

Potentials for demographic dividend and rapid economic growth in Mali: What policy scenario would yield the greatest dividend?

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Abstract: The demographic changes occurring in Mali, evident in high fertility but declining mortality rates have raised optimism about the prospects of reaping demographic dividend. However, it remains unclear how soon and what policy scenario would yield the largest demographic dividend in the country. We used a demographic-economic model “DemDiv” to assess the prospects of reaping a demographic dividend in Mali by 2050. We illuminate this further by examining the cost and implications of different combination of education, family planning and economic policies. The results show that by increasing access to education, family planning services coupled with strong economic reforms, Mali’s GDP per capita will be \$27,044 by 2050. This high per capita GDP is almost thrice the benefit of prioritising only economic reforms. Mali would also have a GDP of \$977 billion. These findings highlight the need for sound demographic and market-oriented economic policies for Mali to reap a large demographic dividend by 2050.

Keywords: demographic dividend, demography, economic development, population growth, Mali

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1. Introduction

Over the past 60 years, population age structures have been changing everywhere in the world resulting from declines in fertility and mortality rates (Lee and Mason, 2012). As a result of these demographic changes, many of the world’s fastest economies have enjoyed a significant demographic dividend- a golden opportunity that has helped accelerate economic growth (Lee and Mason, 2012).

In recent years, Sub-Saharan African countries including Mali have also experienced changes in population structure resulting from an increasing rate of child survival, female school enrolment and demand for family planning, although slower than in other regions (Canning et al., 2015, Garenne and Gakusi, 2006). For instance, in Mali, under-five mortality has declined from about 254 deaths per 1000 live births in 1990 to about 123 deaths per 1000 live

births in 2012 (World Bank, 2014). These demographic changes have raised optimism about the possibilities of reaping a large demographic dividend (Bloom et al., 2017, Canning et al., 2015).

Reducing the levels of fertility and achieving a shift in the population age structure is perceived to be a critical step and perhaps the most challenging towards achieving demographic dividend in a less developed country like Mali (Canning et al., 2015, Gribble and Bremner, 2012, Wang et al., 2014). However, high fertility rates, cultural norms that values large family sizes, elevated levels of child malnutrition, gender inequality, and low domestic savings continues to pose themselves as a challenge in the region (Canning et al., 2015, Choi, 2016, Gribble and Bremner, 2012, Voas, 2003). Despite the slow and fluctuating economic growth experienced in Mali, rapid population growth rates which average about 3.0% in 2013 have slowed per capita gains, and almost

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one-third of the population live on less than \$2 per day (WorldBank, 2012). Youth dependency rate in Mali is also among the highest in the world (Hertrich, 2017). Less than 10% of sexually active women in this country use a modern method of contraception and about one in four women an unmet need for family planning (Choi, 2016, Guengant and Kamara, 2012). Concerns about side effects, traditional views and social norms, problems of access or cost including partner opposition are believed to be contributing factors to the low uptake of family planning services (Darroch et al., 2011). Similarly, more than 40% of the population is under 15 years and depend on financial support from working age adults (WorldBank, 2013). About 3 million people between 15 and 19 years are on their way to becoming financially independent as they enter adulthood thus increasing the risk of high poverty rates, reduced investments in children, lower labour productivity, high unemployment or underemployment, and the risk of political instability within the country (Gribble and Bremner, 2012).

Although demography may be destiny, it needs not lead to disaster. If adequate investments in health and education by families and governments are made, large numbers of young people can produce great economic benefit (Canning et al., 2015, Gribble and Bremner, 2012). While many less developed countries in other regions are entering or already entered the advance investment window and the window to reap demographic dividend appear to be approaching, it is unclear how soon the dividends of demography will be realised in a low-income country like Mali. Moreover, the possibilities of achieving the targets of the African Union towards achieving a demographic dividend by 2063 appears unrealistic given the high level of fertility in the country.

1.1 The Current Study

In order to benefit from demographic changes that would result in an accelerated economic growth, important work lies ahead. Part of this is understanding the policy scenarios that would yield the greatest benefit. Indeed, several studies have examined the possibilities of attaining demographic dividend in Africa and selected African countries using various simulation techniques including the United Nations projection estimates and the national transfer accounts (NTA) framework (Admassie et al., 2015, Bloom et al., 2017, Choi, 2016, Eastwood and Lipton, 2012, Guengant and Kamara, 2012, Karra et al., 2017, Olaniyan et al.,

2012). These studies have highlighted the possibilities of attaining demographic dividend in the studied countries. However, evidence on the policy scenario that would yield the greatest demographic dividend is weak and almost lacking in Mali and several other African countries. Yet, the timing and magnitude of each country's demographic dividend is perceived to be dependent on population change, economic conditions, and the policies that influence them (Bloom et al., 2017, Fürnkranz-Prskawetz et al., 2013). Recent studies have demonstrated that creating a window of opportunity through fertility reduction and capitalising on the dividend through investment in health including family planning, education, governance and economic sector-particularly flexible labour market, international trade, and savings are needed to harness the demographic dividend (Choi, 2016, Gribble and Bremner, 2012, Reher, 2011). As a result, we attempted to fill current research gap on demographic dividend literature in Africa by examining the prospects of attaining demographic dividend in Mali by 2050. We examined whether fertility decline and changes in the population age structure in the country can be accelerated so that a large demographic dividend is reaped and occurs more quickly by 2050. To make this argument solid, we model this as a process of interacting policy changes that encompasses education, family planning and economic policies to simulate the policy scenario that would yield the greatest demographic benefit. An awareness of the demographic and economic profile that would create a window of opportunity is therefore important to achieve rapid economic growth and attain the development path achieved by the Asian Tigers and the other middle-income countries more quickly.

2. The model and data sources

We applied a modelling tool “*DemDiv*” developed by Futures Group's Health Project, to simulate three scenarios of interacting policy changes and examine the policy scenario that would yield the greatest demographic benefits by 2050 (Health Policy Project and United States Agency for International Development, 2014). These policy scenarios are the business-as-usual scenario, economic emphasis and the combined scenario. The business-as-usual scenario assumed that Mali would continue to perform below its potential because of persistent child-dependency ratios and poor economic performance characterised by a weak implementation of development policies.

Under this scenario, there would be no definitive action to address the development bottlenecks. The economic emphasis policy scenario, however, represented an aggressive effort to address the economic bottlenecks that have curtailed socioeconomic development. It assumed that there would be a firm economic action evidenced in enhanced economic reform, productive efficiency and accelerated economic growth through the creation of jobs and reduced poverty levels. Finally, the combined scenario unlike others provided the best policy scenario for attaining the socioeconomic transformation experienced by the Asian tigers. It represents a scenario in which economic, education and family planning policies are concurrently prioritised for enhanced economic growth.

The model like other similar models used a statistical approach including multiple linear regression estimated from a cross-national database for over 100 countries, to project demographic and economic changes (Moreland et al., 2014). This was further developed into a two-part model that examined demographic and economic changes with equations to estimate employment, investment and GDP (Moreland et al., 2014). Conceptually, the model's structure is not new. It follows, to a large extent, in the tradition of simulation modelling employed by Coale and Hoover (1958) more recently, Ashraf et al. (2013) and also drew on an existing econometric model by Bloom et al. (2010). Detailed description of the methodology and modelling equations were estimated are published elsewhere (Moreland et al., 2014). As presented in **Tables 1**, the policy indicators cover economic, education and demographic indicators. The demographic sub-model (Table 2) projects fertility, life expectancy at birth, child mortality, population size, age structure, and dependency ratio. The model works with a dynamic link to the cohort-component population projection model, DemProj, in Spectrum.

2.1 Education Indicators

The education model captured the years of education – expected and actual, for males and females as measures of the overall quality and productivity of the labour force. The education indicators were generated from the 2013 UNESCO report for countries. Targets for the business-as-usual scenario was set at the 2013 value of the medium high development countries while targets for combined emphasis were set at the 2013 values of highly developed countries.

2.2 Family Planning Indicators

The family planning model encompassed the contraceptive prevalence rate (CPR), the period of postpartum in fecundability (PPI), and sterility as important interventions for reducing fertility. Figures from the most recent (2012-13) demographic and health survey of Mali was used as baseline figures. Under the business-as-usual scenario, we assumed that the current level of effort to promote family planning in Mali over the past few years would result in achieving the current unmet need for family planning in each of the countries by 2050. For instance, the unmet need for family planning was 26.0% in 2013. The combined scenario target was set at 75% the current value for Dominica republic – a high human development index country in 2013.

2.3 Economic Indicators

The economic model captured five elements of the 12 “pillars” that make up the overall global competitive index (GCI) to assess the strengths and weakness of Mali's economy and its capacity to promote job creation, economic productivity and investments. These includes the quality of public institutions, imports as a percent of GDP (to measure trade openness), ICT infrastructure, labour market flexibility and financial market efficiency. Except for imports as a percentage of GDP which was measured in percentages, each of the five economic indicators was rated on a scale of 1-7, with 7 as the best performance. Baseline economic indicators were obtained from the 2013 GCI. In 2013, the overall GCI index of Mali was 128th out of 144 countries with the country ranked among the stage 1 or factor driven countries. Target for the business-as-usual scenario was set at the average of Mali's value and the average of stage 3 or innovation-driven countries while the average of “innovation-driven” countries was used as the target for the 2050 economic emphasis scenario targets.

3. Simulation results

3.1 Population Size and Structure

Figure 1 show the baseline and projected age-sex composition while the key features of each policy scenario are presented in **Table 3**. From **Figure 1**, the business-as-usual scenario as well as the economic

Table 1: Policy Scenario Inputs - Education and Family Planning Indicators

POLICY SCENARIO	Ref Year	EDUCATION INDICATORS				FAMILY PLANNING INDICATORS				ECONOMIC INDICATORS			
		Expected Years (Female)	Expected Years (Male)	Mean Years (Female)	Mean Years (Both)	CPR Modern (All Women)	PPI (Women 45-49)	Public Institutions	Imports as % of the GDP	Labour Market Flexibility	Financial Market Efficiency	ICT Use	
Baseline	2013	7.60	9.60	1.40	2.00	9.6	11.70	2.20	42.26	4.61	2.94	1.49	
Business-as-Usual	2050	10.6	11.3	4.6	5.5	35.60	11.00	2.20	52.05	4.64	3.57	3.56	
Economic Emphasis	2050	10.6	11.3	4.6	5.5	35.60	11.00	2.20	61.84	4.68	4.21	5.63	
Combined Economic & FP/EDC Emphasis	2050	13.1	12.5	7.5	8.1	75.0	11.00	2.20	61.84	4.68	4.21	5.63	
		Human Development Report, 2012				2012-13 Mali Demographic and Health Survey				World Economic Forum, Global Competitiveness Report 2013-2014			

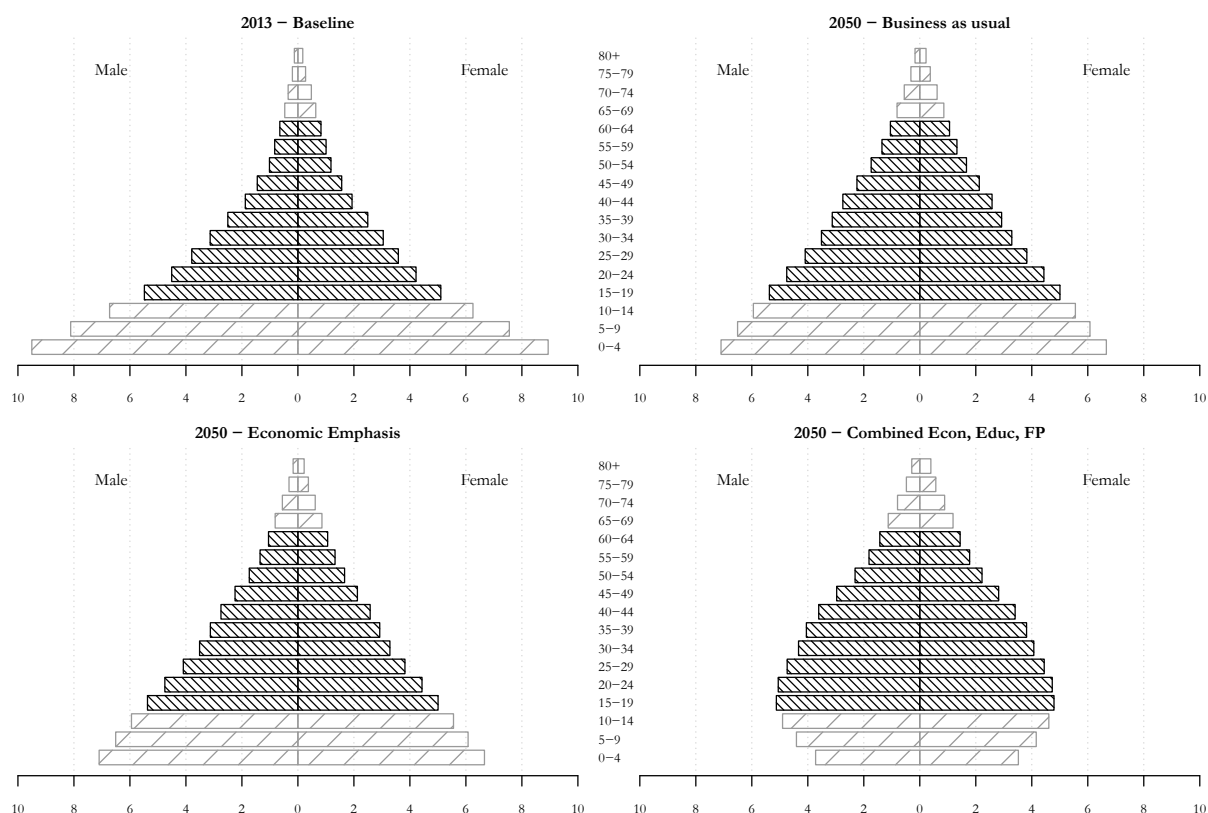


Figure 1: Baseline and Projected Population Pyramid by Policy Scenarios, (DemDiv, 2013-2050)

Table 2: Initial Values of Calculated Variables in the Model

Indicator	Base Year Value	Data Source
Percentage married	84.60	
Total fertility rate (TFR)	6.10	
Percentage of high-risk births	64.50	Most recent demographic and health survey Mali (2012-13)
Infant mortality rate (IMR)	56.0	
Under-five mortality rate (U5M)	95.0	
Maternal mortality rate	368.0	
Female life expectancy	57.31	World Bank Data, 2013
Capital formation per capita	134.93	World Development Indicators, 2013
Initial employment	5,747,875	World Bank Data, 2013
Initial employment growth rate	5.20	World Bank Development Indicators, 2005-2014
GDP per capita (current US\$)	772.25	World Bank Data, 2013
Ratio of capital stock to pop 15+	2015	Model dataset, 2012 (Berlemann & Wesselhoft)
Initial GDP growth rate	2.3	World Bank Data, 2013
Female-male life expectancy difference	-0.426	World Bank Data, 2013
Capital stock growth rate	12.1	Computed
Primary education costs as a % of GDP per capita	12.60	World Bank Data, 2013
Capital stock depreciation rate	4.0	Model dataset, 2012 (Berlemann & Wesselhoft)

emphasis policy scenarios will have a very minimal effect on the population age structure although the base which includes children under 15 years would be reducing. However, when economic, education and family planning policies are prioritised, Mali's population structure by 2050 will emulate those of upper-middle-income countries evident in a higher working age population (**Figure 1**). From **Table 3 below**, the business-as-usual policy scenario for Mali would lead to a total population of about 46.41 million in 2050 while the combined policy scenario would yield a population size of about 36.13 million from the current 16.86 million in the 2013 baseline. Similarly, almost 70% of the population would be between 15-64 years under the combined economic, education and family planning scenario compared to a little above 50% projected under the business-as-usual scenario. The slight increase in access to education for both males and females, combined with increase in access to family planning services and economic reforms would reduce the total fertility rate from 6.1 births per woman in the 2013 to 4.08 births per woman under the business-as-usual scenario by 2050. Under the combined policy scenario however, Mali's total fertility rate would reduce to about 1.64 children per woman which almost matches the levels reached by the Asian Tiger benchmark countries. Child-dependency ratio is also expected to be decline from 0.99 to about 0.72 under the business as usual scenario and 0.45 in the combined scenario by 2050. Mortality would decline slowly, leading to an increased life expectancy at birth from 58.5 years in 2013 to 72 years under the combined scenario by 2050.

3.2 Growth in GDP and Per Capita GDP

Figure 2 showed the baseline and projected growth in Mali's GDP. It emerged that Mali's GDP would rise to about \$360 billion under the business-as-

usual scenario. An extra 130% increase in GDP will however be harnessed resulting in a GDP of about \$825 billion if only economic policies are prioritised. An intensified effort evident in additional investments in education and family planning, would increase the GDP by almost 18% (\$977 billion) under the combined scenario.

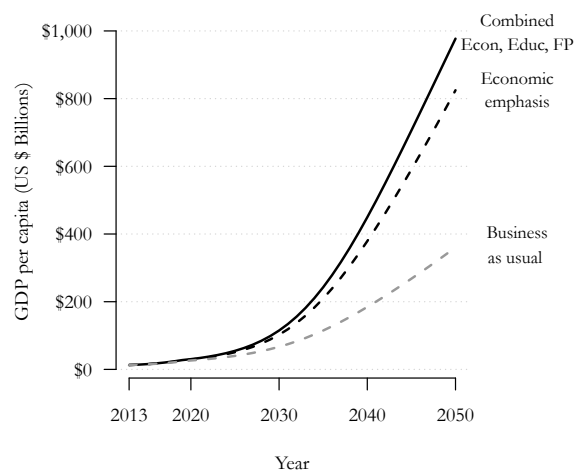


Figure 2: Growth in GDP by Policy Scenarios, (DemDiv, 2013-2050)

The projected per Capita GDP presented in the Figure 3 reflects the possibility of achieving a demographic dividend given the population size and increase in GDP. It emerged that Mali's per capita GDP would rise from the current \$772 in 2013 to \$7,767 by 2050 if the country takes the business-as-usual approach. The country would however benefit an extra \$10,003 in per capita GDP if only economic reforms are intensified. When economic, education and family planning policies are concurrently prioritised, Mali will achieve an almost 248% increase in per capita GDP compared to the business-as-usual scenario and about 50% increase compared to emphasizing only economic reforms.

Table 3: Baseline and Projected Key Features of Mali's Population

Key Features	2013 Baseline	2050 Business -as-Usual	2050 Economic Emphasis	2050 Combined Economic & FP/ EDC Emphasis
Total Population	16,863,588	46,413,368	46,413,368	36,132,548
Working (15-64) age Population	8,466,045	27,020,750	27,020,750	24,913,053
Gross Reproduction Rate	2.95	1.99	1.99	0.88
Total Fertility Rate	6.1	4.08	4.08	1.64
Sex ratios	102.97	105.74	105.74	104.71
Dependency Ratios	0.99	0.72	0.72	0.45
Life Expectancy	58.5	68.9	68.9	72.0

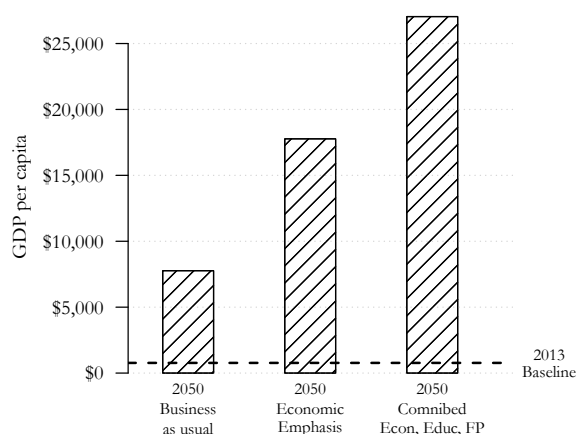


Figure 3: Growth in GDP per Capita by Policy Scenarios, (DemDiv, 2013-2050)

3.3 Investment per Capita Formation

Figure 4 above shows the projected investment per capita formation for the three policy scenarios. As evident in **Figure 4**, a combined policy scenario that concurrently prioritises economic, education and family planning policies would also result to an increased investment per capita up to about \$4,464 by 2050. This investment is almost twice the investment per capita if only economic policies are intensified.

4. Discussion and policy implications for economic growth

In this study, we examined the potentials of realising demographic dividend in Mali as well as the policy scenario that would yield the greatest demographic dividend by 2050. We simulated three scenarios of interacting policies using *DemDiv* to argue that Mali can transition from a low to middle-income country by 2050 if strategic plans and policies that emulate those of middle-income countries are adopted. Compared to other models, the *DemDiv* model used in our analysis is not limited to either population or economic inputs, but examines the interplay between them, as affected by other social and development variables (Moreland et al., 2014). This to a large extent has allowed us to compare several different scenarios to show the varying benefits of different combinations of investments.

Our results show that a concurrent prioritisation

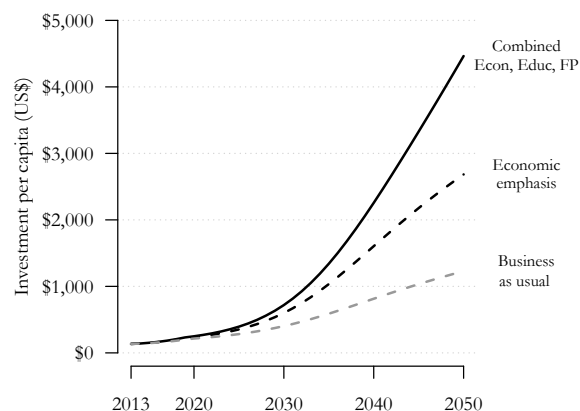


Figure 4: Growth in Investment per Capita by Policy Scenarios, (DemDiv, 2013-2050)

of education, family planning and economic policies, will yield a rapid decline in the current levels of fertility in Mali up to a replacement fertility level. This decline in fertility is expected to reduce Mali's dependency ratio which has also been documented in prior studies (Lee and Mason, 2012). This decline is expected to generate economic benefit in the form of a demographic dividend by raising savings per capita and female labour force participation thereby leading to improvement in human capital and economic growth (Bloom et al., 2009, Eastwood and Lipton, 2012, Zelleke et al., 2013). Higher savings accrued from the demographic dividend are likely to foster increased accumulation of domestic capital which will also increase employment opportunities especially for females (Eastwood and Lipton, 2012, Knowles et al., 2002). In most countries around the world, fertility decline has been accompanied by immediate gains in income per capita, and increase resources that can be invested in the health and education of children (Fürnkranz-Prskawetz et al., 2013, Lee and Mason, 2010)

By increasing the mean years of education to about eight years, we showed that access to quality education for both boys and girls have important implications for Mali's accelerated economic growth. Education gives young people the skills and confidence to be effective in the labour force (Gribble and Bremner, 2012). At the secondary level, it enables girls to delay marriage, first pregnancy and subsequently reduce fertility levels (Canning et al., 2015, Gribble and Bremner, 2012). In Ethiopia, an education reform that increased female education had large effects on fertility (Pradhan and Canning, 2013). Similar relationships have also been found in Kenya

and Nigeria (Chicoine, 2012, Duflo et al., 2006, Osili and Long, 2008). Reduced fertility may also be a cause of increased educational and economic investments by enabling women to participate in labour force (Bloom et al., 2009, Canning et al., 2015). Evidence from 32 countries also confirms the strong effect of fertility decline on high investment in children's health and education resulting in fewer, healthier, nourished, and better-educated children. (Lee and Mason, 2012). This is because of the higher investment in children's health, education and overall well-being in smaller family size (Gribble and Bremner, 2012, Kalemli-Ozcan et al., 2000, Schultz, 2005).

While it is well understood that improvements in education can lead to better economic outcomes, investments in health and nutrition in early childhood can also have significant implications for the cognitive and physical development of young children, and in turn contributes to long-term health and economic well-being (Barker, 1992; Bleakley, 2010). Improvements in health can also reinforce the incentive to continue investing in education and human capital development, given that a longer, healthy life span increases opportunities to recoup educational investments (Kalemli-Ozcan 2003). As child survival improves, the demand for family planning will increase as families begin to know that each child has a better chance of surviving (Joshi, 2012).

It is also expected that an accelerated fertility decline in Mali would produce a larger, healthier, well-educated and more productive workforce. But the supply of labour is not enough in the absence of sufficient demand (Canning et al., 2015). The rapid gains in Mali's human capital are expected to drive faster, economic growth if the supply of labour is matched by an increase in demand for labour to produce economic growth effectively such that Mali would be positioned in the top 60 economies out of about 169 countries by 2050 (Canning et al., 2015). It also depends on the scale of capital investment and how labour-using the activities in which new investments is made. Intuitively, Mali must be prepared to successfully incorporate the large working age population particularly the young women in order to increase output per capita and economic growth (Bloom et al., 2009). Evidence from East Asia has revealed that the countries in the region were able to reap demographic dividend because they combined a rapid demographic transition with export-oriented policies that increased the demand for labour.

Without the appropriate social and economic policies, the extra labour supply can have a terrifying effect on wages in later life, unemployment and underemployment, and subsequently lead to political instability, elevated crime, and a deterioration of social capital (Canning et al., 2015, Fürnkranz-Prskawetz et al., 2013, Urdal, 2006) (Canning et al., 2015, Korenman and Neumark, 2000).

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