit these conditions and, as Figure 1 illustrates, they do point toward "a world without agriculture." The purpose of this monograph is to translate those historical lessons into an understanding of the connections between the sectoral composition of economic growth and reductions in poverty. With this understanding come new insights into how to manage agricultural development to enhance both efficiency and equity.

B. The structural transformation

The structural transformation is the defining characteristic of the development process, both cause and effect of economic growth (Syrquin, 2006). Four quite relentless and interrelated processes define the structural transformation: a declining share of agriculture in GDP and employment (see Figure 1); rural-to-urban migration that stimulates the process of urbanization; the rise of a modern industrial and service economy; and a demographic transition from high rates of births and deaths (common in backward rural areas) to low rates of births and deaths (associated with better health standards in urban areas).

The final outcome of the structural transformation, already visible on the horizon in rich countries, is an economy and society where agriculture as an economic activity has no distinguishing characteristics from other sectors, at least in terms of the productivity of labor and

capital. This stage also shows up in Figure 1, as the gap in labor productivity between agricultural and non-agricultural workers approaches zero when incomes are high enough and the two sectors have been integrated by well-functioning labor and capital markets.

All societies want to raise the productivity of their economies. That is the only way to achieve and sustain higher standards of living. The mechanisms for doing this are well known in principle if difficult to implement in practice. They include the utilization of improved technologies, investment in higher educational and skill levels for the labor force, lower transactions costs to connect and integrate economic activities, and more efficient allocation of resources. The process of actually implementing these mechanisms over time is the process of economic development. When successful, and sustained for decades, it leads to the structural transformation of the economy.

The structural transformation complicates the division of the economy into sectors—rural versus urban, agricultural versus industry and services—for the purpose of understanding how to raise productivity levels. In the long run, the way to raise rural productivity is to raise urban productivity, or as Chairman Mao crudely but rightly put it, "the only way out for agriculture is industry." Unless the non-agricultural economy is growing, there is little long-run hope for agriculture. At the same time, the historical record is very clear on the important role that agriculture itself plays in stimulating the non-agricultural economy (Timmer, 2002).

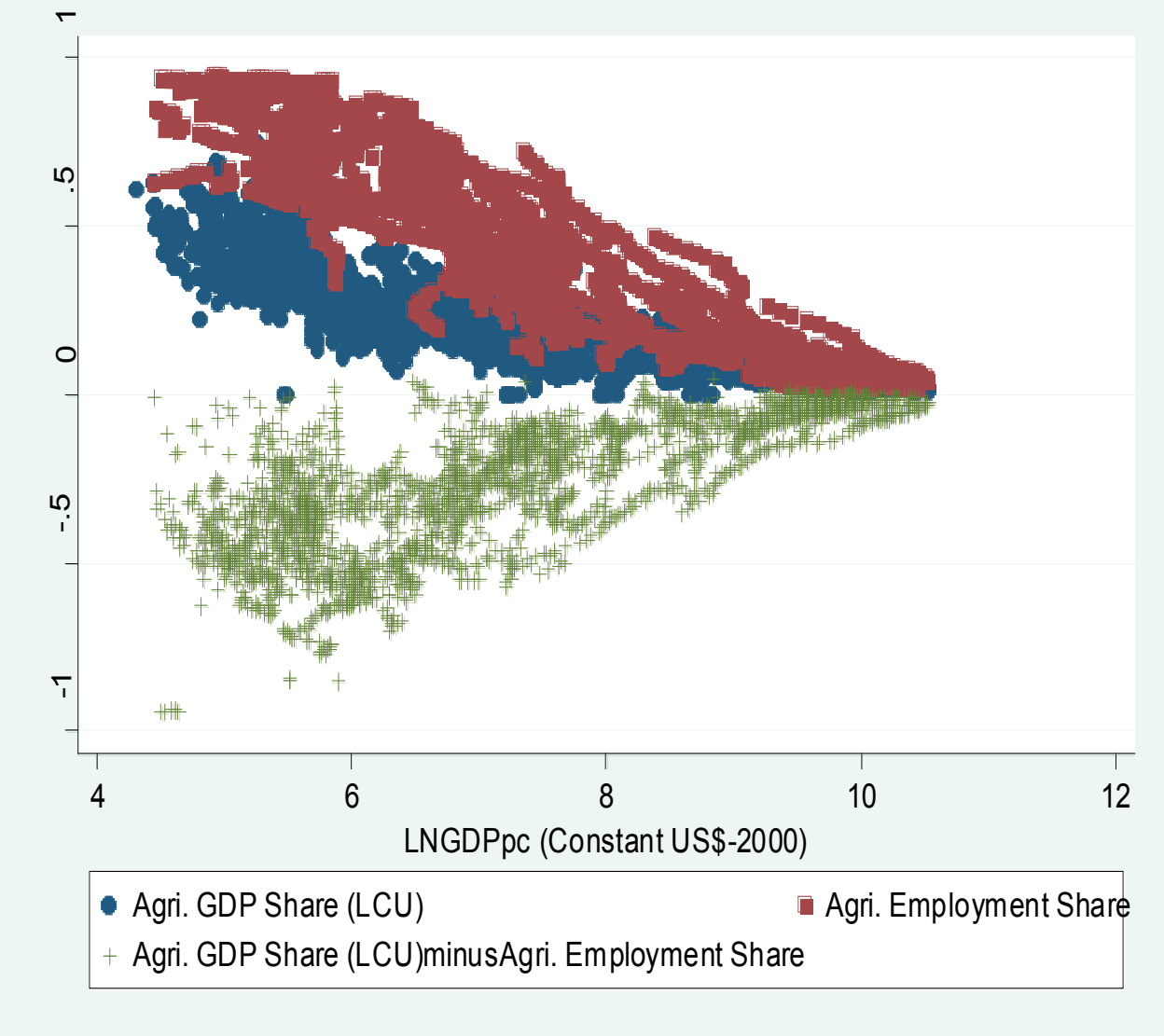
This monograph explains the historical patterns of the structural transformation and determines empirically whether the patterns have been changing over the past four decades. In the early stages of the structural transformation in all countries there is a substantial gap between the share of the labor force employed in agriculture and the share of GDP generated by that work force. Figure 1 shows that this gap narrows with higher incomes. This convergence is also part of the structural transformation, reflecting better integrated labor and financial markets. The role of better technology on farms as a way to raise incomes in agriculture is controversial. Most of the evidence suggests that gains in farm productivity have been quickly lost (to farmers) in lower prices and that income convergence between agriculture and non-agriculture is driven primarily by the labor market (Gardner, 2002; Johnson, 1997).

Moreover, in many countries this structural gap actually widens during periods of rapid growth, a tendency seen in even the earliest developers, the now-rich OECD countries. When overall GDP is growing rapidly, the share of agriculture in GDP falls much faster than the share of agricultural labor in the overall labor force. The turning point in the gap generated by these differential processes, after which labor productivity in the two sectors begins to converge, has also been moving to the right over time, requiring progressively higher per capita incomes before the convergence process begins.

This lag inevitably presents political problems as farm incomes visibly fall behind incomes being earned in the rest of the economy. The long-run answer, of course, is faster integration of farm labor into the non-farm economy (including the rural, non-farm economy), but the historical record shows that such integration takes a long time. It was not fully achieved in the United States until the 1980s (Gardner, 2002), and evidence presented here shows the productivity gap is increasingly difficult to bridge through economic growth alone. *This lag in real earnings from*

agriculture is the fundamental cause of the deep political tensions generated by the structural transformation, and it is getting worse. Historically, the completely uniform response to these political tensions has been to protect the agricultural sector from international competition and ultimately to provide direct income subsidies to farmers (Lindert, 1991). One purpose of this monograph is to understand how the political economy of this process is driven by the structural transformation itself.

Figure 1. The Structural Transformation in 86 Countries from 1965 to 2000:



C. The structural transformation as a general equilibrium process

The economic and political difficulties encountered during a rapid structural transformation are illustrated schematically in Figure 2, which shows a representative structural transformation, and numerically in Table 1, which presents the simple mathematics of structural change over a 20-year period of economic growth and transformation. Although Figure 2 shows the share of agricultural labor in the total labor force, and the contribution of agriculture to overall GDP, both declining smoothly until parity is reached when a country is "rich," the actual relationship between the two shares depends critically on the pace of change outside of agriculture and on the labor-intensity of those activities.

Figure 2 also shows a basic fact that is often overlooked in political discussions about the "failure" of agriculture to grow as fast as the rest of the economy, and thus to decline as a share of GDP and in the labor force: despite the structural transformation, *agricultural output continues to rise in absolute value*. Even as the number of farmers falls toward zero, total farm output sets new records. That is what rising productivity is all about. The sustainability of the production practices that generate such high levels of labor productivity in modern agriculture are the subject of intense debate (World Bank, 2007; Naylor, et al., 2007).

Table 1 quantifies the impact of three alternative paths for a country's structural transformation. At the starting point industry, services and agriculture contribute 20, 30 and 50 percent to GDP respectively, and the share of workers in each sector is 9.7, 20.8 and 69.5 percent respectively, fairly typical for a country in the very early stages of development. Labor productivity in each sector is 3, 2, and 1 respectively, so overall labor productivity for the entire economy is the weighted average, or 1.4 (units of output per worker per year).

The economy then grows for 20 years, with industry growing 7.5 percent per year, services 5.0 percent per year, and agriculture growing 3.0 percent per year. The overall rate of growth at the start is 4.5 percent per year. These growth rates result from technological change that is sector specific on the supply side, and on differential demand patterns that reflect Engel's Law. The *trade implications* of these differential growth rates, which are representative of long-run rates seen in successful developing countries, are not shown in Table 1, but the economy must be relatively open to trade to sustain such rates.

The "simple mathematics" of the structural transformation show what happens to the economy and to labor productivity through 20 years of reasonably rapid growth. At an aggregate level, total GDP grows from 100 to 255, an annual growth rate of 4.8 percent per year. Notice the acceleration in the growth rate despite the assumption that each sector grows at a constant rate for 20 years, a result of changing sectoral weights. Indeed, GDP growth in the last year of the exercise is 5.2 percent, compared with just 4.5 percent per year at the start, despite the fact that each sector continues to grow at a constant rate. If the labor force grows by 2.0 percent per year during this exercise, labor productivity in aggregate will grow to 2.4 (from 1.4 in the base year), a healthy growth rate of 2.7 percent per year.

But the important story is at the sectoral level, where the structural transformation becomes visible. Table 1 show three possible growth paths that encompass modern development

experience. Path A, following the basic logic of the Lewis Model, holds labor productivity *constant* in the industrial and service sectors, as they absorb labor from the agricultural sector at the same rates as each sector itself expands. This labor-intensive path of industrial and service growth leads to the fastest structural transformation of the three scenarios, and is so successful in pulling "surplus" labor out of agriculture that labor productivity in agriculture is actually higher at the end than in the service sector, and only 23 percent less than in the industrial sector. No country has actually managed a growth path with quite that much labor intensity, although the East Asian experience comes closest. The structural transformation is extremely rapid with this path, and the *absolute* number of workers in agriculture is already declining after 20 years of rapid growth.

Path C looks at the opposite extreme, where labor productivity in the industrial and service sectors grows at the same rate as the sectors themselves. Thus neither sector absorbs any new workers at all, so the entire increase in the labor force remains in agriculture. Because agricultural GDP is still rising faster than the labor force, labor productivity in the sector does rise slightly, but at only 0.3 percent per year. This pattern is closer to the African experience, although Indonesia in the 1950s and early 1960s looked similar. Not only is the absolute number of workers in agriculture still rising on this path, so too is the *share* of agricultural labor in the total labor force.

Path B is halfway between these two extremes, with labor productivity in the industrial and service sectors growing at half the rate of increase in sectoral output. The result is actually quite like Indonesian experience since 1970. The agricultural labor force continues to rise (to 69, from 50 at the beginning) but is clearly near its peak—ten more years of such growth would see the agricultural labor force in absolute decline. Labor productivity in agriculture increases by 1.4 percent per year over the entire period, somewhat less than the rate found by Fuglie (2004) for Indonesia from 1961 to 2000, the years of both rapid and slow growth in productivity.

But even this successful pattern of structural transformation leaves a serious problem for policymakers. As Table 1 also shows, income distribution deteriorates under this scenario, at least as measured by the ratio of labor productivity (wages) in the top quintile of laborers to the bottom quintile. From a starting ratio of 2.55, even Path B yields a ratio of 4.02. Of course, things could be worse. If output expansion in industry and services does not employ new workers (Path C), the ratio deteriorates to 7.27! Only a pure "Lewis-style" pattern of growth leads to an improvement in the distribution of labor income (Path A).

The point of this exercise is to emphasize the power, the inevitability, and the paradoxical nature of the structural transformation. Even a narrow focus on agricultural productivity *per se* must be set within this transformation. The crucial point is that the *faster* the structural transformation, the *faster* is the decline in the share of agriculture in both the economy and the overall labor force. And the paradox is that, the *faster* the structural transformation, the faster that rural productivity—proxied by rural labor productivity—*rises* (as in scenario A). *This is true even though the rate of growth of agricultural GDP is the same in all three scenarios.* Consequently, a broader focus on rural productivity and pathways out of rural poverty will inevitably incorporate the structural transformation as the basic framework for macro consistency and general equilibrium.

Figure 2. Schematic illustrating the stylized trends in total agricultural output, output per agricultural worker, agriculture as a share of the labor force and in GDP, during the course of the structural transformation (from "poor" to "rich")

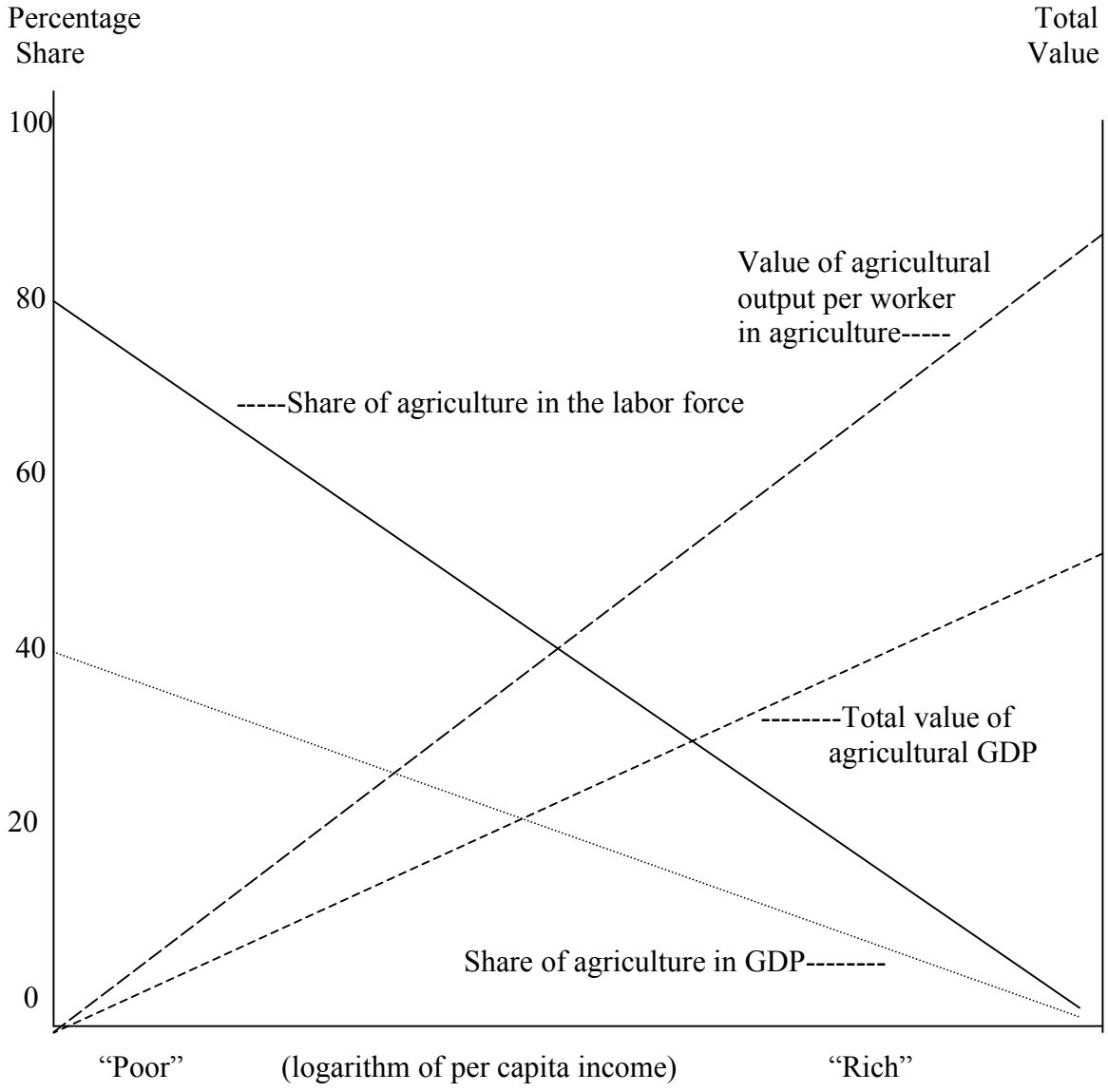


Table 1.--The Simple (but Implacable) Mathematics of the Structural Transformation

Start (Year 0)	Industry	Services	Agriculture	GDP
Output	20	30	50	100
Share of GDP	20	30	50	100
Number of workers[4]	7	15	50	72
Labor productivity	3	2	1	1.4
Share of workers in total	9.7	20.8	69.5	100
Sectoral growth rates (%/year)	7.5	5.0	3.0	4.5
Contribution to growth in year 1	1.5	1.5	1.5	4.5
End (Year 20)				
Output	85	80	90	255
Share of GDP	33.3	31.4	35.3	100
Number of workers[5]				
Path A	28	40	39	107
Path B	14	24	69	107
Path C	7	15	85	107
Labor productivity				
Path A	3	2	2.32	2.4
Path B	6.3	3.3	1.31	2.4
Path C	12.7	5.3	1.06	2.4
Share of workers in total				
Path A	26.2	37.4	36.4	100
Path B	13.1	22.4	64.5	100
Path C	6.5	14.0	79.5	100
Contribution to growth in year 20	2.5	1.6	1.1	5.2

Ratio of labor productivity (wages or income) in the top quintile of workers relative to the bottom quintile

Start	2.55
Path A	1.50
Path B	4.02
Path C	7.2

[4] The active labor force will grow by 2.0 percent per year.

[5] Path A assumes that labor productivity in industry and services remains *constant* as the two sectors absorb new laborers at the same rate as output expansion (the classic Lewis assumption). Agricultural employment remains the residual, with changes there consistent with general equilibrium. In Path B, labor productivity in industry and services increases at half the rate of output. In Path C, labor productivity in the industrial and services sectors increases at the same rate as sectoral output, so no new labor is hired. Note that Paths A and C are extremes that are somewhat outside historical experience.

III. Common Patterns: The Empirical Record from 1965 to 2000

The empirics of the structural transformation have been a research topic for some time.

> Modern analyses of sectoral transformation originated with Fisher (1935, 1939) and Clark (1940), and dealt with sectoral shifts in the composition of the labor force. As in most areas in economics one can find precursors of their ideas in earlier writings [Sir William Petty and Friedrich List]. However, they were probably the first to deal with the process of reallocation during the epoch of modern economic growth, and to use the form of sectoral division (primary-secondary-tertiary) which, in one way or another, is still with us today (Syrquin, 1988, p. 212).

Kuznets (1955, 1966) provided the historical empirics and conceptual framework for modern analysis of the structural transformation, although he used no econometric techniques himself. The first quantitative analyses of patterns in the transformation process were by Chenery (1960) and his collaborators (Chenery and Taylor, 1968; Chenery and Syrquin, 1975). The first systematic effort to study the evolution of the structural gap between labor productivity in agriculture and the rest of the economy is in van der Meer and Yamada (1990), in their analysis of productivity differences in Dutch and Japanese agriculture.

Much effort has gone into finding "patterns of growth," especially for various typologies of countries. The earliest was the classification by Chenery and Taylor (1968) of their sample of countries into (1) large, (2) small-primary oriented, and (3) small-industry oriented. The goal has been to translate growth patterns in different typologies into strategies for development, but the uniqueness of country circumstances, especially in terms of political economy, has largely thwarted that effort. This monograph explicitly revives that search, but this time by bringing the pressures on political economy from the structural transformation itself directly into the analysis.

For the empirical analysis here, 86 countries are followed from 1965 to 2000 (see Annex Table A-1 for a list of countries included and their representative data. All the countries have populations greater than 3 million in 2000). Empirically, most countries lie close to the average paths for the three variables of interest when year-specific and country-specific dummy variables are included along with the "standard" explanatory variables: logarithm of GDP per capita (lnGDPpc), lnGDPpc squared, and the agricultural to non-agricultural terms of trade (AgToT) (see Figure 1 and Table 2). That is, all countries follow a variant of the basic structural transformation if their economies are growing. The three variables to be explained are:

(1) the share of agricultural employment in total employment (AgEMPshr)
(Regression A-4 adjusted R squared = 0.9862);

(2) the share of agricultural GDP in total GDP (AgGDPshr)
(Regression B-4 adjusted R squared = 0.9335); and

(3) the difference between these two shares (AgGDPshr minus AgEMPshr = AgGAPshr)
(Regression C-4 adjusted R squared = 0.9166).

A. Employment share.

Even the simplest specification for testing the relationship between share of agricultural employment in total employment, regression A-1 in Table 2, explains 87 percent of the variance in the full sample of data.[6] The quadratic equation has the expected shape, with the linear term negative and the quadratic term positive. However, the "turning point" in this relationship, when the employment share would reach its minimum, is $5.9 million (US$2000).[7] Adding Year and Country coefficients (regression A-3) sharply reduces the size and significance of both income terms and the turning point falls to $19,009. Finally, adding the agricultural to non-agricultural terms of trade, calculated from national income accounts data as an index equal to one for all countries in 2000, further reduces the size and significance of both income terms—the quadratic term is no longer significant. Importantly, with this "full specification" there is virtually no convergence of the agricultural employment share toward zero—the implied turning point in regression A-4 is $8.9 billion!

The Year and Country effects are extracted and shown in Annex Table A-2. The Year coefficients are closely linked to, but are not identical with, a simple time trend. In regression A-3, the Year effect provides a smooth and large annual reduction in the share of employment in agriculture—one percent per year. There is a slight but significant quadratic term that gradually offsets this negative trend in the employment share. This negative time trend provides *an exogenous source of convergence towards zero in the employment share*, independently of any relationship with per capita incomes, and suggests that technical change is an important driver of the structural transformation in addition to the impact from Engel's Law, which is driven by per capita incomes.

A further implication is that, on average, this negative time effect causes labor productivity in agriculture to rise faster than labor productivity in other sectors because the reallocation is taking place while per capita incomes are held constant (in an analytical sense). As noted in the discussion of the structural transformation as a general equilibrium process, this dimension of differential productivity growth is a normal feature of the structural transformation, despite widespread policy concerns about lagging incomes in the agricultural sector.

The Country effects from regression A-3 also exhibit a regular pattern—they are significantly and negatively related to the country's per capita income in 2000. This relationship suggests that, as they get richer, countries find a way to reduce the share of workers in agriculture independently of the structural reduction from the growth process itself. Political mechanisms would seem to be necessary to see such a pattern, driven by the rising income inequality between

[6] Details of the econometric results are shown in Annex Tables A-2 to A-4. Each Annex also extracts the Year and Country coefficients for each Agshr variable and reports statistical and graphical results.

[7] The "turning point" in all the relationships reported here is calculated by taking the first derivative of the quadratic function in lnGDPpc and setting it equal to zero. This provides meaningful estimates, of course, only when both terms of the quadratic function are significant and of opposite signs.

the agricultural and non-agricultural sectors seen so regularly during the structural transformation.[8]

B. GDP share.

The share of agriculture in GDP follows a similar pattern as employment, but the statistical results are always more significant and the coefficients become larger rather than smaller as additional controls are added. The decline in the GDP share for agriculture is clearly much more regular and powerful than the decline in employment share, thus setting up the obvious potential for a mismatch between the two trends. Indeed, the "turning point" for the share of agriculture in a country's economy is always well defined, whichever regression specification is used, and it is as low as $9102 in regression B-4, which includes full Year and Country effects as well as the terms of trade. Recall that in regression A-4 the turning point for the share of employment in agriculture was not reached until per capita incomes were $8.9 billion. It is no wonder that countries seek other mechanisms than economic growth to equilibrate the employment and GDP shares.

The Year coefficients yield a smaller and less smooth trend decline in the share of agriculture in GDP than in employment, with the decline roughly two-thirds as fast as in the employment share regression. Thus, holding all other variables constant, the gap between employment share and GDP share should be expected to narrow over time for exogenous, and presumably technological, reasons.

There is no parallel to the regular relationship with per capita incomes for the Country coefficients in the GDP regression (B-3)—the coefficient on lnGDPpc(2000) is insignificant.. Perhaps the surprise is that countries do not succeed in making the relationship positive. Regression B-3 does not include the terms of trade variable so any such efforts should be identified in the regression. Regression B-4 does show the highly significant and positive effect of the terms of trade on the share of agriculture in GDP, but this is controlling mostly for short-run movements in agricultural prices that are not a part of the long-run structural transformation. The net effect in regression B-4 is to make the structural transformation variables larger and more significant, just the reverse of the impact in regression A-4 on employment share.

Although controlling mostly for short-run price movements, the terms of trade (AgToT) variable is interesting on its own. Annex Table A-5a shows that AgToT has a significant negative trend over time, after controlling for a slight tendency to increase with lnGDPpc. The Year coefficients for AgToT, which reflect the "global" market forces at work on domestic economies, account for just 20 percent of the variance in the overall AgToT variable. But of this variance, 80 percent is accounted for by indices of world food prices, world non-food agricultural prices, and energy prices (see Annex Table A-5b). So world markets are an important determinant of the domestic terms of trade between agriculture and non-agriculture,

[8] Part of the effect may be definitional, in the sense that the majority source of income can switch quickly with only modest changes in actual sources of income. For example, farm workers who earn 55 percent of their income from agricultural sources (a majority) in one census year and just 45 percent (a minority) in the next, will be re-classified from the agricultural to the non-agricultural labor force even though there has been only a small change in the source of their income. Such re-classifications tend to be based on census data and occur roughly every decade.

but most of the variance is due to specific domestic economic and policy factors. Understanding how domestic policy uses instruments to influence the terms of trade between the two sectors is one key to understanding the political economy of the structural transformation, and is the topic of detailed analysis in Section VI..

C. GAP share.

Most empirical analysis of the structural transformation has focused on these two variables—agriculture's share in employment and in GDP. The gap between the two has often been recognized, but it has received little of the systematic analysis that the two "basic" variables have received. The analysis in van der Meer and Yamada (1990) is an important exception. This paper reverses that pattern. Most of the following analysis is focused directly on the "gap" variable, defined as the difference between the share of agriculture in GDP and its share in employment. The definition consciously causes this gap to be negative for virtually all observations, a visual advantage in Figure 1, which shows the gap approaching zero from below.

One advantage of using the difference in shares rather than their relative values is that the gap variable then translates easily into a "sectoral Gini coefficient" that indicates the inequality of incomes (labor productivity) between the two sectors.[9] The negative of the GAP variable is equal to the Gini coefficient for agricultural GDP per worker compared with non-agricultural GDP per worker. This "sectoral Gini coefficient" accounts for 20-30 percent of the variation in the overall Gini coefficient for this sample of countries. The rural-urban income gap is a significant part of a country's income inequality.

A worrisome aspect of this rural-urban income gap is that it actually gets larger during the early stages of economic growth. The turning point in the relationship for AgGAPshr only occurs at per capita levels of GDP above $9255 in regression C-3 (where the terms of trade variable is not included). For comparison, per capita GDP in 2000 was $5940 in Mexico, $6185 in Uruguay, $7700 in Argentina, $10,300 in Greece, and $10,940 in South Korea. This result alone is likely to explain much of the political difficulty faced during a rapid structural transformation.

Interestingly, the turning point is at a lower per capita income when the terms of trade variable is included. In regression C-4, the turning point is just $5063, well below the value for Mexico and similar to per capita GDP in Chile or Venezuela in 2000. To the extent that individual countries can use agricultural price policy to influence their domestic terms of trade (and, on average, only about 20 percent of the overall variance in the terms of trade is common to all countries on a year to year basis when all countries are assumed to pass through world prices to the same degree), this instrument seems to be effective in making the growth process a more effective integrator of agricultural labor into the rest of the economy, at least in terms of relative productivity. On the other hand, political efforts to influence the domestic terms of trade often run into powerful counter forces from commodity markets, and thus require large subsidies to make them effective.

There are also exogenous forces at work to close the gap in labor productivity, as would be indicated by the results for the Year and Country coefficients in the employment and GDP

[9] See Annex Table A-6 for details and an algebraic proof of this relationship.

regressions. In the GAP share regression, the Year coefficients reflect a convergence of roughly 1.4 percent per year, although the negative quadratic term gradually offsets this trend. For example, in the year 2000, the exogenous decline in the GAP share as estimated from the regression on the Year coefficients is just 0.8 percent per year. Thus, closing the GAP is getting harder over time.

The Country effects are also strongly and positively associated with per capita GDP, indicating that richer countries take measures to close this gap above and beyond the impact from the economic growth process itself. Again, only political mechanisms can explain the use of these measures, although they are closely linked to the wealth of a country and its ability to absorb both the budget subsidies and economic distortions that arise.

Table 2. Summary of regressions to explain the structural transformation, 1965-2000

Regression Number[10]	Dependent variable: Share of agricultural employment in total			
	A-1	A-2	A-3	A-4
Constant	2.227	2.351	0.962	0.745
	(47.9)	(51.4)	(18.6)	(13.5)
lnGDPpc	-0.321	-0.342	-0.107	-0.0368
	(25.2)	(28.2)	(8.0)	(2.5)
(lnGDPpc)sq.	0.0103	0.0118	0.00543	0.000617
	(12.3)	(14.7)	(5.9)	(0.6)
Terms of Trade				-0.000128
				(7.1)
Year?	N	Y	Y	Y
Country?	N	N	Y	Y
Adj. Rsq	0.8694	0.8830	0.9851	0.9862
Turning point				
LnGDPpc	15.582	14.492	9.853	29.822
GDPpc ($2000)	$5.9M	$2.0M	$19009	$8.9B (!)

Regression of country effects from Regression A-3 on lnGDPpc2000

1.048	-0.130 * lnGDPpc2000	Adj. Rsq	0.8463
(22.6)	(21.5)		

Regression of year effects from Regression A-3 on "Year"[11] and "Year squared"

0.532	-0.0100 * "Year" + 0.0000294 * "Year"sq	Adj. Rsq	0.9996 (39.6)
(30.8)	(15.0)		

Source: Annex Table A-2.

[10] *t*- statistics in parentheses.
[11] "Year" = Actual year minus 1900.

Regression Number	Dependent variable: Share of agricultural GDP in total GDP			
	B-1	B-2	B-3	B-4
Constant	1.485 (45.5)	1.571 (47.2)	1.519 (20.9)	1.756 (26.9)
lnGDPpc	-0.273 (30.4)	-0.286 (32.8)	-0.292 (15.3)	-0.392 (22.5)
(lnGDPpc)sq.	0.0129 (21.7)	0.0138 (23.9)	0.0142 (10.7)	0.0215 (17.7)
Terms of Trade				0.000648 (30.6)
Year?	N	Y	Y	Y
Country?	N	N	Y	Y
Adj. Rsq	0.7643	0.7795	0.9079	0.9335
Turning point				
LnGDPpc	10.581	10.362	10.282	9.116
GDPpc ($2000)	$39395	$31644	$29193	$ 9102

Regression of country effects from Regression B-3 on lnGDPpc2000

0.0759	-0.0006 * lnGDPpc2000	Adj. Rsq	0.0004
(3.0)	(0.2)		

Regression of year effects from Regression B-3 on "Year" and "Year squared"

0.315	-0.00677 * "Year" +	0.0000292 * "Year"sq	Adj Rsq	0.9375
(4.9)	(4.3)	(3.1)		

Source: Annex Table A-4.

Regression Number	Dependent variable: AgGDP share minus AgEMP share equals "AgGAPshr"			
	C-1	C-2	C-3	C-4
Constant	-0.812 (15.1)	-0.907 (16.4)	1.0224 (10.3)	1.318 (15.2)
lnGDPpc	0.0637 (4.3)	0.0771 (5.3)	-0.316 (12.4)	-0.4316 (18.5)
(lnGDPpc)sq.	0.00161 (1.7)	0.000665 (0.7)	0.0173 (9.9)	0.02530 (15.4)
Terms of Trade				0.0008327 (29.1)
Year?	N	Y	Y	Y
Country?	N	N	Y	Y
Adj. Rsq	0.5817	0.5944	0.8718	0.9166
Turning point				
LnGDPpc	---	---	9.133	8.530
GDPpc ($2000)	---	---	$9255	$5063

Regression of country effects from Regression C-3 on lnGDPpc2000

-1.033 + 0.1331 * lnGDPpc2000 Adj. Rsq 0.8260
(20.2) (20.0)

Regression of year effects from Regression C-3 on "Year" and "Year squared"

-0.6288 + 0.0136 * "Year" - 0.0000584 * "Year"sq Adj Rsq 0.9573
(5.9) (5.2) (5.9)

Source: Annex Table A-4

IV. Are the GAP Patterns Changing over Time?

An important question about the structural transformation is whether it has been a uniform process over time, or whether the very nature of economic growth, and its ability to integrate surplus agricultural workers into the non-agricultural sector, has been changing in identifiable ways. There are two ways to address the issue. The first is to examine the short-run record of growth using the current sample of countries, with data from 1965 to 2000. That is the task of this section. The second, pursued in the next section, is to examine the long-run record of the early developers to see how their patterns of structural transformation might vary from the modern record.

A. The short run

There are a number of ways to slice the modern record of structural transformation into smaller segments than was reported above for the entire period from 1965 to 2000. Tables 3a and 3b show two useful alternatives. Table 3a reports the results of estimating the AgGAPshr regression for the four time periods 1965-74, 1975-84, 1985-94, and 1995-2000. For each separate time period the turning point is calculated for regressions that first exclude and then include the terms of trade variable. Next, the slope of the gap relationship is calculated for a variety of relevant values of lnGDPpc (from 6 to 11, or from $403 to $59874 in US$2000).

The goal is to see if there are any systematic patterns over time in either the turning points or the slopes. The answer is yes. The clearest pattern occurs for the turning points in the gap relationship when the regression includes the terms of trade variable. These turning points are as follows:

1965-74:	$ 1109
1975-84:	$ 6379
1985-94:	$ 7880
1995-2000:	$15484

Clearly, the turning point for the gap in labor productivity between the agricultural and non-agricultural sectors has been steadily rising since the mid-1960s. That is to say, the economic growth process as manifested in the structural transformation has become progressively less successful at integrating low-productivity agricultural labor into the rest of the economy. Complaints that the agricultural economies of poor countries are not as well integrated into the growth of the rest of their economy are justified. The reasons for this still need to be understood, but the facts that need to be explained are clear.

It is possible, of course, that these results stem from a serendipitous choice of time periods rather than from some deep change in the structural transformation itself. Table 3b investigates this possibility by breaking the data into just three time periods instead of four: 1965-79, 1980-90 and 1991-2000. These three time periods correspond to the early period of "classical" economic growth, the decade of experience with structural adjustment, and the decade when forces of globalization are thought to have taken hold. The turning points in the gap relationship for these three time periods are as follows:

1965-79:	$ 1043
1980-90	$ 19300
1991-2000.	$223044

These results are even stronger than those for the four-period analysis and are strongly suggestive of a failure of modern economic growth processes to integrate the agricultural sector of poor countries into the rest of their economy despite relatively successful aggregate growth records (Ravallion, Chen and Sangraula, 2007).

The analysis of the slopes of the gap relationship at various income levels merely confirms this rather pessimistic result. For example, at nearly all per capita income levels in the 1965-79 era the slope was positive, as labor productivity in agriculture was converging with labor productivity in the non-agricultural sector in nearly all countries. But in the most recent era, 1991-2000, the slopes are negative for all income levels, even the highest.

Perhaps the most striking evidence that the turning point is becoming harder to reach is presented in Figure 3, which shows a nine-year moving average of the calculated turning points for each sub-sample, starting with 1965-1973 and ending with 1992-2000. Although there are ups and downs that seem to be associated with broad trends in the global economy, the upward movement is striking. Indeed, by the latter years in the sample, even rich countries were no longer guaranteed to be on the converging side of the GAP relationship.

A worsening sectoral income gap—a deteriorating Gini coefficient between urban and rural areas—spells political trouble. Policy makers feel compelled to address the problem, and the most visible way is to provide more income to agricultural producers. The long-run way to do this is to raise their labor productivity and encourage agricultural labor to migrate to urban jobs, but the short-run approach—inevitable in most political environments—is to use trade policy to affect domestic agricultural prices (Olson, 1965; Lindert, 1991). It is no wonder that most countries are seeking mechanisms to integrate their agricultural economies into their overall economy that go beyond the economic growth process, and the structural transformation, itself. Agricultural protection is a child of growing income inequality between the sectors during the structural transformation. The empirical relationship is explored in Section VI.

Table 3a. The turning point in the GAP relationship for four different time periods: When does agricultural productivity begin to converge with non-agricultural productivity (for labor)?

	1965/74		1975/84		1985/94		1995/00	
	w/o ToT	ToT	w/o ToT	ToT	w/o ToT	ToT	w/o ToT	ToT
Coefficient on...								
lnGDPpc	-0.2528	-0.2454	-0.1067	-0.2453	-0.5387	-0.5150	-0.3469	-0.4380
	(2.6)	(3.4)	(1.5)	(3.9)	(7.4)	(10.6)	(3.6)	(7.2)
(lnGDPpc)sq	0.0230	0.0175	0.0041	0.0140	0.0303	0.0287	0.0140	0.0227
	(3.6)	(3.5)	(0.8)	(3.1)	(5.8)	(8.2)	(2.2)	(5.5)
ToT		0.000653		0.000614		0.000768		0.001146
		(9.7)		(15.3)		(16.8)		(17.0)
Nobs	780	620	818	777	848	811	516	503
Turning point								
lnGDPpc	5.496	7.011	13.012	8.761	8.889	8.972	12.389	9.648
GDPpc ($2000)	$245	$1109	$447842	$6379	$7255	$7880	$240214	$15484
Slope at lnGDPpc of...								
6 = $403	0.023	-0.035	-0.058	-0.077	-0.175	-0.171	-0.179	-0.166
7 = $1097	0.069	-0.000	-0.049	-0.049	-0.115	-0.113	-0.151	-0.120
8 = $2981	0.115	0.035	-0.041	-0.021	-0.054	-0.056	-0.123	-0.075
9 = $8103	0.161	0.070	-0.033	0.007	0.007	0.002	-0.095	-0.029
10 = $22026	0.207	0.105	-0.025	0.035	0.067	0.059	-0.067	0.016
11 = $59874	0.253	0.140	-0.017	0.063	0.128	0.116	-0.139	0.061

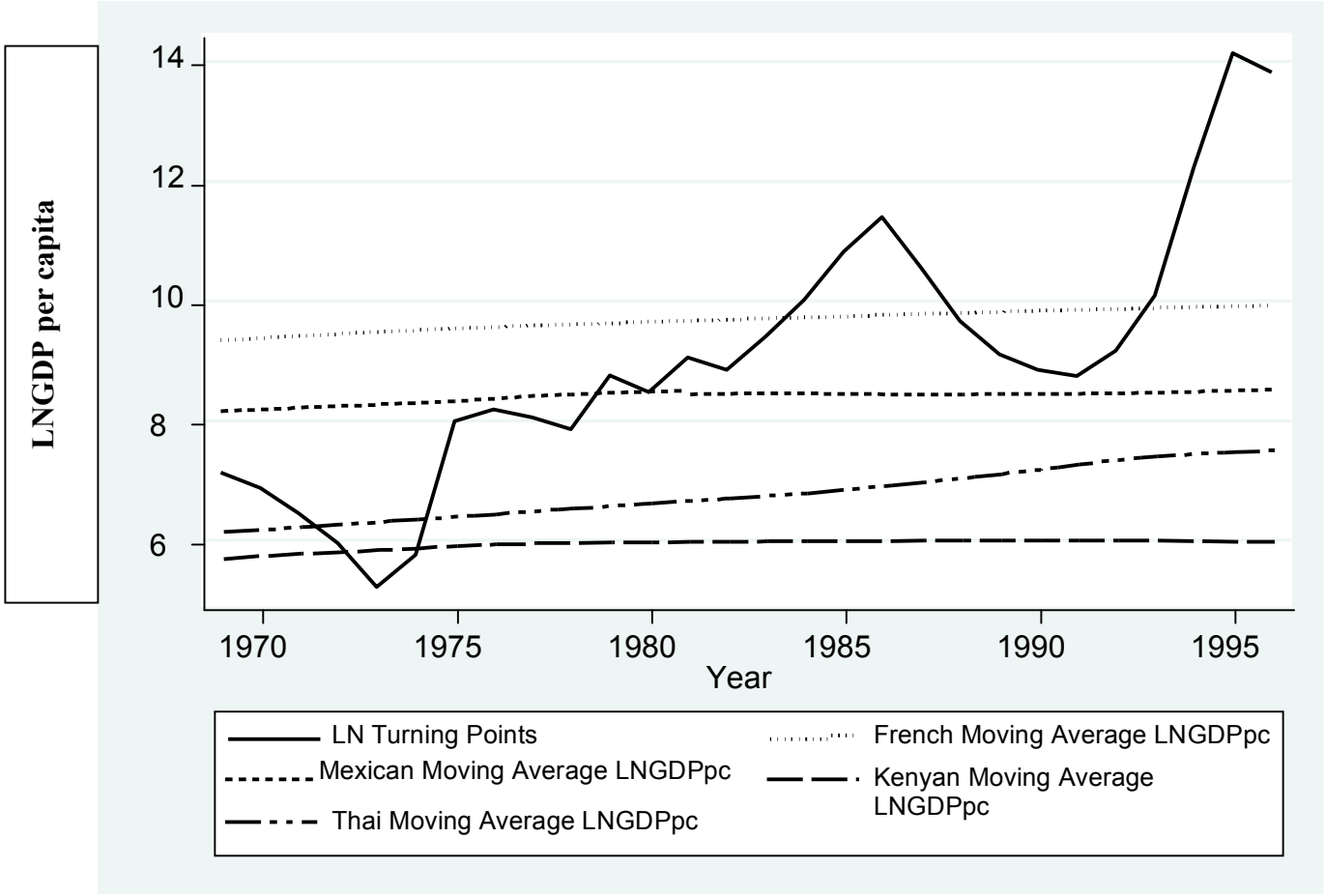
[Note: All regressions have Year and Country coefficients included. *t*-statistics in parentheses]

Table 3b. The turning point in the GAP relationship for three different time periods: When does agricultural productivity begin to converge with non-agricultural productivity (for labor)?

	1965/79		1980/90		1991/00	
	w/o ToT	ToT	w/o ToT	ToT	w/o ToT	ToT
Coefficient on...						
lnGDPpc	-0.2830	-0.2627	-0.2196	-0.2763	-0.1632	-0.2931
	(4.2)	(4.6)	(3.0)	(4.8)	(2.7)	(7.8)
(lnGDPpc)	0.0229	0.0189	0.0087	0.0140	0.0020	0.0119
	(5.0)	(4.7)	(1.7)	(3.5)	(0.5)	(4.3)
ToT		0.000628		0.000864		0.000972
		(13.5)		(14.9)		(22.0)
Nobs	1109	961	919	872	858	831
Turning point						
lnGDPpc	6.179	6.950	12.621	9.868	40.800	12.315
GDPpc, $2000	$483	$1043	$302758	$19300	Very large	$223044
Slope at lnGDPpc of...						
6 = $403	-0.008	-0.036	-0.115	-0.108	-0.139	-0.150
7 = $1097	0.038	0.002	-0.098	-0.080	-0.135	-0.127
8 = $2981	0.083	0.040	-0.080	-0.052	-0.1311	-0.103
9 = $8103	0.129	0.078	-0.063	-0.024	-0.127	-0.079
10 = $22026	0.175	0.115	-0.046	0.004	-0.123	-0.055
11 = $59874	0.221	0.153	-0.028	0.032	-0.119	-0.031

[Note: All regressions have Year and Country coefficients included. *t*-statistics in parentheses]

Figure 3. Nine-year moving average of turning points in GAP convergence, compared with economic growth experience of Kenya, Thailand , Mexico and France



B. What lessons from the early developers? Long-run patterns from 1820-1985

Concerns about the distributional impact of globalization are not new. The world economy experienced an earlier round of globalization from 1870 to World War I, and there may be lessons from that experience from the currently developed countries. Their economies were experiencing rapid economic growth (by the standards of the time) and facing challenges from the growing integration of labor and capital markets across countries (Williamson, 2002). Thanks to the dedicated work of modern economic historians, it is possible to examine the nature of these challenges empirically. The results are shown in Table 4.

Perhaps the most striking result in Table 4 is that the patterns from the early developers seem remarkably similar to those for the full sample of countries from 1965 to 2000. Although the small sample size (9 countries with just four observations for each except the United Kingdom, for which an observation for 1820 is available in addition to an observation for the mid-to-late 19th century, 1939, 1960 and 1985) means the coefficients are measured with considerable error, they are still significant by most standards, with the same pattern of signs and magnitudes as for the full sample (see Table 4).

In particular, the tendency for the gap share variable to widen in the early stages of development does not seem to be a feature of just late-developing countries. Instead, and importantly, the pattern seems equally strong in the early developers, with the negative linear term larger and the positive quadratic term (that brings convergence) also larger. Both coefficients are significant when separate country intercept terms are included. However, the turning point is in the range of $1000 (US$2000), suggesting that the early experience for these advanced countries was much more similar to the growth patterns of the 1960s and 1970s than to the most recent era.

Still, the powerful tendency of the gap in labor productivity to widen in the early stages of development, even in the late 19th and early 20th centuries, is likely to be important in explaining the common pattern of agricultural protection seen since the mid-1930s in most developed countries, and increasingly in developing countries since the 1980s.

Further investigation is needed to explain the magnitude and significance of the country effects, to see the impact of any systematic divergences from these powerful overall patterns of structural transformation. That is the purpose of the next section.

Table 4. Summary of regressions to explain the structural transformation in early developers, 1820-1985*

Regression Number	Constant	lnGDPpc	(lnGDPpc)sq.	Country?	Adj Rsq
Emp-1 hist	4.738	-0.858	0.0387	N	0.8647
	(4.2)	(3.2)	(2.5)		
Emp-2 hist	4.103	-0.706	0.0294	Y	0.9453
	(5.4)	(4.0)	(2.8)		
* * * * * * * * * * * *					
GDP-1 hist	6.039	-1.281	0.0684	N	0.8306
	(7.2)	(6.5)	(5.9)		
GDP-2 hist	5.597	-1.174	0.0633	Y	0.8531
	(6.8)	(6.1)	(5.5)		
	Note: no individual country dummy was significant by itself				
* * * * * * * * * * * *					
GAP-1 hist	1.059	-0.371	0.0269	N	0.6435
	(1.2)	(1.7)	(2.1)		
The turning point for this equation is lnGDPpc = 6.896 = US$ 988 (USD2000)					
GAP-2 hist	1.397	-0.447	0.0316	Y	0.7709
	(1.8)	(2.5)	(3.0)		
The turning point for this equation is lnGDPpc = 7.073 = US$ 1179 (USD2000)					

* The countries included in this panel of early developers include Japan (1885), Netherlands (1850), Sweden (1870), Denmark (1850), Germany (1850), France (1856), United Kingdom (1820, 1861), United States (1889), Australia (1861). In addition to the earliest year shown, data for 1939, 1960 and 1985 were included, for a total of 37 observations. Per capita GDP data are from Maddison (1995) and are in 1990 Geary-Khamis dollars.

V. What Lessons from Divergent Paths?

There are two ways to think about individual country experience in the context of the regular patterns of the structural transformation. First, all countries might be "unique" in a statistically significant way, so only the aggregate of countries actually displays a pattern of transformation over time or across incomes. In this case the structural transformation would be a long-run phenomenon (over 50 to 100 years), but not very applicable in the short run (during intervals of just 5 to 10 years). Second, most countries might follow the regular pattern over time, with just a handful of "outliers" that deviate significantly from that pattern. Then the structural transformation would have both short-run and long-run implications for most countries.

Both the *level* of a country's relationship of its agricultural sector to the rest of the economy, and the *slope* of that relationship with respect to per capita income, can vary significantly from the sample-wide patterns. Country effects, which measure the level of the relationship, are large in the employment share regression. Adding the Country effects to regression A-3 in Table 2, for example, increases the variance explained by 10 percentage points (the adjusted R-squared increases from 0.8830 to 0.9851). Only 6 of the 85 Country effects are *not* statistically significant (see Appendix Table A-2), and they are themselves closely related to per capita GDP. The lnGDPpc variable alone explains 85 percent of the variance in the individual country coefficients. Relatively little additional country variance remains to be explained in the employment share relationship.

The Country effects are also large in the GDP share regression (see Appendix Table A-3). The R-squared increases from 0.7795 in regression B-2 to 0.9079 in regression B-3. Only 10 of the 85 Country effect coefficients are not significant, although the relative size and significance of the coefficients are much smaller for the GDP regressions than for the Employment regressions, reflecting perhaps the greater degrees of freedom politically to affect labor markets than the structure of the economy.

Importantly, however, the Country coefficients in the GDP relationship are not related at all to per capita GDP. Explaining the country coefficients in this regression remains an important research task. Likely candidates include movement in the agricultural to non-agricultural terms of trade, movement in the external terms of trade, openness to foreign trade, composition of exports, and oil importing/exporting status. It is also possible that institutional changes will be significant, although these are slow to change even over a 35 year horizon, and thus difficult to measure empirically.

When explaining the GAP share variable directly, the employment share results dominate. Only 6 of the 85 Country effect coefficients are insignificant, and both the size and significance of the coefficients are large. These large Country effects are largely explained by per capita GDP--83 percent of the variance. Further explanations for variations in the GAP share variable are likely to emerge from factors that also explain the Country effects for changes in GDP shares. One route to these explanations is examination of the full patterns for individual countries in relation to the overall patterns of the structural transformation. Of course, it is only possible to examine the paths of a few countries in the sample. First, a comparison of Asian experience with that of

all other countries is quite revealing as an exercise to motivate the analysis of individual countries.

A. The contrast between Asia and the rest of the world

At first glance, the 13 Asian countries included in the sample seem to have a similar pattern of structural transformation between 1965 and 2000 as the 73 non-Asian countries (see Figure 4). Since the Asian sample includes some of the fastest growing countries during that time period (Japan, Korea, Malaysia, Thailand, and Indonesia), the visual evidence is reassuring that there is in fact a common, long-run pattern of structural transformation.

Statistical analysis, however, confirms that there are important differences in the patterns. Annex Tables A-7 to A-9 reproduce the same basic results for the Asian/non-Asian samples separately that Table 2 reported for the entire sample. The commonalities are perhaps most obvious, but the differences are important as well. In particular, Asian countries have a very different pattern of agricultural employment changes with respect to per capita incomes from non-Asian countries.

The differences are revealed most clearly in column A-4 in Annex Table A-7. For Asian countries the linear term in lnGDPpc is positive and the quadratic term is negative, just the opposite of the non-Asia sample. More importantly, the coefficient on the agricultural terms of trade is *positive* and significant for the Asian sample, whereas it is *negative* and significant for the non-Asian sample. In this, the Asian pattern contrasts with the overall sample as well.

The impact is fairly clear—Asian countries were able to use the agricultural terms of trade as a policy instrument for keeping labor employed in agriculture, a pattern not seen in the rest of the countries in the sample. Average economic growth in the Asian sample was faster than in the rest of the countries, and the rapid decline in the share of GDP from agriculture reflects this. Although the pattern of signs in the agGDPshr regressions is the same for both samples, the coefficient on the agricultural terms of trade is three times larger in the Asian sample than in the non-Asian sample (see column B-4 in Annex Table A-8).

The implication is that Asian countries provided more price incentives to their agricultural sectors over this time period as a way to prevent the movement of labor out of agriculture from being "too fast." Certainly the pattern of movements in the agricultural terms of trade for the two sets of countries is strikingly different, with Asian countries seeing a long-run decline at half the pace of the non-Asian countries (see Figure 5). The political economy of these choices is explored in Section VI, where the agricultural terms of trade are split into two components, one dependent on world prices for agricultural commodities and energy, the second being the residual that reflects domestic factors in the formation of the agricultural terms of trade.

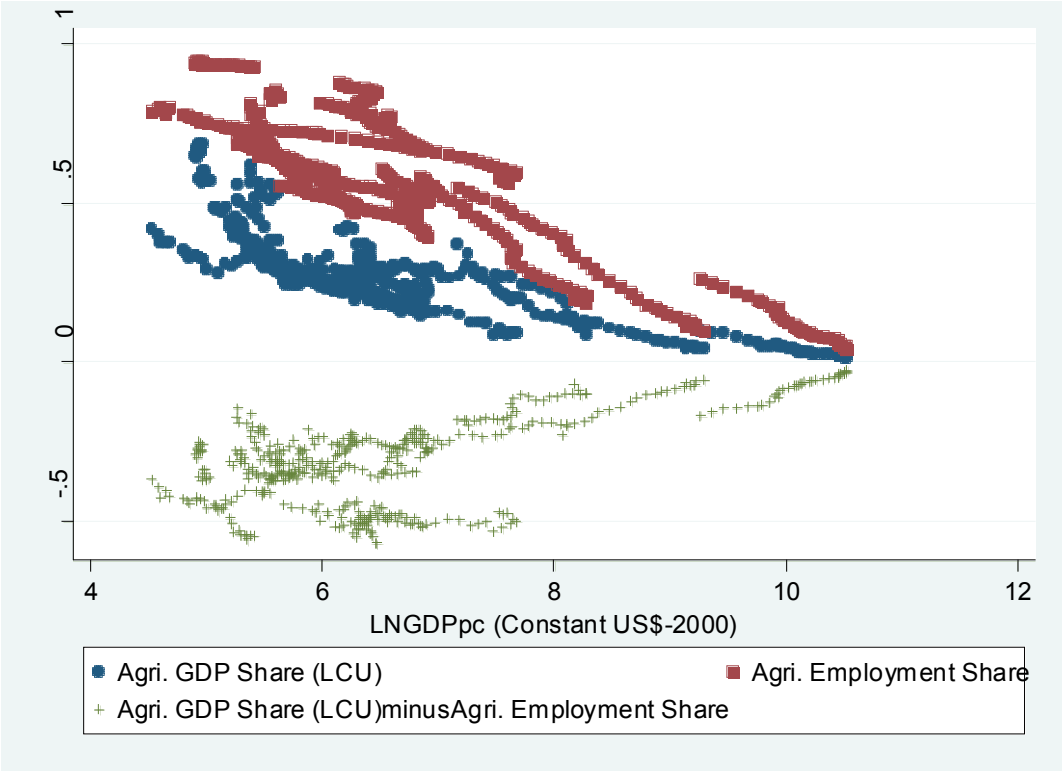
The net effect of these forces on the gap between labor productivity in the two sectors is shown in the regression results for agGAPshr (see Annex Table A-9). For the fully specified model in column C-4 the results reflect the combined differences in the agEMPshr and agGDPshr regressions shown in Annex Tables A-7 and A-8. It is useful to calculate the turning points for the agGAPshr model in this fully specified model, and these are also shown in column C-4.

When the agricultural terms of trade is included in the regression for both the Asian and non-Asian samples, the coefficient is larger in the Asian sample. Furthermore, the turning point in the GAP relationship (after which labor productivity in agriculture begins to converge with labor productivity in non-agriculture) is sharply lower in the Asian sample. The turning point for the Asian countries is just $1,663, whereas it is $11,329 for the non-Asian countries. This difference reflects two features of the Asian economies—their more rapid growth and their greater focus on stimulating agricultural productivity as a source of that growth (Timmer, 2005b).

The reasons for these differences have been the source of considerable debate. An explanation that resonates with the empirical results reported here is that Asian countries were more concerned about providing "macro" food security in urban markets and "micro" food security to rural households because of large and dense populations farming on very limited agricultural resources. Political stability, and with it the foundation for modern economic growth, grew out of the provision of food security that connected poor households to improved opportunities. (Timmer, 2004a, 2005a). These arguments are developed in detail in the second half of the monograph, but it is important here to see their connection to the structural transformation and the pressures created during the process.

Figure 4. The Structural transformation for Asian and non-Asian Countries separately

13 Asian Countries – *Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, and Thailand*



73 Non-Asian Countries

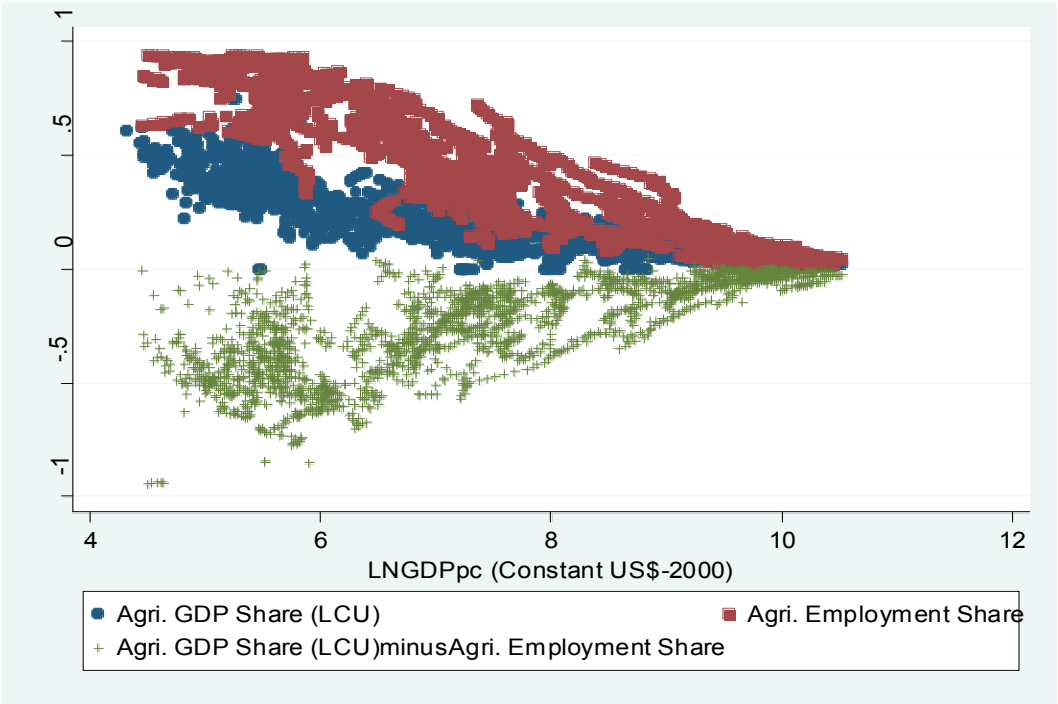
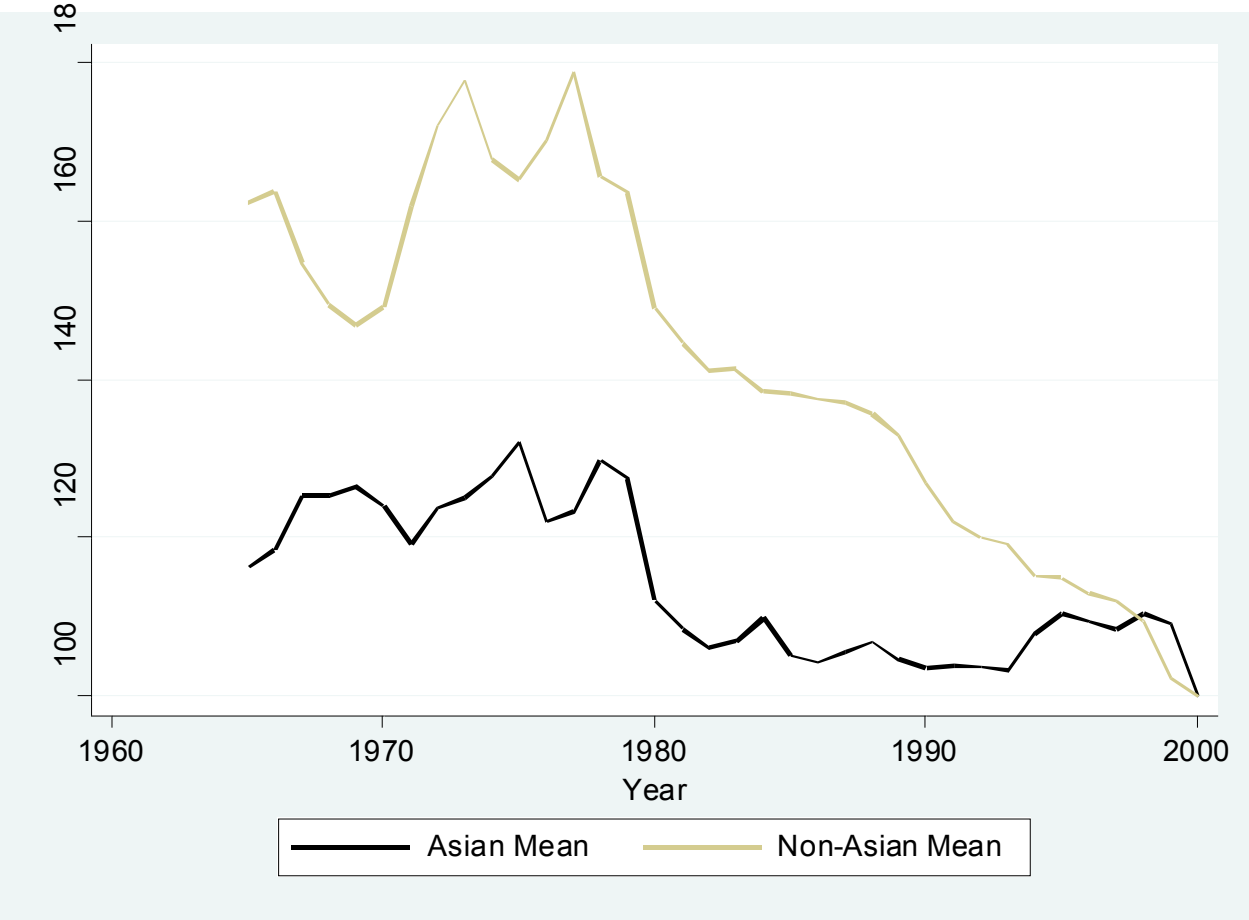


Figure 5. Asian / Non-Asian Mean AgTOT Change:



B. Divergent paths for individual countries

Testing for different country slopes with respect to per capita GDP, for any of the three regression models, is a time-intensive activity requiring careful visual study of actual country time paths (see Annex 1-a to 1-o for examples). The individual country coefficients in the structural regressions give important clues on where to look, and the high explanatory power of these structural regressions suggests that the paths for most countries fit the general pattern.

At one level the high explanatory power of these equations is no surprise. Despite the wide variance in the cross section-time series data for the 86 countries, the fixed effects coefficients for individual years and countries assure that *average* deviations for individual countries are accounted for, so countries with good agricultural resources are shifted onto the general path along with average countries and countries with poor agricultural resources. As noted, the great majority of these Country coefficients were significant for all three share regressions.

Still, countries may experience significantly different *pathways* of structural transformation even after their intercept term has been moved onto the general pathway. The slopes of the paths may be different. To test for this, slope modifiers are introduced, one country at a time, for the lnGDPpc and (lnGDPpc)sq terms for several countries of interest. In particular, modified pathways are tested for a number of large countries--China, India, United States, Indonesia, Brazil, and Nigeria, because visual inspection suggested that some of these countries' pathways might be outliers. Then the countries being studied by the RuralStruc Program in the World Bank are also examined in the same fashion to see if the patterns for a set of smaller countries are any different.[12]

It is difficult to present the results from examining individual country paths in a simple manner. Table 5 shows the results for one country, Indonesia, when this country alone is allowed to have a separate intercept and country-specific slope coefficients for both lnGDPpc and (lnGDPpc)sq. It is necessary to show the common coefficients for the rest of the countries, as these change slightly for each country examined individually. The changes are significant only when China is the country being examined, presumably because China's growth has been so rapid, so atypical, and hence such a large contributor to the overall variance in the sample, that effectively pulling it out of the sample changes the overall coefficients somewhat.

The results for other large countries are quite interesting, as the structural patterns diverge significantly for several of them. Brazil has had several economic reversals since the 1980s and the economic recovery in the past decade has involved an increase in the share of agriculture in GDP, as large-scale commercial farming, especially for soybeans using GM technology, expanded rapidly to meet export demand, especially from China. This was not a labor-intensive

[12] Of course, the role of country size in the process of economic growth has been a topic of research for some time. Kuznets (1955) observed early on that large countries had lower ratios of foreign trade to GDP than did smaller countries, and this observation led Chenery to organize his research program on economic structure and growth around that fact (Chenery, 1960; Chenery and Taylor, 1968; Chenery and Syrquin, 1975). Perkins and Syrquin (1988) directly examine the impact of size in the economic growth of large countries. The RuralStruc research project, co-funded by the French government and the World Bank and directed by Bruno Losch, is investigating the impact of liberalization and globalization on the structure of rural economies in Mexico, Nicaragua, Morocco, Mali, Senegal, Madagascar, and Kenya.

farming system, however, and the share of employment in agriculture continued to fall. Thus Brazil's long-run pattern for share of agriculture in GDP does not differ significantly from the overall pattern, but the share of agriculture in employment follows an inverted quadratic pattern that is sharply different from the overall pattern. Accordingly, the agGAPshr pathway also follows an inverted quadratic pattern that is statistically (and visually, see Annex Figure 1-b) different from the overall pattern, where the gap first widens, and then narrows progressively.

China is unique because it is the fastest growing economy in the sample. Labor migration was strictly regulated under the Maoist regime, so there was a large backlog of underemployed labor in rural areas when economic reforms began in 1978. Thus the decline in the share of agriculture in employment has been slower than would be predicted by the overall pattern. Indeed, the quadratic pattern for China is very flat in the relevant range and actually has a negative coefficient for (lnGDPpc)sq, indicating that the negative path began to accelerate in the mid-1990s (see Annex Figure 1-c). China's path with respect to agricultural share of GDP is similarly inverted, but both the net linear and quadratic terms are negative, so the downward path in GDP share is slowly accelerating. The net effect on agGAPshr, however, is compensating, and China's change in the gap between agriculture's share in employment and its share in GDP is not significantly different from the overall pattern. That is, China is unique in its rapid growth and in the structural patterns that growth has induced in employment and GDP. But China is not unique in the distributional consequences of its growth. Here, it faces the same pressures as other countries, although the fast pace of growth may be accelerating those pressures. If taken literally, the Chinese coefficients for the agGAPshr regression suggest that the gap between labor productivity in agriculture and non-agriculture will not begin to narrow until income levels are above $16,000!

Even a quick glance at the graph for Nigeria (Annex Figure 1-j) suggests that its pattern of structural change is very unusual. This is only partly because of the major reversals in economic growth. Indeed, the pattern of agricultural GDP is not significantly different from the overall pattern, although this is over a narrow range of incomes. What is apparent is that the economic reversal did not reverse previous moves out of agriculture, so there are two levels of agricultural employment over a significant range of Nigeria's income path—a "high" level of employment when the country first reached an income level, and then a "low" level of agricultural employment when the country's income fell back to that level again. Thus the GDP component of the structural transformation is more flexible than the employment component, especially in the face of economic reversals (at least in Nigeria). The net result for the evolution of the gap is in some sense the opposite of that in Brazil, at least for the shape of the quadratic function. In Nigeria, the quadratic term is large and significantly *negative*, indicating that the GAP is widening rapidly at current levels of per capita income.

As expected from the visual evidence, Indonesia does not deviate a lot from the overall pathways of structural change (see Annex Figure 1-e). The share of agriculture in GDP did decline significantly faster than the overall pattern in the early stages of Indonesia's development, but this was largely due to the rapid expansion of the petroleum exporting sector in the 1970s. As the economy has diversified (and growth came to a screeching halt during the financial crisis in 1998) the pattern of agricultural GDP share has also returned to normal. This effect is captured statistically by the larger positive quadratic term in the GDP regression. The other two

regressions show that Indonesia fits the general pattern, as none of the coefficients are significant when slope modifiers are included.

The small countries that are part of the RuralStruc project exhibit no strong divergences from the general patterns (see Table 6). Part of the reason is simple—a number of the countries have shown little growth in the 1965-2000 period and so there is little from which to diverge. But it also seems likely that small countries have fewer degrees of freedom with respect to the structural path they follow, if economic growth is driving that path. For small countries to grow, they must be open to the global economy. And that openness seems to enforce a common pattern of structural transformation.

All in all, the general structural patterns reported here are quite robust. All countries have unique histories and patterns, of course, and many are actually failing to undergo a significant structural transformation. But that is a failure of growth, not of the patterns. When growth is established, the future pathways for nearly all countries are likely to look like those in Figure 1 or, statistically, like the common patterns in Table 2.

Table 5. **Regression results for individual countries: Indonesia**

	Dependent variable		
Independent Variable	agGDPshr	agEMPshr	agGAPshr
Intercept	1.7070	0.7729	1.2621
(t)	(25.3)	(13.6)	(14.1)
lnGDPpc	-0.3799	-0.04333	-0.4180
(t)	(21.3)	(2.9)	(17.5)
(lnGDPpc)sq	0.02078	0.0009925	0.02450
(t)	(16.8)	(0.9)	(14.7)
Terms of trade	0.0006436	-0.0001282	0.0008291
(t)	(30.4)	(7.0)	(28.9)
Country intercept			
Without slope modifiers	0.04935	0.1611	-0.1350
(t)	(4.0)	(16.9)	(7.4)
With slope modifiers	3.1218	0.7338	2.0110
(t)	(2.3)	(0.6)	(1.1)
lnGDPpc * Country	-0.9718	-0.2168	-0.6550
(t)	(2.2)	(0.6)	(1.1)
(lnGDPpc)sq * Country	0.07655	0.02014	0.04958
(t)	(2.1)	(0.6)	(1.0)
Adjusted R squared	0.9338	0.9863	0.9168

Table 6. Summary of coefficients in agGAPshr regressions when country intercept and slope modifiers are included (*t*-statistics in parentheses)

Country (Population, in millions)	Intercept[13] Without	With	lnGDPpc*Cty	(lnGDPpc)sq * Cty
China	-0.3482	-0.5104	0.06992	-0.006197
(1314.0)	(17.2)	(0.8)	(0.3)	(0.3)
India	-0.2274	9.1711	-3.2201	0.2754
(1095.4)	(11.4)	(2.0)	(1.9)	(1.9)
United States	0.3025	17.6672	-3.4144	0.1664
(298.4)	(10.8)	(0.5)	(0.5)	(0.5)
Indonesia	-0.1350	2.0110	-0.6550	0.04958
(245.5)	(7.4)	(1.1)	(1.1)	(1.0)
Brazil	0.01758	46.4877	-12.4180	0.8260
(188.1)	(1.1)	(4.9)	(5.1)	(5.2)
Nigeria	-0.03639	-29.8189	10.3596	-0.9000
(131.9)	(1.9)	(2.9)	(2.9)	(2.9)
Mexico	0.06744	20.2729	-4.9534	0.3028
(107.4)	(3.8)	(0.9)	(0.9)	(0.9)
Kenya	-0.3620	-24.9784	8.5651	-0.7426
(34.7)	(19.7)	(1.4)	(1.4)	(1.4)
Morocco	-0.1058	18.3168	-5.6307	0.4303
(33.2)	(6.4)	(1.8)	(1.8)	(1.9)
Madagascar	-0.4097	-13.9023	4.5729	-0.3863
(18.6)	(21.2)	(1.3)	(1.2)	(1.1)
Senegal	-0.4061	75.4063	-25.9275	2.2149
(12.0)	(22.4)	(0.9)	(0.9)	(0.9)
Mali	-0.3364	-13.4095	4.7013	-0.4224
(11.7)	(15.6)	(0.3)	(0.3)	(0.3)
Nicaragua	0.06663	13.6844	-3.6660	0.2447
(5.6)	(4.1)	(2.0)	(1.9)	(1.7)

[13] "Without" and "With" refers to whether slope modifiers are present in the regression. The coefficients for "without" are taken from Annex Table A-4, whose "overall" coefficients are summarized in Table 2.

VI. The Scope for Country-Specific Policies to Alter the Path of Structural Transformation

The uniqueness of some country paths of structural transformation and the distinct patterns seen earlier for Asia suggest that country-specific policies have the potential to alter not just the rate of economic growth, a result that is well known, but also the structural character of that growth. That potential has sparked a flurry of interest in the determinants of "pro-poor growth," defined to mean rapid economic growth that reaches the poor in at least proportionate terms (Besley and Cord, 2007).

This monograph is no place to review this entire debate, but it is possible to examine the impact on the structural transformation of policy choices in one especially important area—agricultural prices. The key role of the agricultural terms of trade (AgToT) in conditioning the path of structural change has already been discussed at some length. But these are the *actual* terms of trade reflected in an economy, not necessarily those desired by policy makers. It is possible to go a step further to examine those policy desires, what drives them, and their impact.

Most agricultural price policies are implemented through either trade interventions or subsidies. The goal here is *not* to understand the realities of actual agricultural trade policies—as designed and implemented. For that, the update of the classic Krueger, Schiff, and Valdez (1991) study of agricultural price distortions being led by Kym Anderson is providing much valuable information (Masters, 2007; Anderson, forthcoming). Instead, the goal of this section is to examine how agricultural price policy evolves over the long-run process of structural transformation.

In this analysis, the agricultural to non-agricultural terms of trade (AgToT) are used as a starting point to find a quantifiable proxy for desired agricultural trade policy. As noted, the AgToT can be calculated easily as the ratio between the GDP deflator for agricultural value added in national income accounts and the GDP deflator for value added in the rest of the economy. As a result, the analysis focuses exclusively on the *price effects* of agricultural trade policy and does not analyze quantity effects separately.[14] Thus the emphasis is on understanding desired domestic agricultural price policy and its quantifiable impact, with the mechanics of implementation largely ignored.

Of course, agricultural price *policies* are only one of the many variables that influence the actual domestic AgToT. However, many of the influencing variables are beyond the direct influence of policy makers, such as the real exchange rate, international commodity prices, and the changing structure of the economy during economic development (Timmer, 1984). Agricultural trade policies are, by design, things policy makers can change according to their priorities. When we control for the exogenous factors over the process of development, the changing level and impact of agricultural price policies can be identified. That is the approach taken here.

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[14] Quantity effects that impact food consumption are often more important for food security and nutritional well-being than price effects that are measured in markets. Such effects are not the main focus of the analysis here. See Timmer (2005a) for treatment of the food security dimensions.

A. Agricultural Price Policy during the Structural Transformation: The Empirical Link via the Structural Gini

Agricultural prices clearly influence the path of structural transformation. But how are agricultural prices set? The argument here is that political pressures caused by a rising gap between incomes in the agricultural and non-agricultural sectors leads policy makers to improve incentives for agricultural producers. That is, there is a link between sectoral income distribution and policy response, in the form of changes in the agricultural terms of trade.

Two steps are required to test the significance of this link empirically. First, in order to create a price variable that reflects *intentions* of policy makers, the AgToT series for each country needs to be "purged" of impact from prices in world markets, over which individual countries have little or no control. As was noted above, the Year coefficients in the overall AgToT regression explain just 20 percent of total variance in the AgToT variable, but this assumes all countries have the same relationship with world prices. Thus the first step is to relax that assumption and generate a new AgToT series that is net of those prices, a variable that is termed the "domestic policy agricultural terms of trade," or DomPolAgToT for short.[15]

The second step is to explain the variance in this new domestic price policy variable. The hypothesis is that widening sectoral income inequality is a major driver of domestic policy formation, and this is tested by making DomPolAgToT a function of agGAPshr (equal to the negative of the sectoral Gini coefficient). An obvious concern is that domestic agricultural prices appear in some form on both sides of this regression, which should cause a positive bias in the estimated coefficient. But the hypothesis calls for a negative coefficient (because of how agGAPshr is defined). Fortunately, the full fixed-effect model has a large and significantly *negative* coefficient, so the concern over endogeneity bias is alleviated.

Creating DomPolAgToT

Annex Table A-5b shows that the annual average terms of trade variable is significantly related to three key price series from world markets—a food price index, an index of agricultural non-food raw materials, and real crude oil prices—with a +,-,- pattern to the signs. Varying economic structures and levels of development, however, would suggest that not all countries will follow this pattern. Since the interest here is in country-specific policy initiatives to cope with the pressures of changing income distribution during the structural transformation, it is necessary to let each country have its own response to this set of world prices.

The results are, predictably, complex and heterogeneous. Instead of just 20 percent of the variance in domestic AgToT being explained by common world prices (see Annex Table A-5a), the *median* R-squared for the 84 countries run separately is about 0.59. The most common

[15] Clearly, the extent to which world commodity prices are passed through into domestic economies and price formation is also a matter of domestic trade policy (and the capacity to enforce it—an early observer, noting the thousands of islands and small harbors close to other countries in Southeast Asia, said that "God meant Indonesia for free trade."). The technique used here to construct DomPolAgToT allows for each country to have its own response to world prices.

pattern of response to these three world prices remains +,-,- and 29 countries have three significant coefficients with this pattern.[16]

There are 20 countries with just two significant coefficients and 19 countries with just one significant coefficient, with no visible pattern as to which variable is consistently more significant. Interestingly, there are 12 countries with no significant price coefficients at all.[17] Clearly, there is a very wide response of individual countries to the array of prices they face in world markets.

The distribution of *t*-values for the three coefficients for the 84 countries in the analysis (Ireland is excluded to avoid an identity matrix) shows the tendency for a +,-,- pattern of coefficients, but also substantial diversity around this pattern:

Variable	Median *t*-Value	Number of Significant Coefficients	
Food prices	2.0	42 +	5 -
Agric. Non-food prices	-4.1	13 +	52 -
Crude oil prices	-1.7	6 +	38 -

With these statistical results in hand, it is possible to generate a predicted value of each country's agricultural terms of trade for each year. From this new series two alternative versions of a variable reflecting just the domestic policy influence on the terms of trade are created, as follows (resAgToT is the residual when the actual AgToT is subtracted from the predicted value):

DomPolAgToT(difference) = resAgToT + 100

DomPolAgToT(ratio) = (predicted ToT / actual ToT) x 100

Both series are roughly centered on 100, and neither has a distinguishable time trend, which was captured by the strong time trends in all three world price series. For simplicity, the following discussion uses the DomPolAgTot(ratio) variable, but the results from DomPolAgToT(difference) are similar (and even more significant), and are discussed in the analysis of Asia/non-Asia differences.

One additional result from this process is worth noting. As expected, there is a reasonably close relationship between the explanatory power of each country's regression on the three world prices (R-squared, which is a rough measure of how closely domestic commodity prices follow world prices) and the combined significance of the three coefficients. But the rank orders are not always the same, and for some countries the divergence is substantial.

[16] An additional three countries (Burkina Faso, China and Pakistan) have three significant coefficients with a -,+,+ pattern (the opposite of the main pattern), and Costa Rica has three significant coefficients with a +,-,+ pattern.

[17] These are Algeria, Cote d'Ivoire, Ethiopia, Guatemala, Iran, Malawi, Nicaragua, Nigeria, Senegal, Tunisia, Zambia, and Zimbabwe. The dominance of African countries in this set is striking.

For example, when "R-square rank minus Sum|*t*| rank" is calculated, seven countries have a positive difference of 15 rank points or higher.[18] At the other end of the spectrum, ten countries have a negative difference of 15 rank points or higher.[19] Do these extremes tell us anything about factors influencing the domestic agricultural terms of trade in these countries?

It is tempting to argue that countries with highly significant coefficients on world prices, but relatively low explanatory power in explaining the overall domestic terms of trade (i.e. the countries listed in footnote 19) have open commodity markets but a number of other policy instruments, including subsidies and *ad valorem* tariffs (that permit variations in world prices to be transmitted, although levels are different). This is speculative, of course, and the presence of South Korea and Japan on the list, with their tight controls over many agricultural imports, suggests other factors are at work as well. Thus the DomPolAgToT may be one important factor in formation of domestic agricultural price policy, but there are others as well.

Explaining the formation of DomPolAgToT(ratio)

It has taken several steps, both logically and statistically, to reach this stage. But the results are worth the effort. In its simplest specification, the question is whether domestic policy makers are influenced by changing sectoral income distribution during the structural transformation, and whether this influence can be seen in the formation of the "domestic policy" agricultural terms of trade.

The most persuasive result is the simplest:

DomPolAgTot(ratio) = Year effect + Country effect + a x agGAPshr.

As Annex Table 10 shows in detail, 21 of the year coefficients for this regression are significant, 45 of the country coefficients are significant, and the coefficient on agGAPshr is -51.512 with a *t*-statistic of 11.4. This is equivalent to an elasticity of about 0.25 at mean values of DomPolAgToT(ratio) and agGAPshr. *This full fixed effects model shows a highly significant response of domestic policy makers to changes in the sectoral distribution of income, after controlling for year and country effects.*

The adjusted R-squared is only 0.17, but as was noted, many other considerations are likely to go into the formation of domestic price policy, including political structure, that are not included here. In addition, substantial "noise" in this variable is to be expected given the way in which it was constructed, as a residual from the regression of year- and country-specific agricultural terms of trade on world prices for food, agricultural non-food raw materials, and oil.

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[18] In increasing order of disparity, the countries are Benin (18), Venezuela (20), Papua New Guinea (25), Sri Lanka (25), Rwanda (27), Indonesia (32) and Syria (50). Papua New Guinea has only one significant coefficient; the rest have two.

[19] These countries are Norway (-16), Turkey (-16), South Korea (-17), Paraguay (-18), Brazil (-20), Pakistan (-22), Philippines (-22), Japan (-27), Thailand (-27), and Dominican Republic (-31). All of these countries have three significant coefficients with +,-,- pattern, except for Norway, where the third coefficient is only marginally significant (and negative), and Pakistan, which has a significant -,+,+ pattern.

The year and country coefficients exhibit significant patterns with respect to time (for the year coefficients) and with respect to real per capita incomes in 2000 (for the country coefficients). In both cases, the relationship is positive (see the figures following Annex Table A-10). Thus DomPolAgToT(ratio) is increasing over time, independently of what is happening to the sectoral distribution of income. But Figure 3 has also shown that the turning point in the GAP relationship with respect to real per capita incomes is rising rapidly (thus sectoral income distribution is deteriorating), so domestic policy formation is stimulated by both factors.

In addition, the figure following Annex Table A-10 shows that richer countries do more to protect their agricultural sectors, in the form of higher values of DomPolAgToT(ratio), than poorer countries, even after controlling for the time effect and the pressures from the sectoral Gini itself. This overall pattern has been well-known for some time (Lindert, 1991), but disaggregating it into these three sources of policy motivation is new.

From this more disaggregated perspective, agricultural protection can be seen to be a modest economic "necessity," as the income elasticity implied in the figure following Annex Table A-10 is positive but less than one. For the countries in this sample, this income elasticity is about 0.055. This is a small, but significant, income elasticity for this "pure" form of agricultural protection.

B. Is the Asian experience different with respect to agricultural policy?

Somewhat ironically, the response of Asian countries to the growing gap in labor productivity between the agricultural and non-agricultural sectors is less sensitive than in non-Asian countries (see Annex Tables A-11 and A-12). For comparison, results are shown for both DomPolAgToT(ratio) and DomPolAgToT(difference). As noted earlier, the results are actually stronger for the difference form of the variable, but all the results are consistent and significant.

The irony, of course, is that Asian countries have used agricultural price policy very aggressively to protect their farmers, especially in the rapidly growing countries of East Asia (Anderson, 1986). Their agricultural terms of trade declined at only half the rate as for non-Asian countries, despite being subject to the same global market forces (see Figure 5). But the very speed of the Asian transformation, and the greater concentration on raising productivity of small farmers, means that the actual coefficient of policy response to the agGAPshr variable (the sectoral Gini) is smaller.

Recall that the turning point for the agGAPshr regression for Asian countries was just $1,663 compared with a turning point of $11,329 for non-Asian countries (see column C-4 in Annex Table A-9). Asian countries devoted greater policy attention to agriculture across the board, and had the advantage of more equal landholdings than in most other countries. As a result, Asian countries were able to generate a far more rapid and equitable pattern of economic growth (there are several exceptions, the Philippines being perhaps the most obvious). The sheer pace of growth created great political pressures to assist agriculture during the transformation process, but in comparative terms non-Asian countries had to resort to price policy interventions more heavily in response to rapidly worsening income distribution from less rapidly growing

economies. That is, the economies of Asian countries responded more flexibly to movements in their agricultural terms of trade, which somewhat paradoxically meant that Asian policy makers could respond somewhat less aggressively to a growing gap in sectoral incomes. They had kept the gap from growing too fast in the first place.

This effect can be seen even more clearly when both components of the agricultural terms of trade are included separately in the standard structural transformation regressions, for Asia and non-Asia (see Table 7). That is, the "world price" component (Predicted AgToT) and the domestic policy component (DomPolAgToT(did)) are included separately to see their impact on agEMPshr and agGDPshr. The difference in the coefficients between these two regressions is then calculated as agGAPshr to see the net effect on the structural Gini coefficient.

The results are not surprising in view of what has already been reported, but they are powerful nonetheless. In Asia, the Predicted AgToT has a positive and significant impact on *both* agEMPshr and agGDPshr, with a net coefficient of 0.001336 for agGAPshr. Because agGAPshr is defined in a way that it is negative for nearly all observations, the net impact of higher world agricultural and energy prices in Asian countries (through their impact on the overall domestic agricultural terms of trade) is to *reduce* the level of income inequality.

In sharp contrast, the impact of DomPolAgToT is negative, although the coefficient on agEMPshr is not significant. Reverse causation seems to be the only plausible explanation for such an impact, with worsening sectoral income distribution actually causing domestic agricultural policy to respond with greater price incentives. This, as was seen in the overall results above, is precisely what seems to be happening.

As before, the non-Asian countries have a reversed pattern of signs from Asia for the agEMPshr regression, and the same signs but smaller coefficients for the agGDPshr regression. The net effect on agGAPshr is for both coefficients to be about half the magnitude as in Asia. Thus, when price effects are disaggregated into their global and domestic components, Asian countries are seen to be more responsive than non-Asian countries to both.

The broader role of agriculture revealed in these patterns extends well beyond agricultural price policy, and it clearly is powerful enough to influence the basic patterns of structural transformation. It is important, then, to understand what role agriculture actually plays on the way to its virtual disappearance as a share of the economy. It turns out that a "world without agriculture" cannot happen without first investing in the sector in financial and policy terms. What needs to be done is the subject of the following sections.

Table 7. The separate impacts of the predicted agricultural terms of trade based on world prices, and the residual domestic agricultural terms of trade that reflect policy preferences, for Asia and non-Asia separately

Asia

Impact of the specified agricultural terms of trade on...

	AgEMPshr	**AgGDPshr**	**AgGAPshr**
Predicted AgToT	0.000590	0.001926	0.001336
(*t*)	(7.1)	(30.2)	
DomPol AgToT(dif)	-0.000138	-0.001563	-0.001425
(*t*)	(1.2)	(17.7)	
Adj R sq	0.9854	0.9772	

Non-Asia

Predicted AgToT	-0.000163	0.000604	0.000767
(*t*)	(7.4)	(21.9)	
DomPol AgToT(dif)	0.0000521	-0.000663	-0.000715
(*t*)	(1.8)	(18.7)	
Adj R sq	0.9886	0.9341	

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects. The agGAPshr coefficient is calculated as the difference between the agGDPshr and agEMPshr coefficients.

Source: Annex Tables 13 and 14.

VII. The Paradoxical Role of Agriculture in the Structural Transformation[20]

Historically speaking, the pathway out of poverty for most individuals and families has been along the structural transformation. This pathway involves higher labor productivity in the overall economy generally and convergence in labor productivity between agriculture and non-agriculture specifically. But with the decline in interest in agriculture in the 1980s came a concomitant decline in efforts to understand the continuing role of the sector in both economic growth and poverty reduction. Now, four factors are renewing interest in agriculture.

The first new factor is a revolution in knowledge of basic genetic structures and mechanisms. One result of this knowledge is the development of agricultural biotechnology, but even without genetically modified organisms (GMOs), the genetic revolution will push out the frontier of agricultural productivity dramatically (Naylor and Manning, 2005; FAO, 2004; Timmer, 2003; Mew et al., 2003). Many of these productivity gains can be in developing countries, where they are needed most. In particular, there is a real opportunity to increase productivity of many neglected and secondary crops that have been by-passed by mainstream agricultural research, concerned as it is with improving productivity in the main food staples, rice, wheat and corn. These "orphan" crops, such as millets, sorghums, cassava and other root crops, provide the main sustenance for millions of poor households, especially in Africa (Naylor, Falcon, et.al., 2004)

Second, even in poorer developing countries a supermarket revolution is transforming food retail markets, and the supply chains that provision them, at a faster pace than anyone imagined at the turn of the millennium (Reardon et al., 2003; Hu et al., 2004; Reardon and Timmer, 2007). There are important new opportunities for farmers in these countries to diversify out of low-value crops into new commodities with greater demand potential, and thus to capture some of the value added being generated by supermarkets. The strict quality, safety, hygiene, and labor standards demanded by supermarkets are a severe challenge to participation by small farmers and there is concern that rural poverty might worsen as supermarkets expand, but connecting farmers more directly to changing consumer demand offers real hope as well.

Third, the understanding of determinants of poverty and the mechanisms for reducing it in a sustainable fashion has also undergone a quiet revolution in the past decade. Part of this understanding is recognition that economic growth is the main vehicle for reducing poverty, but for this to work the distribution of income must not deteriorate too sharply. In many circumstances, growth in the agricultural sector has been an important ingredient in the formula that connects economic growth to the poor (Ravallion and Huppi, 1991; Ravallion and Datt, 1996; Ravallion and Chen, 2004; Sumarto and Suryahadi, 2003; Fan, Zhang and Zhang, 2004; Fan, Thorat and Rao, 2004; Timmer, 1997, 2002, 2004a, 2005a; World Bank, 2007). As the international community focuses on policies and investments needed to meet the Millennium Challenge Goals by 2015, the basic fact that most of the poor and hungry are in rural areas has renewed attention to stimulating rural economic growth (Ravallion, Chen and Sangraula, 2007; World Bank, 2007). Agriculture will play a key role in this effort (see Figure 6).

Finally, increased demand for agricultural commodities— food staples such as cereals and vegetable oils, as well as for industrial raw materials to feed bio-fuel processing plants—has

[20] This section draws on Timmer (2005b).

pushed up prices across the board. This increased demand comes partly from rapid economic growth in a number of large countries, especially China and India. However, continued high energy prices since 2005 and growing consensus that immediate steps must be taken to slow the pace of climate change have also stimulated an investment boom in bio-fuels. Historically, periods of high agricultural commodity prices have stimulated a large supply response, with prices resuming their long-run downward trend. But the new demand from economic growth does not look temporary, and the political forces behind investments in bio-fuel plants suggest that high commodity prices—and the interest in profiting from them through greater agricultural production—may last for many years (Naylor, et al., 2007; World Bank, 2007).

The focus in this section is on understanding the role that growth in agricultural productivity has on poverty reduction. The sources of that growth are likely to be sharply different in the next several decades than they were in the past—less reliance on area expansion and new irrigation investments; more reliance on modern biology to develop greater yield potential and on improved management techniques that will be highly site-specific. Climate change will almost certainly be a significant challenge to plant breeders and farmers alike. The pace of supply response to the new demand environment is highly uncertain in 2008, although historical evidence is reasonably reassuring over the medium- to long run (FAO, 2004: Naylor and Manning, 2005; World Bank, 2007).

A. The historical debate over the role of agriculture

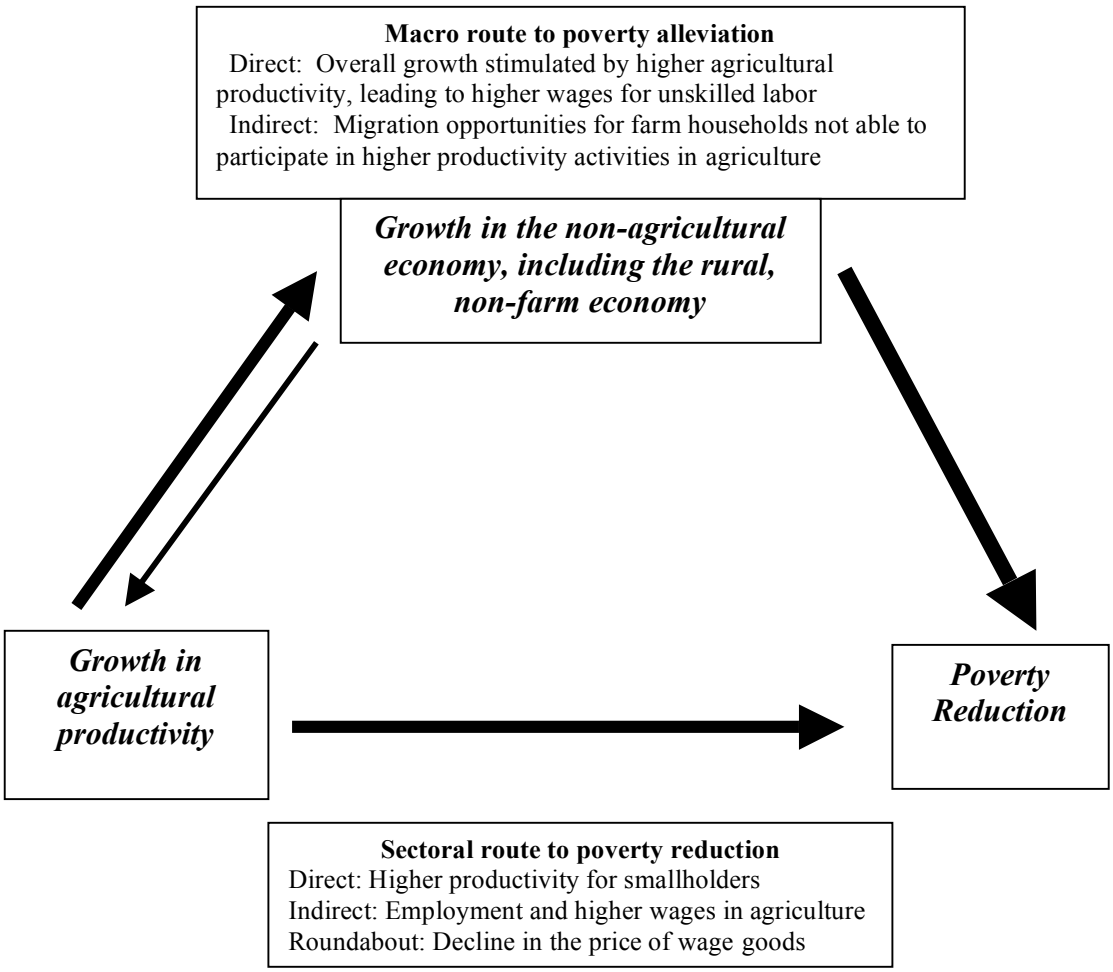
Earlier literature stressed the direct impact on poverty reduction that comes from rising rural wages and incomes. Most of the world's poor live in rural areas, or migrated from them in search of better opportunities. It seems almost obvious that growth in agricultural productivity is the surest way to end poverty. The historical evidence confirms this logic. Growth in agricultural productivity not only can increase farm incomes, it also stimulates linkages to the non-farm rural economy, causing economic growth and rapid poverty reduction, with overall growth multipliers almost always significantly greater than one (Hazell and Haggblade, 1993).

> Nonfarm linkages generated by technical change in agriculture can enhance both growth and its poverty-reducing effect. A growing agricultural sector demands nonfarm production inputs, and supplies raw materials to transport, processing, and marketing firms. Likewise, increases in farm incomes lead to greater demand for consumer goods and services. Besides stimulating national economic growth, these production and consumption linkages affect poverty and spatial growth patterns, particularly when agricultural growth is concentrated on small and medium-size farms (Johnston and Kilby, 1975; Mellor, 1976; and Mellor and Johnston, 1984). [Hazell and Haggblade, 1993, p. 190]

But with more open trade possibilities, low prices for staple cereals in world markets, and population growth slowing, the size and relevance of these linkages are no longer so clear. Agriculture must be dynamic and profitable if it is to help reduce rural poverty, and growing staple cereals has not been a source of dynamism in rural economies for two decades. A profitable agriculture with rising productivity will now depend on diversification into crops and livestock with better demand prospects than for cereals, and into production for the agri-business

sector, which can add value through processing and enhanced consumer appeal. The debate at the moment is whether the new demand environment alters or even reverses these arguments.

Figure 6. Routes through which agriculture contributes to poverty reduction



Issues: How do the five "**GISTE** change agents" influence these relationships? These include:

- **G**lobalization (liberalization, long-run fall in the international price of staples)
- **I**nstitutional innovations (new financial products, participatory approaches).
- **S**upply chain management (economies of scale in retailing)
- **T**echnological innovations (IT, biotechnology)
- **E**nergy prices (and the potential demand for bio-fuels to raise permanently the price of agricultural commodities)

These **GISTE** changes have implications for agricultural growth, for the relationship between growth in the agricultural sector and in the non-agricultural sector, and for the poverty reduction value of agricultural growth through both the sectoral and macro routes.

B. Rural diversification as the conceptual framework

A sequence of progressively broader diversification steps defines a successful agricultural transformation that is part of a broader structural transformation (Timmer, 1988). In countries where farm sizes are small and likely to remain that way for decades because of population pressures and insecure property rights, diversification from production of staple grains to higher-valued commodities will be the first step in this process. The next step will be to move beyond basic commodity production in order to access value-added supply chains for the modern retail sector, especially supermarkets, where the value-added comes in the form of quality, timeliness, food safety, and labor standards in production. These are highly management-intensive factors and may well contribute to economies of scale in production that are not seen in commodity production alone (Timmer, 2004b; Reardon and Timmer, 2007).

The next step is the diversification of the rural economy itself, from being primarily driven by its agricultural base to depending more on industrial and service sectors as the base for rural economic growth. This step seems feasible only when population densities permit substantial clusters of activities that feed on themselves for inputs and demand for output (Hayami and Kawagoe, 1993; Lanjouw and Lanjouw, 2001). Thus the effectiveness of the model proposed by Mellor (1976, 2000) of demand for labor-intensive, rural non-tradables as the vehicle for pro-poor growth, driven by agricultural profitability and wages from labor-intensive exports, would seem to be conditional on good rural infrastructure and human capital, and hence seems to be limited to Asia, parts of coastal and highland Africa, and several countries in Latin America and the Caribbean. At the same time, good rural infrastructure *reduces* the relative importance of non-tradables in local economies and increases competitive pressures from world markets. It is precisely this tension that raises doubts about the future potential for agriculture to be an important driver in poverty reduction, even in rural areas (DfID, 2004).

Where rural diversification is not economically feasible, the alternative to diversification out of agricultural commodity production will be the transition of economic activity from rural to urban areas. In this transition, the importance of migration (and remittances) will be critical. It is really quite astonishing how little attention is paid to facilitating the migration of rural workers to urban jobs when investments in the rural economy have low payoffs.[21] One of the main justifications for investing in rural schools and public health facilities is to improve the competitiveness of rural migrants to urban areas.

Whatever the stage or dimension of rural diversification, it must be driven by market demand. Since the 1970s, the development profession has identified "market demand" with border prices and international trade, on the assumption that domestic markets are saturated, politically manipulated, or not remunerative for producers of higher quality products. This focus on international trade has allowed a revolution in food marketing in developing countries to go virtually unnoticed until several years ago, the extensive consolidation of the food retail sector and the rapid rise of supermarkets. The revolution has already created a challenge to higher rural incomes because the process has a tendency to have such high standards for quality, safety,

[21] The World Bank's *Directions in Development: Agriculture and Poverty Reduction* barely mentioned the topic (World Bank, 2004d), although it receives extensive attention in the *World Development Report, 2008: Agriculture for Development* (World Bank, 2007).

hygiene and farm labor practices that many of a country's own farmers are excluded from the supply chains that provision their consumers, even poor consumers (Reardon et al., 2003; Timmer, 2004b; Timmer and Reardon, 2007).

In the ultimate stage of rural diversification, globalization permits procurement officers to source food supplies from anywhere in the world, so local farmers compete not just against each other for local consumers, they compete against the global market. But farmers increasingly also have access to the global market if they are the low-cost producer meeting global standards. The future of agricultural development will depend on putting productive new technologies in the hands of farmers and creating an open market environment to make the resulting production as profitable to farmers as employment opportunities in other sectors. Where that development is not possible, *and there will be many environments where it is not*, rural poverty will only be solved by migration to alternative opportunities, usually in urban areas.

Where the strategy does work, diversifying the rural economy will be the key to increasing income opportunities. Placing rural diversification at the center of agricultural and rural development means there are two quite different tasks that need to be managed simultaneously: (a) raising the productivity of staple food crops for those farmers who continue to grow them; and (b) using the low costs of these staple foods as "fuel" for the agricultural diversification effort, including as the wage good for workers and as feed for livestock (and possibly also as raw materials for the bio-fuel industry).

In low-income Asia, diversification will depend on continued availability of low-cost rice, especially in rural markets. In Africa and Latin America, having cheap corn, wheat and rice available in rural markets will be important if diversification is to be successful. Low-cost staple foods are also important to the poor directly, because they devote such a large share of their budget to them, and indirectly, because low real wages, made possible by cheap food staples, make labor-intensive activities more profitable. Making substantial progress on both of these "rural" tasks will be among the most "pro-poor" things the development community can hope to accomplish between now and the target date for the Millennium Development Goals in 2015.

C. The role of agriculture

The role of agriculture in economic development is complicated and controversial, despite a long historical literature examining the topic (Johnston and Mellor, 1961; Hayami and Ruttan, 1985; Mundlak, 2000; Timmer, 2002). Part of the controversy stems from the structural transformation itself, which is a general equilibrium process not easily understood from within the agricultural sector (Timmer, 1988). Over long historical periods, agriculture's role seems to evolve through four basic stages (see Figure 7): the early "Mosher" stage when "getting agriculture moving" is the main policy objective (Mosher, 1966); the "Johnston-Mellor" stage when agriculture contributes to economic growth through a variety of linkages (Johnston and Mellor, 1961); the "T.W. Schultz" stage when rising agricultural incomes still fall behind those in a rapidly growing non-agricultural economy, inducing serious political tensions (Schultz, 1978); and the "D. Gale Johnson" stage where labor and financial markets fully integrate the agricultural economy into the rest of the economy (Johnson, 1997; Gardner, 2002). These stages were first proposed in Timmer (1988) and are developed in the context of more recent experience in the World Bank's

treatment of the role of agriculture in poverty reduction (World Bank, 2004d, 2007). Efforts to "skip" the early stages and jump directly to a modern industrial economy have generally been a disaster.

Another reason for controversy over the role of agriculture stems from the heterogeneity of agricultural endowments and the vastly different cropping systems seen in Latin America, Africa and Asia (not to mention the diversity within these regions). It is unrealistic to expect much of a common role in such diverse settings. When coupled with the enormous differences in stage of development around the world, and hence the vastly different roles that agriculture plays in economies at different levels of economic maturity, it is easy to understand why there is so little common ground in academia or the donor community on the role of agriculture in economic development. Bravo-Ortega and Lederman (2004) document clearly the different contributions of agriculture to national welfare across these various categories.

There does seem to be widespread agreement in the literature on the basic linkages connecting agriculture and overall economic growth that were first articulated to a general economics audience by Lewis (1954) and Johnston-Mellor (1961). At a conceptual level, these linkages have long been part of the core of modern development theory and practice (Timmer, 1988; 2002). Establishing the empirical value of these linkages in different settings has been a cottage industry since the early 1970s (Byerlee, 1973; Mellor and Lele, 1973; King and Byerlee, 1978; Hazell and Roell, 1983; Haggblade, Hammer and Hazell; 1991; Hazell and Haggblade; 1993; Timmer, 1997; Delgado, Hopkins and Kelly, 1998; Fan, Hazell and Thorat, 2000; Fan, Zhang and Zhang, 2002; Fan, Thorat and Rao, 2004).

Virtually all of these studies conclude that the "agriculture multiplier" is significantly greater than one, especially in relatively closed, "non-tradable" economies of the sort found in rural Africa, where the multiplier is often between 2 and 3. But even in the more open economies of Asia, where rice was more tradable than most African staple foods and local prices more easily reflected border prices, the agriculture multiplier is close to 2 in the early stages of agricultural modernization when productivity gains are the fastest. Because economic growth usually has a direct impact on poverty, any contribution agriculture makes to speeding overall economic growth through these large multipliers will, in most circumstances, also directly contribute to reducing poverty (Dollar and Kraay, 2002; World Bank, 2004a; Besley and Cord, 2006).

Despite the potential impact of these large multipliers, a combination of market failures and political biases led to a systematic undervaluation of output from rural economies. Correcting these biases can have economy-wide benefits. The historic bias against the rural sector in developing countries left them starved for resources and discriminated against by macro economic and trade policies (Lipton, 1977; Timmer, 1993). Failures in rural credit and labor markets – some of which can cause "poverty traps" – have provided the analytical context for much of modern neoclassical development economics (Dasgupta, 1993). But even global commodity markets for many products from developing countries "fail" in the sense that agricultural surpluses from rich countries are dumped there, depressing world market prices below long-run costs of production.

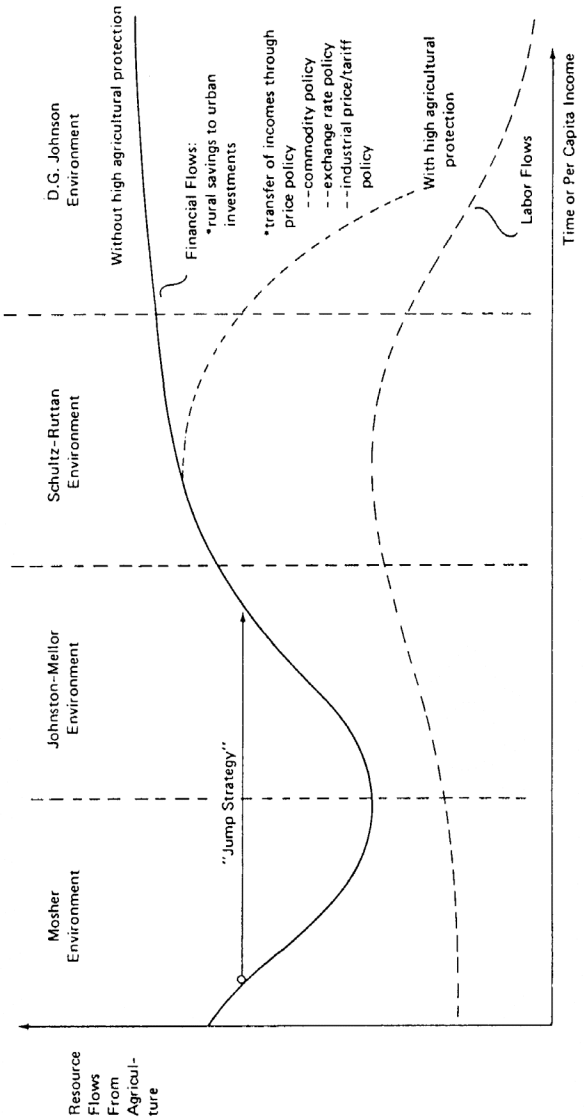


Figure 8.1. Changing environments for agriculture's contribution to economic growth.

Figure 7 (Source, Timmer, 1988)

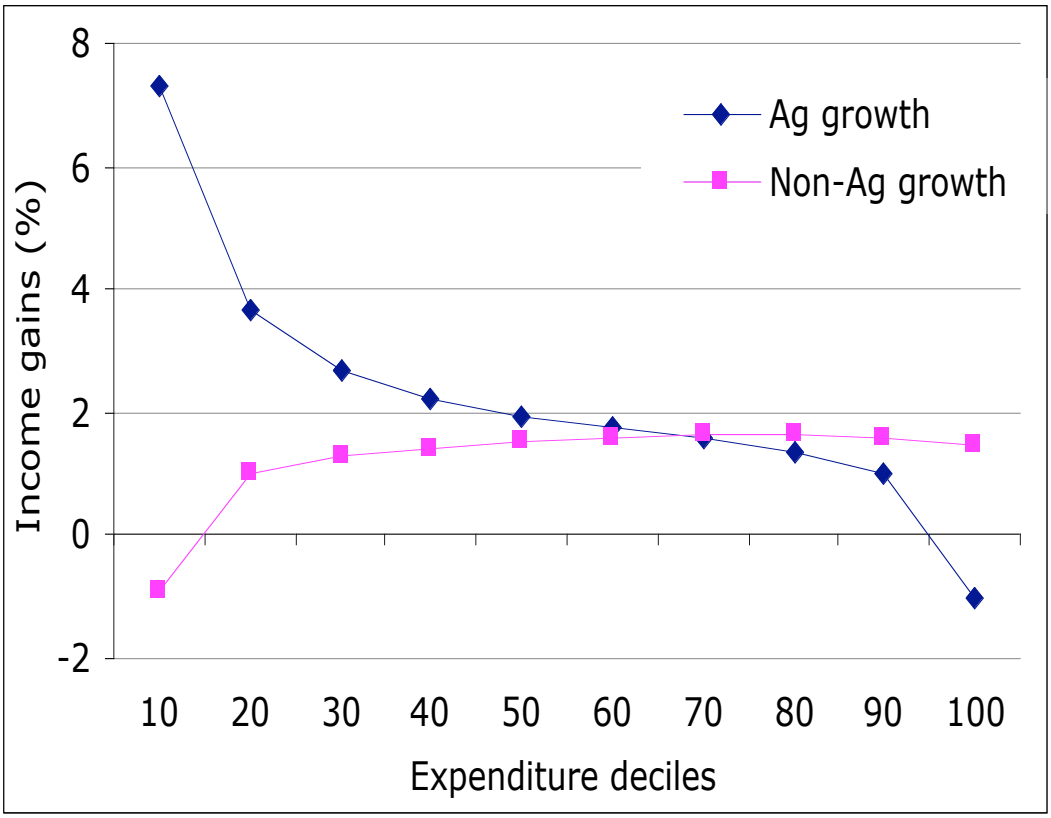
A final set of linkages makes growth originating in the agricultural sector tend to be more "pro-poor" than it would be if the source of growth came from the industrial or service sectors (Mellor, 1976; Ravallion and Datt, 1996; Ravallion and Chen, 2004; Timmer, 1997, 2002). New agricultural technologies that improve farm productivity strengthen this connection. Separate reviews by Thirtle, et al. (2004) and by Majid (2004) confirm the strong empirical link between higher agricultural productivity and poverty reduction, as does research conducted for the World Bank's *World Development Report, 2008: Agriculture for Development* (see World Bank, 2007 and Figure 8).

Direct contribution to economic growth via Lewis linkages.--The "Lewis Linkages" between agriculture and economic growth provide the non-agricultural sector with labor and capital freed up by higher productivity in the agricultural sector. These linkages work primarily through factor markets, but there is no suggestion that these markets work perfectly in the dualistic setting analyzed by Lewis (1954). Chenery and Syrquin (1975) argue that a major source of economic growth is the transfer of low-productivity labor from the rural to the urban sector. If labor markets worked perfectly, there would be few productivity gains from this structural transfer, a point emphasized by Syrquin in more recent work (Syrquin, 2006).

Indirect contributions to economic growth via Johnston-Mellor linkages.--The "Johnston-Mellor Linkages" allow market-mediated, input-output interactions between the two sectors so that agriculture can contribute to economic development. These linkages are based on the agricultural sector supplying raw materials to industry, food for industrial workers, markets for industrial output, and the exports to earn foreign exchange needed to import capital goods (Johnston and Mellor, 1961). Again, for the Johnston-Mellor linkages as with the Lewis linkages, it is difficult to see any significance for policy or economic growth unless some of the markets that serve these linkages are operating imperfectly (or, as with many risk markets, are missing altogether). That is, resource allocations must be out of equilibrium and face constraints and bottlenecks not immediately reflected in market prices if increases in agricultural output are to stimulate the rest of the economy at a rate that causes the "contribution" from agriculture to be greater than the market value of the output, i.e. the agricultural income multiplier is greater than one (Timmer, 1995).

Roundabout contributions from agriculture to economic growth.--Writing in the mid-1960s, Mosher was able to assume that "getting agriculture moving" would have a high priority in national plans because of its "obvious" importance in feeding people and providing a spur to industrialization (Mosher, 1966). That assumption has held only in parts of East and Southeast Asia, and has been badly off the mark in much of Africa and Latin America. In the latter regions, a historically prolonged and deep urban bias led to a distorted pattern of investment. Too much public and private capital was invested in urban areas and too little in rural areas. Too much capital was held as liquid and non-productive investments that rural households use to manage risk. Too little capital was invested in raising rural productivity.

Figure 8. Income gains from agricultural and nonagricultural growth shift as income increases



Source: Ligon and Others (2006), as cited in *World Development Report 2008*.

Such distortions have resulted in strikingly different marginal productivities of capital in urban and rural areas. New growth strategies--such as those pursued in Indonesia after 1966, China after 1978, and Vietnam after 1989--altered investment priorities in favor of rural growth and benefited from this disequilibrium in rates of return, at least initially. For example, in Indonesia from the mid-1960s to the mid-1990s, farm GDP per capita increased by nearly half, whereas it had declined from 1900 to the mid-1960s. In China, the increase from 1978 to 1994 was nearly 70 percent, whereas this measure had dropped by 20 percent between 1935 and 1978 (Prasada Rao, Maddison and Lee, 2002). A switch in investment strategy and improved rates of return on capital increase factor productivity (and farm income) because efficiency in resource allocation is improved.

One explanation for more rapid and pro-poor economic growth as urban bias is reduced is provided by Mellor's model of agricultural growth, rural employment and poverty reduction that emphasizes the role of the rural non-tradables sector in pulling underemployed workers out of agriculture and into the non-agricultural rural economy. The Mellor model explicitly integrates manufactured export performance (the source of much dynamism in East Asia's economies since the 1960s) and the non-tradables sector in the rural economy (which includes a wide array of local agro-processing) to explain subsequent reductions in poverty. This model, drawing on Mellor's earlier work in India (Mellor, 1976) and more recently in Egypt (Mellor, 2000), explains why countries with substantial agricultural sectors that experienced rapid growth from labor-intensive manufactured exports had such good records of overall economic growth and poverty reduction.

An additional set of linkages focuses on more nebulous and hard-to-measure connections between growth in agricultural productivity and growth in the rest of the economy. These linkages grow explicitly out of market failures, and, if they are quantitatively important, government interventions are required for the growth process to proceed as rapidly as possible. The contribution of agricultural growth to productivity growth in the non-agricultural economy stems from several sources: greater efficiency in decision making as rural enterprises claim a larger share of output and higher productivity of industrial capital as urban bias is reduced; higher productivity of labor as nutritional standards are improved; and a link between agricultural profitability (as distinct from agricultural *productivity*) and household investments in rural human capital, which raises labor productivity as well as facilitates rural-urban migration.

Several of these mechanisms stand out as likely to be important (and potentially measurable) because they draw on the efficiency of decision making in rural households, the low opportunity cost of their labor resources, the opportunity for farm investment without financial intermediaries, and the potential to earn high rates of return on public investments that correct for urban bias. Each of these factors alone, as public investments and favorable policy stimulate growth in the agricultural sector, should cause an increase in the efficiency of resource allocation. In combination, these mechanisms should translate faster agricultural growth into measurably faster economic growth in aggregate, after controlling for the direct contribution of the agricultural sector to growth in GDP itself (Timmer, 2002).

One of the most visible determinants of poverty is hunger and malnutrition. The development profession continues to argue over the causation—whether hunger causes poverty or vice versa--

but hunger as a *measure* of poverty is widely established. Most poverty lines have an explicit or implicit food component. The evidence for nutritional poverty traps, where workers are too malnourished to work hard enough to feed themselves and their families, has strong historical roots (Fogel, 1991, 1994; Bliss and Stern, 1978; Strauss, 1986; Strauss and Thomas, 1998). But simple energy shortages cannot account for very much of the chronic poverty observed over the past several decades because the cost of raw calories, in the form of staple foods, has fallen too sharply relative to wages for unskilled labor (Johnson, 1997; Fox, 2002). If *inadequate food intake* is the primary cause of poverty, the solution would be in sight (and food aid could be an important part of the answer). If, however, *poverty* is the main cause of inadequate food intake, hunger will be much harder to end. In most countries, the domestic agricultural sector is likely to play a key role in ending hunger (and ready availability of food aid may well be part of the problem).

VIII. Managing the Structural Transformation to Avoid Hurting the Poor

It was noted more than two decades ago that a successful structural transformation has always been painful for rural households (Timmer, 1988). Although the structural transformation seems to offer the only sustainable pathway out of poverty in the long run, it can be a very challenging process for the poor in the short run. Is there any way to manage the process without hurting the poor? To answer the question, a historical perspective on the structural transformation is essential, especially the experiences in the countries of East and Southeast Asia that managed both rapid growth and stability or even improvement in income distribution during the process (World Bank, 1993; Ravallion and Chen, 2004; Timmer, 2004a).

Partly as a result of the World Bank's research project on pro-poor growth (World Bank, 2004a), a wealth of detail available in country studies and supporting documents helps illuminate this experience. Analysis of these materials suggests that an "Asian" pattern of rural development and poverty reduction exists (Oshima, 1987: Besley and Cord, 2006; Grimm, Klasen and McKay, 2007). The common structure involves the evolution of the agricultural sector from a starting point of household subsistence production, through the adoption of new technologies that provide surpluses and rural food security, to more diversified farm activities driven by commercial forces, and finally to the full integration of the agricultural economy into the overall economy.

This structural pattern can be examined from two directions: first, from the perspective of the main *policy concerns* shown by Asian countries at each stage, and the links between these policy concerns and the key economic drivers and mechanisms for change. Asia may have been unique in its early concern for food security, including for rural households, as the main policy focus that mobilized substantial resources on behalf of agriculture (Timmer, 2005a). The importance of rice in Asian food security, and the tenuous (and tense) relationship between domestic rice economies and the world market for rice, focused political and economic attention on agricultural productivity in ways not seen in other parts of the world.

For Asia, the Green Revolution technologies for wheat and rice transformed their potential for a domestic approach to food security. When this potential was fully realized, in Indonesia in the early 1980s, in India in the late 1980s, in Bangladesh in the early 1990s and in Vietnam in the mid-1990s, the policy concern turned to supporting farm incomes in the face of declining world prices for cereals. The "efficient" way to do this was through the next structural phase, into diversification and specialization, and Bangladesh seems to be moving in this direction. The more advanced regions in China are already well down this road. The alternative approach, however, is to maintain farm incomes by protecting the rice sector, using subsidies to keep inputs cheap, and thus to slow the diversification process. Both India and Indonesia are caught in this expensive and distortionary approach. It is impossible to move on to the stage of rapid productivity growth and integration into the overall economy as long as the diversification phase is postponed.

The second perspective on these structural changes is from the point of view of relations between the farm and rural non-farm sectors. None of the country papers spend much time on the rural non-farm sector, although the Indonesia paper stresses the importance of Mellor's model of non-

tradables production, mostly in rural areas, as the key to understanding the role of agriculture in pro-poor growth (Timmer, 2006, 2007). But the broader literature helps understand this role more clearly. In particular, there seems to be a structural transformation of enterprises in the rural non-farm sector that parallels that of agricultural enterprises, as they evolve from very small household-based enterprises into larger firms with "permanent" structures as the place of business. These permanent, rural non-farm enterprises were the fastest growing part of the Bangladesh economy in the 1990s (World Bank, 2004c).

All of the Asian countries are having a very difficult time transitioning from the "food security" to the "farm income" and on to the "rural productivity" objective for public policy (Timmer, 2005a). The difficulties are clearest in India and Indonesia, where the preferred policy mechanism is price protection and input subsidies, not diversification and commercialization. Similar pressures are evident in Bangladesh, Vietnam and China, but budget pressures and more successful diversification by the market have helped keep the structural retardation under control.

This retardation is seen most clearly in enterprise productivity in the rural non-farm sector. India and Indonesia are seriously lagging in this regard. China, because of its unique institutional history and experience with town and village enterprises (TVEs), seems to be in the vanguard of rural enterprise development. Bangladesh, because of sheer population density and shrinking agricultural land, is developing productive rural non-farm enterprises at a surprisingly rapid rate (World Bank, 2004c). There is little information on the topic in the Vietnam paper (Bonschab and Klump, 2004), but it does suggest that rural non-farm enterprises should become the leading source of rural employment growth in that country. The problem until now has been the socialist planning legacy and restricted property rights for owners of non-farm rural enterprises, especially if they appeared to compete with state-owned enterprises. Accordingly, Vietnam has focused more on an urban growth pole model than on diversified rural enterprises. As a consequence, rural to urban migration is a much larger factor in the poverty reduction story in Vietnam than it seems to be in the other countries studied.

Much of India's problem stems from the "structure" of its support to the rural economy, i.e. from the relative size of subsidies compared with investments, especially in roads and agricultural research (Fan, Thorat and Rao, 2004; World Bank, 2004b). The political economy of agricultural subsidies in a democracy is well understood, but India is the poorest country to try them on such an extravagant scale. The cost is not just to the budget, although that is high enough. The larger costs seem to be to the agricultural transformation itself, and hence to the structural transformation, which is the only long-run hope for India's poor.

The other "large" common theme across the papers with respect to the role of agriculture in pro-poor growth is the impact of food prices on poverty. In India, Indonesia, and Bangladesh, the story is consistent and unambiguous. Higher productivity in the food crop sector, especially in domestic rice production, led to lower relative food prices in both rural and urban areas, with very substantial impact on the poor. The India and Bangladesh papers argue that this mechanism may have been the leading contribution of agriculture to pro-poor growth, and any long-run reversal of the pattern would seriously hurt the poor.

The impact of rice prices on the poor in Vietnam is more complex. Much of Vietnam's rapid poverty reduction was driven *directly* by higher incomes in rice-producing households, stimulated to a large extent by the realignment of the exchange rate and consequently greater price incentives for production and export. In some sense, Vietnam's reforms transformed rice from a non-tradable to a tradable commodity, with large gains in efficiency and output. But regions less well situated for rapid expansion of rice production, and the poor in urban areas, were probably hurt by this new economic environment. Bonschab and Klump (2004) argue that much of the widening in income inequality across regions was because of differential potential for rice exports.

The Chinese story seems to be radically different. Ravallion and Chen (2004) show that poverty rates fall dramatically when rural producer prices are *higher*, implying that most of the rural poor have their net incomes directly and positively affected by food prices. Because of the nature of the Chinese food marketing system however, Ravallion and Chen argue that improving terms of trade for farmers is equivalent to removing a tax on their incomes and does not actually have a direct impact on food prices for consumers. If this is the case, then the Chinese example also follows the more general pattern in Asia where lower food prices directly benefit the poor.

A. The importance of the rural, non-farm economy[22]

Even when comparing five of the largest countries in the world, all of them rice-based food economies in Asia (with apologies to the wheat farmers in Bangladesh, China and India, and the maize farmers in poorer parts of most of these countries), it is striking how diverse they are, both at one time across countries and within a single country across time. This diversity extends to the role of agriculture in pro-poor growth, in three important ways.

First, the initial conditions and institutional settings for rapid gains in productivity varied enormously in the 1960s, when new rice and wheat technologies became available from the International Agricultural Research Centers (or from domestic centers in China). India had been investing heavily in irrigation, agricultural universities, land reform, and fertilizer production well before the Green Revolution, whereas Indonesia had virtually destroyed what little agricultural infrastructure remained when the Dutch were forced out. Bangladesh took over a decade to become a functioning country after independence in 1971. Vietnam was prone to famines before 1989 and imported rice to feed even its farm population. Opening its economy and stabilizing macro policy led to a surge in agriculture, but continued socialist controls on private ownership and market restrictions prevented a dynamic rural non-farm sector from emerging. Migration has become a leading source of poverty reduction in Vietnam. Despite the early success in China with TVEs, rural to urban migration has also been essential there to linking the poor to economic growth.

Second, despite all the temporal and cross section diversity, a common pattern of structural transformation can be seen. The Asian experience shows clearly that this *structural* transformation is driven by a successful *agricultural* transformation. In turn, the investments in agriculture needed for this transformation, in both policy and financial terms, were driven by a deep political concern for food security (Timmer, 2005a). The very integrity of the state was

[22] The new standard reference on the rural nonfarm economy is Haggblade, Hazell and Reardon, 2007.

threatened by hunger and famine, whether in democratic India, autocratic Indonesia, or communist Vietnam or China (although the communist countries certainly held out longer in the face of hunger and famine than did the more open societies). This concern for food security drove the transition from subsistence agricultural to rural food surpluses, thus alleviating rural poverty directly, and overall poverty through lower real food prices.

Third, diversity returns again at the next stage. None of these five countries has yet managed a successful transition from rural food security to rural productivity through diversification and commercialization. Some countries are more successful than others, as parts of China, Bangladesh, and areas on Java are responding quickly to the economic signals pushing in this direction. But almost uniformly, policymakers are resisting this transition, apparently because they fear a loss of food security as measured by the relative volume of rice imports.

A reader from outside Asia, seeking lessons for Latin America or Africa from these five countries, would be excused for being totally confused. Gains in food crop production, stimulated by government investments, subsidies to inputs, and guaranteed output prices, were the initial basis for pro-poor growth in all these countries. *But now those same policy instruments are counterproductive both for growth and the poor*. Agriculture needs to restructure into a diversified and commercialized sector that will have little direct impact on the poor, even through food prices. At this stage, especially in India and Indonesia, agriculture's main impact on poverty is more likely to come through its support for a dynamic rural non-farm economy, which will be a bridge for the rural poor to cross on their way to jobs in the formal economy.

This role does not show up in the econometric tests of agriculture's contribution to poverty reduction, for two reasons. First, this "new" agriculture is still largely nascent, and hence does not appear in the statistical record very clearly. Second, the impact will be through the linkages and multipliers that have been hard to conceptualize, model and estimate, because they depend so crucially on local conditions and institutional context. That does not mean that the role of agriculture in pro-poor growth has diminished to the point of being irrelevant. It does mean that agriculture's role, as always, must be understood in the context of multi-sectoral and general equilibrium frameworks, not through a sectoral lens alone.

B. Connecting agriculture to poverty reduction

In current strategies used by countries and donor agencies to cope with poverty, the role of agriculture has been limited, largely because of failure to recognize the importance of direct links between agricultural development, food availability, caloric intake by the poor, and reduction in poverty. Part of the reduction in poverty is definitional because the poverty line is often measured in caloric terms. But raising caloric intake of the poor has a positive effect on their well-being, work productivity, and investment in human capital. Empirical evidence provided by Paul Schultz (1993) and Fogel (1991) illustrates this importance, but a more general case can also be made.

The case builds on three empirical relationships: between agricultural growth and poverty alleviation; between increases in domestic food production and improvements in nutrient intake;

and between agricultural productivity and productivity growth in the rest of the economy. It has long been established that, for a given level of income per capita, a higher share of GDP originating in agriculture contributes to a more equal distribution of income, and the empirical work reported here confirms that message (Kuznets, 1955; Chenery and Syrquin, 1975). An agriculture-driven growth strategy, if it does not sacrifice aggregate growth, directs a greater share of income to the poor, i.e. it is more pro-poor. This is the essential first step in breaking the cycle of poverty.

Next, increases in domestically produced food supplies contribute *directly* to increases in average caloric intake per capita, after controlling for changes in income per capita, income distribution, and food prices (Timmer, 1996). Countries with rapidly increasing food production have much better records of poverty alleviation, perhaps because of changes in the local economics of access to food, changes that are not captured by aggregate statistics on incomes and prices. The most recent confirmation of this relationship is in Majid (2004). With the $1 per day headcount poverty rate from the ILO data set as the dependent variable, *both* the log of agricultural output per worker *and* the per capita food production index have a large and statistically significant impact on reducing poverty (controlling for per capita income and other standard variables).

Whatever the mechanisms, intensive campaigns to raise domestic food production through rural investments and rapid technical change, can be expected to have positive spillover effects on nutrient intake among the poor. This is the second step in breaking the cycle of poverty.

The third step is to ensure that these sectoral gains can be sustained without distorting the economy or destroying the environment. These dual goals can be achieved only if factor productivity increases for the entire economy. Eventually, growth in factor productivity must provide a substantial share of total growth in income per capita. When using its resource base efficiently, agriculture has a key role to play at this stage as well (Sarris, 2001; Timmer, 2005b).

Agriculture has been seriously undervalued by both the public and private sectors in those societies in which poverty has remained untouched or even deepened. In addition to an urban bias in domestic policies, the root cause of this undervaluation is a set of market failures. Commodity prices, by not valuing reduced hunger or progress against poverty, often do not send signals with appropriate incentives to decision makers. These inappropriate signals cause several problems, in addition to those noted above.

First, low values for agricultural commodities in the marketplace are reflected in low political commitments. But political commitments to rural growth are needed to generate a more balanced political economy, with less urban bias than has been seen in most developing countries historically (Lipton, 1977; Timmer, 1993). The developing world has already seen a notable reduction in the macroeconomic biases against agriculture, such as overvalued currencies, repression of financial systems, and exploitive terms of trade (Westphal and Robinson, 2002). Further progress might be expected as democracy spreads and empowers the rural population in poor countries (although agricultural policies in most democracies make economists cringe).

The second problem with low valuation of agricultural commodities is that rural labor is also undervalued. This weakens the link between urban and rural labor markets, which is often manifested in the form of seasonal migration and remittances. There is no hope of reducing rural poverty without rising real wages for rural workers. Rising wages have a demand and a supply dimension, and migration can affect both in ways that support higher living standards in both parts of the economy. Migration of workers from rural to urban areas raises other issues, of course, but those issues depend fundamentally on whether this migration is driven by the push of rural poverty or the pull of urban jobs (Larson and Mundlak, 1997).

Either way, the food security dimensions of rural-urban migration are clear. Urban markets become relatively more important in supplying food needs for the population. Whether the country's own rural economy or the world market is the best source of this supply will be one of the prime strategic issues facing economic policy makers and negotiators for the Doha Round of trade deliberations (Naylor and Falcon, 1995; Elliott, 2004, 2006). It is no accident that China, through its commitments upon entering the WTO, has decided to use world markets to provision a significant share of its basic food supply. The intent is to keep food costs low and stable and thus to provide a competitive advantage to its labor-intensive industries and producers of high-value agricultural commodities. China sees few long-run income opportunities for small-scale producers of staple grains, even if it must continue to make grain production profitable in the face of unstable supplies in world markets.

C. From agricultural to rural development

Once all these elements are in place as the basis for profitable farming, policy attention and budget priorities should turn to the rural non-tradables sector. Part of the profitability for this sector will come from a labor-intensive export sector that is successfully linked into the global economy, and in many countries this will include the agri-business sector. Rapid growth in this export sector creates demand for labor directly as well as for the goods and services of the rural economy that raise demand for labor indirectly.

The rural non-farm sector is usually the bridge between commodity-based agriculture—which is often on a "treadmill" between rising productivity and falling prices (Gardner, 2002)—and livelihoods earned in the modern industrial and service sectors in urban centers. Throughout Asia most rural households earn half or more of their incomes from non-farm sources, and often this sector is the "ladder" from underemployment at farm tasks to regular wage employment in the local economy, and from there to jobs in the formal sector (Mellor, 2000; Delgado, Hopkins and Kelly, 1998).

A certain enthusiasm has grown since the early 1990s for market-based rural finance initiatives that circumvent the problems faced by earlier efforts to provide subsidized credit to small farmers so they could adopt modern technologies (Morduch, 1999). By tapping the knowledge of local villagers of each other's capacities for repayment of loans, grassroots micro finance operations have been widely established to provide vehicles for risk management and household savings. Unfortunately, there is no significant evidence that these operations actually contribute to economic growth. Somewhat more surprising, the evidence is thin that such schemes actually reduce poverty in a sustainable fashion (Zeller and Meyer, 2002).

What does seem to work, but which is much more difficult to implement, is a formal system of rural-urban financial intermediation that improves factor mobility. Linking small, rural, local savings to investment opportunities outside the rural economy is arguably an important way to help households maximize returns on their capital, create incentives to save, and smooth the flow of resources out of agriculture as part of the structural transformation. Establishing these linkages, however, requires reasonably large financial institutions, able to establish branch offices in rural areas and tap modern financial instruments in urban areas. Such institutions tend not to spring up from rural roots.

IX. Is Agricultural Development More Difficult Now? New Challenges and New Opportunities

There is no mistaking the new challenges facing agricultural development, especially in the poorest countries where it is needed most. Globalization has brought new sources of demand, but these come with difficult safety and environmental standards that are enforced by modern supply chains. Globalization is also a two-edged sword, because it also brings new supplies to these countries, competing effectively with local farmers and traditional food marketing chains. All of the early indications from models of climate change are that farmers in sub-Saharan Africa will be adversely affected as higher temperatures and drought become even more prevalent. The new demand for bio-fuels would seem to be a big bonus for agricultural producers of the raw materials for this industry, but if the net impact is higher food prices facing the poor, and greater environmental degradation in the rush to expand production, the bonus might be small indeed. Finally, the gap is widening between labor productivity in the agricultural and non-agricultural sectors. This worsening sectoral income distribution presents a major challenge to policy makers seeking to stay on a balanced path during the structural transformation.

Creating a dynamic and efficient agriculture was never easy, but policy makers in the 1960s and 1970s had significant advantages over those since the mid-1980s in creating the right environment for both public and private investments in their rural economies.[23] The differences fall into four basic categories: (1) "new" and more difficult initial conditions confronting policy makers; (2) rising opposition from rich countries, both in the form of protection of their own farmers and concerns over losing their export markets; (3) a relatively stagnant shelf of available agricultural technologies that could be easily borrowed and widely adopted by farmers; and (4) donors who have been distracted from their core mission by development fads and pressures from "single-issue" interest groups.

DfID (2004) characterizes the same issues into two camps, the "smallholder optimists" and the "smallholder pessimists." The debate between the two camps is sharp:

> There is probably less of a consensus now—particularly amongst development agencies—on the best (in terms of impact on poverty and hunger) agricultural development strategy than at any time over the last half-century or longer (Ashley and Maxwell, 2001). This is particularly true of Africa, where an unsuccessful model based on improving performance through technology supported by publicly owned development agencies has been replaced by the equally disappointing response of farmers to the liberalization of markets (Dfid, 2004, p. 19).

[23] A similar interpretation of the problems facing policymakers in developing countries in the 1960s and 1970s, versus the problems facing policymakers now, is in Dorward, Kydd, Morison and Urey (2004). They stress the sharply different attitudes among the donors now toward governmental interventions in support of agricultural development, and are perhaps less concerned about the widespread governmental failures in those efforts. This paper is more concerned about the origins of these donor attitudes in the policies of the rich countries and their concern to protect their own farmers. In the end, we have very similar policy conclusions.

The smallholder pessimists, such as Maxwell (2004), argue that small-scale agriculture is becoming increasingly uncompetitive in the face of the revolution in supply chains and globalization of food trade. The smallholder optimists, on the other hand, led by Lipton (2004) and scholars at the International Food Policy Research Institute (IFPRI), hold that the historic relationships between agriculture and economic growth still hold, especially in Africa where smallholders are "protected" by high transportation costs and the cultivation of many non-tradable food commodities. Naturally, the policy conclusions of the two camps are totally different, and depend fundamentally on whether it is possible to skip the stage of agricultural modernization in the structural transformation.

A. "New" initial conditions

The initial success of the green revolution, and from it of agriculture as the engine of pro-poor economic growth, was in East and Southeast Asia. Despite difficult initial conditions in the minds of many—heavy population pressures against available arable land, poorly educated and overwhelmingly rural populations, with widespread and deep poverty—these turned out to be precisely the initial conditions that made investments in new agricultural technology and rural infrastructure highly profitable. The remaining poor countries in Africa and Central Asia face low population densities in their low productivity areas, and hence building rural infrastructure to raise productivity in these areas is prohibitively expensive.

Second, the real prices of agricultural commodities have been very low in historical terms, thus making it difficult to justify investments whose payoff will be increased production of exactly these low-valued commodities. The real price of rice in world markets dropped from $1000 per metric ton to $200 per metric ton in the past quarter century (and the 50 percent rebound since 2007 still leaves the price at just $300 per ton), and many other agricultural commodity prices have followed a similar trend (Dawe, 2001, 2002; World Bank, 2004d). With average farm size decreasing in most countries due to population growth, finding a technology package and farm-gate price that will increase farm household incomes above the poverty line is 3-5 times harder now than in the mid-1970s.[24]

Third, the easy investments in hospitable environments, especially for irrigation infrastructure, have mostly been made. In the same fashion, high-yielding seed technology for widely uniform planting environments has been developed. What remains are the more distant, more difficult, and less productive agricultural settings that have been bypassed by the main stream of the green revolution. To add to the difficulties, the world now has more concern for environmental degradation, whether from expanding cultivated area into tropical rain forests, upstream and downstream impacts from construction of large dams, or simply the impact on fragile ecosystems of highly intensive cropping systems. These environmental concerns have substantially raised the barrier to any large scale investment in raising agricultural output, at least with donor financing.

[24] There is much talk that high food prices are here to stay and that this will change such economic calculations (FAO, 2007). A historical perspective suggests two cautionary provisos: first, in real terms the current prices are high relative to the past decade or so, but not from a longer-term perspective. Second, the bio-fuel industry is uneconomic at current raw material prices and this reality is likely to hit home eventually among even the most enthusiastic politicians. A backlash has already started in Europe (Bradsher, 2008; Rosenthal, 2008).

In combination, the initial conditions facing the currently poorest countries (and regions), precisely those by-passed by the first green revolution, are far more difficult than those facing the successful countries in East and Southeast Asia. The obvious question, but one without an obvious answer, is whether agricultural development is now simply too expensive, or too controversial, to pursue as the engine of pro-poor growth, even for those countries where the vast majority of the poor are farmers.

B. Opposition from rich countries

Increasingly, the rich countries are part of the problem rather than part of the solution. Agricultural protection in the OECD countries remains very high, despite agreements at the Uruguay Round of trade negotiations that brought agriculture within the purview of the WTO. This protection has two pernicious effects. First, by maintaining production levels well above those that would be profitable without the subsidies and protection, global supplies have been increased and world prices lowered. The actual consequences for developing countries are mixed and controversial, as a number of countries protect themselves against these "unfair" prices. It is entirely possible that farmers and consumers in Indonesia, for example, might face lower rice prices after market liberalization because of the high protection provided now, even at prices prevailing in early 2008.

Second, and perhaps more important, the rich countries have reserved an increasing share of world agricultural consumption for their own protected farmers. The share of rich countries in agricultural exports has actually increased significantly in the past thirty years, contradicting everything economists think they know about comparative advantage and the structural transformation. This would simply not have been possible without the massive subsidies the rich countries devote to their farmers. The impact, of course, is to take market share away from the world's poorest farmers.

There is also a disconcerting concern in the legislatures of some rich countries, and especially in the United States, that successful agricultural development in poor countries will impair the export markets for agricultural products from rich countries. This concern is manifest in legislative directives that prohibit USAID, for example, from helping poor countries develop their soybean, sugar, or orange industries. It is manifest in the continued insistence that food aid is "development assistance," despite overwhelming evidence that food aid usually distorts market incentives for local farmers (OXFAM, 2002). Cash transfers of even half the nominal value of the food aid would almost certainly do more good.

Efforts have been made over the years to build the case that agricultural development is the necessary first step from which overall economic development is built, and that richer countries quickly graduate from being aid recipients to growing commercial markets for agricultural exports. That case has strong historical precedents, and there can be little doubt that national welfare in both poor and rich country trading partners rises with economic growth in the poor country. But individual commodity producers in rich countries can lose in this process, and they can be powerful advocates for restrictions on how development assistance is delivered to poor countries, if the result would be to jeopardize their market access. By thwarting public-sector

support for agricultural development by the rich donors, these commodity interests are also thwarting more rapid economic growth and poverty reduction.

C. Stagnant technology and much more complicated problems

Modern science and technology have wrought revolution after revolution in agriculture, resulting in crop yields and labor productivity so high in advanced countries that farmers are routinely paid to curb their abundance (Hayami and Ruttan, 1985; Johnson, 1997). The green revolution technologies that emerged from the CGIAR system in the 1960s provided a stimulus not just to the agricultural economies of the Asian countries able to utilize the fertilizer-responsive varieties of wheat and rice, but to pro-poor economic growth throughout the region.

But two problems loom increasingly large. First, cereal technologies for the most advanced agro-economic zones have been stagnant for a decade, and unless modern genetic technologies are brought to bear on the problem, there is little promise of a radical breakthrough in the visible future (Pingali, et al., 1997; World Bank, 2007). This has caused DfID to raise the following questions:

> Few doubt that achieving the MDG of halving the number of people living in absolute poverty by 2015 will require a significant improvement in agricultural performance, particularly in Africa. But in looking at the future and the likelihood of this being achieved, differences of opinion emerge around two key questions:[25]
> 1. Do the conditions exist for agricultural productivity to be increased where it is most needed and what part, if any, can small-scale agriculture play in achieving this?
> 2. Given quite fundamental differences in context between Asia in the Green Revolution and today's poorest countries, will the historical relationship between agricultural growth and poverty reduction continue to hold true?

Second, Africa's cropping systems and (lack of) water control make agricultural research complicated and expensive. There are few uniform tracts of mono-cropped cereals, with good water control and easy access to commercial inputs such as fertilizer, precisely the circumstances that made the green revolution feasible in Asia. The harsh environment, both agronomically and commercially, is one reason for the complex cropping systems and risk-averse behavior. But such cropping systems are notoriously hard to improve, because standard research methodologies seek to control all variables but the one under investigation. There are just too many variables for this approach to work very effectively in most African agricultural settings.

There have been successes (Wiggins, 2000; World Bank, 2007). Hybrid maize and sorghum work well in Africa when appropriate inputs are available, and markets are available for the surpluses produced. High-value crops such as green beans and flowers are exported successfully to Europe. A number of tree crops thrive when infrastructure is available and border prices reach farmers. But the overall trend in food production per capita has been negative for two decades

[25] Grain yields in Asia and Africa have been flat since the early 1990s (DfID, 2004, p. 8) and the highest yielding experimental varieties at IRRI are no more productive than a decade ago. Still, there are many opportunities for farmers to increase cereal yields through better management practices, even if the genetic potential of their seeds is not rising steadily.

and there is little prospect of reversing that trend without massive investment in rural infrastructure and specialized agricultural research, neither of which seem to be on government or donor agendas. Adrian Wood, the Chief Economist for DfID, has painted a picture of an African continent "hollowed out," with most populations in the interior moving to the coasts, where they can be fed easily with imported food, and where access to ports and economies of scale in manufacturing might make the sector more competitive (Wood, 2003). That is not exactly a picture of pro-poor growth led by agriculture.

D. Distracted donors and development fads

Development assistance is under challenge in most western societies. One set of critics argues that the funding levels are inadequate—Western European leaders are pushing for a doubling of official development assistance (ODA). In the United States, there is widespread doubt that development assistance works at all (Easterly, 2004). Analysts in the World Bank have been working hard to sort out what works and what does not. Their answer, perhaps not surprisingly, is that despite mistakes in the past, the donors in general and the World Bank in particular now know how to help poor countries get on a sustainable development path. More money, they argue, can be used very productively (Collier, 2002, 2007; Sachs, 2005).[26]

The goals and mechanisms of development assistance have broadened considerably since the field was founded in the 1950s. From an early emphasis on growth in gross domestic product (GDP) and containing communism, the mandate of most development agencies, and especially that of USAID, grew to include, among many other things, reductions in poverty, improvements in child health, gender equity, environmental sustainability, transition to market economies and democratization.[27]

In the early 1990s, Brian Atwood tried to sharpen USAID's increasingly blurred focus by withdrawing the Agency from its economic growth agenda and emphasizing several themes of great interest to Congress: short-run humanitarian assistance, especially food aid; health care, especially child survival and family planning programs; environmental sustainability, especially

[26] The debate over the impact of foreign assistance has been played out recently in a series of econometric exercises that purport to show the impact, or lack thereof, of foreign assistance on economic growth in recipient countries. The current standard in this debate is Clemens, Radelet and Bhivnani (2004), who show that aid with expected impact in the "short-term," i.e. within the four-year horizon of their panel data, does indeed have a large, robust, and highly significant impact on economic growth. This short-term aid makes up about 45 percent of total aid, with another 45 percent devoted to "long-term" assistance, and 10 percent devoted to emergency and humanitarian assistance. Neither of the latter two components have a statistically significant impact on growth. Clemens, Radelet and Bhivnani also provide an extensive review of the theoretical and empirical literature leading up to their work.

[27] Many institutions involved in development activities saw similar broadening of agendas. The Development Advisory Service (DAS), founded by Harvard University in the early 1960s to help poor countries prepare economic development plans, expanded its scope in 1975 to become the Harvard Institute for International Development (HIID). New activities in health, education, and rural development were integrated into the Institute's traditional core of macroeconomists. The University's program on Women in Development was housed in HIID. An environmental program started in the late 1970s with the arrival of Theo Panayotou. Both in academia and government, development came to be seen as a multifaceted and complex process. This progress came at a cost, however. Focus was lost as agendas multiplied. Harvard closed HIID in 1999, arguing that it was managerially too complex for an academic institution.

the development of agricultural technology for poor farmers, including women, working in fragile ecosystems; and gender issues more broadly. As the challenges and opportunities presented by the collapse of communism in the former Soviet Union became apparent, democratization was added as a USAID objective.

Somehow lost in the multiple agendas and donor efforts to program effectively in the face of developmental complexity was the need for poor countries to have growing economies as the only sustainable solution to all of their broader problems. To turn on its head the title of Paul Streeten's famous book on meeting basic needs, "first things first" means reestablishing economic growth as the foundation of development (Streeten, 1986).

The review by the *Economist* (2004) of Sebastian Mallaby's book (2004) on James Wolfenson and the World Bank notes this lack of focus at the Bank and attributes it to too many "one issue" voices that Wolfenson, and the Bank, and the rest of the donor community, were listening to in an effort to be open and transparent to their critics. The *Economist's* criticism of Wolfenson is telling:

> Trying to placate the Bank's critics seemed a good idea at the time, and he has managed to build constructive relationships with the more grown-up NGOs, such as OXFAM. Yet most pressure groups "do not have an off switch," as Mr. Mallaby puts it. Nothing the Bank does will ever satisfy them, but by attaching some of the conditions that they demand to its loans, the World Bank makes those loans unattractive, despite their cheapness, to the more credit-worthy countries, such as Brazil, South Africa and China. ... Every infrastructure project the Bank funds must meet rich-world standards: nothing pretty may be bulldozed unless strictly necessary, and no worker may be asked to do anything that a Californian might find demeaning. As a result, fewer dams, roads and flood barriers are built in poor countries. More poor people stay poor, live in darkness and die younger (*Economist*, 2004, p. 99).

Partly because so many new topics are on the development agenda, and partly because there is no accepted core of development theory and only hotly contested empirical "truths," fads have long dominated donor thinking about appropriate development strategy. From community development in the 1950s, to import substitution in the 1960s, to reaching the poorest of the poor in the 1970s, to structural adjustment in the 1980s, to sustainable development in the 1990s, and back to community development now (in the name of "community-*driven* development), the search for something "new" as the answer to poverty has actually impeded the implementation of core strategies that focus on sound governance, effective macro economic management, and a reliance on sustained public support for private markets.

From the point of view of enhancing pro-poor growth in developing countries—that is, linking the poor to rapid economic growth--leaders of donor agencies and managers of the global economy missed three opportunities over the past several decades. First, two decades intervened between the first and the second world food conferences with little to show in terms of increased food security and reduced poverty in the most vulnerable countries, those that might have hoped that Henry Kissinger's promise in 1976 that no child would go to bed hungry within a decade actually would translate into visible action (Timmer, 2005a).

Second, subsidies to farmers in rich countries remain extremely large, despite promises made at the Uruguay Round to reduce them significantly. The result has not just been a large budget burden in OECD countries. More importantly for developing countries, the result has been increasing surpluses dumped on world markets, depressing world prices and the incomes of farmers in poor countries who have to compete with these prices. The best guess is that every dollar of agricultural subsidies in rich countries costs farmers in poor countries a similar amount (of course, bio-fuel subsidies are beginning to offset this effect). Official development assistance is only one quarter of this total, and very little of it goes to rural economies. It is not a fair trade.

Third, the Cold War took a terrible toll on good governance. If we now recognize how important good economic governance is to the foundations of economic development, we are just coming to realize how the willingness of governments in the West to do business with any government ostensibly in the anti-communist camp undermined those institutional foundations. Many decades have been lost in the creation of sound economic governance and they cannot be recaptured overnight. Impatience on the part of donors will not help, and it may well impede progress (Diamond, 2007).

X. Pulling the Story Together

At the beginning of this monograph it was argued that the story was easy to tell "because it is, well, telling." Perhaps the reader is not so convinced at the end, where the story seems to have ended up very complicated and convoluted. Just what is the story line, and where does it lead?

There are three basic points. First, the structural transformation is the main pathway out of poverty for all societies, and it depends on rising productivity in both the agricultural and non-agricultural sectors. Second, the process of structural transformation puts enormous pressure on rural societies to adjust and modernize, and these pressures are translated into visible and significant policy responses that alter agricultural prices. Third, despite the decline in relative importance of the agricultural sector, leading to the "world without agriculture" in rich societies, the process of economic growth and structural transformation requires major investments in the agricultural sector itself. This seeming paradox has complicated (and obfuscated) planning in developing countries as well as donor agencies seeking to speed economic growth and connect the poor to it.

So where does this analysis lead, in useful and concrete terms? It would be folly, or at least presumptuous, to offer detailed recommendations on what countries and donors should do to revitalize the agricultural and rural economies of the poorest societies, and to hook these economies to a broader base of pro-poor growth. The "optimism" and "pessimism" camps identified in the DfID (2004) report have starkly different policy implications, for example. But there are six tasks that are pretty obvious, and need to be done whichever perspective is right, and it is appropriate to list them here. Developing them into country programs will be, inevitably, country specific. But these tasks need to be done across the board.

A. The obvious steps for poor countries

First, focus on the priority: economic growth that reaches the poor. High food prices make this very difficult.

Second, invest in rural health and education. These investments would make sense in straight humanitarian terms, but they also pay off in enhanced productivity and mobility.

Third, make rural-to-urban migration easier when rural development is too expensive. This seems difficult in short-run political terms, but it can be as easy as ensuring reliable buses and making remittances to rural areas cheap and affordable.

Fourth, push hard on global trade reforms to make agriculture more profitable for developing countries, with fewer subsidies and trade barriers. This will benefit both developed and developing countries.

Fifth, make major investments in agricultural science and technology at both the global and national levels. The historic rates of return on these investments have typically been three to four times the opportunity cost of capital. The failure to invest more is one of the great public

failures of our time. Raising productivity of "orphan crops" may have especially high payoff for the poor.

Finally, develop local financing and planning mechanisms for investments in rural infrastructure. With political decentralization a reality in most developing countries, this is where the action will be in terms of investments that reach farm households and raise rural productivity (von Luebke, 2007).

B. The "optimists" versus the "pessimists"

Beyond these general recommendations, it seems likely that some countries probably offer hope along the "optimists" line of reasoning, and some fall into the "pessimists" camp. Again, which is which will be country-, or at least region-specific. But it is useful to summarize the conclusions that the DfID (2004) report offers in terms of policy approaches for each setting (see Table 7).

Table 7. Contrasting views on agricultural development instruments

Role for investing in ...	**Optimists**	**Pessimists**
Rural human capital	Yes, for productivity impact	Yes, for flexibility of exit
Rural infrastructure	Yes, for input and output markets	Mostly wasted
Agricultural research	Yes, to raise yields and and lower food costs	Private sector activity for specialized supply chains
Targeted safety nets	A productive rural economy provides this	Active government role to cushion transition to urban areas
Input subsidies	Needed to induce adoption of new technologies	Wasted
Price guarantees/stability	Needed to maintain producer incentives and food security	Difficult to implement within WTO rules and not desirable anyway

These are very different views of the world. It seems unlikely that either the optimists or the pessimists are always right in all circumstances. But admitting that the pessimists are likely to be right some of the time in some countries places the onus on supporters of agricultural-led, pro-poor growth to show that it is feasible and efficient. History has been a powerful backer of this argument, but times have changed and the argument continues to need careful analytical and empirical support.

C. What happens in rich countries facing a "world without agriculture"?

It is clear that for many decades rich countries have sought mechanisms to place a higher value on their agricultural sectors than market prices would indicate. Under pressure from a number of agricultural exporting countries, including the United States, these mechanisms have increasingly tried to break the link between policy support for farmers and the additional production of commodities (and surpluses) that were historically forthcoming. The various ways of de-linking have generated an entire language and sub-profession of its own (Elliott, 2004; 2006).

Not all of the arguments for paying farmers more than the market would pay are without merit, although the most vociferous voices, especially from Japan, France and South Korea, inevitably sound narrowly protectionist. Still, at least three rationales for supporting agriculture in rich countries at taxpayer and consumer expense are increasingly accepted by mainstream policy analysts as reflecting appropriate public action in the face of market failures. These are support for the multiple functions that agriculture performs, beyond the commodity production that is offered for sale; support for "local" food systems that might offer reduced carbon footprints for most food consumers and possibly even fresher and healthier food; and support for bio-fuel production as a mechanism to break dependence on imported fossil fuels and slow emissions of greenhouse gases.

Multi-functionality

Bucolic landscapes, green buffers to urban density, preservation and development of rural societies, domestic food security, and flood alleviation through proper land management all have economic value even if there is no market price for their "production." The basic argument for the multi-functionality of agriculture as a basis for policy support to farmers is that these non-commodity outputs, although essential to economic, environmental and social well-being, are unpaid by-products of commodity production (Losch, 2004). If farmers are paid only the market price for their commodities, the by-products will not be produced in optimal amounts, and may be lost altogether if farmers are forced out of business because of international competitive pressures.

A major theme of this monograph is that many countries have undervalued their agricultural sectors in terms of contribution to economic growth and reductions in poverty. Large countries rightly see a link between the level of domestic food production and the degree of food security, although even China, India and Indonesia can improve the efficiency of their food security policies through international trade. The rural economy broadly and farm households in particular offer a buffer to macro economic shocks that can provide a safety net of last resort. Successful rural development can slow the flow of migrants to urban slums, and perhaps

stabilize both rural and urban societies. These are all reasons why poor countries need to think carefully about how to provide adequate incentives to their farmers.

These are not reasons for rich countries to protect and subsidize their farmers. At a minimum, the multi-functional by-products of agricultural commodity production in rich countries need to be investigated for more efficient mechanisms of production that are less distorting than direct protection and subsidies. The Economic Research Service of the United States Department of Agriculture (USDA) provides several examples (see Table 8).

Table 8. Comparison of policies according to their market effects

Nonfood output	**Minimal market effects**	**Large distortion**
Environmental:		
Rural landscape	Purchase or transfer of land development rights	Production subsidies that raise profitability of agriculture relative to other land uses
Rural development:		
Viable rural communities	Rural infrastructure to support creation of agriculture and non-agriculture jobs	Agricultural policies linked to production that raises output in both wealthy and marginal rural areas
Food security:		
Assure availability of food supply	Public food stocks	Production subsidies to achieve domestic self-sufficiency

Source: Bohman, et al., 1999.

Obviously, not every non-commodity output associated with agricultural production can be produced in ways that are de-linked from commodity production. Country and regional circumstances will differ and matter, as population densities in much of rural Asia, for example, make investments in infrastructure more socially profitable than they might be in sparsely settled rural Africa. How can rural development be promoted in Africa, without some additional stimulus to farm profitability?

Still, this is the way to address the question. Efforts to value in economic terms the flow of multiple services from natural ecosystems, including agriculture, need far more analytical research and empirical testing (Tallis, et al., forthcoming). With better valuation will come better designed initiatives to conserve the natural resources and better mechanisms to pay the provider of these services, including farmers. Simply paying farmers to do more of what they do

anyway cannot be an efficient use of fiscal or natural resources. Agriculture performs multiple functions, but finding ways for the market to value, and pay for, these functions will be essential to sustainable production.

Local food systems

Buying food that is produced "locally" is the current agenda for two related causes: the anti-globalization movement and the sustainability movement (Feenstra, 2002). The anti-globalization movement has its roots in a clear sense of lost control over something as deeply felt as where the food on our tables comes from. Modern supply chains seem impervious to consumer desires to control what they eat. The sustainability movement has its roots in the broader environmental movement that now links to climate change as the key challenge to quality of life in rich and poor countries alike. Can transporting food thousands of miles, often on jet freighters, possibly be a sustainable way of eating? Will buying and consuming foods produced locally make any difference to either of these agendas?

Economic efficiency has a hard time entering these debates. Both the anti-globalization and sustainability movements specifically reject market prices as the basis for evaluating decisions about what consumers should consume, because these prices have too many subsidies and distortions to reflect real opportunity costs in terms of natural resources used. There is some merit to these arguments. In rich countries, for certain, a vast array of public expenditures helps multi-national agribusinesses keep local food systems from being competitive. The question is, should the "local food movement" receive more policy support?

It should be obvious that any effort to support the purchase and consumption of foods grown locally, however that is defined, is inherently anti-trade. New Zealand is fully aware of this threat, and researchers at Lincoln University have issued a study confronting the environmental challenges to long-distance agricultural trade:

> New Zealand has greater production efficiency in many food commodities compared to the UK. For example New Zealand agriculture tends to apply less fertilizers (which require large amounts of energy to produce and cause significant CO2 emissions) and animals are able to graze year round outside eating grass instead of large quantities of brought-in feed such as concentrates. In the case of dairy and sheep meat production NZ is by far more energy efficient even including the transport cost than the UK, twice as efficient in the case of dairy, and four times as efficient in case of sheep meat. In the case of apples NZ is more energy efficient even though the energy embodied in capital items and other inputs data was not available for the UK (Saunders, Barber, and Taylor, 2006).

Measuring environmental impact of food production is not simple. Any measure that pretends otherwise is flawed. Whether it is the energy consumption per food calorie delivered to consumers, or average distance traveled of the food consumed, many other intervening variables confound any welfare significance of such simple ratios.

Still, there is clear appeal to consumers, especially wealthy consumers, to knowing where their food comes from and buying from producers they know. The rapid growth of farmers' markets,

of organic food, and of "local food" sections in supermarkets is testimony to this basic desire. There may be positive health consequences from consuming local foods, as they may be more nutritious, and there is little doubt that local varieties and produce are tastier. But the local food movement is not yet a serious threat to the globalization of food chains, and may in the end even be consistent with it, if supply chains are able to "localize" their suppliers of Kenyan green beans or Costa Rican shade-grown coffee. But the trend bears watching, because it is the ultimate form of agricultural protection. Expanded trade has been the basis of much economic growth, and restricting it could have serious and unforeseen consequences.

Bio-fuels and the potential to reverse the structural transformation

Bio-fuels are not new. Although coal was known in China in pre-historic times, and was traded in England as early as the 13th century, it was not used widely for industrial purposes until the 17th century. Until then, bio-fuels were virtually the only source of energy for human economic activities, and for many poor people they remain so today. But the widespread use of fossil fuels since the Industrial Revolution has provided a huge subsidy to these activities—because coal and later petroleum were so cheap--a subsidy which seems to be nearing an end.

What will be the role of bio-fuels going forward, and what will be the impact on agriculture? In the extreme, the demand for bio-fuels in rich countries to power their automobiles has the potential to raise the price of basic agricultural commodities to such a level that the entire structural transformation could be reversed. If so, the growing use of bio-fuels has two alternative futures: it could spell impoverishment for much of the world's population because of the resulting high food prices, or it could spell dynamism for rural economies and the eventual end of rural poverty. Which future turns out to be the case depends fundamentally on the technology, economics, and politics of bio-fuel production (Peskett, et al., 2007).

The potential devastating effects of bio-fuels are easy to conceptualize. The income elasticity of demand for starchy staples (cereals and root crops for direct human consumption) is less than 0.2 on average, and falling with higher incomes. Adding in the indirect demand from grain-fed livestock products brings the average income elasticity to about 0.5, and this is holding steady in the face of rapid economic growth in India and China. Potential supply growth seems capable of managing this growth in demand (Naylor, et al., 2007).

But the demand for bio-fuels is almost insatiable in relation to the base of production of staple foods. The income elasticity of demand for liquid fuels for automobile and truck fleets, not to mention power generation, is greater than one in developing countries. The average for the world is rising as middle class consumers in China, India and beyond seek to graduate from bicycles to motorbikes to automobiles. One simple calculation shows the dimension of the problem: if all the corn produced in the United States were used for ethanol to fuel automobiles, it would replace just 15 percent of current gasoline consumption in the US. Something has to give.

If this were a market-driven process, it is easy to see what will give. High grain prices will make ethanol production uneconomic, driving down the demand (and returns on investments in ethanol processing plants). Greater profitability of grain production will stimulate a supply response,

although this may take several years if improved technologies are needed. Grain prices will reach a new equilibrium, with demand from the bio-fuel industry having only a modest impact.

This is not the scenario most analysts see. Instead, political mandates to expand bio-fuel production in many countries will continue to drive investments in processing facilities and the need to keep these profitable in the face of high raw material prices will require large public subsidies. Rich countries will be able to afford these more easily than poor countries, so a combination of inelastic demand for fuel and a willingness to pay large subsidies will keep grain prices very high.

If this scenario plays out, what are the consequences for economic growth and poverty reductions in developing countries? Not surprisingly, the answer depends on the role of agriculture in individual countries, the pattern of commodity production and the distribution of rural assets, especially land. It is certainly possible to see circumstances where small farmers respond to higher grain prices by increasing output and reaping higher incomes. These incomes might be spent in the local, rural non-farm economy, stimulating investments and raising wages for non-farm workers. In such environments, higher grain prices could stimulate an upward spiral of prosperity.

An alternative scenario seems more likely however, partly because the role of small farmers has been under so much pressure in the past several decades. If only large farmers are able to reap the benefits of higher grain prices, and their profits do not stimulate a dynamic rural economy, a downward spiral can start for the poor. High food prices cut their food intake, children are sent to work instead of school and an intergenerational poverty trap develops. If the poor are numerous enough, the entire economy is threatened, and the structural transformation comes to a halt. The share of agriculture in both employment and GDP starts to rise, and this reversal condemns future generations to lower living standards.

A reversal of the structural transformation as the regular path to economic development and reduced poverty will be a historical event, countering the patterns generated by market forces over the past several centuries. Such an event is likely to have stark political consequences, as populations do not face the sustained prospect of lower living standards with equanimity. It is possible, of course, that new technologies will come on-stream and lower energy costs across the board and thus allow the bio-fuel dilemma to disappear quietly. But it looks like a rocky couple of decades before that happens.

XI. Concluding Observations

The historical process of structural transformation seems like a distant hope for the world's poor, who are mostly caught up in eking out a living day by day. There are many things governments can do to give them more immediate hope, such as keeping staple foods cheap and accessible, connecting rural laborers to urban jobs, and providing adequate educational and health facilities in rural areas. But to be sustained, all of these poverty actions depend fundamentally on a growing economy that successfully integrates the rural with urban sectors, and stimulates higher productivity in both. That is, the long-run success of poverty reduction hinges directly on a successful structural transformation.

As this monograph has emphasized, even a highly successful structural transformation is not without its problems for the poor. Two newly revealed and analyzed features of the structural transformation give special cause for concern. First, there is a strong historical pattern of worsening income distribution between rural and urban economies during the initial stages of the structural transformation. Even the currently rich countries saw this pattern during their early development in the 19th and early 20th centuries. Absolute poverty is not necessarily worsening during such episodes, and in East Asia the evidence is that absolute poverty actually fell very rapidly during rapid structural transformation (Timmer, 2005a). But in countries with less rapid growth, or growth which connected less well to the rural poor, poverty stagnated or even rose (World Bank, 2007).

Even when absolute poverty is falling, however, the worsening distribution of income challenges policy makers to take corrective action. So far, the evidence is that these actions—agricultural protection and widespread subsidies to farmers—not only fail to help the poor, they often make their fate worse because most of the poor must purchase their food in markets. A dynamic rural economy stimulated by real productivity growth has been pro-poor in all circumstances, but a rural economy with farm profits stimulated by protection tends to hurt the poor in both the short- and long-run.

The second feature is that this tendency for sectoral income distribution to worsen during the early stages of the structural transformation is now extending much further into the development process. Consequently, with little prospect of reaching the turning point quickly, many poor countries are turning to agricultural protection and farm subsidies sooner rather than later in their development process. The tendency of these actions to hurt the poor is then compounded, because there are so many more rural poor in these early stages.

It is too soon to say whether the reversal of long-run downward trends in real prices of agricultural commodities—driven by demand for bio-fuels and possibly by the impact of climate change on agricultural productivity--will also reverse the steady movement of the turning point in the structural transformation to higher income levels (Naylor, et al., 2007). If so, the short-run impact on the poor is almost certain to be negative, but the higher real returns promised to commodity producers, without agricultural protection, could stimulate real productivity increases in rural areas, raise real wages, and be the long-run pathway out of rural poverty.

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Annex Table A-1. Country names, ID numbers, and basic data

Country Name	Dummy Specification	LNGDPpc-2000 Constant US$	GDPpc2000 ConstantUS$	agGDPshare (LCU)	agEMPshare
Algeria	no dummy	7.4702239	1,755	0.0825	0.2438907
Argentina	dummy_country2	8.949366	7,703	0.0468	0.0976065
Australia	dummy_country3	9.915119	20,234	0.0345	0.0457429
Austria	dummy_country4	10.0939	24,195	0.0189	0.0512684
Bangladesh	dummy_country5	5.866468	353	0.2551	0.5569448
Belgium	dummy_country6	10.01145	22,280	0.013	0.0182811
Benin	dummy_country7	5.746203	313	0.3653	0.5397445
Bolivia	dummy_country8	6.917706	1,010	0.1297	0.4415929
Brazil	dummy_country9	8.149313	3,461	0.0568	0.1668077
Burkina Faso	dummy_country10	5.438079	230	0.3387	0.9225738
Burundi	dummy_country11	4.65396	105	0.4501	0.9036108
Cameroon	dummy_country12	6.393591	598	0.4259	0.594525
Canada	dummy_country13	10.05277	23,220	0.0215	0.0235755
Central African Republic	dummy_country14	5.529429	252	0.5021	0.7271167
Chad	dummy_country15	5.129899	169	0.3835	0.7522936
Chile	dummy_country16	8.500454	4,917	0.0433	0.1577592
China	dummy_country17	6.855409	949	0.1483	0.6661344
Colombia	dummy_country18	7.595387	1,989	0.1194	0.2041276
Congo, Dem. Rep.	dummy_country19	4.454347	86	0.6257	0.6321738
Costa Rica	dummy_country20	8.308692	4,059	0.0861	0.2017435
Cote d`Ivoire	dummy_country21	6.434546	623	0.2302	0.4920734
Denmark	dummy_country22	10.29654	29,630	0.0247	0.0378194
Dominican Republic	dummy_country23	7.776535	2,384	0.1114	0.1669435
Ecuador	dummy_country24	7.166266	1,295	0.1062	0.2585921
Egypt	dummy_country25	7.325808	1,519	0.1518	0.3357177
El Salvador	dummy_country26	7.645398	2,091	0.0979	0.2905887
Ethiopia	dummy_country27	4.624973	102	0.4394	0.8239119
Finland	dummy_country28	10.0504	23,165	0.0338	0.0549577
France	dummy_country29	10.0234	22,548	0.0254	0.0334998
Germany	dummy_country30	10.04819	23,114	0.0114	0.0251302
Ghana	dummy_country31	5.525453	251	0.36	0.5686519
Greece	dummy_country32	9.23708	10,271	0.066	0.1675778
Guatemala	dummy_country33	7.45472	1,728	0.2282	0.4607985
Guinea	dummy_country34	5.910797	369	0.2238	0.8385248
Honduras	dummy_country35	6.833032	928	0.1402	0.3168521
India	dummy_country36	6.109248	450	0.2242	0.5963729
Indonesia	dummy_country37	6.684612	800	0.156	0.4836444
Iran	dummy_country38	7.369601	1,587	0.1366	0.2659308
Ireland	dummy_country39	10.1227	24,902	0.0316	0.1016109
Italy	dummy_country40	9.832528	18,630	0.0256	0.0531509
Japan	dummy_country41	10.52967	37,409	0.0139	0.0405113
Jordan	dummy_country42	7.456455	1,731	0.0202	0.1142163
Kenya	dummy_country43	6.025866	414	0.2872	0.7548963
Korea, Republic of	dummy_country44	9.295049	10,884	0.0433	0.0995371
Madagascar	dummy_country45	5.476463	239	0.2613	0.7424004

Malawi	dummy_country46	5.01728	151	0.3566	0.8295249
Malaysia	dummy_country47	8.275631	3,927	0.0881	0.1869235
Mali	dummy_country48	5.337538	208	0.387	0.8100142
Mexico	dummy_country49	8.688622	5,935	0.0378	0.2135241
Morocco	dummy_country50	7.087574	1,197	0.1383	0.3608729
Mozambique	dummy_country51	5.351858	211	0.2348	0.8130891
Nepal	dummy_country52	5.416101	225	0.3824	0.9301576
Netherlands	dummy_country53	10.05505	23,273	0.0255	0.0337094
New Zealand	dummy_country54	9.511333	13,512	0.0835	0.0902335
Nicaragua	dummy_country55	6.677083	794	0.1849	0.199899
Niger	dummy_country56	5.030438	153	0.3784	0.8774194
Nigeria	dummy_country57	5.880533	358	0.2788	0.3330769
Norway	dummy_country58	10.52312	37,165	0.0192	0.0458081
Pakistan	dummy_country59	6.274762	531	0.2435	0.4715469
Papua New Guinea	dummy_country60	6.46925	645	0.2674	0.7425388
Paraguay	dummy_country61	7.252762	1,412	0.2036	0.3428849
Peru	dummy_country62	7.623642	2,046	0.0945	0.3036976
Philippines	dummy_country63	6.909753	1,002	0.1576	0.3953481
Portugal	dummy_country64	9.250618	10,411	0.0312	0.127376
Rwanda	dummy_country65	5.420535	226	0.4141	0.9077859
Senegal	dummy_country66	6.049734	424	0.1939	0.7376226
Sierra Leone	dummy_country67	4.94876	141	0.5501	0.6220329
South Africa	dummy_country68	8.013012	3,020	0.0298	0.0956617
Spain	dummy_country69	9.570668	14,338	0.0396	0.0735205
Sri Lanka	dummy_country70	6.738153	844	0.1781	0.454901
Sudan	dummy_country71	5.916202	371	0.385	0.6106295
Sweden	dummy_country72	10.20404	27,012	0.0169	0.0315043
Switzerland	dummy_country73	10.44141	34,249	0.0155	0.0420278
Syria	dummy_country74	6.978214	1,073	0.2266	0.2797452
Tanzania	dummy_country75	5.56452	261	0.4156	0.8047912
Thailand	dummy_country76	7.599902	1,998	0.0902	0.5645619
Togo	dummy_country77	5.513429	248	0.3422	0.5973015
Tunisia	dummy_country78	7.618742	2,036	0.1236	0.2463996
Turkey	dummy_country79	7.991592	2,956	0.133	0.4625952
Uganda	dummy_country80	5.497168	244	0.3399	0.8014128
United Kingdom	dummy_country81	10.08893	24,075	0.0094	0.0178127
United States	dummy_country82	10.45158	34,599	0.0115	0.0207718
Uruguay	dummy_country83	8.730044	6,186	0.0621	0.1264138
Venezuela	dummy_country84	8.480322	4,819	0.0393	0.0810267
Zambia	dummy_country85	5.713733	303	0.1988	0.6925699
Zimbabwe	dummy_country86	6.375025	587	0.1586	0.6271541

Annex Table A-2. The share of agricultural employment in total employment (AgEmpshr)

Regression Emp-1: Y (Agri. Employ. Share) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F(  2,  2959) = 9855.41
       Model |  222.133303     2  111.066651            Prob > F      =  0.0000
    Residual |  33.3467957  2959  .011269617           R-squared     =  0.8695
-------------+------------------------------           Adj R-squared =  0.8694
       Total |  255.480098  2961  .086281695           Root MSE      =  .10616

------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.3209081   .0127343   -25.20   0.000    -.3458772   -.2959391
lngdpperc~20 |   .0102977   .0008382    12.28   0.000     .0086541    .0119413
       _cons |   2.226785   .0464661    47.92   0.000     2.135676    2.317894
------------------------------------------------------------------------------
```

Regression Emp-2: Y (Agri. Employ. Share) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F( 37,  2924) =  605.13
       Model |  225.969745    37  6.10729041            Prob > F      =  0.0000
    Residual |  29.5103533  2924   .01009246           R-squared     =  0.8845
-------------+------------------------------           Adj R-squared =  0.8830
       Total |  255.480098  2961  .086281695           Root MSE      =  .10046

------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.3418526   .0121057   -28.24   0.000    -.3655892   -.3181159
lngdpperc~20 |   .0117516   .0007972    14.74   0.000     .0101885    .0133146
 dummy_year2 |  -.0029665    .016297    -0.18   0.856    -.0349213    .0289882
 dummy_year3 |  -.0056231    .016244    -0.35   0.729     -.037474    .0262278
 dummy_year4 |  -.0044196   .0161923    -0.27   0.785     -.036169    .0273297
 dummy_year5 |  -.0038855   .0161924    -0.24   0.810    -.0356352    .0278642
 dummy_year6 |  -.0034839   .0161926    -0.22   0.830     -.035234    .0282661
 dummy_year7 |  -.0072951   .0161425    -0.45   0.651    -.0389469    .0243566
 dummy_year8 |  -.0099877   .0161429    -0.62   0.536    -.0416403    .0216648
 dummy_year9 |  -.0132058   .0161434    -0.82   0.413    -.0448593    .0184478
dummy_year10 |  -.0147599   .0160941    -0.92   0.359    -.0463169    .0167971
dummy_year11 |  -.0233999   .0160456    -1.46   0.145    -.0548617     .008062
dummy_year12 |   -.024502   .0160462    -1.53   0.127     -.055965    .0069611
dummy_year13 |  -.0273975   .0160467    -1.71   0.088    -.0588615    .0040664
```

```
dummy_year14 |  -.0304434   .0160472    -1.90   0.058    -.0619082    .0010215
dummy_year15 |  -.0351597   .0160475    -2.19   0.029    -.0666252   -.0036942
dummy_year16 |  -.0409421   .0159997    -2.56   0.011     -.072314   -.0095701
dummy_year17 |  -.0455987   .0159998    -2.85   0.004    -.0769707   -.0142267
dummy_year18 |   -.051763   .0159528    -3.24   0.001    -.0830429   -.0204831
dummy_year19 |  -.0585215   .0159529    -3.67   0.000    -.0898016   -.0272415
dummy_year20 |   -.062908   .0159534    -3.94   0.000    -.0941891   -.0316269
dummy_year21 |   -.066161   .0159538    -4.15   0.000    -.0974428   -.0348792
dummy_year22 |  -.0673868   .0159084    -4.24   0.000    -.0985797   -.0361939
dummy_year23 |  -.0707365    .015909    -4.45   0.000    -.1019305   -.0395424
dummy_year24 |  -.0714874   .0158647    -4.51   0.000    -.1025946   -.0403803
dummy_year25 |  -.0754603   .0158652    -4.76   0.000    -.1065683   -.0443523
dummy_year26 |  -.0797187   .0158658    -5.02   0.000    -.1108279   -.0486094
dummy_year27 |  -.0829451    .015866    -5.23   0.000    -.1140548   -.0518354
dummy_year28 |  -.0871719   .0158668    -5.49   0.000    -.1182832   -.0560606
dummy_year29 |  -.0930195   .0158245    -5.88   0.000    -.1240478   -.0619912
dummy_year30 |  -.0968295   .0158262    -6.12   0.000    -.1278611   -.0657979
dummy_year31 |  -.0975827   .0158265    -6.17   0.000     -.128615   -.0665504
dummy_year32 |  -.0979836   .0158271    -6.19   0.000    -.1290169   -.0669502
dummy_year33 |  -.0991478   .0158286    -6.26   0.000    -.1301842   -.0681115
dummy_year34 |   -.102224    .015829    -6.46   0.000    -.1332612   -.0711869
dummy_year35 |  -.1054655     .01583    -6.66   0.000    -.1365046   -.0744263
dummy_year36 |  -.1079399   .0158317    -6.82   0.000    -.1389824   -.0768974
       _cons |   2.351463   .0457377    51.41   0.000     2.261782    2.441145
------------------------------------------------------------------------------
```

Regression Emp-3: Y (Agri. Employ. Share) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F(122,  2839) = 1608.03
       Model |  251.835678   122  2.06422687           Prob > F      =  0.0000
    Residual |  3.64442038  2839  .001283699           R-squared     =  0.9857
-------------+------------------------------           Adj R-squared =  0.9851
       Total |  255.480098  2961  .086281695           Root MSE      =  .03583
```

agriemploy~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lngdppe~2000	-.1066265	.0133658	-7.98	0.000	-.1328341	-.0804189
lngdpperc~20	.0054273	.0009211	5.89	0.000	.0036212	.0072333
dummy_year2	-.0054324	.0058125	-0.93	0.350	-.0168296	.0059648
dummy_year3	-.0112881	.0057954	-1.95	0.052	-.0226517	.0000754
dummy_year4	-.015967	.0057801	-2.76	0.006	-.0273006	-.0046334
dummy_year5	-.0206928	.0057858	-3.58	0.000	-.0320376	-.009348
dummy_year6	-.0253526	.005793	-4.38	0.000	-.0367116	-.0139937
dummy_year7	-.0317914	.005781	-5.50	0.000	-.0431267	-.0204561
dummy_year8	-.0376605	.0057898	-6.50	0.000	-.0490131	-.0263078
dummy_year9	-.0436457	.0058001	-7.52	0.000	-.0550186	-.0322728
dummy_year10	-.0487109	.005795	-8.41	0.000	-.0600737	-.0373481
dummy_year11	-.054625	.0057784	-9.45	0.000	-.0659553	-.0432947
dummy_year12	-.0601443	.0057937	-10.38	0.000	-.0715046	-.048784
dummy_year13	-.0659821	.0058045	-11.37	0.000	-.0773635	-.0546008
dummy_year14	-.0718257	.0058159	-12.35	0.000	-.0832295	-.0604219
dummy_year15	-.07799	.0058254	-13.39	0.000	-.0894124	-.0665676
dummy_year16	-.0846843	.005816	-14.56	0.000	-.0960883	-.0732803
dummy_year17	-.0895688	.0058171	-15.40	0.000	-.100975	-.0781625
dummy_year18	-.0949586	.005797	-16.38	0.000	-.1063254	-.0835918
dummy_year19	-.1003135	.0057943	-17.31	0.000	-.1116751	-.088952
dummy_year20	-.1053139	.0058022	-18.15	0.000	-.1166908	-.0939369
dummy_year21	-.1100329	.0058101	-18.94	0.000	-.1214254	-.0986405
dummy_year22	-.1149405	.0058049	-19.80	0.000	-.1263228	-.1035583
dummy_year23	-.1197014	.0058155	-20.58	0.000	-.1311044	-.1082984
dummy_year24	-.1242569	.0058158	-21.37	0.000	-.1356606	-.1128532
dummy_year25	-.1290749	.0058233	-22.17	0.000	-.1404933	-.1176565
dummy_year26	-.1339603	.0058314	-22.97	0.000	-.1453945	-.1225261
dummy_year27	-.1384617	.0058388	-23.71	0.000	-.1499104	-.127013
dummy_year28	-.1432591	.0058486	-24.49	0.000	-.154727	-.1317911
dummy_year29	-.1480658	.0058413	-25.35	0.000	-.1595195	-.1366122
dummy_year30	-.1528396	.0058577	-26.09	0.000	-.1643255	-.1413538
dummy_year31	-.1568343	.0058768	-26.69	0.000	-.1683576	-.145311
dummy_year32	-.1607673	.0058992	-27.25	0.000	-.1723345	-.1492002
dummy_year33	-.1649618	.0059268	-27.83	0.000	-.1765832	-.1533405
dummy_year34	-.1692768	.0059368	-28.51	0.000	-.1809176	-.157636
dummy_year35	-.1737037	.0059511	-29.19	0.000	-.1853726	-.1620348
dummy_year36	-.1780398	.005974	-29.80	0.000	-.1897536	-.166326
dummy_cou~y2	-.2175357	.0100168	-21.72	0.000	-.2371767	-.1978947
dummy_cou~y3	-.2806953	.0124216	-22.60	0.000	-.3050517	-.2563389
dummy_cou~y4	-.2422022	.0128382	-18.87	0.000	-.2673752	-.2170291
dummy_cou~y5	.2701968	.0104213	25.93	0.000	.2497627	.290631
dummy_cou~y6	-.3121131	.012634	-24.70	0.000	-.3368859	-.2873402
dummy_cou~y7	.2449508	.0102304	23.94	0.000	.2248911	.2650105

dummy_cou~y8	.1129076	.0086035	13.12	0.000	.0960379	.1297774
dummy_cou~y9	-.0329699	.0086225	-3.82	0.000	-.0498769	-.016063
dummy_cou~10	.4649955	.0111699	41.63	0.000	.4430936	.4868974
dummy_cou~11	.4415833	.0127031	34.76	0.000	.4166751	.4664916
dummy_cou~12	.3276575	.0090602	36.16	0.000	.3098923	.3454227
dummy_cou~13	-.289351	.0129881	-22.28	0.000	-.3148182	-.2638839
dummy_cou~14	.3933152	.0101814	38.63	0.000	.3733515	.413279
dummy_cou~15	.4027538	.0112583	35.77	0.000	.3806784	.4248291
dummy_cou~16	-.158305	.0086368	-18.33	0.000	-.17524	-.14137
dummy_cou~17	.2891085	.0106105	27.25	0.000	.2683035	.3099136
dummy_cou~18	-.0265623	.0084455	-3.15	0.002	-.0431223	-.0100023
dummy_cou~19	.2527448	.0109274	23.13	0.000	.2313183	.2741712
dummy_cou~20	-.0341607	.0086941	-3.93	0.000	-.051208	-.0171134
dummy_cou~21	.2449671	.0087793	27.90	0.000	.2277527	.2621815
dummy_cou~22	-.2697636	.014263	-18.91	0.000	-.2977304	-.2417967
dummy_cou~23	-.0520249	.0084565	-6.15	0.000	-.0686063	-.0354434
dummy_cou~24	.0096401	.0085029	1.13	0.257	-.0070323	.0263125
dummy_cou~25	.1075683	.0086647	12.41	0.000	.0905785	.1245581
dummy_cou~26	.0604719	.0084584	7.15	0.000	.0438866	.0770571
dummy_cou~27	.4112568	.0178303	23.07	0.000	.3762951	.4462185
dummy_cou~28	-.220355	.0126719	-17.39	0.000	-.2452021	-.195508
dummy_cou~29	-.2592856	.0127814	-20.29	0.000	-.2843473	-.234224
dummy_cou~30	-.2753809	.013304	-20.70	0.000	-.3014674	-.2492945
dummy_cou~31	.1510654	.0107274	14.08	0.000	.1300311	.1720997
dummy_cou~32	-.0462526	.0103567	-4.47	0.000	-.06656	-.0259452
dummy_cou~33	.1655735	.0084527	19.59	0.000	.1489994	.1821476
dummy_cou~34	.4844956	.0123321	39.29	0.000	.4603148	.5086764
dummy_cou~35	.1246763	.0086823	14.36	0.000	.107652	.1417005
dummy_cou~36	.2310246	.0104749	22.06	0.000	.2104855	.2515638
dummy_cou~37	.161142	.0095281	16.91	0.000	.1424593	.1798247
dummy_cou~38	-.0095694	.0091453	-1.05	0.295	-.0275014	.0083626
dummy_cou~39	-.1598698	.0113567	-14.08	0.000	-.1821379	-.1376017
dummy_cou~40	-.219732	.0120036	-18.31	0.000	-.2432687	-.1961953
dummy_cou~41	-.22698	.0148963	-15.24	0.000	-.2561886	-.1977714
dummy_cou~42	-.1865567	.0092313	-20.21	0.000	-.2046574	-.168456
dummy_cou~43	.3900597	.0096519	40.41	0.000	.3711344	.4089851
dummy_cou~44	-.0441082	.00908	-4.86	0.000	-.0619123	-.026304
dummy_cou~45	.3662437	.0101538	36.07	0.000	.3463341	.3861533
dummy_cou~46	.4032935	.0121809	33.11	0.000	.3794092	.4271778
dummy_cou~47	.0044271	.0084697	0.52	0.601	-.0121802	.0210345
dummy_cou~48	.424649	.0113302	37.48	0.000	.4024327	.4468653
dummy_cou~49	-.0130225	.009211	-1.41	0.158	-.0310833	.0050384
dummy_cou~50	.1337405	.0086332	15.49	0.000	.1168125	.1506686
dummy_cou~51	.4034594	.012918	31.23	0.000	.3781298	.4287891
dummy_cou~52	.4706612	.0117559	40.04	0.000	.4476104	.4937121
dummy_cou~53	-.2908573	.0128539	-22.63	0.000	-.3160613	-.2656534

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dummy_cou~54 |  -.2373436   .0114539   -20.72   0.000    -.2598025   -.2148847
dummy_cou~55 |  -.0180342   .0085733    -2.10   0.036    -.0348447   -.0012236
dummy_cou~56 |   .4547774   .0109612    41.49   0.000     .4332847    .4762701
dummy_cou~57 |   .0973835   .0098402     9.90   0.000     .0780888    .1166783
dummy_cou~58 |  -.2612756   .0143984   -18.15   0.000    -.2895081   -.2330432
dummy_cou~59 |   .1513196   .0097944    15.45   0.000     .1321149    .1705244
dummy_cou~60 |   .4067182   .0090538    44.92   0.000     .3889656    .4244708
dummy_cou~61 |    .047152   .0084862     5.56   0.000     .0305122    .0637918
dummy_cou~62 |   .0281604   .0084786     3.32   0.001     .0115355    .0447853
dummy_cou~63 |    .10815   .0086836    12.45   0.000     .0911231    .1251768
dummy_cou~64 |  -.115413    .009808   -11.77   0.000    -.1346445   -.0961816
dummy_cou~65 |   .4764389   .0106861    44.58   0.000     .4554856    .4973922
dummy_cou~66 |    .369228   .0095305    38.74   0.000     .3505405    .3879155
dummy_cou~67 |   .2544225   .0104957    24.24   0.000     .2338426    .2750025
dummy_cou~68 |  -.1692746   .0087419   -19.36   0.000    -.1864158   -.1521335
dummy_cou~69 |  -.1634855   .0108885   -15.01   0.000    -.1848355   -.1421354
dummy_cou~70 |   .0902435   .0093403     9.66   0.000      .071929     .108558
dummy_cou~71 |    .280667   .0102704    27.33   0.000     .2605287    .3008052
dummy_cou~72 |  -.2847807    .013737   -20.73   0.000    -.3117162   -.2578452
dummy_cou~73 |  -.2834137   .0156089   -18.16   0.000    -.3140196   -.2528078
dummy_cou~74 |   .0136066   .0086958     1.56   0.118    -.0034441    .0306572
dummy_cou~75 |   .4409401   .0134014    32.90   0.000     .4146626    .4672176
dummy_cou~76 |    .300851   .0086265    34.88   0.000     .2839362    .3177659
dummy_cou~77 |   .2434938   .0103027    23.63   0.000     .2232922    .2636953
dummy_cou~78 |  -.0120821   .0084805    -1.42   0.154    -.0287106    .0045465
dummy_cou~79 |   .2215231   .0086825    25.51   0.000     .2044986    .2385477
dummy_cou~80 |   .4228285   .0127728    33.10   0.000     .3977836    .4478734
dummy_cou~81 |  -.3207515   .0130045   -24.66   0.000    -.3462507   -.2952523
dummy_cou~82 |  -.3117026    .014705   -21.20   0.000    -.3405363    -.282869
dummy_cou~83 |  -.1947513   .0093021   -20.94   0.000    -.2129908   -.1765118
dummy_cou~84 |  -.1886012   .0095639   -19.72   0.000    -.2073541   -.1698484
dummy_cou~85 |   .3338358   .0095203    35.07   0.000     .3151685    .3525032
dummy_cou~86 |   .3025426   .0090372    33.48   0.000     .2848225    .3202627
       _cons |   .9623328   .0518769    18.55   0.000     .8606127    1.064053
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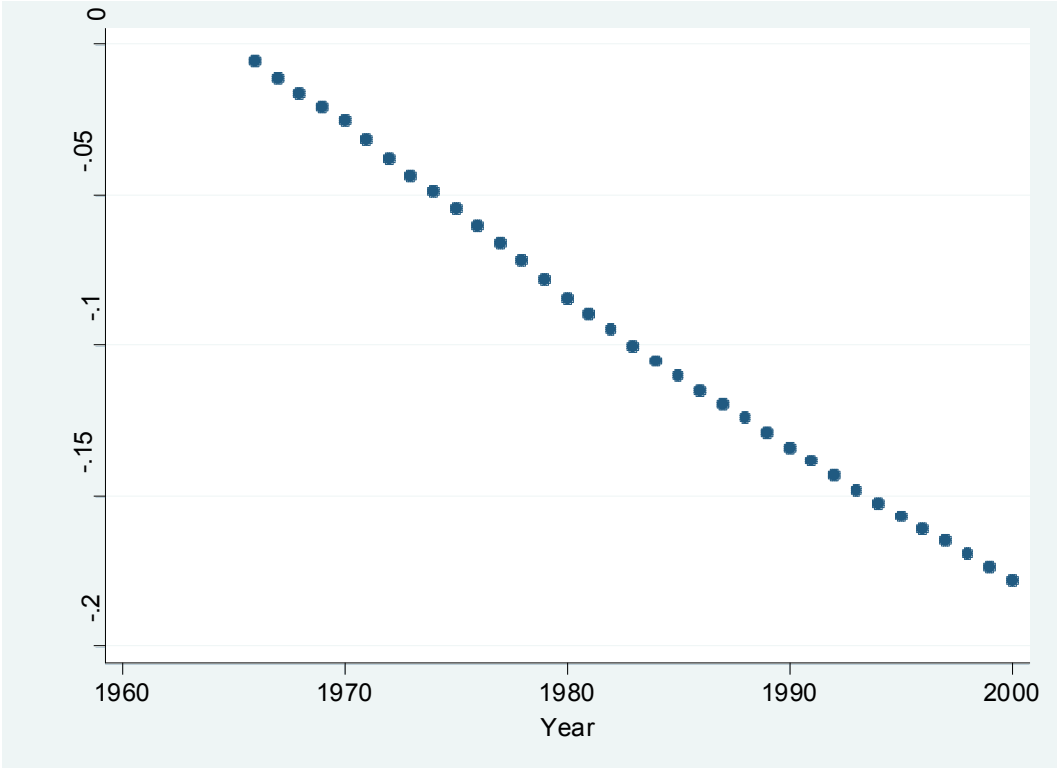
1) The Graph of the Time Dummy Coefficients for the regression function:

Y (Agri. Employ. Share) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

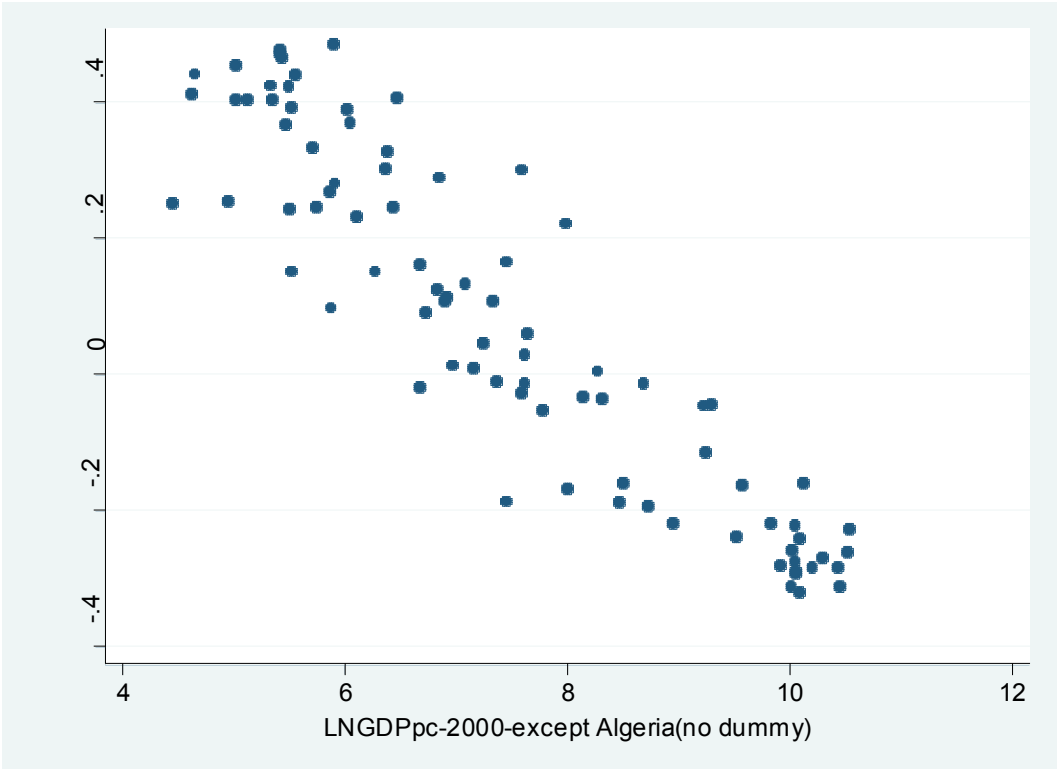
Y (Time coefficient Estimates-2) = a + b*new_year + c*(new_yearsquared) + e.

Source	SS	df	MS		Number of obs	35
					F(2, 32)	42462.61
Model	0.095214466	2	.047607233		Prob > F	0
Residual	0.000035877	32	1.1212e-06		R-squared	0.9996
					Adj R-squared	0.9996
Total	0.095250343	34	.002801481		Root MSE	0.00106

Timecoeffi.estimates2	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
new_year	-0.010043	.0003265	-30.76	0	-0.0107081	-0.0093778
new_yearsquared	0.0000294	1.96e-06	14.98	0	0.0000254	0.0000334
_cons	0.5317022	.0134132	39.64	0	0.5043805	0.5590239

2) The Graph of the Country Dummy Coefficients plotted against LNGDPpc2000 for the regression function:

Y (Agri. Employ. Share) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

Y (country dummy coefficients) = a + b*(LNGDPpc2000) + e

Source	SS	df	MS		Number of obs	85
					F(1, 83)	463.51
Model	4.68671918	1	4.68671918		Prob > F	0
Residual	0.839239156	83	.010111315		R-squared	0.8481
					Adj R-squared	0.8463
Total	5.52595834	84	.065785218		Root MSE	0.10056
countrydummycoefficients	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
lngdppc2000	-0.1300987	.0060429	-21.53	0	-0.1421177	-0.1180797
_cons	1.048155	.046398	22.59	0	0.9558714	1.140439

Y (Agri. Emply.Share) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (Agr./Non-Agr.ToT) + B_5 (dummy_year2) + B_6 (dummy_year3) + B_7 (dummy_year4) +….. + B_{39} (dummy_year36) + B_{40} (dummy_country2) + B_{41} (dummy_country3) + …. + B_{126} (dummy_country88) + e

```
      Source |       SS       df       MS              Number of obs =    2711
-------------+------------------------------           F(121,  2589) = 1606.28
       Model |  227.013494   121  1.87614458           Prob > F      =  0.0000
    Residual |  3.02396255  2589  .001168004           R-squared     =  0.9869
-------------+------------------------------           Adj R-squared =  0.9862
       Total |  230.037456  2710   .08488467           Root MSE      =  .03418

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agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.0367663   .0147827    -2.49   0.013    -.0657533   -.0077792
lngdpperc~20 |   .0006167   .0010404     0.59   0.553    -.0014234    .0026567
ToT_base~100 |  -.0001284   .0000182    -7.06   0.000    -.0001641   -.0000927
 dummy_year2 |  -.0067823   .0070144    -0.97   0.334    -.0205367    .0069721
 dummy_year3 |  -.0160388    .006885    -2.33   0.020    -.0295394   -.0025382
 dummy_year4 |  -.0214866   .0068295    -3.15   0.002    -.0348785   -.0080947
 dummy_year5 |  -.0270769   .0068072    -3.98   0.000     -.040425   -.0137288
 dummy_year6 |  -.0355352   .0066197    -5.37   0.000    -.0485157   -.0225547
 dummy_year7 |  -.0497647   .0064018    -7.77   0.000    -.0623179   -.0372114
 dummy_year8 |  -.0543286   .0064041    -8.48   0.000    -.0668863   -.0417709
 dummy_year9 |  -.0594648    .00641    -9.28   0.000     -.072034   -.0468956
dummy_year10 |  -.0657364   .0064031   -10.27   0.000    -.0782922   -.0531807
dummy_year11 |  -.0720897   .0063888   -11.28   0.000    -.0846173    -.059562
dummy_year12 |   -.077284    .006401   -12.07   0.000    -.0898356   -.0647324
dummy_year13 |  -.0828538   .0063967   -12.95   0.000    -.0953971   -.0703106
dummy_year14 |  -.0899638   .0064049   -14.05   0.000     -.102523   -.0774046
dummy_year15 |  -.0962337   .0064112   -15.01   0.000    -.1088053   -.0836621
dummy_year16 |  -.1043679   .0064384   -16.21   0.000    -.1169929    -.091743
dummy_year17 |  -.1098539   .0064422   -17.05   0.000    -.1224863   -.0972215
dummy_year18 |  -.1158153   .0064281   -18.02   0.000     -.12842   -.1032106
dummy_year19 |  -.1209758   .0064256   -18.83   0.000    -.1335756    -.108376
dummy_year20 |  -.1265455   .0064174   -19.72   0.000    -.1391292   -.1139618
dummy_year21 |  -.1314602   .0064258   -20.46   0.000    -.1440605    -.11886
dummy_year22 |   -.136364   .0064044   -21.29   0.000    -.1489223   -.1238056
dummy_year23 |   -.141055   .0064114   -22.00   0.000     -.153627    -.128483
dummy_year24 |  -.1458816    .006442   -22.65   0.000    -.1585136   -.1332495
dummy_year25 |  -.1511115   .0064504   -23.43   0.000    -.1637599   -.1384631
dummy_year26 |  -.1568497   .0064404   -24.35   0.000    -.1694785   -.1442209
dummy_year27 |   -.161689   .0064685   -25.00   0.000     -.174373   -.1490051
dummy_year28 |  -.1663686   .0064793   -25.68   0.000    -.1790736   -.1536636
dummy_year29 |  -.1712626   .0064589   -26.52   0.000    -.1839277   -.1585975
dummy_year30 |  -.1759868   .0064757   -27.18   0.000    -.1886848   -.1632887
dummy_year31 |  -.1798534   .0064923   -27.70   0.000     -.192584   -.1671228
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dummy_year32	-.1838454	.0064997	-28.29	0.000	-.1965904	-.1711003
dummy_year33	-.1878556	.0065252	-28.79	0.000	-.2006507	-.1750605
dummy_year34	-.1923455	.0065373	-29.42	0.000	-.2051643	-.1795267
dummy_year35	-.1974049	.0065642	-30.07	0.000	-.2102764	-.1845334
dummy_year36	-.2019267	.0065906	-30.64	0.000	-.21485	-.1890035
dummy_cou~y2	-.2016593	.010005	-20.16	0.000	-.2212779	-.1820408
dummy_cou~y3	-.2403618	.0132974	-18.08	0.000	-.2664364	-.2142872
dummy_cou~y4	-.2019371	.0140672	-14.36	0.000	-.2295213	-.174353
dummy_cou~y5	.2835254	.0101421	27.96	0.000	.2636379	.3034128
dummy_cou~y6	-.2645721	.0137344	-19.26	0.000	-.2915036	-.2376406
dummy_cou~y7	.24715	.0102632	24.08	0.000	.2270251	.2672748
dummy_cou~y8	.120855	.0085801	14.09	0.000	.1040305	.1376795
dummy_cou~y9	-.0271807	.0082858	-3.28	0.001	-.0434281	-.0109333
dummy_cou~10	.4927087	.0111431	44.22	0.000	.4708584	.5145591
dummy_cou~11	.4850666	.0127093	38.17	0.000	.4601451	.5099881
dummy_cou~12	.3232179	.0087691	36.86	0.000	.3060227	.3404131
dummy_cou~13	-.2497175	.0140204	-17.81	0.000	-.2772098	-.2222251
dummy_cou~14	.3989695	.0098807	40.38	0.000	.3795947	.4183443
dummy_cou~15	.4178755	.0111349	37.53	0.000	.3960412	.4397098
dummy_cou~16	-.1622276	.0083214	-19.50	0.000	-.1785448	-.1459103
dummy_cou~17	.2965991	.0103272	28.72	0.000	.2763487	.3168496
dummy_cou~18	-.0313228	.0080847	-3.87	0.000	-.0471759	-.0154696
dummy_cou~19	.2656326	.010923	24.32	0.000	.2442139	.2870514
dummy_cou~20	-.0245338	.0084196	-2.91	0.004	-.0410436	-.008024
dummy_cou~21	.2469721	.0084205	29.33	0.000	.2304604	.2634838
dummy_cou~22	-.2224967	.0153829	-14.46	0.000	-.2526608	-.1923326
dummy_cou~23	-.0570242	.0081003	-7.04	0.000	-.072908	-.0411404
dummy_cou~24	.0060502	.0081358	0.74	0.457	-.0099031	.0220034
dummy_cou~25	.1019306	.0083456	12.21	0.000	.0855659	.1182953
dummy_cou~26	.0759828	.0083571	9.09	0.000	.0595955	.0923701
dummy_cou~27	.4459257	.0174277	25.59	0.000	.4117521	.4800993
dummy_cou~28	-.1937442	.0131937	-14.68	0.000	-.2196156	-.1678729
dummy_cou~29	-.2255487	.0138551	-16.28	0.000	-.2527169	-.1983804
dummy_cou~30	-.2450971	.0139038	-17.63	0.000	-.2723608	-.2178333
dummy_cou~31	.1638349	.0104428	15.69	0.000	.1433578	.1843119
dummy_cou~32	-.0335958	.0103718	-3.24	0.001	-.0539338	-.0132579
dummy_cou~33	.1599311	.0081022	19.74	0.000	.1440437	.1758184
dummy_cou~34	.4938032	.0119084	41.47	0.000	.4704522	.5171541
dummy_cou~35	.1270299	.0083202	15.27	0.000	.110715	.1433448
dummy_cou~36	.238952	.0101792	23.47	0.000	.2189918	.2589121
dummy_cou~37	.1666126	.009251	18.01	0.000	.1484725	.1847527
dummy_cou~38	-.004788	.0089273	-0.54	0.592	-.0222934	.0127174
dummy_cou~39	(dropped)					
dummy_cou~40	-.1932071	.01286	-15.02	0.000	-.2184239	-.1679903
dummy_cou~41	-.1907799	.0158423	-12.04	0.000	-.2218447	-.1597151
dummy_cou~42	-.1739002	.0089264	-19.48	0.000	-.1914037	-.1563967

dummy_cou~43	.3906644	.0093533	41.77	0.000	.3723237	.409005
dummy_cou~44	-.0392047	.0088277	-4.44	0.000	-.0565148	-.0218947
dummy_cou~45	.3815466	.0102607	37.19	0.000	.3614266	.4016666
dummy_cou~46	.4348965	.012097	35.95	0.000	.4111758	.4586173
dummy_cou~47	-.0102025	.0084451	-1.21	0.227	-.0267623	.0063574
dummy_cou~48	.4443632	.0110875	40.08	0.000	.4226219	.4661045
dummy_cou~49	-.003662	.0089959	-0.41	0.684	-.021302	.013978
dummy_cou~50	.1257995	.0083476	15.07	0.000	.1094308	.1421682
dummy_cou~51	.4363263	.0132127	33.02	0.000	.4104177	.4622348
dummy_cou~52	.4900718	.0115116	42.57	0.000	.4674988	.5126448
dummy_cou~53	-.2433191	.0139478	-17.45	0.000	-.270669	-.2159692
dummy_cou~54	-.1912504	.0123698	-15.46	0.000	-.2155061	-.1669946
dummy_cou~55	-.0146525	.0082072	-1.79	0.074	-.0307459	.0014409
dummy_cou~56	.474163	.0107339	44.17	0.000	.4531151	.4952109
dummy_cou~57	.1045229	.0095263	10.97	0.000	.0858429	.1232028
dummy_cou~58	-.2147576	.0159511	-13.46	0.000	-.2460359	-.1834793
dummy_cou~59	.1546423	.0094846	16.30	0.000	.1360441	.1732404
dummy_cou~60	.4093826	.0087103	47.00	0.000	.3923028	.4264624
dummy_cou~61	.0486575	.0081041	6.00	0.000	.0327663	.0645488
dummy_cou~62	.0309573	.0084938	3.64	0.000	.0143019	.0476127
dummy_cou~63	.1083303	.0083177	13.02	0.000	.0920204	.1246402
dummy_cou~64	-.0889681	.0106174	-8.38	0.000	-.1097876	-.0681487
dummy_cou~65	.4981199	.0105211	47.34	0.000	.4774893	.5187505
dummy_cou~66	.37079	.0092155	40.24	0.000	.3527195	.3888605
dummy_cou~67	(dropped)					
dummy_cou~68	-.1611982	.0084472	-19.08	0.000	-.1777622	-.1446342
dummy_cou~69	-.1495149	.0115758	-12.92	0.000	-.1722136	-.1268162
dummy_cou~70	.0895092	.0090305	9.91	0.000	.0718015	.107217
dummy_cou~71	.2844092	.0103992	27.35	0.000	.2640176	.3048008
dummy_cou~72	-.2367117	.0149537	-15.83	0.000	-.266034	-.2073893
dummy_cou~73	-.1872612	.019168	-9.77	0.000	-.2248474	-.149675
dummy_cou~74	.0097698	.0083551	1.17	0.242	-.0066136	.0261533
dummy_cou~75	.4567152	.0136108	33.56	0.000	.4300259	.4834044
dummy_cou~76	.2998647	.0082571	36.32	0.000	.2836736	.3160558
dummy_cou~77	.2544478	.0100078	25.42	0.000	.2348236	.2740719
dummy_cou~78	-.0169211	.0081251	-2.08	0.037	-.0328535	-.0009887
dummy_cou~79	.2195615	.0083122	26.41	0.000	.2032623	.2358607
dummy_cou~80	.443968	.0124564	35.64	0.000	.4195425	.4683935
dummy_cou~81	-.2694549	.0140998	-19.11	0.000	-.2971028	-.2418069
dummy_cou~82	-.2459372	.0163278	-15.06	0.000	-.2779541	-.2139202
dummy_cou~83	-.1810644	.0091617	-19.76	0.000	-.1990294	-.1630994
dummy_cou~84	-.1791908	.0094097	-19.04	0.000	-.1976421	-.1607396
dummy_cou~85	.3356006	.0092032	36.47	0.000	.3175543	.3536469
dummy_cou~86	.3072558	.0089354	34.39	0.000	.2897344	.3247771
_cons	.7452994	.0550653	13.53	0.000	.6373228	.853276

Annex Table A-3: The share of agriculture in total GDP (AgGDPshr)

Regression GDP-1: Y (Agri.GDPsharelcu) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + e

```
      Source |       SS       df       MS              Number of obs =    2809
-------------+------------------------------           F(  2,  2806) = 4553.74
       Model |  49.9474416     2  24.9737208           Prob > F      =  0.0000
    Residual |  15.3887142  2806  .005484217           R-squared     =  0.7645
-------------+------------------------------           Adj R-squared =  0.7643
       Total |  65.3361558  2808  .023267862           Root MSE      =  .07406

------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.2732819   .0089835   -30.42   0.000    -.2908968   -.2556671
lngdpperc~20 |   .0128713   .0005934    21.69   0.000     .0117078    .0140348
       _cons |   1.485149   .0326772    45.45   0.000     1.421075    1.549223
------------------------------------------------------------------------------
```

Regression GDP-2: Y (Agri. GDP Share-lcu) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + e

```
      Source |       SS       df       MS              Number of obs =    2809
-------------+------------------------------           F( 37,  2771) =  269.29
       Model |  51.1196017    37  1.38161086           Prob > F      =  0.0000
    Residual |  14.2165542  2771  .005130478           R-squared     =  0.7824
-------------+------------------------------           Adj R-squared =  0.7795
       Total |  65.3361558  2808  .023267862           Root MSE      =  .07163

------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.2864913   .0087408   -32.78   0.000    -.3036303   -.2693522
lngdpperc~20 |   .0138345    .000578    23.94   0.000     .0127013    .0149678
 dummy_year2 |   -.007889   .0135386    -0.58   0.560    -.0344357    .0186576
 dummy_year3 |  -.0093971   .0134812    -0.70   0.486    -.0358313     .017037
 dummy_year4 |  -.0109264   .0134255    -0.81   0.416    -.0372514    .0153986
 dummy_year5 |  -.0141535   .0134256    -1.05   0.292    -.0404787    .0121718
 dummy_year6 |  -.0183705   .0132191    -1.39   0.165    -.0442908    .0075499
 dummy_year7 |  -.0213289   .0126923    -1.68   0.093    -.0462163    .0035585
 dummy_year8 |  -.0182816   .0126934    -1.44   0.150    -.0431711    .0066079
 dummy_year9 |   -.018244   .0126946    -1.44   0.151    -.0431358    .0066478
dummy_year10 |   -.012929   .0126607    -1.02   0.307    -.0377544    .0118964
dummy_year11 |  -.0265327   .0126268    -2.10   0.036    -.0512916   -.0017737
dummy_year12 |  -.0245118   .0125954    -1.95   0.052    -.0492091    .0001855
```

```
dummy_year13 |  -.0213794   .0125963    -1.70   0.090    -.0460784    .0033197
dummy_year14 |  -.0282868   .0125972    -2.25   0.025    -.0529877   -.0035859
dummy_year15 |  -.0312301   .0125979    -2.48   0.013    -.0559324   -.0065278
dummy_year16 |  -.0448242   .0125973    -3.56   0.000    -.0695252   -.0201233
dummy_year17 |  -.0469884   .0125641    -3.74   0.000    -.0716245   -.0223524
dummy_year18 |  -.0493357   .0125315    -3.94   0.000    -.0739078   -.0247636
dummy_year19 |  -.0487484   .0125316    -3.89   0.000    -.0733207   -.0241761
dummy_year20 |  -.0565877    .012501    -4.53   0.000    -.0810998   -.0320756
dummy_year21 |  -.0548176   .0125016    -4.38   0.000    -.0793309   -.0303042
dummy_year22 |  -.0508929   .0124416    -4.09   0.000    -.0752886   -.0264972
dummy_year23 |  -.0533904   .0124424    -4.29   0.000    -.0777877   -.0289932
dummy_year24 |  -.0511096   .0124734    -4.10   0.000    -.0755678   -.0266515
dummy_year25 |  -.0560161    .012474    -4.49   0.000    -.0804754   -.0315567
dummy_year26 |  -.0594669   .0124182    -4.79   0.000    -.0838167    -.035117
dummy_year27 |  -.0594405   .0124187    -4.79   0.000    -.0837914   -.0350896
dummy_year28 |  -.0635027   .0124199    -5.11   0.000     -.087856   -.0391495
dummy_year29 |  -.0632499   .0124204    -5.09   0.000     -.087604   -.0388957
dummy_year30 |  -.0689357   .0124222    -5.55   0.000    -.0932934    -.044578
dummy_year31 |  -.0668683   .0124232    -5.38   0.000     -.091228   -.0425087
dummy_year32 |   -.062196   .0123952    -5.02   0.000    -.0865006   -.0378913
dummy_year33 |   -.062457   .0123971    -5.04   0.000    -.0867655   -.0381485
dummy_year34 |  -.0619444   .0123977    -5.00   0.000    -.0862541   -.0376347
dummy_year35 |  -.0663228   .0123989    -5.35   0.000    -.0906348   -.0420108
dummy_year36 |  -.0717193   .0124008    -5.78   0.000    -.0960349   -.0474036
       _cons |   1.571065    .033308    47.17   0.000     1.505754    1.636376
------------------------------------------------------------------------------
```

Regression GDP-3: Y (Agri. GDP Share-lcu) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e

```
      Source |       SS       df       MS              Number of obs =    2809
-------------+------------------------------           F(122,  2686) =  227.93
       Model |  59.5811072   122  .488369731           Prob > F      =  0.0000
    Residual |  5.7550486  2686  .002142609           R-squared     =  0.9119
-------------+------------------------------           Adj R-squared =  0.9079
       Total |  65.3361558  2808  .023267862           Root MSE      =  .04629

------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |   -.292274    .019132   -15.28   0.000    -.3297889   -.2547591
lngdpperc~20 |   .0142423   .0013345    10.67   0.000     .0116255    .0168591
 dummy_year2 |  -.0065353   .0087519    -0.75   0.455    -.0236964    .0106258
 dummy_year3 |  -.0092382   .0087166    -1.06   0.289    -.0263303    .0078538
 dummy_year4 |  -.0122453   .0086838    -1.41   0.159    -.0292729    .0047824
```

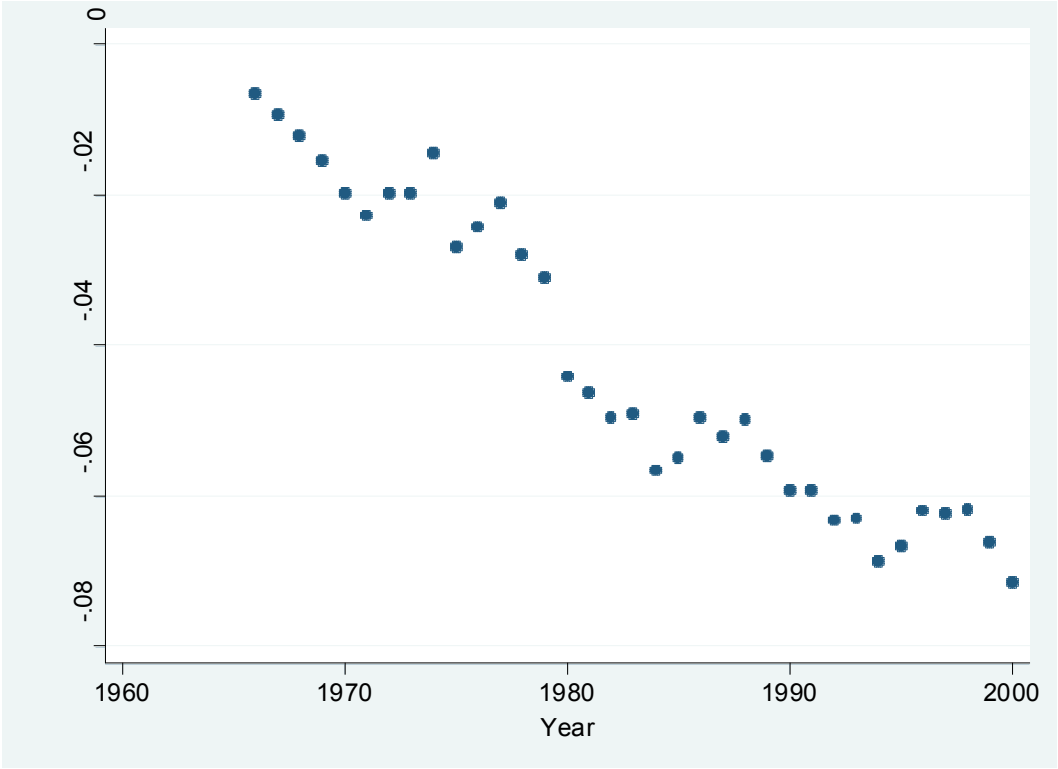
dummy_year5	-.0154643	.0086896	-1.78	0.075	-.0325032	.0015747
dummy_year6	-.0196685	.0085685	-2.30	0.022	-.03647	-.0028669
dummy_year7	-.0227279	.0082415	-2.76	0.006	-.0388883	-.0065676
dummy_year8	-.0197041	.0082451	-2.39	0.017	-.0358714	-.0035367
dummy_year9	-.019697	.0082489	-2.39	0.017	-.0358719	-.0035222
dummy_year10	-.0145102	.0082399	-1.76	0.078	-.0306675	.001647
dummy_year11	-.0268343	.0082201	-3.26	0.001	-.0429525	-.010716
dummy_year12	-.0242496	.0082151	-2.95	0.003	-.0403581	-.008141
dummy_year13	-.0211212	.0082266	-2.57	0.010	-.0372522	-.0049902
dummy_year14	-.028035	.0082392	-3.40	0.001	-.0441908	-.0118791
dummy_year15	-.0309979	.0082466	-3.76	0.000	-.0471681	-.0148276
dummy_year16	-.0441857	.0082532	-5.35	0.000	-.0603691	-.0280024
dummy_year17	-.0463378	.0082358	-5.63	0.000	-.0624869	-.0301887
dummy_year18	-.0496773	.0082114	-6.05	0.000	-.0657787	-.033576
dummy_year19	-.0491018	.0082075	-5.98	0.000	-.0651954	-.0330081
dummy_year20	-.0566595	.0081973	-6.91	0.000	-.0727331	-.0405859
dummy_year21	-.0549004	.0082038	-6.69	0.000	-.0709869	-.038814
dummy_year22	-.0496429	.0081745	-6.07	0.000	-.065672	-.0336139
dummy_year23	-.0521541	.0081849	-6.37	0.000	-.0682035	-.0361047
dummy_year24	-.0498746	.0082214	-6.07	0.000	-.0659956	-.0337536
dummy_year25	-.0547939	.0082273	-6.66	0.000	-.0709264	-.0386614
dummy_year26	-.0592063	.0082027	-7.22	0.000	-.0752906	-.0431221
dummy_year27	-.0591875	.0082101	-7.21	0.000	-.0752862	-.0430888
dummy_year28	-.0632738	.0082176	-7.70	0.000	-.0793874	-.0471603
dummy_year29	-.0630286	.0082229	-7.67	0.000	-.0791525	-.0469048
dummy_year30	-.0687451	.0082385	-8.34	0.000	-.0848995	-.0525906
dummy_year31	-.0666842	.0082614	-8.07	0.000	-.0828836	-.0504848
dummy_year32	-.0620128	.0082673	-7.50	0.000	-.0782238	-.0458018
dummy_year33	-.062298	.0082983	-7.51	0.000	-.0785698	-.0460263
dummy_year34	-.0617914	.00831	-7.44	0.000	-.078086	-.0454968
dummy_year35	-.0661857	.0083257	-7.95	0.000	-.0825111	-.0498603
dummy_year36	-.0716065	.0083512	-8.57	0.000	-.0879819	-.0552311
dummy_cou~y2	.0511019	.0132994	3.84	0.000	.0250238	.07718
dummy_cou~y3	.0704304	.0175081	4.02	0.000	.0360996	.1047612
dummy_cou~y4	.0637887	.0183724	3.47	0.001	.0277631	.0998142
dummy_cou~y5	.1025701	.0136938	7.49	0.000	.0757186	.1294217
dummy_cou~y6	.0464174	.0178887	2.59	0.010	.0113404	.0814944
dummy_cou~y7	.0761489	.0134266	5.67	0.000	.0498213	.1024764
dummy_cou~y8	.0343154	.0116089	2.96	0.003	.0115522	.0570787
dummy_cou~y9	.0267506	.0123933	2.16	0.031	.0024492	.051052
dummy_cou~10	-.0257426	.0147423	-1.75	0.081	-.0546501	.0031649
dummy_cou~11	.1398465	.0171084	8.17	0.000	.1062995	.1733935
dummy_cou~12	.1101085	.0117867	9.34	0.000	.0869966	.1332204
dummy_cou~13	.0537513	.0178212	3.02	0.003	.0188066	.088696
dummy_cou~14	.1307169	.0133582	9.79	0.000	.1045236	.1569103
dummy_cou~15	.0251364	.0148664	1.69	0.091	-.0040144	.0542872

dummy_cou~16	.0152935	.0111983	1.37	0.172	-.0066647	.0372516
dummy_cou~17	-.0171346	.013962	-1.23	0.220	-.0445119	.0102427
dummy_cou~18	.0989979	.0109112	9.07	0.000	.0776028	.120393
dummy_cou~19	.0464046	.0179876	2.58	0.010	.0111336	.0816756
dummy_cou~20	.1280891	.0112836	11.35	0.000	.1059636	.1502145
dummy_cou~21	.1195736	.0113898	10.50	0.000	.0972399	.1419073
dummy_cou~22	.0669918	.0198356	3.38	0.001	.0280973	.1058864
dummy_cou~23	.0630038	.010927	5.77	0.000	.0415777	.0844299
dummy_cou~24	.0494795	.0109945	4.50	0.000	.0279209	.0710381
dummy_cou~25	.0559928	.0112258	4.99	0.000	.0339807	.0780048
dummy_cou~26	.195533	.0109302	17.89	0.000	.1741006	.2169654
dummy_cou~27	.0680222	.0196782	3.46	0.001	.0294363	.1066081
dummy_cou~28	.0871184	.0173437	5.02	0.000	.05311	.1211269
dummy_cou~29	.0636518	.0182013	3.50	0.000	.0279619	.0993417
dummy_cou~30	.0414909	.0182839	2.27	0.023	.005639	.0773428
dummy_cou~31	.1579599	.0141223	11.19	0.000	.1302682	.1856516
dummy_cou~32	.1160191	.0138202	8.39	0.000	.0889199	.1431184
dummy_cou~33	.1540456	.0109218	14.10	0.000	.1326297	.1754615
dummy_cou~34	-.0108524	.0161026	-0.67	0.500	-.0424271	.0207223
dummy_cou~35	.0774264	.0112522	6.88	0.000	.0553625	.0994904
dummy_cou~36	.0410121	.0137689	2.98	0.003	.0140133	.0680109
dummy_cou~37	.0493463	.0124424	3.97	0.000	.0249488	.0737439
dummy_cou~38	.0835741	.0118179	7.07	0.000	.060401	.1067471
dummy_cou~39	.1174867	.0161287	7.28	0.000	.0858608	.1491126
dummy_cou~40	.0668512	.0169261	3.95	0.000	.0336617	.1000407
dummy_cou~41	.0603164	.0207018	2.91	0.004	.0197233	.1009094
dummy_cou~42	-.0259556	.0119279	-2.18	0.030	-.0493444	-.0025667
dummy_cou~43	.0519129	.0126172	4.11	0.000	.0271725	.0766533
dummy_cou~44	.1206241	.0118809	10.15	0.000	.0973275	.1439207
dummy_cou~45	-.003265	.0134191	-0.24	0.808	-.0295778	.0230478
dummy_cou~46	.0037376	.0161623	0.23	0.817	-.0279542	.0354295
dummy_cou~47	.1270476	.0109481	11.60	0.000	.10558	.1485152
dummy_cou~48	.1382309	.0149576	9.24	0.000	.1089014	.1675605
dummy_cou~49	.0586626	.012069	4.86	0.000	.0349971	.082328
dummy_cou~50	.0333284	.0111818	2.98	0.003	.0114027	.0552541
dummy_cou~51	.0072173	.0170651	0.42	0.672	-.0262448	.0406793
dummy_cou~52	.1826548	.015565	11.73	0.000	.1521342	.2131753
dummy_cou~53	.062192	.0182411	3.41	0.001	.026424	.09796
dummy_cou~54	.0990095	.0159106	6.22	0.000	.0678113	.1302078
dummy_cou~55	.0531422	.0110953	4.79	0.000	.031386	.0748984
dummy_cou~56	.1584411	.0144502	10.96	0.000	.1301065	.1867758
dummy_cou~57	.0879817	.0128808	6.83	0.000	.0627243	.113239
dummy_cou~58	.0599666	.0208332	2.88	0.004	.0191159	.1008172
dummy_cou~59	.026763	.0128163	2.09	0.037	.0016321	.0518939
dummy_cou~60	.1302265	.0117781	11.06	0.000	.1071314	.1533215
dummy_cou~61	.1752427	.0109702	15.97	0.000	.1537317	.1967537

```
dummy_cou~62 |   .041541   .0114933     3.61   0.000     .0190045    .0640776
dummy_cou~63 |   .0931841   .0112541     8.28   0.000     .0711165    .1152516
dummy_cou~64 |   .1158768   .0137126     8.45   0.000     .0889886    .1427651
dummy_cou~65 |   .1759608   .0140645    12.51   0.000     .1483824    .2035391
dummy_cou~66 |  -.0152146   .0124474    -1.22   0.222    -.0396221     .009193
dummy_cou~67 |   .0823144    .013798     5.97   0.000     .0552586    .1093702
dummy_cou~68 |   .0079087   .0113553     0.70   0.486    -.0143574    .0301747
dummy_cou~69 |   .0877557    .015302     5.73   0.000      .057751    .1177605
dummy_cou~70 |   .0323355   .0121799     2.65   0.008     .0084526    .0562183
dummy_cou~71 |   .0705786   .0140662     5.02   0.000      .042997    .0981603
dummy_cou~72 |   .0606235   .0195269     3.10   0.002     .0223342    .0989128
dummy_cou~73 |   .0641293   .0251241     2.55   0.011     .0148648    .1133937
dummy_cou~74 |   .0807978   .0112707     7.17   0.000     .0586977    .1028978
dummy_cou~75 |   .1527179   .0184018     8.30   0.000     .1166349     .188801
dummy_cou~76 |   .0458918   .0111697     4.11   0.000     .0239898    .0677939
dummy_cou~77 |   .0615271   .0135279     4.55   0.000     .0350011    .0880532
dummy_cou~78 |    .036541   .0109617     3.33   0.001     .0150467    .0580353
dummy_cou~79 |   .1587876   .0112296    14.14   0.000      .136768    .1808072
dummy_cou~80 |   .1504253   .0168238     8.94   0.000     .1174363    .1834142
dummy_cou~81 |   .0423083   .0184362     2.29   0.022     .0061577    .0784589
dummy_cou~82 |   .0504608   .0210255     2.40   0.016      .009233    .0916887
dummy_cou~83 |   .1057142   .0122079     8.66   0.000     .0817764     .129652
dummy_cou~84 |   .0348048   .0126072     2.76   0.006     .0100841    .0595256
dummy_cou~85 |  -.0804735   .0124326    -6.47   0.000     -.104852    -.056095
dummy_cou~86 |  -.0298141   .0117548    -2.54   0.011    -.0528634   -.0067648
       _cons |   1.519445   .0726592    20.91   0.000     1.376971    1.661918
------------------------------------------------------------------------------
```

1) The Graph of the Time Dummy Coefficients for the regression function:

Y (Agri. GDP Share-lcu) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

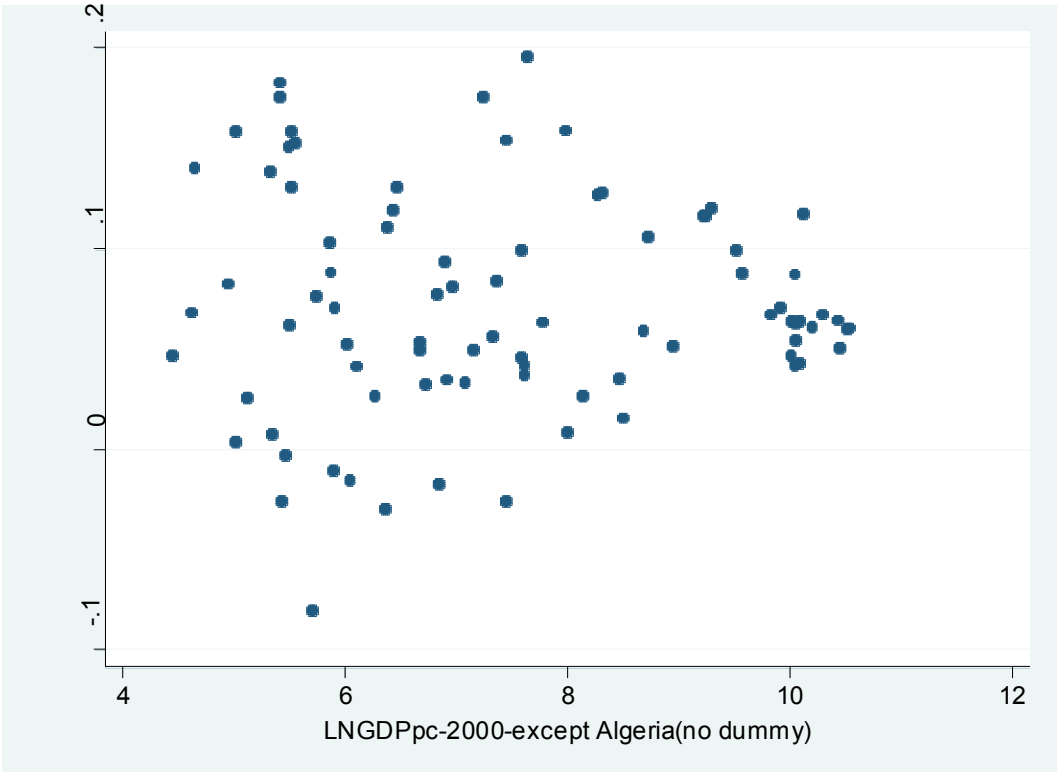
Y (Time coefficient Estimates -2) = a + b*new_year + c*(new_yearsquared) + e.

Source	SS	df	MS		Number of obs	35
					F(2, 32)	42462.61
Model	0.013375323	2	.006687661		Prob > F	0
Residual	0.000836335	32	.000026135		R-squared	0.9412
					Adj R-squared	0.9375
Total	0.014211658	34	.00041799		Root MSE	0.00511

Timecoeffi.estimates2	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
new_year	-0.0067701	0.0015766	-4.29	0	-0.0099815	-0.0035587
new_yearsquared	0.0000292	9.48e-06	3.08	0.004	9.91e-06	0.0000485
_cons	0.3152013	0.0647609	4.87	0	0.1832877	0.447115

2) The Graph of the Country Dummy Coefficients plotted against LNGDPpc2000 for the regression function:

Y (Agri. GDP Share-lcu) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

Y (country dummy coefficients) = a + b*(LNGDPpc2000) + e

Source	SS	df	MS	Number of obs =	85
F(1, 83) =	0.03				
Model	9.94E-05	1	9.94E-05	Prob> F=	0.8564
Residual	0.250281	83	0.003015	R-squared=	0.0004
Total	0.25038	84	0.002981	Root MSE=	0.05491
Adj R-squared=	-0.0116				
Countrydummy coefficient estimates	Coef.	Std.Err.	t	P>t	[95% Conf.	Interval]
lngdppc200~y	-0.0006	0.0033	-0.18	0.856	-0.00716	0.005964
_cons	0.075941	0.025338	3	0.004	0.025545	0.126337

Y (agrigdpsharelcu) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (Agr./Non-Agr.ToT) + B_5 (dummy_year2) + B_6 (dummy_year3) + B_7 (dummy_year4) +….. + B_{39} (dummy_year36) + B_{40} (dummy_country2) + B_{41} (dummy_country3) + …. + B_{126} (dummy_country88) + e

```
      Source |       SS       df       MS              Number of obs =    2696
-------------+------------------------------           F(121,  2574) =  313.88
       Model |  58.712556   121  .485227736             Prob > F      =  0.0000
    Residual |  3.97910654  2574  .001545884             R-squared     =  0.9365
-------------+------------------------------           Adj R-squared =  0.9335
       Total |  62.6916625  2695  .023262212             Root MSE      =  .03932
```

agrigdpsha~u	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lngdppe~2000	-.3920354	.0174377	-22.48	0.000	-.4262289	-.357842
lngdpperc~20	.021489	.0012164	17.67	0.000	.0191037	.0238743
ToT_base~100	.0006483	.0000212	30.63	0.000	.0006068	.0006898
dummy_year2	-.0063739	.0081561	-0.78	0.435	-.022367	.0096192
dummy_year3	-.0042538	.0080025	-0.53	0.595	-.0199457	.0114381
dummy_year4	-.0043501	.0079694	-0.55	0.585	-.0199772	.0112769
dummy_year5	-.0075294	.0079407	-0.95	0.343	-.0231002	.0080413
dummy_year6	-.0135129	.007712	-1.75	0.080	-.0286352	.0016094
dummy_year7	-.0186628	.0074499	-2.51	0.012	-.0332712	-.0040543
dummy_year8	-.0226507	.007452	-3.04	0.002	-.0372633	-.0080381
dummy_year9	-.0261377	.0074576	-3.50	0.000	-.0407612	-.0115141
dummy_year10	-.0149346	.0074489	-2.00	0.045	-.029541	-.0003282
dummy_year11	-.0271093	.0074322	-3.65	0.000	-.041683	-.0125355
dummy_year12	-.026752	.0074289	-3.60	0.000	-.0413191	-.0121848
dummy_year13	-.0286482	.0074234	-3.86	0.000	-.0432046	-.0140918
dummy_year14	-.0286328	.0074343	-3.85	0.000	-.0432107	-.0140549
dummy_year15	-.0301621	.0074418	-4.05	0.000	-.0447546	-.0155696
dummy_year16	-.0339551	.007475	-4.54	0.000	-.0486128	-.0192974
dummy_year17	-.0333894	.0074649	-4.47	0.000	-.0480273	-.0187515
dummy_year18	-.0349056	.0074498	-4.69	0.000	-.0495137	-.0202975
dummy_year19	-.0350483	.0074473	-4.71	0.000	-.0496516	-.020445
dummy_year20	-.0427193	.0074257	-5.75	0.000	-.0572803	-.0281584
dummy_year21	-.0406849	.0074337	-5.47	0.000	-.0552615	-.0261083
dummy_year22	-.0340136	.0074106	-4.59	0.000	-.048545	-.0194821
dummy_year23	-.0379364	.0074193	-5.11	0.000	-.0524848	-.023388
dummy_year24	-.0347537	.0074546	-4.66	0.000	-.0493713	-.020136
dummy_year25	-.0381853	.0074641	-5.12	0.000	-.0528215	-.023549
dummy_year26	-.0397058	.0074538	-5.33	0.000	-.0543218	-.0250897
dummy_year27	-.0370641	.0074852	-4.95	0.000	-.0517418	-.0223865
dummy_year28	-.0403968	.0074962	-5.39	0.000	-.055096	-.0256977
dummy_year29	-.0392141	.0074873	-5.24	0.000	-.0538958	-.0245324
dummy_year30	-.0434684	.0075062	-5.79	0.000	-.0581872	-.0287496
dummy_year31	-.0417252	.007526	-5.54	0.000	-.0564828	-.0269676

dummy_year32	-.036726	.0075356	-4.87	0.000	-.0515023	-.0219496
dummy_year33	-.0377932	.0075653	-5.00	0.000	-.0526279	-.0229585
dummy_year34	-.0362991	.0075798	-4.79	0.000	-.0511622	-.021436
dummy_year35	-.0367141	.0076119	-4.82	0.000	-.0516401	-.0217882
dummy_year36	-.0399466	.0076425	-5.23	0.000	-.0549327	-.0249606
dummy_cou~y2	.0041617	.0115453	0.36	0.719	-.0184774	.0268007
dummy_cou~y3	.0203682	.0153576	1.33	0.185	-.0097463	.0504827
dummy_cou~y4	-.0184234	.0162458	-1.13	0.257	-.0502795	.0134328
dummy_cou~y5	.0927855	.0118525	7.83	0.000	.069544	.116027
dummy_cou~y6	-.0455661	.0158608	-2.87	0.004	-.0766673	-.014465
dummy_cou~y7	.0776246	.0119647	6.49	0.000	.0541631	.1010861
dummy_cou~y8	.0380386	.0098837	3.85	0.000	.0186578	.0574194
dummy_cou~y9	-.0014191	.0105832	-0.13	0.893	-.0221715	.0193334
dummy_cou~10	-.0001278	.0130406	-0.01	0.992	-.025699	.0254434
dummy_cou~11	.1098138	.0150031	7.32	0.000	.0803944	.1392333
dummy_cou~12	.1515241	.0101262	14.96	0.000	.1316678	.1713805
dummy_cou~13	.0110151	.0161935	0.68	0.496	-.0207385	.0427688
dummy_cou~14	.1530857	.0115089	13.30	0.000	.1305181	.1756533
dummy_cou~15	.0365173	.0130537	2.80	0.005	.0109205	.0621141
dummy_cou~16	.0403688	.0095863	4.21	0.000	.0215711	.0591664
dummy_cou~17	.0136648	.0120569	1.13	0.257	-.0099773	.0373069
dummy_cou~18	.1234509	.0093015	13.27	0.000	.1052116	.1416902
dummy_cou~19	.0435383	.0155959	2.79	0.005	.0129564	.0741202
dummy_cou~20	.0851678	.0096934	8.79	0.000	.06616	.1041755
dummy_cou~21	.1198704	.0097144	12.34	0.000	.1008216	.1389192
dummy_cou~22	-.0525876	.0177654	-2.96	0.003	-.0874236	-.0177516
dummy_cou~23	.0896759	.0093194	9.62	0.000	.0714015	.1079502
dummy_cou~24	.069536	.0093622	7.43	0.000	.0511777	.0878942
dummy_cou~25	.0928867	.0096121	9.66	0.000	.0740384	.1117349
dummy_cou~26	.1172448	.0096193	12.19	0.000	.0983824	.1361072
dummy_cou~27	.0543308	.0171908	3.16	0.002	.0206217	.08804
dummy_cou~28	.036828	.0152381	2.42	0.016	.0069478	.0667082
dummy_cou~29	.0074594	.0160019	0.47	0.641	-.0239185	.0388373
dummy_cou~30	-.0068208	.0160586	-0.42	0.671	-.0383099	.0246684
dummy_cou~31	.1593837	.0122177	13.05	0.000	.1354262	.1833412
dummy_cou~32	.0924731	.0119753	7.72	0.000	.0689909	.1159554
dummy_cou~33	.1826983	.0093216	19.60	0.000	.1644197	.2009769
dummy_cou~34	-.0015599	.0138194	-0.11	0.910	-.0286582	.0255384
dummy_cou~35	.0725673	.0095915	7.57	0.000	.0537594	.0913752
dummy_cou~36	.0606867	.01188	5.11	0.000	.0373914	.083982
dummy_cou~37	.0547765	.0107275	5.11	0.000	.0337411	.0758118
dummy_cou~38	.0716434	.0102721	6.97	0.000	.0515009	.0917858
dummy_cou~39	(dropped)					
dummy_cou~40	.0101169	.0148515	0.68	0.496	-.0190051	.0392389
dummy_cou~41	.0019853	.0182958	0.11	0.914	-.0338906	.0378613
dummy_cou~42	-.0772021	.0102742	-7.51	0.000	-.0973487	-.0570555

dummy_cou~43	.0847561	.0108502	7.81	0.000	.06348	.1060321
dummy_cou~44	.1152733	.0101747	11.33	0.000	.0953218	.1352247
dummy_cou~45	.0117331	.0119608	0.98	0.327	-.0117206	.0351868
dummy_cou~46	-.0328509	.0142679	-2.30	0.021	-.0608286	-.0048732
dummy_cou~47	.1443841	.0097189	14.86	0.000	.1253264	.1634418
dummy_cou~48	.1218832	.0130139	9.37	0.000	.0963645	.147402
dummy_cou~49	.0283657	.0103716	2.73	0.006	.0080281	.0487034
dummy_cou~50	.0795697	.0096111	8.28	0.000	.0607235	.0984159
dummy_cou~51	-.0126245	.0155033	-0.81	0.416	-.0430247	.0177756
dummy_cou~52	.177882	.0135384	13.14	0.000	.1513348	.2044292
dummy_cou~53	-.0152912	.0161079	-0.95	0.343	-.0468769	.0162946
dummy_cou~54	.0771122	.0142815	5.40	0.000	.0491079	.1051165
dummy_cou~55	.0413564	.0094543	4.37	0.000	.0228176	.0598952
dummy_cou~56	.1333227	.0125935	10.59	0.000	.1086283	.158017
dummy_cou~57	.0932273	.0110813	8.41	0.000	.0714981	.1149564
dummy_cou~58	-.0107718	.0184224	-0.58	0.559	-.046896	.0253524
dummy_cou~59	.0507332	.011019	4.60	0.000	.0291263	.0723402
dummy_cou~60	.1350153	.0100704	13.41	0.000	.1152685	.1547622
dummy_cou~61	.1695706	.009327	18.18	0.000	.1512815	.1878597
dummy_cou~62	.0285494	.0097728	2.92	0.004	.009386	.0477128
dummy_cou~63	.0994602	.0095862	10.38	0.000	.0806628	.1182577
dummy_cou~64	.0077308	.0122464	0.63	0.528	-.016283	.0317445
dummy_cou~65	.1313281	.012338	10.64	0.000	.1071347	.1555215
dummy_cou~66	.0090322	.0106854	0.85	0.398	-.0119207	.0299851
dummy_cou~67	(dropped)					
dummy_cou~68	-.0265295	.0097274	-2.73	0.006	-.0456039	-.0074551
dummy_cou~69	.0327236	.0133643	2.45	0.014	.0065177	.0589295
dummy_cou~70	.0640943	.0104538	6.13	0.000	.0435957	.0845929
dummy_cou~71	.0890285	.0121048	7.35	0.000	.0652924	.1127647
dummy_cou~72	-.0178517	.0172704	-1.03	0.301	-.0517171	.0160136
dummy_cou~73	-.0180355	.0221218	-0.82	0.415	-.0614138	.0253428
dummy_cou~74	.1086396	.0096263	11.29	0.000	.0897634	.1275158
dummy_cou~75	.1539043	.0158235	9.73	0.000	.1228763	.1849323
dummy_cou~76	.0608252	.0095121	6.39	0.000	.042173	.0794774
dummy_cou~77	.0604103	.0116814	5.17	0.000	.0375044	.0833161
dummy_cou~78	.0632215	.0093488	6.76	0.000	.0448896	.0815533
dummy_cou~79	.1764771	.0095672	18.45	0.000	.1577168	.1952374
dummy_cou~80	.1380968	.0145888	9.47	0.000	.1094898	.1667039
dummy_cou~81	-.0351104	.0162836	-2.16	0.031	-.0670406	-.0031801
dummy_cou~82	-.0779807	.0188587	-4.13	0.000	-.1149605	-.0410009
dummy_cou~83	.055436	.0105619	5.25	0.000	.0347254	.0761466
dummy_cou~84	.0113658	.0108564	1.05	0.295	-.0099224	.032654
dummy_cou~85	-.0568074	.0106711	-5.32	0.000	-.0777323	-.0358825
dummy_cou~86	-.0095321	.0103213	-0.92	0.356	-.0297711	.0107068
_cons	1.756131	.0653732	26.86	0.000	1.627941	1.88432

Annex Table A-4: The gap between agriculture's share in employment and in GDP (AgGAPshr)

Regression GAP-1: Y (GAP variable) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F(  2,  2959) = 2059.56
       Model |  62.6419961     2   31.320998           Prob > F      =  0.0000
    Residual |   44.999252  2959  .015207588           R-squared     =  0.5820
-------------+------------------------------           Adj R-squared =  0.5817
       Total |  107.641248  2961  .036353005           Root MSE      =  .12332

------------------------------------------------------------------------------
agrigdpsha~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |   .0636654   .0147928     4.30   0.000     .0346601    .0926707
lngdpperc~20 |   .0016091   .0009737     1.65   0.099    -.0003002    .0035183
       _cons |  -.8123785   .0539773   -15.05   0.000    -.9182154   -.7065415
------------------------------------------------------------------------------
```

Regression GAP-2: Y (Gap variable) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….+ B_{36} (dummy_year36) + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F( 37,  2924) =  118.26
       Model |   64.523121    37  1.74386814           Prob > F      =  0.0000
    Residual |  43.1181271  2924  .014746281           R-squared     =  0.5994
-------------+------------------------------           Adj R-squared =  0.5944
       Total |  107.641248  2961  .036353005           Root MSE      =  .12143

------------------------------------------------------------------------------
agrigdpsha~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |   .0771169    .014633     5.27   0.000     .0484248     .105809
lngdpperc~20 |   .0006647   .0009636     0.69   0.490    -.0012246    .0025541
 dummy_year2 |   .0034577   .0196993     0.18   0.861    -.0351681    .0420836
 dummy_year3 |   .0060067   .0196353     0.31   0.760    -.0324937     .044507
 dummy_year4 |   .0042606   .0195727     0.22   0.828     -.034117    .0426383
 dummy_year5 |   .0016448   .0195728     0.08   0.933    -.0367331    .0400228
 dummy_year6 |   .0102715   .0195731     0.52   0.600     -.028107    .0486499
 dummy_year7 |   .0249702   .0195125     1.28   0.201    -.0132895    .0632298
 dummy_year8 |   .0306773    .019513     1.57   0.116    -.0075833    .0689378
 dummy_year9 |   .0341749   .0195136     1.75   0.080    -.0040869    .0724367
dummy_year10 |   .0408972   .0194541     2.10   0.036     .0027522    .0790423
dummy_year11 |   .0363654   .0193954     1.87   0.061    -.0016647    .0743955
```

```
dummy_year12 |   .041092   .0193962     2.12   0.034     .0030605    .0791236
dummy_year13 |   .0469892  .0193967     2.42   0.015     .0089566    .0850218
dummy_year14 |   .0431484  .0193973     2.22   0.026     .0051147    .0811821
dummy_year15 |   .0450008  .0193977     2.32   0.020     .0069663    .0830353
dummy_year16 |   .0359753   .01934      1.86   0.063    -.001946     .0738967
dummy_year17 |   .0382523   .01934      1.98   0.048     .0003308    .0761738
dummy_year18 |   .0424569  .0192832     2.20   0.028     .0046467     .080267
dummy_year19 |   .0493098  .0192833     2.56   0.011     .0114995    .0871201
dummy_year20 |   .0515576   .019284     2.67   0.008     .013746     .0893692
dummy_year21 |   .0562571  .0192844     2.92   0.004     .0184447    .0940695
dummy_year22 |   .0631289  .0192296     3.28   0.001     .0254239    .1008339
dummy_year23 |   .0640784  .0192303     3.33   0.001     .0263721    .1017848
dummy_year24 |   .0589364  .0191767     3.07   0.002     .0213351    .0965377
dummy_year25 |   .0583648  .0191773     3.04   0.002     .0207625    .0959671
dummy_year26 |   .063548   .019178      3.31   0.001     .0259442    .1011518
dummy_year27 |   .0659623  .0191783     3.44   0.001      .028358    .1035667
dummy_year28 |   .065858   .0191793     3.43   0.001     .0282516    .1034644
dummy_year29 |   .073144   .0191282     3.82   0.000      .035638     .11065
dummy_year30 |   .0714037  .0191302     3.73   0.000     .0338937    .1089137
dummy_year31 |   .074233   .0191306     3.88   0.000     .0367222    .1117439
dummy_year32 |   .082986   .0191313     4.34   0.000     .0454739    .1204981
dummy_year33 |   .0839349  .0191331     4.39   0.000     .0464192    .1214506
dummy_year34 |   .0875295  .0191336     4.57   0.000     .0500128    .1250461
dummy_year35 |   .0864315  .0191348     4.52   0.000     .0489124    .1239507
dummy_year36 |   .0835688  .0191369     4.37   0.000     .0460457    .1210919
       _cons |   -.906554  .0552863   -16.40   0.000    -1.014958   -.7981501
------------------------------------------------------------------------------
```

Regression GAP-3: Y (Gap variable) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e

```
      Source |       SS       df       MS              Number of obs =    2962
-------------+------------------------------           F(122,  2839) =  165.99
       Model |  94.4064998   122  .773823769           Prob > F      =  0.0000
    Residual |  13.2347483  2839  .004661764           R-squared     =  0.8770
-------------+------------------------------           Adj R-squared =  0.8718
       Total |  107.641248  2961  .036353005           Root MSE      =  .06828

------------------------------------------------------------------------------

agrigdpsha~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |  -.3163182   .0254705   -12.42   0.000    -.3662607   -.2663756
lngdpperc~20 |   .0173392   .0017553     9.88   0.000     .0138975    .020781
 dummy_year2 |    .005864   .0110767     0.53   0.597    -.0158551    .0275831
```

dummy_year3	.0103903	.011044	0.94	0.347	-.0112647	.0320453
dummy_year4	.0131661	.0110148	1.20	0.232	-.0084318	.0347639
dummy_year5	.0159889	.0110257	1.45	0.147	-.0056303	.037608
dummy_year6	.0300495	.0110395	2.72	0.007	.0084033	.0516957
dummy_year7	.0478212	.0110165	4.34	0.000	.02622	.0694223
dummy_year8	.0563699	.0110334	5.11	0.000	.0347356	.0780041
dummy_year9	.0621227	.011053	5.62	0.000	.0404499	.0837954
dummy_year10	.0725524	.0110432	6.57	0.000	.0508989	.0942059
dummy_year11	.0665698	.0110116	6.05	0.000	.0449781	.0881614
dummy_year12	.0757741	.0110408	6.86	0.000	.0541253	.0974229
dummy_year13	.0847204	.0110613	7.66	0.000	.0630314	.1064093
dummy_year14	.0837144	.0110831	7.55	0.000	.0619827	.1054461
dummy_year15	.0866409	.0111011	7.80	0.000	.0648738	.108408
dummy_year16	.0789687	.0110833	7.13	0.000	.0572366	.1007008
dummy_year17	.0814645	.0110855	7.35	0.000	.0597281	.1032009
dummy_year18	.0837143	.0110471	7.58	0.000	.0620531	.1053756
dummy_year19	.0887637	.011042	8.04	0.000	.0671125	.1104148
dummy_year20	.0911213	.011057	8.24	0.000	.0694407	.1128018
dummy_year21	.0972041	.011072	8.78	0.000	.0754941	.1189142
dummy_year22	.1084404	.0110622	9.80	0.000	.0867497	.1301311
dummy_year23	.1105226	.0110823	9.97	0.000	.0887925	.1322528
dummy_year24	.1089242	.011083	9.83	0.000	.0871927	.1306557
dummy_year25	.1089835	.0110972	9.82	0.000	.087224	.130743
dummy_year26	.1144604	.0111126	10.30	0.000	.0926708	.13625
dummy_year27	.1181505	.0111267	10.62	0.000	.0963332	.1399678
dummy_year28	.1181716	.0111454	10.60	0.000	.0963177	.1400255
dummy_year29	.1239501	.0111315	11.14	0.000	.1021235	.1457767
dummy_year30	.1225146	.0111628	10.98	0.000	.1006265	.1444026
dummy_year31	.1286959	.0111992	11.49	0.000	.1067365	.1506552
dummy_year32	.1410677	.0112418	12.55	0.000	.1190247	.1631106
dummy_year33	.1447005	.0112945	12.81	0.000	.1225543	.1668467
dummy_year34	.1494865	.0113134	13.21	0.000	.1273031	.1716698
dummy_year35	.1492832	.0113407	13.16	0.000	.1270464	.1715201
dummy_year36	.1478408	.0113844	12.99	0.000	.1255183	.1701632
dummy_cou~y2	.2579497	.0190886	13.51	0.000	.2205208	.2953786
dummy_cou~y3	.3050685	.0236713	12.89	0.000	.2586538	.3514833
dummy_cou~y4	.2570207	.0244651	10.51	0.000	.2090496	.3049918
dummy_cou~y5	-.2038904	.0198594	-10.27	0.000	-.2428308	-.16495
dummy_cou~y6	.3157804	.0240761	13.12	0.000	.268572	.3629888
dummy_cou~y7	-.2019761	.0194955	-10.36	0.000	-.2402029	-.1637494
dummy_cou~y8	-.1114248	.0163953	-6.80	0.000	-.1435726	-.0792769
dummy_cou~y9	.0175792	.0164314	1.07	0.285	-.0146395	.0497979
dummy_cou~10	-.5383574	.0212859	-25.29	0.000	-.5800947	-.49662
dummy_cou~11	-.4558986	.0242077	-18.83	0.000	-.503365	-.4084321
dummy_cou~12	-.2312571	.0172655	-13.39	0.000	-.2651114	-.1974028
dummy_cou~13	.3079224	.0247508	12.44	0.000	.2593909	.3564538

dummy_cou~14	-.295107	.0194023	-15.21	0.000	-.333151	-.257063
dummy_cou~15	-.426564	.0214544	-19.88	0.000	-.4686318	-.3844961
dummy_cou~16	.1731389	.0164587	10.52	0.000	.1408667	.2054112
dummy_cou~17	-.3482297	.0202199	-17.22	0.000	-.3878769	-.3085824
dummy_cou~18	.12522	.0160943	7.78	0.000	.0936623	.1567776
dummy_cou~19	-.4304243	.0208238	-20.67	0.000	-.4712557	-.389593
dummy_cou~20	.1618949	.0165679	9.77	0.000	.1294087	.1943812
dummy_cou~21	-.1336955	.0167302	-7.99	0.000	-.1665001	-.100891
dummy_cou~22	.288704	.0271802	10.62	0.000	.235409	.3419991
dummy_cou~23	.1137461	.0161151	7.06	0.000	.0821477	.1453446
dummy_cou~24	.0376063	.0162035	2.32	0.020	.0058344	.0693781
dummy_cou~25	-.058287	.016512	-3.53	0.000	-.0906637	-.0259103
dummy_cou~26	.1356448	.0161188	8.42	0.000	.104039	.1672505
dummy_cou~27	-.4286127	.0339784	-12.61	0.000	-.4952376	-.3619878
dummy_cou~28	.2747037	.0241482	11.38	0.000	.2273538	.3220535
dummy_cou~29	.2748339	.0243568	11.28	0.000	.2270751	.3225928
dummy_cou~30	.2753977	.0253528	10.86	0.000	.225686	.3251094
dummy_cou~31	-.0340973	.0204427	-1.67	0.095	-.0741813	.0059867
dummy_cou~32	.148554	.0197363	7.53	0.000	.1098551	.1872528
dummy_cou~33	-.0120685	.016108	-0.75	0.454	-.0436531	.019516
dummy_cou~34	-.528496	.0235007	-22.49	0.000	-.5745761	-.4824158
dummy_cou~35	-.0533592	.0165454	-3.23	0.001	-.0858014	-.0209169
dummy_cou~36	-.2274487	.0199615	-11.39	0.000	-.2665892	-.1883083
dummy_cou~37	-.1350476	.0181572	-7.44	0.000	-.1706503	-.0994449
dummy_cou~38	.0875875	.0174277	5.03	0.000	.0534153	.1217596
dummy_cou~39	.228377	.0216418	10.55	0.000	.1859417	.2708123
dummy_cou~40	.245283	.0228748	10.72	0.000	.2004302	.2901359
dummy_cou~41	.2362944	.0283871	8.32	0.000	.180633	.2919558
dummy_cou~42	.1557692	.0175916	8.85	0.000	.1212756	.1902627
dummy_cou~43	-.361994	.0183931	-19.68	0.000	-.3980591	-.3259288
dummy_cou~44	.1587406	.0173034	9.17	0.000	.1248122	.1926691
dummy_cou~45	-.4096697	.0193496	-21.17	0.000	-.4476105	-.3717289
dummy_cou~46	-.4616867	.0232125	-19.89	0.000	-.5072018	-.4161716
dummy_cou~47	.1217204	.0161403	7.54	0.000	.0900726	.1533683
dummy_cou~48	-.3364261	.0215915	-15.58	0.000	-.3787627	-.2940896
dummy_cou~49	.0674423	.0175529	3.84	0.000	.0330246	.10186
dummy_cou~50	-.105793	.016452	-6.43	0.000	-.138052	-.073534
dummy_cou~51	-.457384	.0246173	-18.58	0.000	-.5056535	-.4091145
dummy_cou~52	-.3442032	.0224026	-15.36	0.000	-.3881301	-.3002762
dummy_cou~53	.3050069	.0244951	12.45	0.000	.2569769	.3530369
dummy_cou~54	.2929305	.0218272	13.42	0.000	.2501317	.3357293
dummy_cou~55	.0666275	.0163378	4.08	0.000	.0345924	.0986625
dummy_cou~56	-.3411263	.0208882	-16.33	0.000	-.3820839	-.3001687
dummy_cou~57	-.0363853	.0187521	-1.94	0.052	-.0731543	.0003838
dummy_cou~58	.2614258	.0274384	9.53	0.000	.2076246	.3152269
dummy_cou~59	-.15115	.0186647	-8.10	0.000	-.1877476	-.1145523

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dummy_cou~60 |  -.2898039   .0172533   -16.80   0.000    -.3236341   -.2559736
dummy_cou~61 |   .1260527   .0161718     7.79   0.000     .094343    .1577624
dummy_cou~62 |  -.0036998   .0161573    -0.23   0.819    -.0353811    .0279815
dummy_cou~63 |  -.0211637    .016548    -1.28   0.201    -.053611    .0112837
dummy_cou~64 |   .1901517   .0186906    10.17   0.000     .1535032    .2268002
dummy_cou~65 |  -.3408697    .020364   -16.74   0.000    -.3807994     -.30094
dummy_cou~66 |  -.4061107   .0181619   -22.36   0.000    -.4417225   -.3704989
dummy_cou~67 |  -.2097592   .0200011   -10.49   0.000    -.2489774    -.170541
dummy_cou~68 |   .1767308    .016659    10.61   0.000     .1440658    .2093959
dummy_cou~69 |   .2111811   .0207496    10.18   0.000     .1704953    .2518669
dummy_cou~70 |  -.0770056   .0177994    -4.33   0.000    -.1119067   -.0421045
dummy_cou~71 |  -.3174921   .0195718   -16.22   0.000    -.3558685   -.2791156
dummy_cou~72 |   .2914373    .026178    11.13   0.000     .2401076    .3427671
dummy_cou~73 |   .2542776   .0297451     8.55   0.000     .1959534    .3126018
dummy_cou~74 |   .0602855   .0165711     3.64   0.000     .0277929    .0927781
dummy_cou~75 |   -.399135   .0255385   -15.63   0.000    -.4492108   -.3490592
dummy_cou~76 |  -.2621955   .0164391   -15.95   0.000    -.2944293   -.2299617
dummy_cou~77 |  -.2163494   .0196334   -11.02   0.000    -.2548466   -.1778522
dummy_cou~78 |   .0465023   .0161609     2.88   0.004     .0148141    .0781906
dummy_cou~79 |  -.0648971   .0165457    -3.92   0.000     -.09734   -.0324542
dummy_cou~80 |  -.3271806   .0243405   -13.44   0.000    -.3749074   -.2794537
dummy_cou~81 |   .3173843    .024782    12.81   0.000     .2687917    .3659769
dummy_cou~82 |   .3024795   .0280227    10.79   0.000     .2475326    .3574264
dummy_cou~83 |   .2955204   .0177265    16.67   0.000     .2607622    .3302786
dummy_cou~84 |   .2164341   .0182254    11.88   0.000     .1806977    .2521705
dummy_cou~85 |  -.4361628   .0181423   -24.04   0.000    -.4717363   -.4005894
dummy_cou~86 |  -.3453555   .0172217   -20.05   0.000    -.3791238   -.3115871
       _cons |   1.022424   .0988593    10.34   0.000     .8285812    1.216268
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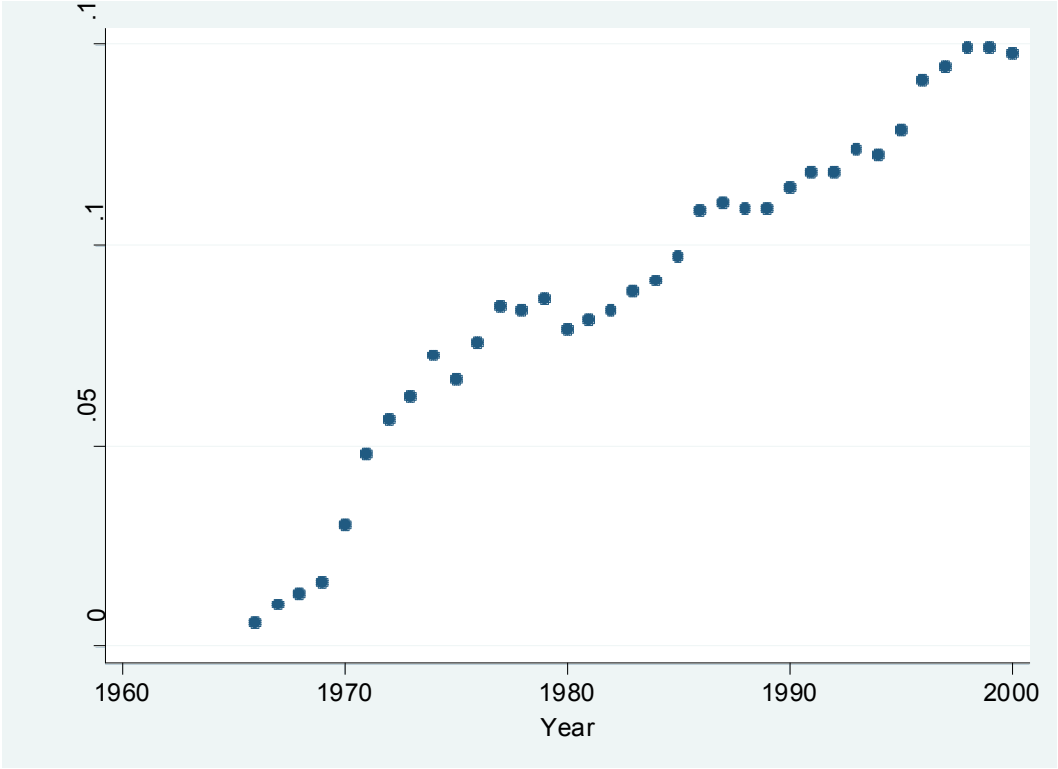
1) The Graph of the Time Dummy Coefficients for the regression function:

Y (Gap variable) = $B_1 + B_2$ (LNGDP) + B_3 (LNGDP)^2 + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

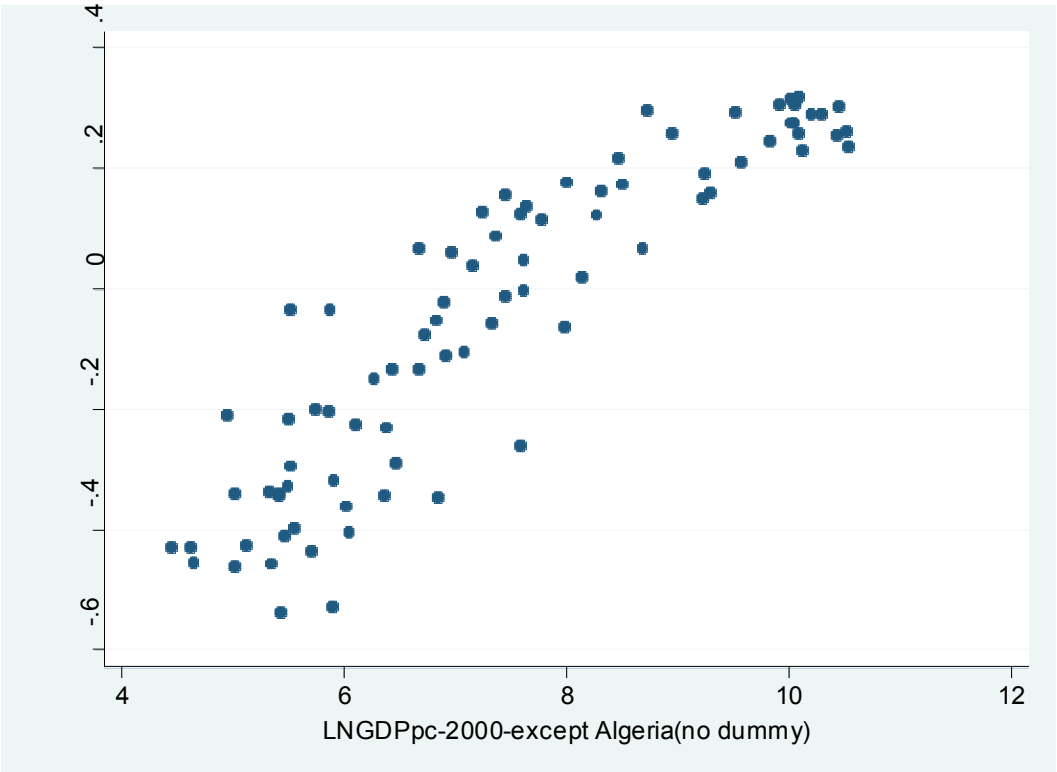
Y (Time coefficient Estimates -2) = a + b*new_year + c*(new_yearsquared) + e.

Source	SS	df	MS		Number of obs	35
					F(2, 32)	382.38
Model	0.054574917	2	.027287459		Prob > F	0
Residual	0.00228361	32	.000071363		R-squared	0.9598
					Adj R-squared	0.9573
Total	0.056858527	34	.00167231		Root MSE	0.00845

timecoeffi~2	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
new_year	0.0135753	.0026052	5.21	0	0.0082687	0.0188819
new_yearsquared	-0.0000584	.0000157	-3.73	0.001	-0.0000904	-0.0000265
_cons	-0.6288153	.1070123	-5.88	0	-0.8467922	-0.4108384

2) The Graph of the Country Dummy Coefficients plotted against LNGDPpc2000 for the regression function:

Y (Gap variable) = B_1 + B_2 (LNGDP) + B_3 $(LNGDP)^2$ + B_4 (dummy_year2) + B_5 (dummy_year3) + B_4 (dummy_year4) +….. + B_{36} (dummy_year36) + B_{37} (dummy_country2) + B_{38} (dummy_country3) + …. + B_{125} (dummy_country88) + e



The Regression Results for the Function:

Y (country dummy coefficients) = a + b*(LNGDPpc2000) + e

Source	SS	df	MS		Number of obs	85
					F(1, 83)	399.8
Model	4.90600368	1	4.90600368		Prob > F	0
Residual	1.01851576	83	.012271274		R-squared	0.8281
					Adj R-squared	0.826
Total	5.92451945	84	.070529993		Root MSE	0.11078

countrydum~s	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
lngdppc200~y	0.1331075	.0066571	19.99	0	0.1198668	0.1463481
_cons	-1.033274	.0511141	-20.22	0	-1.134938	-0.9316104

Y (GAPvariable) = B_1 + B_2 (LNGDP) + B_3 (LNGDP)^2 + B_4 (Agr./Non-Agr.ToT) + B_5 (dummy_year2) + B_6 (dummy_year3) + B_7 (dummy_year4) +….. + B_{39} (dummy_year36) + B_{40} (dummy_country2) + B_{41} (dummy_country3) + …. + B_{126} (dummy_country88) + e

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      Source |       SS       df       MS              Number of obs =    2711
-------------+------------------------------           F(121,  2589) =  247.14
       Model |  86.6944013   121  .716482656           Prob > F      =  0.0000
    Residual |  7.50564042  2589   .00289905           R-squared     =  0.9203
-------------+------------------------------           Adj R-squared =  0.9166
       Total |  94.2000418  2710  .034760163           Root MSE      =  .05384

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agrigdpsha~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppe~2000 |   -.431638   .0232894   -18.53   0.000    -.4773057   -.3859703
lngdpperc~20 |   .0253012   .0016391    15.44   0.000     .0220872    .0285152
ToT_base~100 |   .0008327   .0000287    29.05   0.000     .0007765    .0008889
 dummy_year2 |   .0010415   .0110509     0.09   0.925     -.020628    .0227109
 dummy_year3 |   .0128649   .0108469     1.19   0.236    -.0084047    .0341345
 dummy_year4 |   .0164424   .0107596     1.53   0.127     -.004656    .0375407
 dummy_year5 |   .0200517   .0107244     1.87   0.062    -.0009776    .0410811
 dummy_year6 |   .0240329   .0104291     2.30   0.021     .0035827     .044483
 dummy_year7 |   .0345969   .0100858     3.43   0.001     .0148198    .0543739
 dummy_year8 |   .0347382   .0100894     3.44   0.001     .0149541    .0545223
 dummy_year9 |   .0360305   .0100987     3.57   0.000     .0162282    .0558327
dummy_year10 |   .0540188   .0100878     5.35   0.000     .0342378    .0737997
dummy_year11 |   .0486716   .0100652     4.84   0.000     .0289349    .0684084
dummy_year12 |    .055568   .0100845     5.51   0.000     .0357936    .0753425
dummy_year13 |   .0589788   .0100778     5.85   0.000     .0392175    .0787401
dummy_year14 |   .0666024   .0100906     6.60   0.000     .0468159    .0863888
dummy_year15 |   .0713641   .0101006     7.07   0.000     .0515581     .09117
dummy_year16 |   .0765591   .0101434     7.55   0.000     .0566691    .0964491
dummy_year17 |   .0822186   .0101494     8.10   0.000     .0623168    .1021203
dummy_year18 |   .0868564   .0101271     8.58   0.000     .0669983    .1067146
dummy_year19 |   .0911047   .0101232     9.00   0.000     .0712543    .1109551
dummy_year20 |   .0942786   .0101103     9.33   0.000     .0744536    .1141036
dummy_year21 |   .1015001   .0101236    10.03   0.000      .081649    .1213513
dummy_year22 |   .1129904   .0100899    11.20   0.000     .0932053    .1327755
dummy_year23 |   .1135853   .0101009    11.25   0.000     .0937787    .1333919
dummy_year24 |   .1221653   .0101491    12.04   0.000      .102264    .1420665
dummy_year25 |   .1241534   .0101623    12.22   0.000     .1042264    .1440804
dummy_year26 |   .1284615   .0101465    12.66   0.000     .1085655    .1483575
dummy_year27 |    .135519   .0101908    13.30   0.000      .115536    .1555021
dummy_year28 |    .136554   .0102078    13.38   0.000     .1165379    .1565702
dummy_year29 |   .1433829   .0101757    14.09   0.000     .1234297    .1633362
dummy_year30 |   .1438164   .0102022    14.10   0.000     .1238112    .1638216
dummy_year31 |   .1496969   .0102283    14.64   0.000     .1296404    .1697534
dummy_year32 |   .1590197   .0102399    15.53   0.000     .1389405     .179099
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dummy_year33	.1621602	.0102801	15.77	0.000	.1420022	.1823183
dummy_year34	.1683239	.0102992	16.34	0.000	.1481285	.1885194
dummy_year35	.1733352	.0103415	16.76	0.000	.1530567	.1936137
dummy_year36	.1747659	.0103831	16.83	0.000	.1544059	.195126
dummy_cou~y2	.2105366	.0157623	13.36	0.000	.1796285	.2414446
dummy_cou~y3	.2619818	.0209494	12.51	0.000	.2209026	.3030611
dummy_cou~y4	.1811374	.0221623	8.17	0.000	.1376798	.2245951
dummy_cou~y5	-.2248799	.0159784	-14.07	0.000	-.2562117	-.1935482
dummy_cou~y6	.2164104	.0216379	10.00	0.000	.173981	.2588397
dummy_cou~y7	-.2010887	.0161692	-12.44	0.000	-.2327945	-.1693829
dummy_cou~y8	-.0904036	.0135175	-6.69	0.000	-.1169098	-.0638974
dummy_cou~y9	-.0099485	.0130539	-0.76	0.446	-.0355456	.0156485
dummy_cou~10	-.5324515	.0175555	-30.33	0.000	-.5668758	-.4980272
dummy_cou~11	-.4332082	.020023	-21.64	0.000	-.4724709	-.3939455
dummy_cou~12	-.1838386	.0138154	-13.31	0.000	-.2109288	-.1567483
dummy_cou~13	.2614024	.0220885	11.83	0.000	.2180895	.3047153
dummy_cou~14	-.2745343	.0155665	-17.64	0.000	-.3050584	-.2440102
dummy_cou~15	-.4231556	.0175426	-24.12	0.000	-.4575545	-.3887566
dummy_cou~16	.2095209	.01311	15.98	0.000	.1838138	.235228
dummy_cou~17	-.3165108	.0162701	-19.45	0.000	-.3484144	-.2846071
dummy_cou~18	.1564295	.0127371	12.28	0.000	.1314536	.1814054
dummy_cou~19	-.4024796	.0172087	-23.39	0.000	-.4362238	-.3687354
dummy_cou~20	.1115242	.0132647	8.41	0.000	.0855138	.1375346
dummy_cou~21	-.1378343	.0132662	-10.39	0.000	-.1638477	-.1118209
dummy_cou~22	.163607	.0242351	6.75	0.000	.1160848	.2111292
dummy_cou~23	.1471322	.0127617	11.53	0.000	.122108	.1721564
dummy_cou~24	.0613252	.0128175	4.78	0.000	.0361916	.0864588
dummy_cou~25	-.0145547	.0131481	-1.11	0.268	-.0403366	.0112271
dummy_cou~26	.0361367	.0131662	2.74	0.006	.0103192	.0619541
dummy_cou~27	-.4671223	.0274565	-17.01	0.000	-.5209613	-.4132834
dummy_cou~28	.2327943	.0207861	11.20	0.000	.1920352	.2735534
dummy_cou~29	.2330785	.0218281	10.68	0.000	.1902762	.2758809
dummy_cou~30	.2389225	.0219048	10.91	0.000	.1959697	.2818753
dummy_cou~31	-.0409533	.0164521	-2.49	0.013	-.073214	-.0086927
dummy_cou~32	.1326828	.0163404	8.12	0.000	.1006413	.1647243
dummy_cou~33	.0239491	.0127646	1.88	0.061	-.0010807	.0489789
dummy_cou~34	-.5252545	.0187611	-28.00	0.000	-.5620429	-.4884662
dummy_cou~35	-.0635331	.0131081	-4.85	0.000	-.0892364	-.0378297
dummy_cou~36	-.2105671	.0160369	-13.13	0.000	-.2420135	-.1791208
dummy_cou~37	-.1330745	.0145745	-9.13	0.000	-.1616533	-.1044956
dummy_cou~38	.073244	.0140645	5.21	0.000	.0456651	.1008229
dummy_cou~39	(dropped)					
dummy_cou~40	.2046057	.0202603	10.10	0.000	.1648777	.2443337
dummy_cou~41	.1906387	.0249588	7.64	0.000	.1416975	.2395799
dummy_cou~42	.0911715	.0140631	6.48	0.000	.0635955	.1187475
dummy_cou~43	-.3271697	.0147356	-22.20	0.000	-.3560645	-.2982749

dummy_cou~44	.1598233	.0139076	11.49	0.000	.1325522	.1870945
dummy_cou~45	-.4012569	.0161653	-24.82	0.000	-.432955	-.3695587
dummy_cou~46	-.5216181	.0190583	-27.37	0.000	-.558989	-.4842471
dummy_cou~47	.1574905	.0133049	11.84	0.000	.1314013	.1835798
dummy_cou~48	-.3658109	.0174679	-20.94	0.000	-.4000633	-.3315585
dummy_cou~49	.0372067	.0141727	2.63	0.009	.0094157	.0649976
dummy_cou~50	-.0499091	.0131513	-3.79	0.000	-.0756972	-.024121
dummy_cou~51	-.5015468	.020816	-24.09	0.000	-.5423645	-.4607291
dummy_cou~52	-.3595102	.0181361	-19.82	0.000	-.3950728	-.3239475
dummy_cou~53	.2262303	.0219741	10.30	0.000	.1831418	.2693188
dummy_cou~54	.2723435	.0194881	13.97	0.000	.2341297	.3105573
dummy_cou~55	.0486173	.0129301	3.76	0.000	.0232629	.0739717
dummy_cou~56	-.3821601	.0169108	-22.60	0.000	-.4153201	-.349
dummy_cou~57	-.0373332	.0150083	-2.49	0.013	-.0667626	-.0079038
dummy_cou~58	.1997901	.0251303	7.95	0.000	.1505127	.2490676
dummy_cou~59	-.1278915	.0149425	-8.56	0.000	-.157192	-.098591
dummy_cou~60	-.2894545	.0137226	-21.09	0.000	-.3163629	-.2625461
dummy_cou~61	.1170654	.0127677	9.17	0.000	.0920295	.1421013
dummy_cou~62	-.0011202	.0133817	-0.08	0.933	-.0273601	.0251196
dummy_cou~63	-.0170367	.0131041	-1.30	0.194	-.0427322	.0086589
dummy_cou~64	.0947814	.0167272	5.67	0.000	.0619813	.1275815
dummy_cou~65	-.4068388	.0165755	-24.54	0.000	-.4393413	-.3743362
dummy_cou~66	-.3821097	.0145186	-26.32	0.000	-.410579	-.3536404
dummy_cou~67	(dropped)					
dummy_cou~68	.1377037	.0133082	10.35	0.000	.1116079	.1637996
dummy_cou~69	.1846356	.0182371	10.12	0.000	.1488748	.2203963
dummy_cou~70	-.0427651	.0142271	-3.01	0.003	-.0706628	-.0148674
dummy_cou~71	-.2245684	.0163835	-13.71	0.000	-.2566944	-.1924423
dummy_cou~72	.2156475	.0235588	9.15	0.000	.1694515	.2618435
dummy_cou~73	.1591993	.0301983	5.27	0.000	.0999839	.2184146
dummy_cou~74	.0920955	.0131631	7.00	0.000	.0662842	.1179069
dummy_cou~75	-.341018	.0214432	-15.90	0.000	-.3830656	-.2989704
dummy_cou~76	-.246135	.0130086	-18.92	0.000	-.2716434	-.2206266
dummy_cou~77	-.2260898	.0157669	-14.34	0.000	-.2570068	-.1951728
dummy_cou~78	.079222	.0128008	6.19	0.000	.0541212	.1043228
dummy_cou~79	-.0390926	.0130954	-2.99	0.003	-.0647712	-.013414
dummy_cou~80	-.3522595	.0196245	-17.95	0.000	-.3907408	-.3137783
dummy_cou~81	.232338	.0222135	10.46	0.000	.1887799	.2758961
dummy_cou~82	.1586515	.0257237	6.17	0.000	.1082103	.2090927
dummy_cou~83	.2401673	.0144338	16.64	0.000	.2118642	.2684703
dummy_cou~84	.1969963	.0148245	13.29	0.000	.1679273	.2260654
dummy_cou~85	-.4128099	.0144992	-28.47	0.000	-.4412411	-.3843788
dummy_cou~86	-.3307339	.0140774	-23.49	0.000	-.358338	-.3031299
_cons	1.318121	.0867529	15.19	0.000	1.148009	1.488233

Annex Table A-5a. Regression Results for:
ToT = Constant + B(1)* lnGDPpc + B(2) *(lnGDPpc)sq + B(3) * dummy_year2 + … + B(37)*dummy_year36

Source	SS	df	MS		Number of obs	2723
					F(37, 2685)	19.76
Model	1972003.79	37	53297.3997		Prob > F	0
Residual	7240473.35	2685	2696.63812		R-squared	0.2141
					Adj R-squared	0.2032
Total	9212477.14	2722	3384.45156		Root MSE	51.929
ToT_2000~100	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
lngdppccon~0	18.2222	6.404284	2.85	0.004	5.664369	30.78002
lngdppcsqu~0	-0.4587605	.4231844	-1.08	0.278	-1.288561	0.3710398
dummy_year2	0.9242428	10.65635	0.09	0.931	-19.97124	21.81973
dummy_year3	-3.084957	10.45251	-0.30	0.768	-23.58075	17.41083
dummy_year4	-7.250342	10.36004	-0.70	0.484	-27.5648	13.06411
dummy_year5	-9.230883	10.31581	-0.89	0.371	-29.45863	10.99686
dummy_year6	-8.023869	10.00998	-0.80	0.423	-27.65191	11.60417
dummy_year7	-2.363302	9.667979	-0.24	0.807	-21.32074	16.59413
dummy_year8	6.559846	9.668806	0.68	0.498	-12.39921	25.5189
dummy_year9	11.32463	9.669817	1.17	0.242	-7.636406	30.28567
dummy_year10	3.2391	9.645291	0.34	0.737	-15.67385	22.15205
dummy_year11	1.862731	9.621081	0.19	0.846	-17.00275	20.72821
dummy_year12	3.8987	9.621868	0.41	0.685	-14.96832	22.76572
dummy_year13	10.90713	9.599639	1.14	0.256	-7.9163	29.73057
dummy_year14	0.7277091	9.60015	0.08	0.94	-18.09673	19.55214
dummy_year15	-1.433556	9.600848	-0.15	0.881	-20.25936	17.39225
dummy_year16	-16.33049	9.624809	-1.70	0.09	-35.20327	2.542301
dummy_year17	-20.08843	9.601444	-2.09	0.037	-38.9154	-1.261454
dummy_year18	-22.93968	9.578247	-2.39	0.017	-41.72116	-4.158191
dummy_year19	-22.49143	9.578464	-2.35	0.019	-41.27335	-3.709524
dummy_year20	-24.06248	9.557112	-2.52	0.012	-42.80253	-5.322442
dummy_year21	-25.17786	9.557579	-2.63	0.008	-43.91882	-6.436907
dummy_year22	-25.70993	9.514202	-2.70	0.007	-44.36584	-7.054031
dummy_year23	-25.92303	9.514851	-2.72	0.006	-44.5802	-7.26585
dummy_year24	-27.4548	9.536939	-2.88	0.004	-46.15529	-8.754316
dummy_year25	-30.09681	9.537451	-3.16	0.002	-48.7983	-11.39532
dummy_year26	-35.52899	9.49771	-3.74	0	-54.15255	-16.90543
dummy_year27	-39.69737	9.519671	-4.17	0	-58.364	-21.03074
dummy_year28	-41.45511	9.520739	-4.35	0	-60.12383	-22.78639
dummy_year29	-42.31326	9.499576	-4.45	0	-60.94048	-23.68603
dummy_year30	-45.06872	9.501156	-4.74	0	-63.69904	-26.4384
dummy_year31	-45.1054	9.501546	-4.75	0	-63.73648	-26.47431
dummy_year32	-46.95137	9.481205	-4.95	0	-65.54257	-28.36017
dummy_year33	-48.21638	9.482437	-5.08	0	-66.80999	-29.62276
dummy_year34	-50.09673	9.482728	-5.28	0	-68.69092	-31.50255
dummy_year35	-56.5411	9.483456	-5.96	0	-75.13672	-37.94549
dummy_year36	-60.05601	9.48485	-6.33	0	-78.65436	-41.45766
_cons	51.07281	24.72814	2.07	0.039	2.5847	99.56093

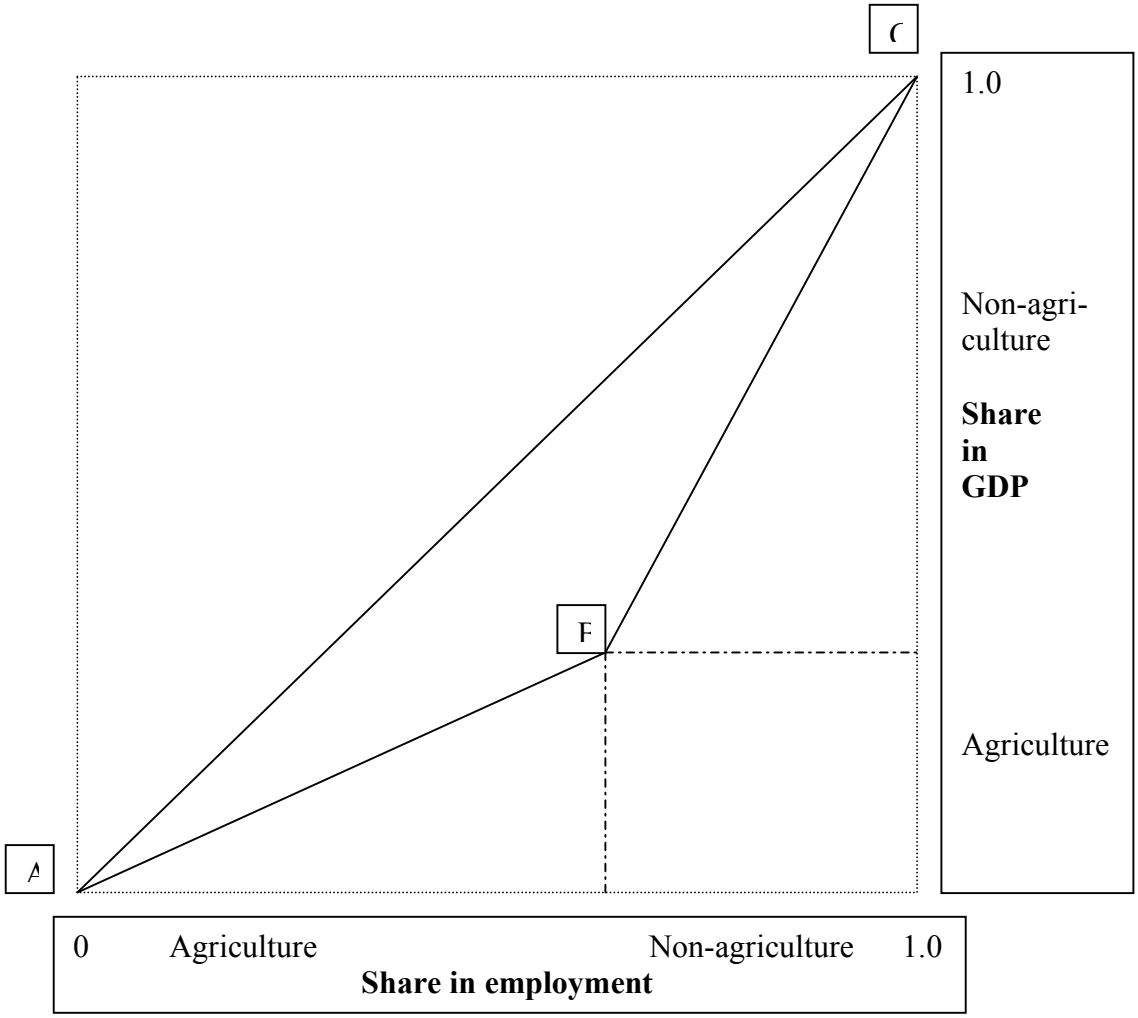
Annex Table A-5b. Regression results to explain the Year coefficients in the Terms of Trade (ToT) regression on lnGPDpc and (lnGDPpc) squared:

Y (Year Coefficients) = a + b*(WorldFoodPriceIndex) + c*(Agri.RawMaterialsPriceIndex) + d*(RealPridesforCrudeOil) + e

Source	SS	df MS		Number of obs	35
				F(3, 31)	44.42
Model	12104.1527	3 4034.71756		Prob > F	0
Residual	2815.79212	31 90.832004		R-squared	0.8113
				Adj R-squared	0.793
Total	14919.9448	34 438.821906		Root MSE	9.5306
yearcoefficientsforTOT	Coef.	Std. Err. t	P>t	[95% Conf.	Interval]
worldfoodpriceindex	0.5966682	.1015925 5.87	0	0.3894689	0.8038676
Worldagrirawmater.price indexx	-0.9034912	.0818054 -11.04	0	-1.070334	-0.7366478
realpriceforcrudeoil	-4.52973	1.168563 -3.88	0.001	-6.91303	-2.146429
_cons	-3.419399	6.64719 -0.51	0.611	-16.97643	10.13763

Annex Table A-6. Calculating the sectoral Gini coefficient and relating it to the overall Gini coefficient for an economy

The sectoral Gini coefficient is equal to the area of triangle ABC/2. But this is also equal to minus the value of AgGAPshr. The proof is as follows:
Let agEMPshr = X (in the interval 0,1) and agGDPshr = Y (in the interval 0,1). Define GAP = Y – X (in the interval -1,0 typically). The "sectoral Gini" is equal to ABC/0.5, so 2*ABC = (X – Y). Therefore, the "sectoral Gini" = - GAP
Proof: ABC = ½ - [X*Y/2 + (1 – X)*(1 – Y)/2 + Y*(1-X) = ½*(X – Y).



Annex Table A-7. Regression results for Asia and non-Asia separately for AgEMPshr

Regression Number[1] 1 / Dependent variable: Share of agricultural employment in total

	A-1		A-2		A-3		A-4	
	Asian	**Non-Asian**	**Asian**	**Non-Asian**	**Asian**	**Non-Asian**	**Asian**	**Nor**
Constant	1.652378	2.34735	1.584326	2.562045	0.4059	1.67092	0.2105	
	(0.11761)	(0.049931)	(0.125802)	(0.0482404)	(0.06749)	(0.06969)	(0.08192)	
lnGDPpc	-0.1791097	-0.3515412	-0.15423	-0.3938795	0.2256562	-0.305759	0.17746	
	(0.032561)	(0.013651)	(0.034216)	(0.0126915)	(0.019798)	(0.017493)	(0.019989)	
(lnGDPpc)sq.	0.002468	0.0121276	0.001011	0.0149468	-0.020873	0.01958	-0.01838	
	(0.002167)	(0.000897)	(0.00227)	(0.0008341)	(0.001348)	(0.00115)	(0.001304)	
Terms of Trade							0.00044	
							(0.00007)	
Year?	N	N	Y	Y	Y	Y	Y	
Country?	N	N	N	N	Y	Y	Y	
Adj. Rsq	0.765	0.879	0.7527	0.8979	0.9823	0.9872	0.985	
Turning point								
LnGDPpc								
GDPpc ($2000)								

[1] *t*- statistics in parentheses.
[2] "Year" = Actual year minus 1900.

Annex Table A-8. Regression results for Asia and non-Asia separately for AgGDPshr

Regression Number 2 / Dependent variable: Share of Agricultural GDP in total GDP								
	B-1		**B-2**		**B-3**		**B-4**	
	Asian	**Non-Asian**		**Non-Asian**	**Asian**	**Non-Asian**	**Asian**	**Non-Asian**
Constant	1.528857	1.473201	1.387158	1.577941	1.103434	1.59486	1.456235	1.81065
	(0.082182)	(0.035624)	(0.07847)	(0.0374)	(0.0945)	(0.10835)	(0.06304)	(0.09845)
lnGDPpc	-0.28364	-0.27073	-0.23316	-0.28957	-0.128183	-0.3163	-0.30513	-0.4268
	(0.02275)	(0.009776)	(0.021344)	(0.009715)	(0.027722)	(0.02785)	(0.01538)	(0.02567)
(lnGDPpc)sq.	0.013559	0.012728	0.0106043	0.014025	0.0006934	0.01606	0.014564	0.02527
	(0.00151)	(0.000645)	(0.00141)	(0.00064)	(0.001887)	(0.00187)	(0.001003)	(0.00173)
Terms of Trade							0.00181	0.00063
							(0.000054)	(0.000022)
Year?	N	N	Y	Y	Y	Y	Y	Y
Country?	N	N	N	N	Y	Y	Y	Y
Adj. Rsq	0.7007	0.7669	0.7490	0.7768	0.9094	0.9077	0.9766	0.9340
Turning point								
LnGDPpc								
GDPpc ($2000)								

Annex Table A-9. Regression results for Asia and non-Asia separately for AgGAPshr

Dependent variable: AgGDP share minus AgEMP share equals "AgGAPshr"								
	C-1		**C-2**		**C-3**		**C-4**	
	Asian	**Non-Asian**	**Asian**	**Non-Asian**	**Asian**	**Non-Asian**	**Asian**	**Non-Asian**
Constant	-0.12352	-0.96473	-0.19717	-1.15547	0.69753	0.56278	1.2458	0.67894
	(0.1102)	(0.06006)	(0.1174)	(0.06088)	(0.09897)	(0.14518)	(0.09751)	(0.13107)
lnGDPpc	-0.10453	0.10113	-.078932	0.13525	-0.35384	-0.18561	-0.48258	-0.26325
	(0.03051)	(0.01642)	(0.03193)	(0.01602)	(0.029)	(0.03644)	(0.0238)	(0.03452)
(lnGDPpc)sq.	0.01109	-0.000598	0.00959	-0.00288	0.02781	0.0078	0.03294	0.0141
	(0.00203)	(0.00108)	(0.00211)	0.00105	(0.00198)	(0.0024)	(0.00155)	(0.00236)
Terms of Trade							0.00137	0.0008
							(0.00008)	(0.00003)
Year?	N	N	Y	Y	Y	Y	Y	Y
Country?	N	N	N	N	Y	Y	Y	Y
Adj. Rsq	0.4262	0.5993	0.401	0.6278	0.894	0.8734	0.9408	0.9183
Turning point								
LnGDPpc							7.4162	9.3351
GDPpc ($2000)							$1,663	$11,329

Annex Table A-10. DomPolAgToT(ratio) = a + b*GAP + year dummies + country dummies

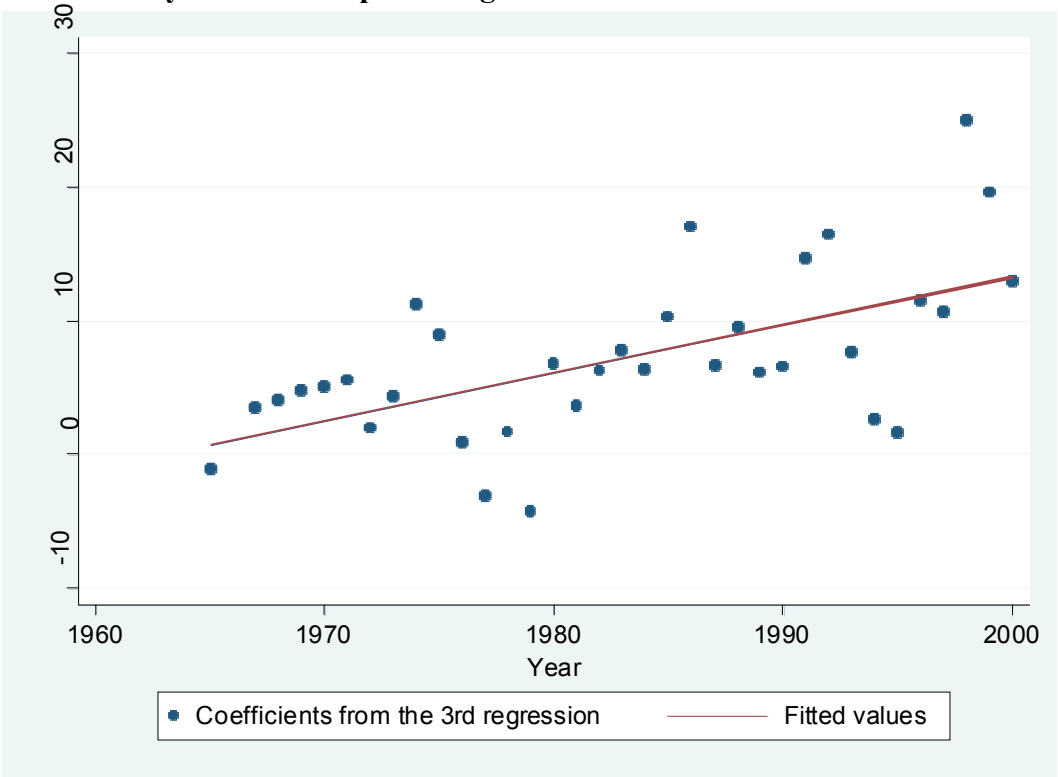
```
      Source |       SS       df       MS              Number of obs =    2711
-------------+------------------------------           F(119,  2591) =    4.56
       Model |  119294.474   119  1002.47457           Prob > F      =  0.0000
    Residual |  568988.955  2591  219.602067           R-squared     =  0.1733
-------------+------------------------------           Adj R-squared =  0.1354
       Total |   688283.43  2710  253.979125           Root MSE      =  14.819

------------------------------------------------------------------------------
dompolagto~o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
agrigdpsha~e |  -51.51209   4.503103   -11.44   0.000    -60.34214   -42.68205
 dummy_year2 |  (dropped)
 dummy_year3 |   3.414663   2.968159     1.15   0.250     -2.40554    9.234866
 dummy_year4 |   4.045568   2.942415     1.37   0.169    -1.724155    9.815291
 dummy_year5 |   4.733267    2.93019     1.62   0.106    -1.012483    10.47902
 dummy_year6 |   5.066182   2.845261     1.78   0.075    -.5130331     10.6454
 dummy_year7 |   5.528644   2.749615     2.01   0.044     .1369791    10.92031
 dummy_year8 |   1.960102   2.750657     0.71   0.476    -3.433606    7.353809
 dummy_year9 |   4.314549   2.751722     1.57   0.117    -1.081248    9.710346
dummy_year10 |    11.2829   2.747198     4.11   0.000     5.895973    16.66983
dummy_year11 |   8.967961   2.738764     3.27   0.001     3.597574    14.33835
dummy_year12 |    .857996    2.74056     0.31   0.754    -4.515913    6.231905
dummy_year13 |  -3.190175   2.736802    -1.17   0.244    -8.556716    2.176366
dummy_year14 |   1.686457   2.736233     0.62   0.538    -3.678967    7.051882
dummy_year15 |  -4.296891   2.737408    -1.57   0.117     -9.66462    1.070838
dummy_year16 |   6.730222   2.742459     2.45   0.014     1.352589    12.10785
dummy_year17 |    3.57122   2.743337     1.30   0.193    -1.808133    8.950574
dummy_year18 |   6.269018   2.737812     2.29   0.022     .9004968    11.63754
dummy_year19 |   7.837624    2.73979     2.86   0.004     2.465226    13.21002
dummy_year20 |   6.316209    2.73476     2.31   0.021     .9536731    11.67875
dummy_year21 |   10.29345   2.737069     3.76   0.000     4.926385    15.66051
dummy_year22 |   17.04888   2.729852     6.25   0.000     11.69597     22.4018
dummy_year23 |   6.627582   2.730321     2.43   0.015      1.27375    11.98141
dummy_year24 |   9.491264   2.740473     3.46   0.001     4.117525     14.865
dummy_year25 |   6.105955   2.740509     2.23   0.026     .7321458    11.47977
dummy_year26 |   6.564034   2.729577     2.40   0.016      1.21166    11.91641
dummy_year27 |   14.63281   2.737357     5.35   0.000     9.265184    20.00044
dummy_year28 |   16.45272   2.737385     6.01   0.000     11.08504     21.8204
dummy_year29 |   7.587522    2.73064     2.78   0.005     2.233065    12.94198
dummy_year30 |   2.628377   2.730193     0.96   0.336    -2.725204    7.981958
dummy_year31 |   1.572339   2.733246     0.58   0.565    -3.787228    6.931906
dummy_year32 |   11.58136   2.731584     4.24   0.000     6.225049    16.93767
dummy_year33 |   10.72547   2.732786     3.92   0.000     5.366803    16.08413
dummy_year34 |   25.01811   2.736037     9.14   0.000     19.65306    30.38315
```

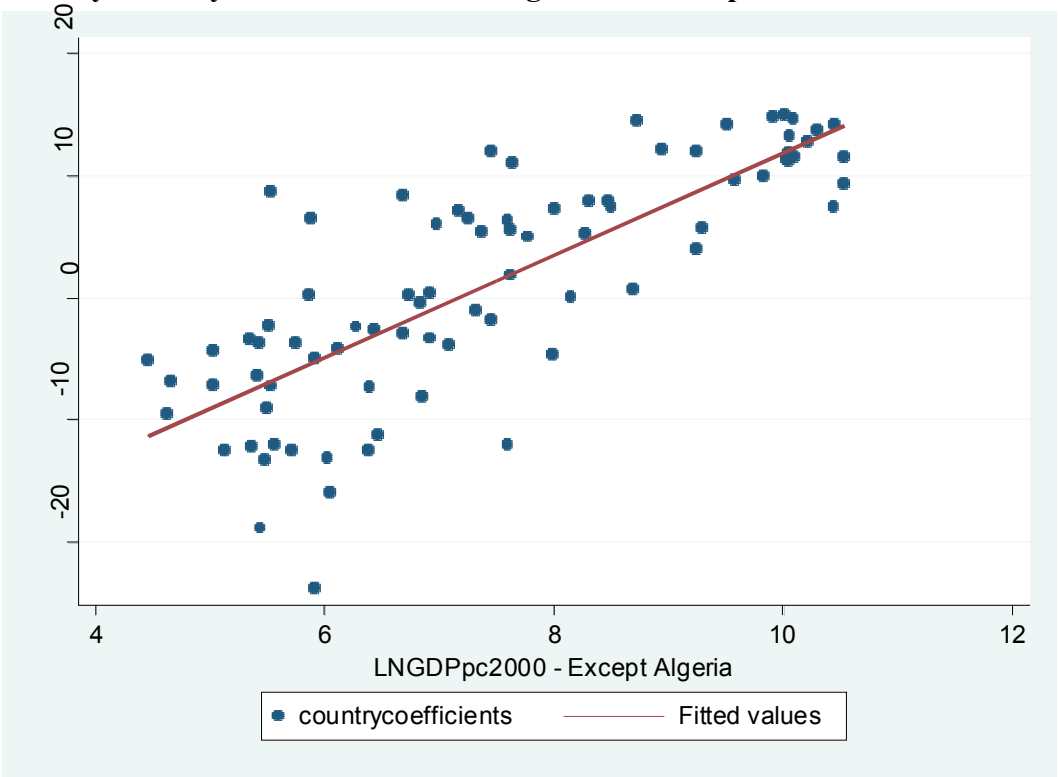
dummy_year35	19.61171	2.735813	7.17	0.000	14.24711	24.97631
dummy_year36	12.97062	2.735013	4.74	0.000	7.607583	18.33365
dummy_year1	-1.11923	3.041418	-0.37	0.713	-7.083085	4.844625
dummy_cou~y2	12.15475	3.615535	3.36	0.001	5.065117	19.24438
dummy_cou~y3	14.8755	3.84879	3.86	0.000	7.328489	22.42252
dummy_cou~y4	11.56238	3.79967	3.04	0.002	4.111682	19.01308
dummy_cou~y5	.2297088	3.497206	0.07	0.948	-6.627893	7.08731
dummy_cou~y6	15.09636	3.829146	3.94	0.000	7.587865	22.60486
dummy_cou~y7	-3.707566	3.638871	-1.02	0.308	-10.84295	3.427822
dummy_cou~y8	-3.251131	3.641561	-0.89	0.372	-10.3918	3.889533
dummy_cou~y9	.1323536	3.493032	0.04	0.970	-6.717063	6.98177
dummy_cou~10	-18.79903	3.957912	-4.75	0.000	-26.56002	-11.03804
dummy_cou~11	-6.816893	3.670544	-1.86	0.063	-14.01439	.3806044
dummy_cou~12	-7.318193	3.559355	-2.06	0.040	-14.29766	-.3387254
dummy_cou~13	11.88085	3.843522	3.09	0.002	4.344168	19.41754
dummy_cou~14	-7.224933	3.551798	-2.03	0.042	-14.18958	-.2602835
dummy_cou~15	-12.41779	3.677858	-3.38	0.001	-19.62963	-5.205955
dummy_cou~16	7.5462	3.555496	2.12	0.034	.5742985	14.5181
dummy_cou~17	-8.059394	3.575113	-2.25	0.024	-15.06976	-1.049026
dummy_cou~18	6.382625	3.539762	1.80	0.071	-.5584244	13.32367
dummy_cou~19	-4.993095	3.707322	-1.35	0.178	-12.26271	2.276518
dummy_cou~20	7.984359	3.543263	2.25	0.024	1.036445	14.93227
dummy_cou~21	-2.535491	3.51099	-0.72	0.470	-9.420121	4.34914
dummy_cou~22	13.71276	3.696344	3.71	0.000	6.464673	20.96085
dummy_cou~23	5.0319	3.536714	1.42	0.155	-1.903172	11.96697
dummy_cou~24	7.176577	3.50249	2.05	0.041	.3086145	14.04454
dummy_cou~25	-1.005434	3.49345	-0.29	0.774	-7.85567	5.844801
dummy_cou~26	11.16341	3.539469	3.15	0.002	4.222933	18.10388
dummy_cou~27	-9.465302	5.836931	-1.62	0.105	-20.91082	1.980219
dummy_cou~28	11.30144	3.64086	3.10	0.002	4.162152	18.44073
dummy_cou~29	11.45447	3.821929	3.00	0.003	3.960127	18.94881
dummy_cou~30	11.8281	3.816808	3.10	0.002	4.343803	19.31241
dummy_cou~31	8.754385	3.555249	2.46	0.014	1.782969	15.7258
dummy_cou~32	3.980633	3.520385	1.13	0.258	-2.92242	10.88369
dummy_cou~33	-1.742156	3.49295	-0.50	0.618	-8.591411	5.107099
dummy_cou~34	-23.71746	4.888298	-4.85	0.000	-33.30283	-14.1321
dummy_cou~35	-.3799394	3.493116	-0.11	0.913	-7.22952	6.469642
dummy_cou~36	-4.181483	3.502916	-1.19	0.233	-11.05028	2.687315
dummy_cou~37	-2.88223	3.547713	-0.81	0.417	-9.83887	4.07441
dummy_cou~38	5.471028	3.885934	1.41	0.159	-2.148823	13.09088
dummy_cou~39	(dropped)					
dummy_cou~40	9.981171	3.755357	2.66	0.008	2.617366	17.34498
dummy_cou~41	9.354413	3.610407	2.59	0.010	2.274838	16.43399
dummy_cou~42	12.05609	3.88438	3.10	0.002	4.439283	19.67289
dummy_cou~43	-13.05394	3.658368	-3.57	0.000	-20.22756	-5.880323
dummy_cou~44	5.776802	3.538374	1.63	0.103	-1.161525	12.71513

dummy_cou~45	-13.14989	3.798768	-3.46	0.001	-20.59882	-5.700966
dummy_cou~46	-7.122691	3.677484	-1.94	0.053	-14.33379	.0884134
dummy_cou~47	5.310495	3.676397	1.44	0.149	-1.898478	12.51947
dummy_cou~48	-3.347739	3.592466	-0.93	0.351	-10.39213	3.696656
dummy_cou~49	.7166437	3.494582	0.21	0.838	-6.135812	7.5691
dummy_cou~50	-3.871572	3.505753	-1.10	0.270	-10.74593	3.00279
dummy_cou~51	-12.0456	4.485008	-2.69	0.007	-20.84016	-3.251038
dummy_cou~52	-6.350823	3.529887	-1.80	0.072	-13.27251	.5708625
dummy_cou~53	13.28545	3.849012	3.45	0.001	5.738001	20.8329
dummy_cou~54	14.18497	4.053196	3.50	0.000	6.237142	22.1328
dummy_cou~55	8.457705	3.521255	2.40	0.016	1.552946	15.36246
dummy_cou~56	-4.197906	3.55555	-1.18	0.238	-11.16991	2.7741
dummy_cou~57	6.593892	3.519358	1.87	0.061	-.3071467	13.49493
dummy_cou~58	11.54287	3.810923	3.03	0.002	4.070112	19.01564
dummy_cou~59	-2.348537	3.494178	-0.67	0.502	-9.200201	4.503127
dummy_cou~60	-11.16081	3.620554	-3.08	0.002	-18.26028	-4.061337
dummy_cou~61	6.607906	3.55196	1.86	0.063	-.3570604	13.57287
dummy_cou~62	5.649744	3.665533	1.54	0.123	-1.537927	12.83741
dummy_cou~63	.4219652	3.494428	0.12	0.904	-6.430188	7.274119
dummy_cou~64	12.00768	3.749548	3.20	0.001	4.655268	19.36009
dummy_cou~65	-3.644317	3.567877	-1.02	0.307	-10.6405	3.351863
dummy_cou~66	-15.90654	3.734983	-4.26	0.000	-23.2304	-8.58269
dummy_cou~67	(dropped)					
dummy_cou~68	7.303003	3.552938	2.06	0.040	.3361172	14.26989
dummy_cou~69	9.696753	3.764899	2.58	0.010	2.314238	17.07927
dummy_cou~70	.2482777	3.494491	0.07	0.943	-6.604	7.100555
dummy_cou~71	-4.905439	3.756117	-1.31	0.192	-12.27073	2.459856
dummy_cou~72	12.85824	3.83919	3.35	0.001	5.330046	20.38643
dummy_cou~73	7.552148	5.213414	1.45	0.148	-2.670731	17.77503
dummy_cou~74	6.071034	3.525884	1.72	0.085	-.8428026	12.98487
dummy_cou~75	-11.94543	5.169814	-2.31	0.021	-22.08282	-1.80805
dummy_cou~76	-11.93448	3.630555	-3.29	0.001	-19.05356	-4.815397
dummy_cou~77	-2.247485	3.502496	-0.64	0.521	-9.11546	4.62049
dummy_cou~78	1.928261	3.504362	0.55	0.582	-4.943373	8.799895
dummy_cou~79	-4.651333	3.59013	-1.30	0.195	-11.69115	2.388481
dummy_cou~80	-8.910929	4.241707	-2.10	0.036	-17.22841	-.5934501
dummy_cou~81	14.76253	3.857857	3.83	0.000	7.19774	22.32733
dummy_cou~82	14.24845	3.854064	3.70	0.000	6.691088	21.8058
dummy_cou~83	14.59525	3.671207	3.98	0.000	7.396458	21.79405
dummy_cou~84	7.966418	3.574598	2.23	0.026	.9570592	14.97578
dummy_cou~85	-12.39907	3.785145	-3.28	0.001	-19.82129	-4.976859
dummy_cou~86	-12.40387	3.802859	-3.26	0.001	-19.86082	-4.946919
_cons	79.96483	3.581989	22.32	0.000	72.94097	86.98868

Time Dummy Coefficients plotted against time variable:



Country Dummy Coefficients Plotted against LNGDPpc2000 variable:



Annex Table A-11. Separate results for Asian countries

A-11a. DompolAgToT(ratio) = a + b*GAP + year dummies + country dummies

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 48,   412) =    2.03
       Model |  9802.13978    48  204.211245            Prob > F      =  0.0001
    Residual |   41348.949   412  100.361527            R-squared     =  0.1916
-------------+------------------------------           Adj R-squared =  0.0975
       Total |  51151.0887   460  111.198019            Root MSE      =  10.018

------------------------------------------------------------------------------
DomAgToT_r~o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
agrigdpsha~e |   -41.5203   9.593717    -4.33   0.000    -60.37904   -22.66156
```

(Details of year and country coefficients not shown)

A-11b. DompolAgToT(difference) = a + b*GAP + year dummies + country dummies

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 48,   412) =    2.81
       Model |  17386.4408    48  362.217516            Prob > F      =  0.0000
    Residual |  53067.7652   412  128.805255            R-squared     =  0.2468
-------------+------------------------------           Adj R-squared =  0.1590
       Total |   70454.206   460  153.161317            Root MSE      =  11.349

------------------------------------------------------------------------------
DomAgToT_d~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
agrigdpsha~e |   -62.9882   10.86851    -5.80   0.000    -84.35285   -41.62354
```

(Details of year and country coefficients not shown)

Annex Table A-12. Separate results for non-Asian countries

A-12a. DompolAgToT(ratio) = a + b*GAP + year dummies + country dummies

```
      Source |       SS       df       MS              Number of obs =    2250
-------------+------------------------------           F(106,  2143) =    5.01
       Model |  126479.819   106  1193.20584           Prob > F      =  0.0000
    Residual |  509971.092  2143  237.970645           R-squared     =  0.1987
-------------+------------------------------           Adj R-squared =  0.1591
       Total |  636450.911  2249  282.992846           Root MSE      =  15.426

------------------------------------------------------------------------------
DomAgToT_r~o |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
agrigdpsha~e |  -58.99072   5.137405   -11.48   0.000    -69.06553    -48.9159
```

(Details of year and country coefficients not shown)

A-12b. DompolAgToT(difference) = a + b*GAP + year dummies + country dummies

```
 Source |       SS       df       MS              Number of obs =    2250
-------------+------------------------------           F(106,  2143) =    5.64
       Model |  316507.998   106  2985.92451           Prob > F      =  0.0000
    Residual |  1133928.22  2143  529.131228           R-squared     =  0.2182
-------------+------------------------------           Adj R-squared =  0.1795
       Total |  1450436.22  2249  644.924953           Root MSE      =  23.003

------------------------------------------------------------------------------
DomAgToT_d~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
agrigdpsha~e |  -100.9171   7.660618   -13.17   0.000    -115.9402   -85.89412
```

(Details of year and country coefficients not shown)

Annex Table A-13: Impact on agGDPshr of AgToT(predicted) and DomPolAgToT(Difference) for Asia and non-Asia

Regression 1 (AgGDPshare for Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 50,   410) =  117.09
       Model |  8.33190834    50  .166638167            Prob > F      =  0.0000
    Residual |  .583484087   410  .001423132            R-squared     =  0.9346
-------------+------------------------------           Adj R-squared =  0.9266
       Total |  8.91539243   460  .019381288            Root MSE      =  .03772
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.1289775   .0252823    -5.10   0.000    -.1786766   -.0792784
lngdppcsqu~0 |   .0066858   .0017169     3.89   0.000     .0033108    .0100609
DomAgToT_d~e |   -.001388   .0001584    -8.76   0.000    -.0016994   -.0010766
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 2 (AgGDPshare for Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*predicted TOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     468
-------------+------------------------------           F( 50,   417) =  223.29
       Model |  8.72928769    50  .174585754            Prob > F      =  0.0000
    Residual |  .326050721   417  .000781896            R-squared     =  0.9640
-------------+------------------------------           Adj R-squared =  0.9597
       Total |  9.05533841   467  .019390446            Root MSE      =  .02796
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.2949639   .0198791   -14.84   0.000    -.3340396   -.2558882
lngdppcsqu~0 |   .0141193   .0012972    10.88   0.000     .0115694    .0166692
PredictedTOT |   .0018948   .0000829    22.86   0.000     .0017319    .0020578
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 3 which includes both DomAgToT_difference and predictedToT (AgGDPshare for Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + e*predictedTOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 51,   409) =  387.18
       Model |  8.73447691    51  .171264253           Prob > F      =  0.0000
    Residual |  .180915515   409  .000442336           R-squared     =  0.9797
-------------+------------------------------           Adj R-squared =  0.9772
       Total |  8.91539243   460  .019381288           Root MSE      =  .02103
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.3131547   .0153605   -20.39   0.000    -.3433501   -.2829593
lngdppcsqu~0 |   .0149127   .0009953    14.98   0.000     .0129562    .0168692
DomAgToT_d~e |  -.0015628   .0000885   -17.66   0.000    -.0017368   -.0013888
PredictedTOT |   .0019262   .0000638    30.17   0.000     .0018007    .0020517
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 4 (AgGDPshare forNon-Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =    2235
-------------+------------------------------           F(108,  2126) =  236.38
       Model |  47.8695839   108  .443236888           Prob > F      =  0.0000
    Residual |  3.98638676  2126  .001875064           R-squared     =  0.9231
-------------+------------------------------           Adj R-squared =  0.9192
       Total |  51.8559707  2234  .023212162           Root MSE      =   .0433
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.3107795   .0279382   -11.12   0.000    -.3655686   -.2559904
lngdppcsqu~0 |   .0167466   .0018816     8.90   0.000     .0130566    .0204366
DomAgToT_d~e |  -.0006505   .0000392   -16.59   0.000    -.0007274   -.0005736
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 5 (AgGDPPshare forNon-Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*predictedTOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =    2341
-------------+------------------------------           F(110,  2230) =  251.12
       Model |  50.3109002   110   .45737182           Prob > F      =  0.0000
    Residual |  4.06158738  2230   .00182134           R-squared     =  0.9253
-------------+------------------------------           Adj R-squared =  0.9216
       Total |  54.3724876  2340  .023236106           Root MSE      =  .04268
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.3952271   .0259754   -15.22   0.000    -.4461656   -.3442886
lngdppcsqu~0 |   .0219462   .0017463    12.57   0.000     .0185217    .0253707
PredictedTOT |   .0005859   .0000294    19.91   0.000     .0005282    .0006436
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 6 which includes both DomAgToT_difference and predictedToT (AgGDPshare for Non-Asian Countries): Y(agrigdpsharelcu) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + e*predictedTOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =    2235
-------------+------------------------------           F(109,  2125) =  291.30
       Model |  48.6031931   109  .445900854           Prob > F      =  0.0000
    Residual |  3.25277752  2125  .001530719           R-squared     =  0.9373
-------------+------------------------------           Adj R-squared =  0.9341
       Total |  51.8559707  2234  .023212162           Root MSE      =  .03912
------------------------------------------------------------------------------
agrigdpsha~u |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.4237962   .0257653   -16.45   0.000    -.4743241   -.3732683
lngdppcsqu~0 |   .0250477   .0017419    14.38   0.000     .0216318    .0284636
DomAgToT_d~e |  -.0006631   .0000354   -18.72   0.000    -.0007326   -.0005937
PredictedTOT |   .0006037   .0000276    21.89   0.000     .0005496    .0006578
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Annex Table A-14: Impact on agEMPshr of AgToT(predicted) and DomPolAgToT(Difference) for Asia and non-Asia

Regression 1 (AgEMPshare for Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 50,   410) =  553.95
       Model |  23.2446935    50  .46489387            Prob > F      =  0.0000
    Residual |  .344089041   410  .000839242           R-squared     =  0.9854
-------------+------------------------------           Adj R-squared =  0.9836
       Total |  23.5887826   460  .051279962           Root MSE      =  .02897
------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |   .2239157    .019415    11.53   0.000     .1857504    .2620811
lngdppcsqu~0 |  -.0204678   .0013185   -15.52   0.000    -.0230596    -.017876
DomAgToT_d~e |  -.0000844   .0001216    -0.69   0.488    -.0003235    .0001548
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 2 (AgEMPshare for Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*predicted TOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     468
-------------+------------------------------           F( 50,   417) =  569.48
       Model |  23.2785499    50  .465570998           Prob > F      =  0.0000
    Residual |  .340911452   417  .000817533           R-squared     =  0.9856
-------------+------------------------------           Adj R-squared =  0.9838
       Total |  23.6194614   467  .050577005           Root MSE      =  .02859
------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |    .177733   .0203271     8.74   0.000     .1377768    .2176893
lngdppcsqu~0 |  -.0188077   .0013265   -14.18   0.000    -.0214151   -.0162003
PredictedTOT |   .0005445   .0000848     6.42   0.000     .0003778    .0007111
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 3 which includes both DomAgToT_difference and predictedToT (AgEMPshare for Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + e*predictedTOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =     461
-------------+------------------------------           F( 51,   409) =  609.66
       Model |  23.2825184    51  .456519968           Prob > F      =  0.0000
    Residual |  .306264199   409  .000748812           R-squared     =  0.9870
-------------+------------------------------           Adj R-squared =  0.9854
       Total |  23.5887826   460  .051279962           Root MSE      =  .02736
------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |   .1674605   .0199856     8.38   0.000     .1281732    .2067477
lngdppcsqu~0 |   -.017946   .001295   -13.86   0.000    -.0204916   -.0154004
DomAgToT_d~e |  -.0001379   .0001152    -1.20   0.232    -.0003643    .0000884
PredictedTOT |   .0005904   .0000831     7.11   0.000     .0004271    .0007537
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 4 (AgEMPshare forNon-Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =    2250
-------------+------------------------------           F(108,  2141) = 1767.22
       Model |  196.687036   108  1.82117626           Prob > F      =  0.0000
    Residual |  2.20637382  2141  .001030534           R-squared     =  0.9889
-------------+------------------------------           Adj R-squared =  0.9883
       Total |   198.89341  2249  .088436376           Root MSE      =   .0321
------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.3307971   .0198231   -16.69   0.000    -.3696716   -.2919226
lngdppcsqu~0 |   .0215426   .0013535    15.92   0.000     .0188882    .0241969
DomAgToT_d~e |   .0000497    .000029     1.71   0.087    -7.22e-06    .0001066
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 5 (AgEMPshare forNon-Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*predictedTOT + dummy_year* + dummy_country* + e

```
      Source |       SS       df       MS              Number of obs =    2494
-------------+------------------------------           F(110,  2383) = 1780.89
       Model |  220.510079   110  2.00463708           Prob > F      =  0.0000
    Residual |  2.68238747  2383  .001125635           R-squared     =  0.9880
-------------+------------------------------           Adj R-squared =  0.9874
       Total |  223.192467  2493  .089527664           Root MSE      =  .03355

------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.2929216   .0175067   -16.73   0.000    -.3272516   -.2585917
lngdppcsqu~0 |   .0185287   .0011592    15.98   0.000     .0162556    .0208018
PredictedTOT |  -.0001291   .0000219    -5.89   0.000    -.0001721   -.0000861
```

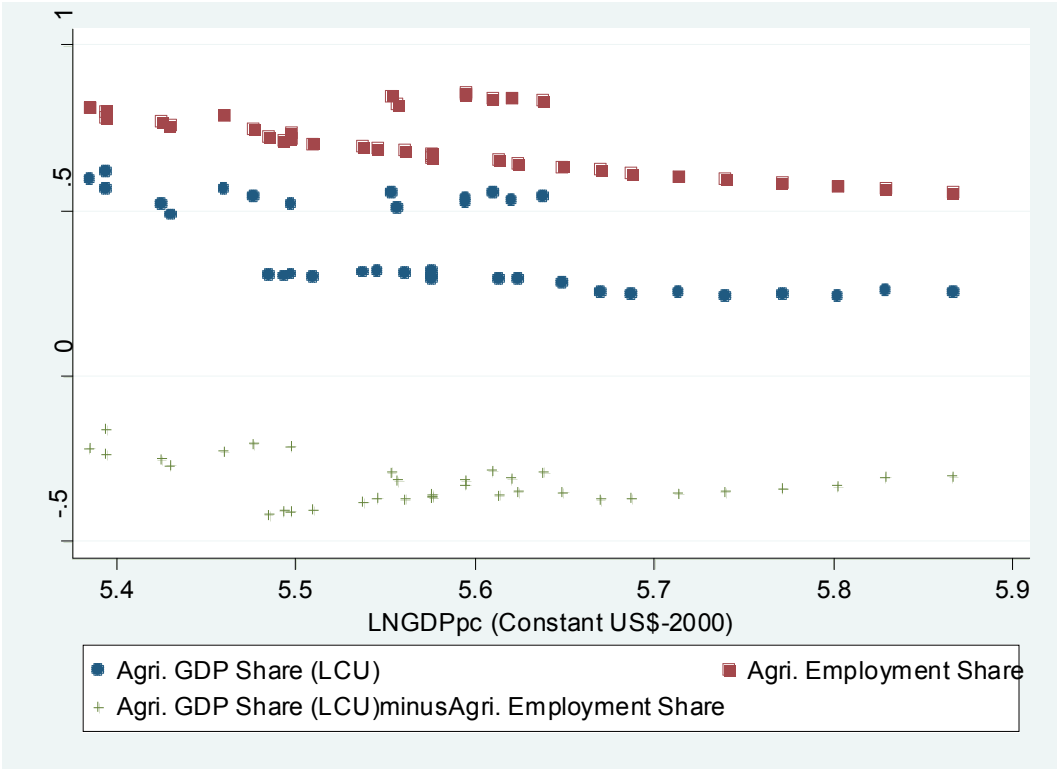
Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

Regression 6 which includes both DomAgToT_difference and predictedToT (AgEMPshare for Non-Asian Countries): Y(agriemploymentshare) = a + b*lngdppcconstantus2000 + c*lngdppcsquareconstantus2000 + d*DomAgToT_difference + e*predictedTOT + dummy_year* + dummy_country* + e

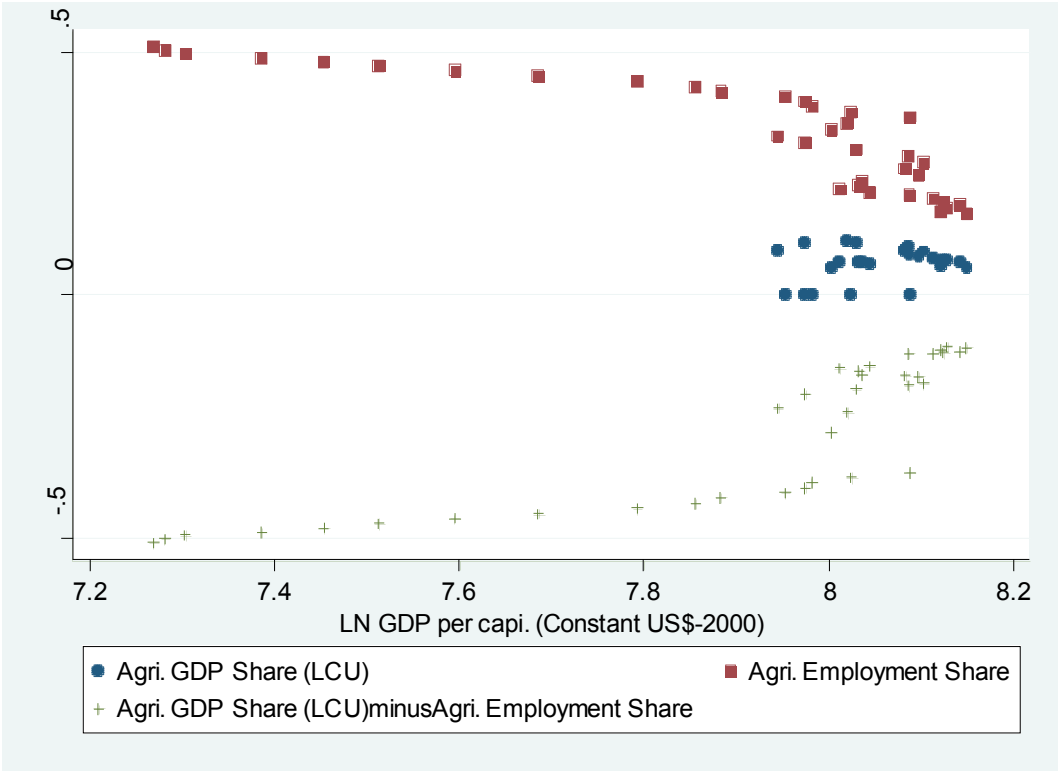
```
      Source |       SS       df       MS              Number of obs =    2250
-------------+------------------------------           F(109,  2140) = 1795.19
       Model |  196.741756   109  1.80497023           Prob > F      =  0.0000
    Residual |  2.15165413  2140  .001005446           R-squared     =  0.9892
-------------+------------------------------           Adj R-squared =  0.9886
       Total |   198.89341  2249  .088436376           Root MSE      =  .03171
------------------------------------------------------------------------------
agriemploy~e |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lngdppccon~0 |  -.3067055   .0198507   -15.45   0.000    -.3456342   -.2677767
lngdppcsqu~0 |   .0196806   .0013605    14.47   0.000     .0170125    .0223488
DomAgToT_d~e |   .0000521   .0000287     1.82   0.069    -4.09e-06    .0001084
PredictedTOT |  -.0001628   .0000221    -7.38   0.000    -.0002061   -.0001195
```

Note: All regressions also included lnGDPpc and (lnGPDpc)squared, as well as Year and Country fixed effects.

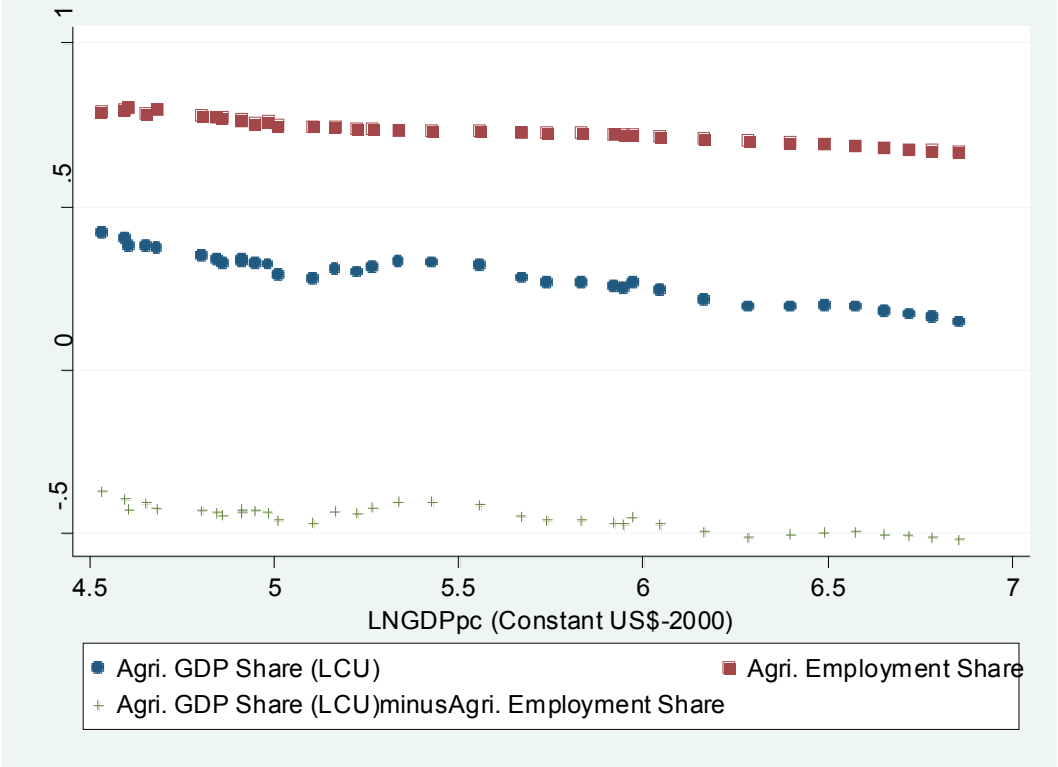
Annex Figure 1-a: The structural transformation in *Bangladesh*



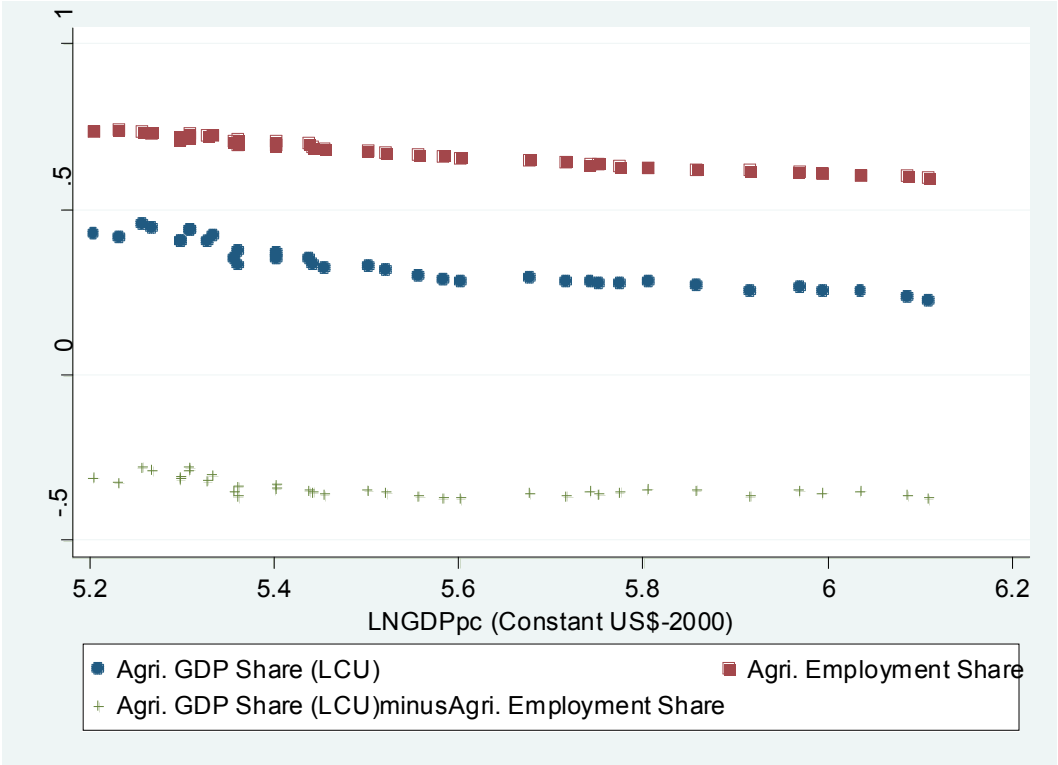
Annex Figure 1-b: The structural transformation in *Brazil*



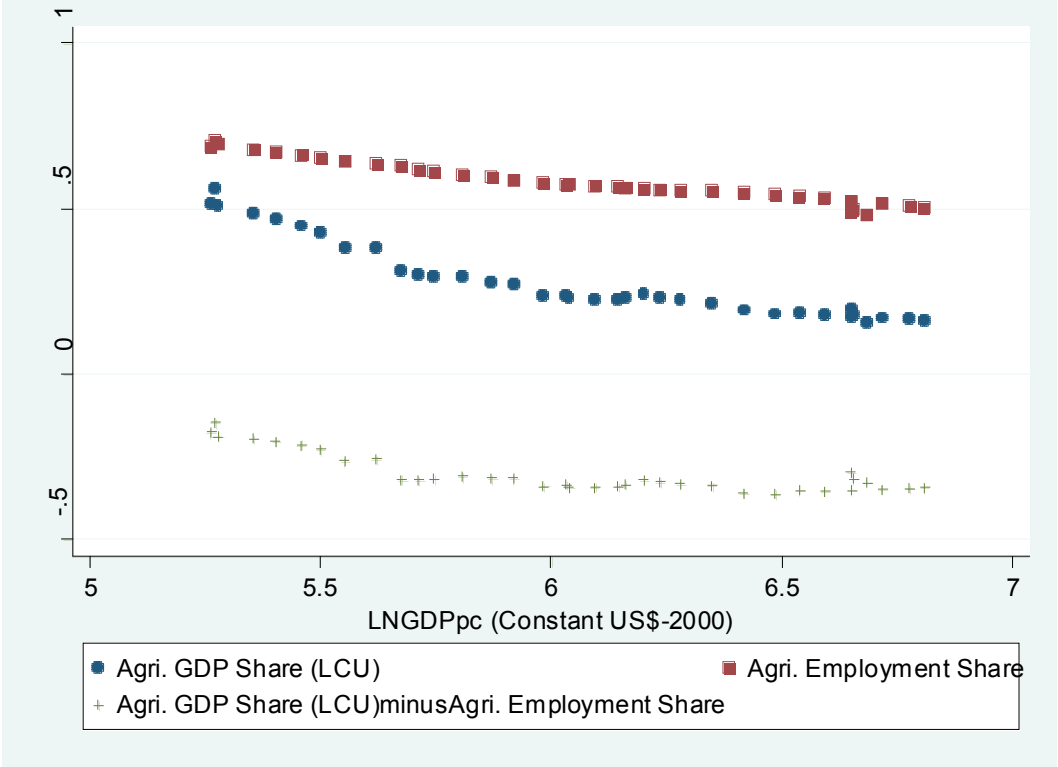
Annex Figure 1-c: The structural transformation in *China*



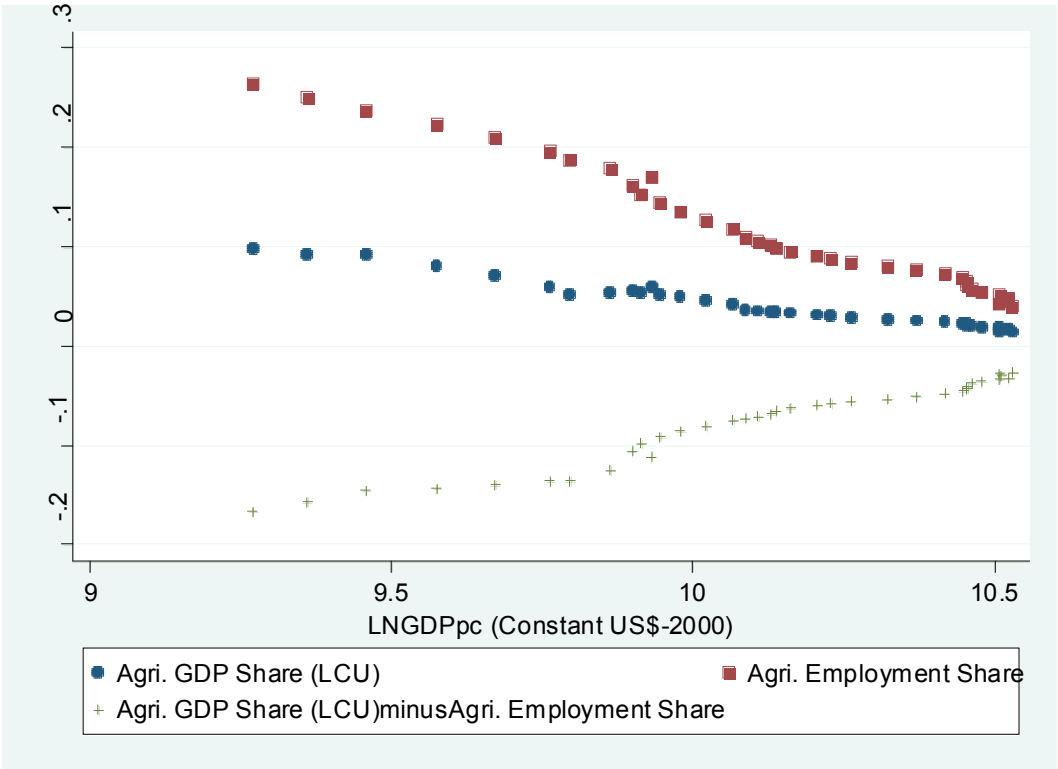
Annex Figure 1-d: The structural transformation in *India*



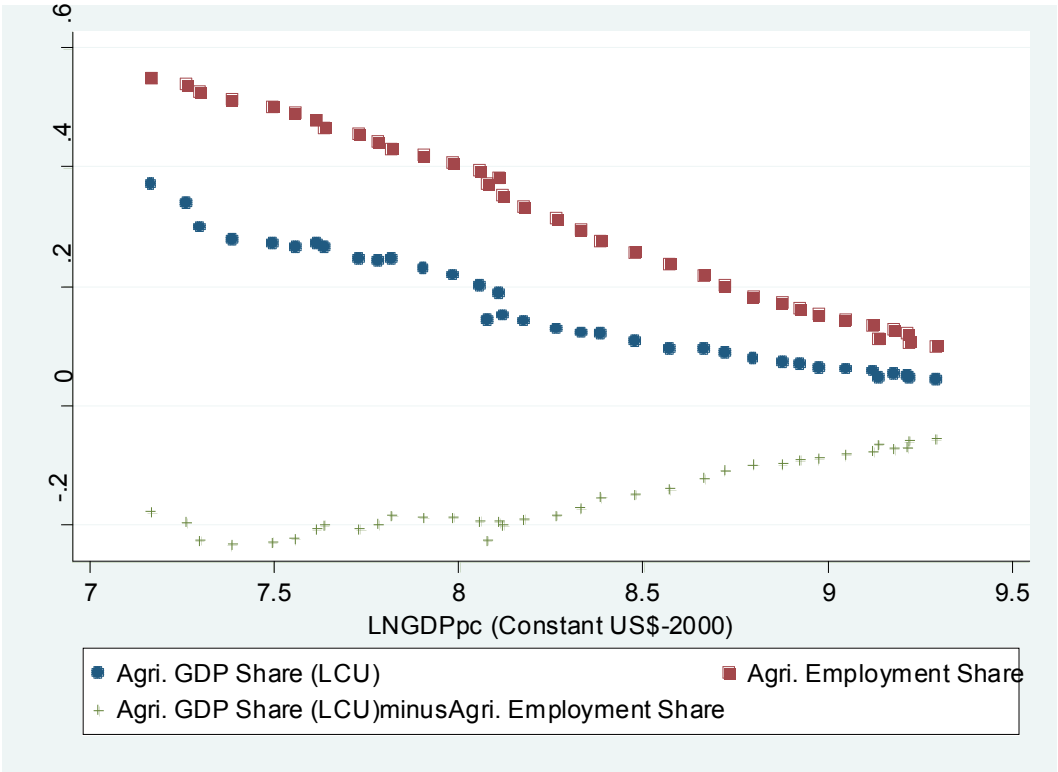
Annex Figure 1-e: The structural transformation in *Indonesia*



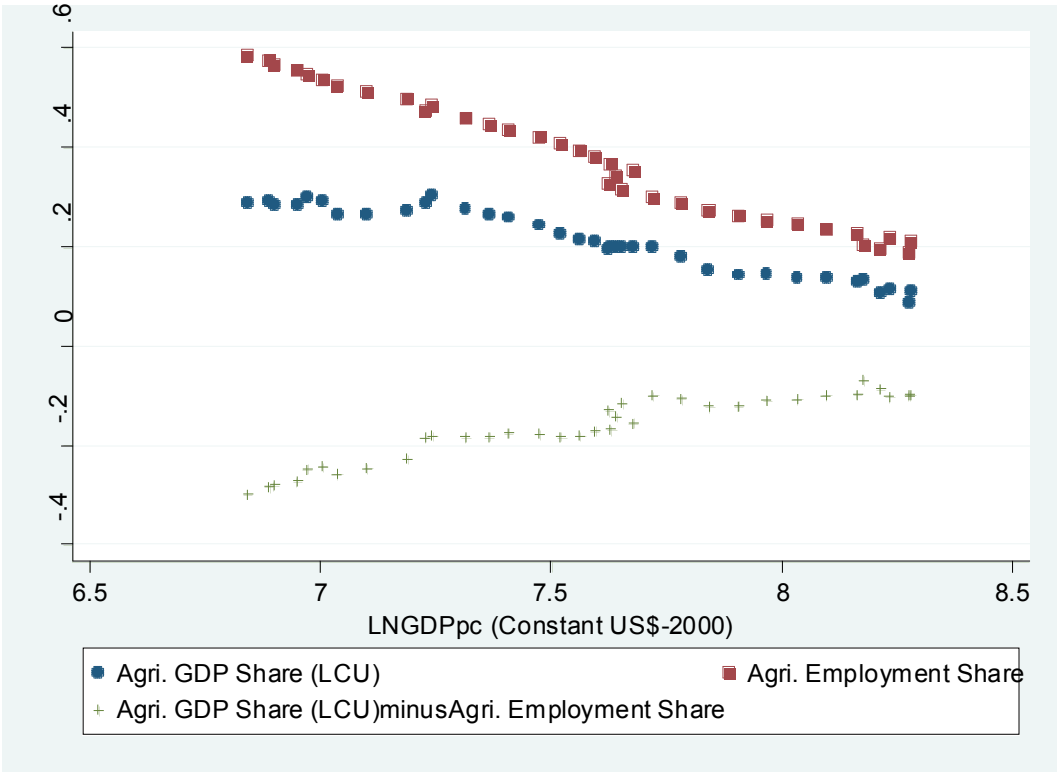
Annex Figure 1-f: The structural transformation in *Japan*



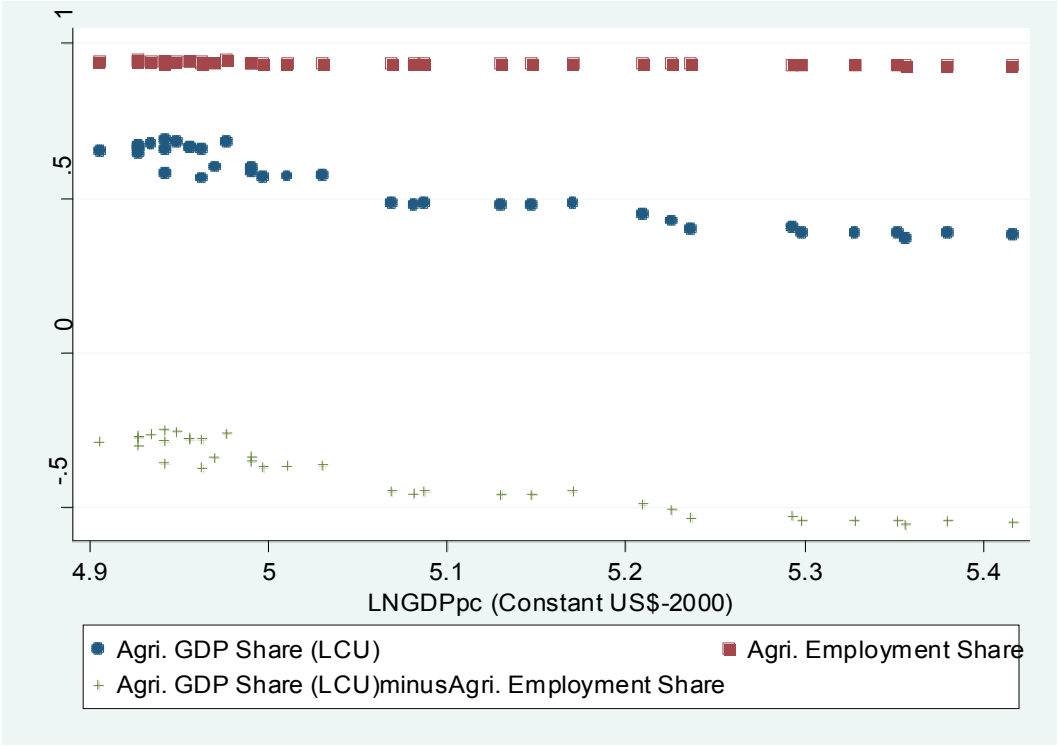
Annex Figure 1-g: The structural transformation in *Korea*



Annex Figure 1-h: The structural transformation in *Malaysia*

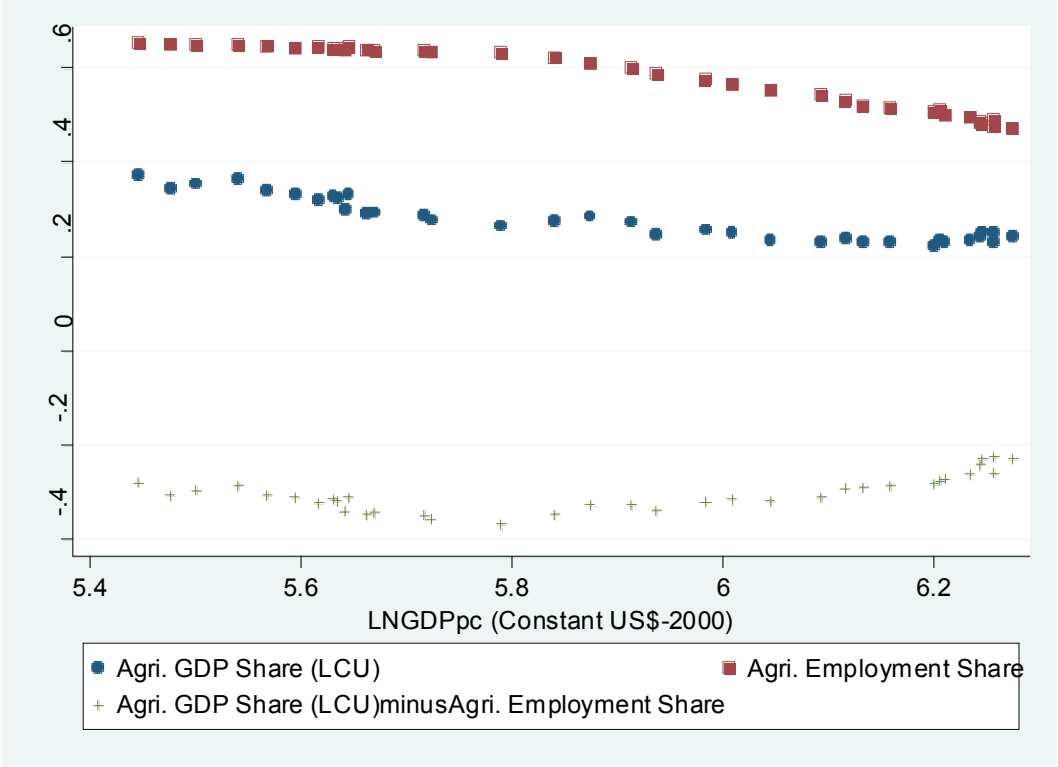


Annex Figure 1-i: The structural transformation in *Nepal*



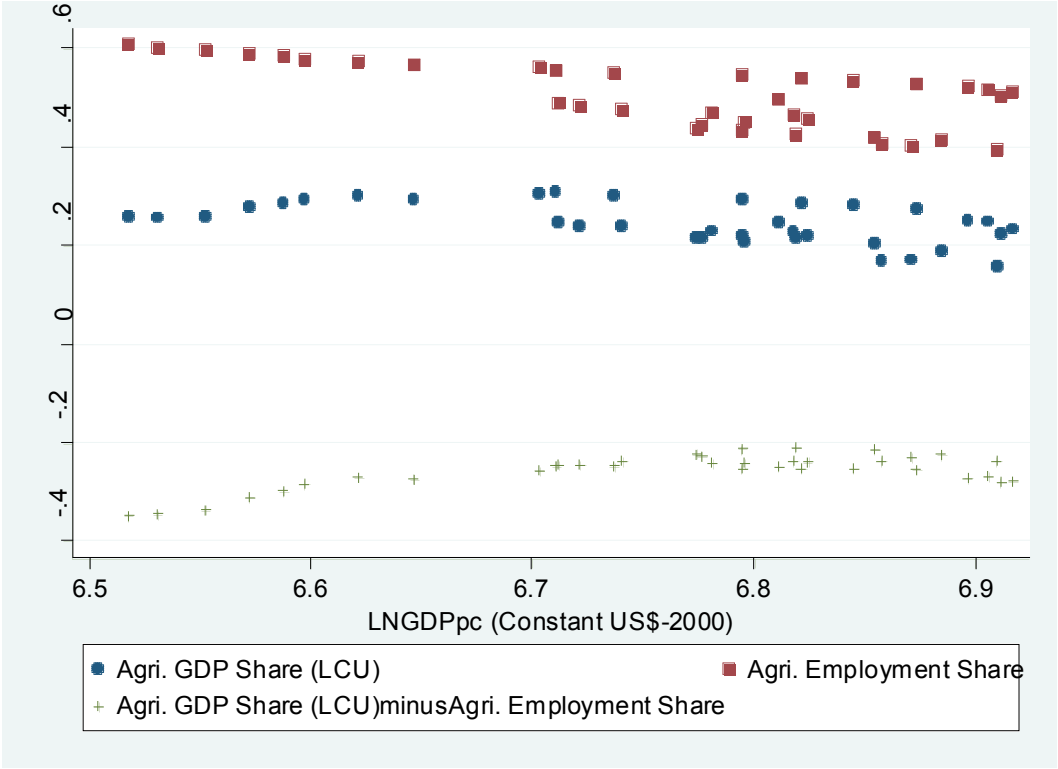
Annex Figure 1-j: The structural transformation in *Nigeria*

Annex Figure 1-k: The structural transformation in *Pakistan*

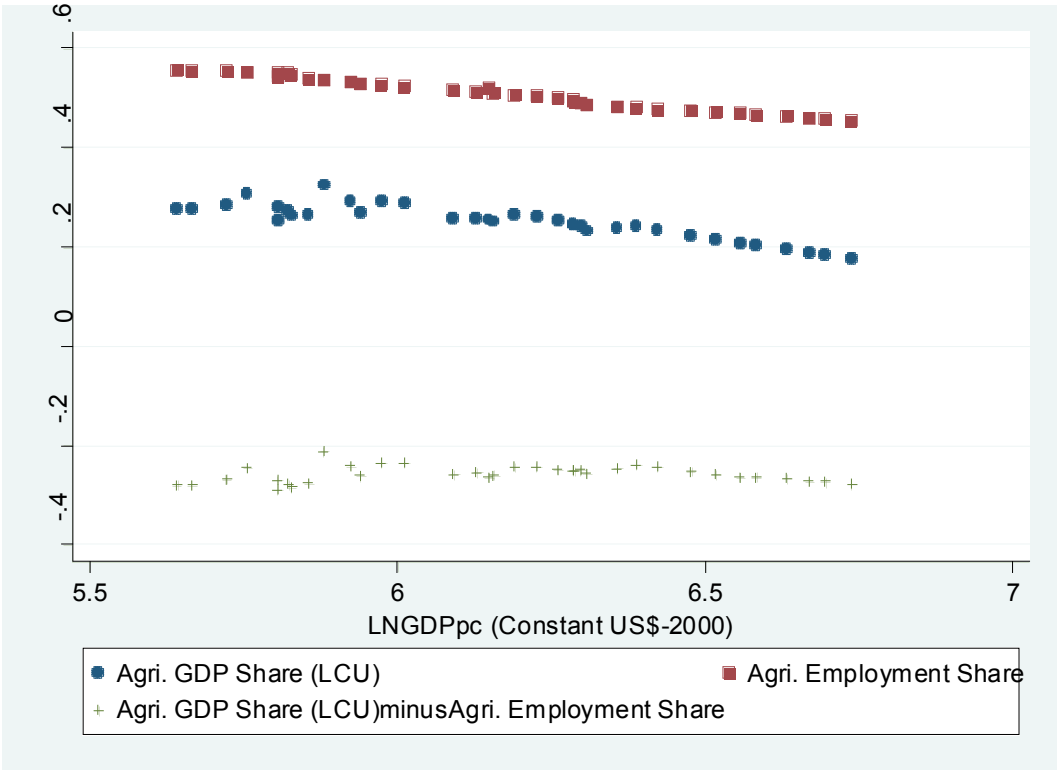


Annex Figure 1-l: The structural transformation in *Papua New Guinea*

Annex Figure 1-m: The structural transformation in *Philippines*



Annex Figure 1-n: The structural transformation in *Sri Lanka*



Annex Figure 1-o: The structural transformation in *Thailand*