

The Impact of Educating Girls in Bangladesh as Viewed Through the Lenses of Kremer's O-Ring Theory, Rostow's Stage Theory, and Lewis' Structural Change Model

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March 2011

ABSTRACT

In 1971, after a civil war in Pakistan, Bangladesh (the eastern side) became a nation. With the help of developed countries and international organizations such as UNICEF and the World Bank, Bangladesh began to chart a path toward development, including the goal of having 95 percent of its school-age children enrolled by 2015 and, also, eliminating gender disparity in education. Since Bangladesh has surged ahead of Pakistan, as measured by all but one indicator used to assess development and overall well-being, it is significant that Bangladesh has also made much greater progress in eliminating gender-based educational disparities. Bangladesh has also more than halved its birth rate — an accomplishment that can be directly linked to educating girls. Three economic theories serve as especially helpful lenses through which we can examine the economic development impact of educating girls in Bangladesh: Walter Rostow's Stage Theory, Michael Kremer's O-Ring Theory, and (3) Arthur Lewis' Structural Change Model. In particular, it is Kremer's O-Ring Theory, with its emphasis on the powerful impact of even "small inputs," that best explains the dramatic "ripple effect" of educating girls — in developing countries, generally, and Bangladesh, in particular.

INTRODUCTION

In 1971, after a civil war in Pakistan between its east and west sections, Bangladesh (the eastern side) was born as a nation. Both countries were among the most impoverished in the world—plagued by overpopulation, high population growth rates, widespread illiteracy and

malnutrition, few educational opportunities for girls, and the oppression of women.¹ As severely underdeveloped, highly overpopulated countries with indigenous populations concentrated almost entirely in rural, agricultural areas, they faced considerable challenges. After all, "being indigenous makes it much more likely that an individual will be less educated, in poorer health, and in a lower socioeconomic stratum than other individuals. This is particularly true for indigenous women."² Not surprisingly, even as recently as two decades ago, "... the educational attainment of Bangladeshi women was among the lowest in the world. Eighty percent were illiterate [and] trapped in a cycle of dependency."³

But with the help of developed countries, NGOs, and international organizations such as the United Nations, UNICEF⁴, and the World Bank⁵, Bangladesh began to chart a path toward development, including the goal of having 95 percent of its school-age children enrolled in school by 2015.⁶ Of the eight Millennium Development Goals set by the United Nations in September 2000, four directly affect the well-being of girls and women: "... achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health..."⁷ It is important to note that "... four of the Millennium Goals — improvements in child mortality, maternal health, reduction of disease including HIV/AIDS, and environmental stability — *will not be met or will be severely hindered without progress in girls'*

1 "Women make up a substantial majority of the world's poor. If we compared the lives of the inhabitants of the poorest communities throughout the developing world, we would discover that virtually everywhere, women and children experience the harshest deprivation." (Todaro, 227)

2 Todaro, Michael P. and Stephen C. Smith. 2006. *Economic Development*. New York: Pearson Addison Wesley.

3 "Bangladesh: Educating Girls." WorldBank.org

4 UNICEF. "Bangladesh - Overview - Millennium Development Goals." http://www.unicef.org/bangladesh/overview_4851.htm

5 "Since independence in 1971, Bangladesh has received more than \$30 billion in grant aid and loan commitments from foreign donors, about \$15 billion of which has been disbursed. Major donors include the World Bank, the Asian Development Bank, the UN Development Program, the United States, Japan, Saudi Arabia, and west European countries". ("Background Note: Bangladesh." 24 May 2010. U.S. Department of State, Bureau of South and Central Asian Affairs. <http://www.state.gov/r/pa/ei/bgn/3452.htm> (accessed 25 February 2011).

6 Ardt, et al. "Report on Primary Education in Bangladesh: Challenges and Successes." 19 May 2005.

7 Todaro, 23.

education."⁸ (Emphasis added.) Therefore, one of the goals set by Bangladesh with the encouragement and financial support of the aforementioned international organizations was to eliminate gender disparity in education.

One might ask, "Why was this so important when Bangladesh had such a multiplicity of problems and concerns?" The answer is that closing the gender gap educationally has at least four powerful results:

1. "The rate of return on women's education is higher than that on men's in most developing countries.
2. Increasing women's education not only increases their productivity on the farm and in the factory but also results in greater labor force participation, later marriage, lower fertility, and greatly improved child health and nutrition.
3. ... more educated mothers lead to multiplier effects on the quality of a nation's human resources for many generations to come.
4. Because women carry a disproportionate burden of the poverty and landlessness that permeates developing societies, any significant improvement in their role and status via education can have an important impact on breaking the vicious cycle of poverty and adequate schooling."⁹

Not surprisingly, Bangladesh has made much greater strides in eliminating gender-based educational disparities than Pakistan, the country from which it was birthed.¹⁰ In fact, in virtually every indicator used to assess development and overall well-being, Bangladesh is now ahead of Pakistan. (See Table 1 in "Appendices.") Specifically, when it comes to education, "according to the Social Watch Report, 2004, Bangladesh scores in the 'above average' (second-highest) group in overall gender equity, while Pakistan in the fourth and lowest category."¹¹ In Pakistan, the female to male literacy rate is 60%; in Bangladesh, it is 71%. (*Ibid.*) And "... in Bangladesh, a larger share of girls are enrolled in primary education than boys, while in Pakistan, the enrollment level of girls is less than three-quarters that of boys." (*Ibid.*) What has

8 Kane, Eileen. "It turns out that economists are now a girl's best friend." 8 March 2005. *The Irish Times*. Online. 12 January 2011.

9 Todaro, 377.

10 "According to the Social Watch Report, 2004, Bangladesh scores in the 'above average' (second-highest) group in overall gender equity, while Pakistan in the fourth and lowest category." (Todaro, 87.)

11 Todaro, 87.

been accomplished since then is impressive, but more needs to be done.

But other than its importance as a human rights issue, why is educating girls so important? After all, isn't it enough to simply say that all children, girls and boys alike, should have an education? Yes and no. All children should have the benefit of a primary and secondary education. However, educating girls has a unique impact — beginning at the household level and radiating throughout society — that is as multifaceted as it is powerful. In fact, "it is argued that public rates of return (to society), which measure externalities such as effects on fertility and child health, are higher for female education than for male."¹² Study after study continues to show that "... getting and keeping girls in school reduces child mortality and malnutrition; improves family health; delays the age of first marriage; lowers fertility rates; enhances women's domestic role and their political participation in society; improves their functioning in the wage labour force; strengthens a family's survival strategies; and probably most intriguing to governments, *increases economic growth*."¹³ (Emphasis added.)

There is one cautionary note, however: In any developing country, the population at large needs to be educated about why education for girls is so important (and, ideally, this should be framed in economic and pragmatic terms), because in some countries, an educated girl may be considered less marriageable.¹⁴

THEORETICAL MODELS TO BE TESTED

This paper focuses on three economic theories that I believe best explain the impact, on economic development, of educating girls in Bangladesh: (1) Walter Rostow's Stage Theory¹⁵,

12 Oxaal, 1997, quoted in Subrahmanian, Ramya. 2007. *Gender in Primary and Secondary Education: A Handbook for Policy-makers and Other Stakeholders*. London: Commonwealth Secretariat, 9.

13 Kane.

14 Todaro, 378.

15 Kulkarni (160), Todaro (104, 108) and class notes (Economic Development, Professor Kishore Kulkarni, Josef Korbel School of International Studies, University of Denver, Winter Quarter 2011).

(2) Michael Kremer's O-Ring Theory¹⁶, and (3) Arthur Lewis' Structural Change Model.¹⁷

Rostow's Stage Theory

In the 1960s, Cambridge economist Walter Rostow outlined five stages of economic development in his book *The Stages of Economic Growth*:

1. Traditional Society (crude production methods, agriculturally based GDP, no industrial production, age-old technology, constrained public consumption habits).
2. Pre-Conditions for Take-Off (modern techniques begin to be used in production, manufacturing becomes more significant, agriculture becomes less important, there are institutional and infrastructural changes, and communication techniques improve).
3. Take-Off (a small percentage of the population is in agriculture, technology is more modern, the service sector grows, manufacturing becomes the dominant sector, and economic growth is the highest).
4. Drive to Maturity (there is improved infrastructure and an efficient service sector, the consumption pattern is very wide, and economic growth is complete [most developed countries belong in this stage]).
5. Age of High Mass Consumption (there is an abundance of all productions with no supply constraints or shortages, and the consumer is king [only a few countries have achieved this]).

The O-Ring Theory

The name for this theory comes from the Challenge Shuttle disaster in 1986 — when a faulty O-ring (a very small part) led the shuttle to explode. O-Ring theorist Michael Kremer says that, similarly, contributions from small inputs are as important to economic development as

¹⁶ Todaro (166-171) and class notes (Economic Development, Professor Kishore Kulkarni, Josef Korbel School of International Studies, University of Denver, Winter Quarter 2011).

¹⁷ Kulkarni (230-231), Todaro (108-113) and class notes (Economic Development, Professor Kishore Kulkarni, Josef Korbel School of International Studies, University of Denver, Winter Quarter 2011).

much larger ones. These include education, females in the labor force, work culture, public habits, human capital, and NGOs. Kremer focuses on the production value of skilled workers as opposed to unskilled workers, assuming that "it is not possible to substitute several low-skill workers for one high-skill worker, where skill refers to the probability a worker will successfully complete a task."¹⁸

The importance of educating girls in a developing country may seem like a secondary issue to some people; but when we note that at least half of the "small inputs" listed by Kremer involve females, the education of girls is seen to be a core issue. After all, women and girls constitute at least half of any country's population (China excepted); so when they are disenfranchised and uneducated, it has a profound impact on that country's ability to improve its production and industrial capabilities. In fact, for each girl that you educate, there is a "ripple" effect that is geometric in importance. "Educating girls yields a higher rate of return than any other investment in the developing world," said Larry Summers in 1992, when [he was] chief economist of the World Bank ..."¹⁹

Lewis' Structural Change Model

Arthur Lewis explained the process of economic development by focusing on change in the structure of the economy, as he maintained that structural change is a precondition for economic growth. Developing countries have two dominant sectors: (1) the Traditional (agricultural or rural) sector, and (2) the Industrial section (manufacturing or urban). Lewis maintained that as a country's economy shifts from an emphasis on agriculture or rural enterprises to industrial or urban ones, economic development occurs through:

- Migration from rural to urban areas with higher wages
- More production

¹⁸ Kremer, Michael. "The O-Ring Theory of Economic Development."

¹⁹ Kane.

- Higher profits
- Reinvestment by the producers
- Shift upward of the total product curve

THE IMPACT OF EDUCATING GIRLS ON THE DEVELOPMENT OF BANGLADESH

While Bangladesh remains a poor, very densely populated²⁰, and inefficiently-governed nation²¹, "The economy has grown 5-6% per year since 1996 despite political instability, poor infrastructure, corruption, insufficient power supplies, and slow implementation of economic reforms. Although more than half of GDP is generated through the service sector, 45% of Bangladeshis are employed in the agriculture sector, with rice as the single-most-important product."²² And as of 2007, 93.7 percent of primary school-age children in Bangladesh were enrolled in school.²³ Bangladesh is clearly on track to reach its goal of a "... 95% enrollment rate by the year 2015, and through its PEDP II program [it] has expressed the desire to drastically increase the equality of access to primary education among all populations."²⁴

In comparison with its "mother" country, Pakistan, which is also overpopulated, Bangladesh has made much greater progress in reducing fertility: "Shortly after independence in 1971, both countries had an extremely high level of just over 6 births per woman. In Bangladesh, fertility fell to 3.5 by 2002. But for Pakistan, fertility has fallen only to 5.1."²⁵ This is also an indicator of Bangladesh's leap ahead of Pakistan in terms of development because "fertility tends to fall as social and economic progress increases. Women perceive better economic opportunities and less need to rely on having several children for security."²⁶ With lower fertility, there is a

20 In spite of its small geographic size, Bangladesh has a population larger than Russia's (<http://www.worldbank.org/ida/profile-gender.html>).

21 CIA, "Bangladesh," *The World Factbook*. <https://www.cia.gov/library/-publications/the-world-factbook/geos/bg.html> (accessed 27 February 2011).

22 *Ibid.*

23 Data.worldbank.org

24 Ardt, et al.

25 Todaro, 86.

26 *Ibid.*

positive cascading effect beginning in the woman's family and rippling outward through the country because "... more can be invested in each child in health and education, both by families and by governments and nongovernmental organizations."²⁷

Evaluation of the Rostow, O-Ring, and Lewis Theories vis-a-vis the Economic Impact of Educating Girls (See Table 2)

In the early 1970s, the infant nation of Bangladesh was clearly in Stage 1, the Traditional Stage, with some Stage 3 influence (an emerging service sector). Where is it today, and what impact has the two decades-long prioritization of educating girls had on its progress? While the service sector has stayed relatively stable, the previously dominant agricultural sector has swapped positions with the industrial sector, which is now dominant. Therefore, Bangladesh is clearly straddling Stages 2 (Pre-Conditions for Take-Off) and 3 (Take-Off). While we cannot conclude that there is a clear causal connection between educating girls and Bangladesh's growth from a Stage 1 economy to a Stage 2/3 economy, anthropologist Eileen Kane, author of *Girls' Education in Africa* (World Bank 2004), maintains that "causation is clear: improvement in girls' education is the cause of increase in economic growth, not the effect." Likewise, for similar reasons, Lewis' structural change model contributes to our understanding of why educating girls can have such a powerful impact economically long-term: educated and trained women are far more aware of options and opportunities, including ones that draw them to migrate from rural to urban areas and participate in the production process.

However, I believe the O-Ring theory does the best job of explaining the powerful "ripple effect" of educating girls. As previously mentioned, at least half of the "small inputs" outlined by Kremer (education, females in the labor force, work culture, and human capital) involve females directly or indirectly. When you educate a girl, she can contribute more to her

²⁷ *Ibid.*

family, her community, and the GNP of her country. She will marry later, have fewer children, and have children who are healthier and much more likely to be educated. She will have more time to devote to work outside the home and more money to allocate to her children and her family's prosperity. Moreover, "education can make a significant contribution to the reduction of poverty by conferring skills, knowledge and attitudes that increase the productivity of the poor. Education also makes workers in industry more productive and can contribute to entrepreneurship."²⁸

The value of one trained or skilled worker (compared with several untrained or unskilled workers) cannot be overestimated. After all as Kremer explains, "This O-ring production function differs from the standard efficiency units formulation of labor skill, in that it does not allow quantity to be substituted for quality within a single production chain."²⁹

Population Growth

With the way in which the world's population has skyrocketed from 1 billion to 7 billion since 1850³⁰, slowing and then stabilizing it at or near replacement level is essential. Indeed, "... the populations of many developing countries have been increasing at annual rates in excess of 2.5% over the past few decades, and some are rising even faster today."³¹ Simply encouraging (or even coercing) people in developing countries to have smaller families is not the answer, for "... no policy measure will be successful in controlling fertility rates unless efforts are made to *raise the social and economic status of women* and hence create conditions favorable to delayed

28 "Education lights path to progress: Gender Gap Threatens Sustained Economic and Social Development." 20 November 1995. *The Nikkei Weekly*. Accessed 12 January 2011.

29 Kremer. "The O-Ring Theory of Economic Development."

30 In 1850, there were 1 billion people in the world; in 1950, 2 billion; and in 1970, 3 billion. The world's population has increased by approximately 1 billion a decade ever since, now standing at 7 billion. (Class notes)

31 Todaro, 74.

marriage and lower marital fertility."³² And as previously mentioned, decreases in population growth can be directly linked to educating girls.

A crucial ingredient in any program designed to lower fertility rates is the increased education of women, followed by the creation of jobs for them outside the home.... An independent source of income also secures a stronger position for married women in the household, reducing their dependence on other family members."³³ The core message of the United Nations International Conference on Population and Development held in Cairo in 1994, was that "if women's health, education, and economic well-being are improved along with their role and status in both the family and the community, this empowerment of women will inevitably lead to smaller families and lower population growth."³⁴

In light of that assertion, it is interesting to note that "shortly after independence in 1971, both Pakistan and Bangladesh had an extremely high level of just over 6 births per woman. In Bangladesh, fertility fell to 3.5 by 2002. But for Pakistan, fertility has fallen only to 5.1.... Fertility tends to fall as social and economic progress increases. Women perceive better economic opportunities and less need to rely on having several children for security.... with lower fertility, more can be invested in each child in health and education, both by families and by governments and nongovernmental organizations."³⁵ Interestingly enough, Bangladesh has made much greater progress than Pakistan in reducing fertility³⁶, which — given its greater success in educating its girls for more than two decades now — may be directly related to the

32 *Ibid.*, 298

33 *Ibid.*

34 *Ibid.*, 289.

35 Todaro, 86.

36 Trading Economics. "Birth rate; crude (per 1;000 people) in Bangladesh."
<http://www.tradingeconomics.com/bangladesh/birth-rate-crude-per-1-000-people-wb-data.html> (accessed 3 March 2011).

documented connection between educating girls and lowered fertility. (Bangladesh's birth rate has fallen by more than half, from about 47 births per 1,000 to about 22 births per 1,000.)

SUMMARY AND CONCLUSION

It is clear that in the past four decades, Bangladesh has made impressive economic progress — especially in comparison to its "mother country," Pakistan. (*See Table 1.*) According to the World Bank, "Poverty has dropped from 57% of the population in 1990 to 40% in 2005 ... [and it] is on track to meet the Millennium Development Goal of halving extreme poverty by 2015."³⁷ However, it still suffers from significant constraints, including "... poor governance, rampant corruption, infrastructural bottlenecks, underdeveloped financial markets, inefficiency bureaucracy, and failure to attract FDI."

The Big-Push Hypothesis by Cambridge economist Rosenstein-Rodan follows the Keynesian argument that government has a major role to play in economic development — especially in the heavy industries, bulky productions, and infrastructure investment. Since, up to this point, Bangladesh's economy has struggled to grow in these very areas, a "Big Push" may be just what Bangladesh needs, going forward, to roll it solidly into Stage 3 of Rostow's paradigm.

As one Bangladeshi analyst put it:

Since our economy is trapped in the 'vicious circle' of poverty and stagnation, the government can play a positive role through its budgetary measures in breaking this vicious circle. A conscious effort can be made by the government in framing the budget for providing investment capital in the public sector. The government of Bangladesh has a pervasive role in controlling the economy and finance, safeguarding its course and the composition of economic and development activities through a host of discretionary policies. These controls are exercised in an increasing number of fiscal and monetary instruments and these policies have very serious ramifications for both resource allocation and distribution and composition of the economy.³⁸

37 "Bangladesh Country Overview." Updated 18 October 2010. The World Bank.

38 <http://www.shvoong.com/humanities/theory-criticism/1906027-critics-development-strategy-bangladesh>

Indeed, the reason for Pakistan's higher PPP (the only factor listed in Table 1 for which Pakistan is ahead of Bangladesh) is that between 2001-2007, the central government at Islamabad "... steadily raised development spending."³⁹

But "Big Push" or no, educating girls has led to healthier, better informed, and more empowered women who will continue to not only make better personal and economic choices for themselves but directly influence the choices of their children, both girls and boys. And the more women in developing countries are empowered for entrepreneurship, the better off those countries will be: "Studies in Latin America and Asia have found that where credit is available to women with informal-sector micro-enterprises, repayment rates have equaled or exceeded those for men."⁴⁰

If we look at Bangladesh through the lens of Lewis' structural change theory and Walter Rostow's stage theory, we see that it is in the process of shifting from an agricultural economy to an industrial one (although it still has a long way to go). The country has clearly moved from Stage 1 (Traditional Society) to somewhere between Stage 2 (Pre-Conditions for Take-Off), and Stage 3 (Take-Off). Once Bangladesh becomes less dependent on agriculture, with more modern technology and developed infrastructure, and a dominant manufacturing sector, it will be in Stage 3, Take-Off. If corruption can be reduced, and the Bangladeshi government begin strategically planning for the country that successive generations are to inherit, Stage 4, Drive to Maturity (improved infrastructure, an efficient service sector, and very wide consumption pattern), will not be far off, whereupon Bangladesh will have joined the ranks of the developed countries.

39 CIA, *The World Factbook*.

40 Todaro, 334.

Given the already-dire state of overpopulation in Bangladesh in the 1970s, it is most encouraging that the birth rate has been halved — and educating girls has been a major, if not the major, contributing factor to this improvement. Over time, achieving a point of equilibrium (replacement level in the birth rate) will enable Bangladesh to reach its full potential. Therefore, if we had to choose one single "lever" guaranteed to move Bangladesh more quickly in that direction of peak development, therefore, it would be maintaining and building upon a high priority on educating its girls — "... for educated women not only have fewer children but also have better economic prospects themselves."⁴¹ As Hoon Eng Khoo, Acting Vice-Chancellor and Provost of the Asian University for Women, Bangladesh, put it:

There is no question that educating girls is a prerequisite for eradicating poverty. Education empowers and transforms women. It allows them to break the "traditional" cycle of exclusion that keeps them at home and disengaged from decision making. Education, especially higher education, can prepare women to take on roles of responsibility in government, business and civil society. Women make ideal leaders: numerous studies have demonstrated that they tend to allocate resources more wisely than men. For example, women spend a larger percentage of their income on food and education for their children. Thus, strengthening the economic and political role of women directly benefits the next generation.⁴²

That said, let us never forget that, ultimately, economic development is not about production levels or GNP or even the HDI, as important an indicator of human well-being as that is. It is about enabling each and every human being to have the opportunity to grow, to learn, to explore, and to make his or her unique contribution to the world.

41 "Educate Girls to Alleviate Poverty." 6 January 2011. Chinadaily.com.cn. Accessed 12 January 2011.

42 "Educate Girls, Eradicate Poverty: A Mutually Reinforcing Goal." 2010. *UN Chronicle*. Online. 2 March 2011.

APPENDICES

Table 1

A Comparison of Bangladesh and Pakistan

(green areas indicate more progress compared to the other country)

Bangladesh

PPP (2009)	Population growth rate (2010, est.)	Life expectancy at birth (2010)	Total fertility rate (children born per woman)	School life expectancy (years of primary to secondary education)	Unemployment rate	Public debt (2010, est.)	Inflation rate
\$1,600	1.55%	Male = 67.64 years Female = 71.3 years	2.65	Female = 8 years Male = 8 years	5.1%, with 40% underemployment	39.3%	8.1%

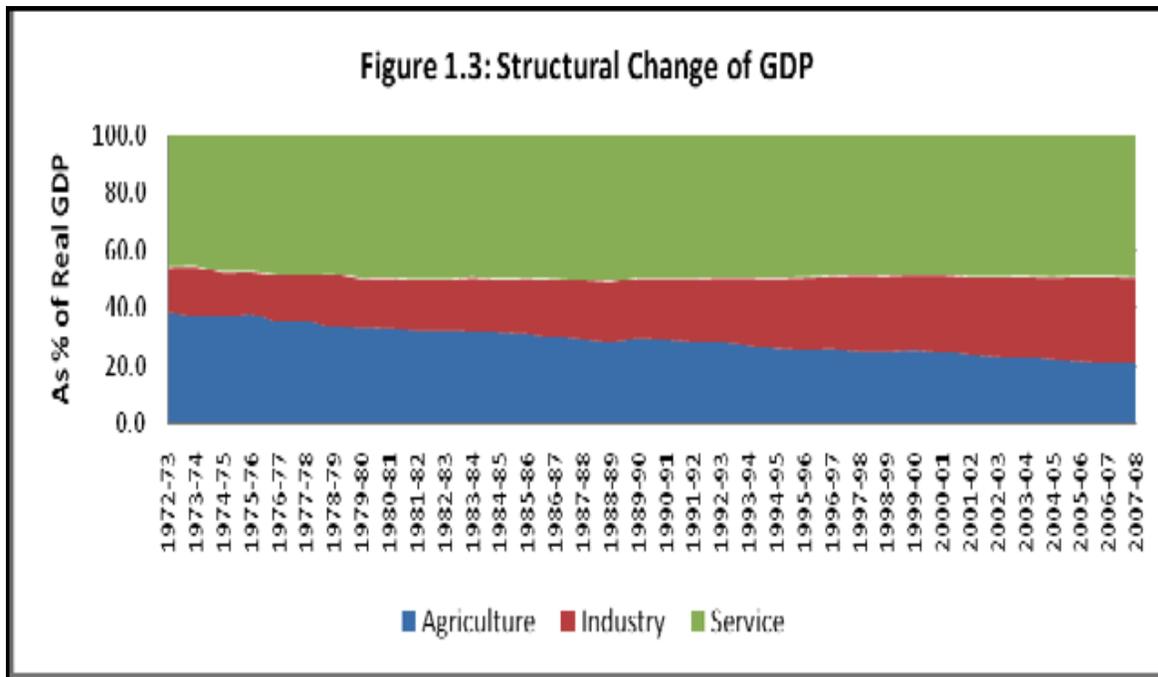
Pakistan

PPP (2009)	Population growth rate	Life expectancy at birth	Total fertility rate (children born per woman)	School life expectancy	Unemployment rate (2010, est.)	Public debt (2010, est.)	Inflation rate
\$2,400	1.589%	Male = 63.84 years Female = 67.5 years	3.28	Female = 6 years Male = 8 years	15%, with "substantial" underemployment	49.9%	13.4%

From "Bangladesh" and "Pakistan." CIA: The World Factbook. <https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html> (accessed 27 February 2011).

Table 2

Trend of Structural Transformation of Broad Sectoral Shares in GDP (at Constant Prices)



"[Table 2] shows the structural transformation of Bangladesh economy. The key findings include:

- While in the early seventies, the share of the agriculture sector to GDP was more than 38%, it fell to 21% by 2007-08.
- In contrast, the share of the industry sector rose from only 15.5% in 1972-73 to around 30% in 2007-08.
- The largest sector of the economy is the service sector, representing about half of GDP. It
- Its share has remained relatively stable over time, representing about 46% of GDP in the early 70s and has remained within the range of 48% to 50% since.
- There has been a considerable shift from agriculture sector to the industry sector."⁴³

43 "Bangladesh Economy: Recent Macroeconomic Trend." www.mof.gov.bd/en/budget/-rw/real_sector.pdf (accessed 28 February 2011).

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