

Health, Labour Productivity and Industrialization in Nigeria

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Abstract: The relationship between health outcomes, labour productivity and output in general or industrial output in particular cannot be undermined as it constitutes the life wire of any economy. Its measurements and the roles they play is relevant in policy formulation of the economy, however there seldom exists empirical evidence that simultaneously examined them in Nigeria. It is on this premise that this study examined the effect of health outcome on labour productivity and the impact of labour productivity on industrial output in with the aid of a simultaneous regression model. The study employs time series data spanning 1981-2015 from the Central Bank of Nigeria Statistical Bulletin, 2015, World Bank Development Indicator 2016 and Global Statistical Year Book, June 2016. The results show that health outcome significantly and positively impacts on labour productivity and labour productivity significantly impacts on industrial output as expected. Therefore health outcomes must be sustained to ensure labour productivity and labour productivity must be optimized to improve industrial output in Nigeria. It is also important to note that health outcome is not significantly influence by health expenditure due to the poor funding in the sector and population growth rate significantly and negatively affects it. This implies that governments at all levels should pay attention to the 15% benchmark proportion of health expenditure in their annual budgets. The study further recommends that there is need to checkmate population growth rate vis a vis resources. And more conscious efforts must be made to regulate electricity production in the country to the extent that it plays a significant role on industrial output.

Key words: Labour productivity • Health outcomes and economy

INTRODUCTION

The desire to industrialize by developing countries is based on its importance for economic growth and development as it is a source of income, employment and diversification especially for a highly primary sector dependent developing country like Nigeria. In fact, one of the major differences between a developed country and a developing country is in their degree of industrialization. Despite its huge benefits and potentials, industrialization in Nigeria is still underexploited as oppose to the nation's huge resource endowment. Successive governments in Nigeria have formulated and implemented many industrial related policies, programmes, incentives and schemes to encourage industrialization in Nigeria. Some of these include import substitution of 1960s; Indigenization policy of 1972; Structural Adjustment Programme of 1986; establishment of Bank of Industry in 2000; National Integrated Industrial Development (NIID) in 2007 as well as many programs to encourage small and medium scale enterprises.

The effectiveness of these policies and programs in achieving the goal of industrialization is very much in doubt as the sector has performed at a very dismal level. This is evidenced by its contribution to GDP and employment as well as capacity utilization in the sector. Data from Central Bank Nigeria [1], showed that the industrial sector's contribution to GDP was 22.03% in 2010. In years that followed, the sector's contribution to GDP was 24.81% in 2011; shrunk to 23.67% in 2012; 21.99% in 2013; 20.67% in 2014 and down to 16.01% in 2015. The average capacity utilization rate of the manufacturing sector is also low. In 2002, the capacity utilization rate averaged 44.30% while in 2003, it was 41.10%. It was 52.78% and 53.29% in 2005 and 2007 respectively. The industrial sector contribution to employment is also shows the rudimentary level of Nigeria's industrialization. In 2005, the sector employed only 1.5% of total employment. While in 2007, it declined to 1.59% and further dropped to 1.48% in 2008. The sector was also the lead importer of commodities as food and beverage alone accounted for about 21% of total imports

in 2005; about 31% in 2006 and 12% in 2009 [2]. These go to show that Nigeria that the level of industrialization in Nigeria is low.

Factors hindering Nigeria's industrialization efforts include lack of competitiveness relative to foreign firms. This is often caused by acute shortages of critical ingredients to firm performance and efficiency- social capital (infrastructure – good road, water and power), financial capital and most importantly human capital (skilled and productive labour). The human capital includes education, skill and health of the people. To industrialize requires a structural change in the composition of the human capital; from uneducated, unskilled, sickly, backward and ill-fed to skilled, healthy, efficient and trained workers.

In modern literature, health is found to be an important determinant of growth. Many studies have found that health contributes to growth [3], [4], [5], [6]. Some others have found an indirect impact of health on economic growth, specifically through enhanced labour productivity [7], [8], [9], [10], [11]. [12], posited that good health can increase the output of an individual through improvement in physical energy and mental activity while yearly output through reduced sickness absence and career output through decreased morbidity or increased longevity. These, on the aggregate increases labour productivity which can help in the industrialization efforts.

The labour productivity in Nigeria recorded an average growth rate of 11.1% from 2011 -2015. However, between 2015 and 2016, there was a sharp decline of 4.7% in labour productivity in Nigeria [2]. The decline was associated to high level of unemployment, underemployment as well as infrastructural challenges in Nigeria as well as dismal performances in health outcomes. Life expectancy as a measure of a healthy nation, affects the labour force and labour productivity. For example, [13] study shows that a country with a higher life expectancy (5-years higher) records a higher growth in income per capita (0.3-0.5% higher). In a similar vein, [14] found that a growth in life expectancy by 10% results in a 0.4% growth in GDP.

In Nigeria the health sector has not received adequate government attention. This is evident in the total spending on health as a percentage of GDP of 3.67% in 2014. From 1995-2014, the total government spending as a ratio of GDP records highest in 2007 and lowest in 2002 with 4.47% and 2.43%, respectively, and records average of 3.53% over the period under review. This is far below the world average of 6.82% in 2014 and Nigerian ranking 164th in the world. (The Global Economy). The

consequences of this inadequate attention are many and diverse. For instance life expectancy in Nigeria is low, especially when compare to other developing countries. The country is grappling with HIV/AIDS which prevalence in Nigeria rose from 4.4% in 2005 to 4.6% in 2008 and fell to 4.1% 2010 [15]. In 2014, HIV/AIDS prevalence in Nigeria fell to 3.17%, but ranks 20th in the world [16]. The incidence of Tuberculosis decreased by 4.7% from 2013 to 2015 (The Global Economy). The prevalence of diseases such as HIV/AIDS, diarrhea and malaria results in high mortality of the poor and reduces their income. The sick lose their capacity to contribute to productive growth [17]. In Nigeria, the maternal mortality rate of 814 deaths/100,000 in 2015, ranking 11th in the world and infant mortality rate of 71 deaths/1000 births, ranking 10th in the world [16]. The economic implication of disease and ill health on workforce could be negative as it reduces their productive capacity and depletes national savings.

The rising life expectancy with falling prevalence of HIV/AIDS and incidence of Tuberculosis show the quality of health in Nigeria. The study therefore examines the impact of health outcomes on labour productivity in Nigeria; and how labour productivity affects industrialization in Nigeria. This study therefore has two key objectives, which include:

- To examine the impact of health outcomes on labour productivity in Nigeria
- To investigate the impact of labour productivity on industrialisation in Nigeria

Conceptual Review: The definition of health by the World Health Organization [13] is 'a state of complete physical, mental, social and economic well-being and not merely the absence of diseases or infirmity'. This means that health is could be referred to as the ability to lead a socially and economically productive life that would yield benefits for the economy of a country. Therefore, for the manpower and resources of a nation to be effectively and efficiently utilized to harness its resources and that of other nations, labour must be healthy because without good health, labour productivity is low, industrial advancement is hindered and economic growth and development declines or remains stagnant. This is due to the fact that healthier workers (manpower) are physically and mentally more energetic and robust, so they are less likely to miss work due to illness, either of themselves or their families [18]. In the literature, health outcomes have been proxied with infant mortality rate, under 5 mortality rate and life expectancy. For the sake if this study, the research employs life expectancy as proxy for health outcome.

Labour productivity could be defined as the degree to which an employee's effort results in units of output produced, that is; labour productivity depends on how much value was created by the employee per hour of his work either by producing, selling or providing some sort of services. The Organization for Economic Co-operation and Development (OECD) defines labour productivity as 'the ratio of a volume measure of output to a volume measure of input'. Here the volume measures of output are normally Gross Domestic Product (GDP) or Gross Value Added (GVA) expressed at constant prices that is adjusted for inflation. The labour productivity formula is given as the ratio of the total output (goods and services) to the number of man hours or the number of workers used to produce output. Hence this means that labour productivity influences the productivity of labour in terms of personal capacities of workers or the intensity of their efforts geared towards productivity [19].

Industrialization is a sustainable economy development based on factory production, division of labour, concentration of industries and population in country with the aim of achieving objectives such as improvement in welfare (standard of living), securing of viable employment, increasing of consumer and capital goods as well as expanding people's choices generally [20]. The development of the industrial sector, which is important for industrialization, will involve the use of educated, skilled and healthy personnel, extensive technology innovations, and other resources from inefficient means of production. Industrialisation in this study is proxied by industrial output, which is measured as industrial sector GDP.

Theoretical Relationship Between Health Outcomes, Labour Productivity and Industrial Output: Human capital theory is based on the premise that increases in a person's stock of knowledge and health increases his or her productivity in both market and non market production activities. This theory argues that health has pervasive effect on wages, earnings, participation, hours worked, retirement, job turnover and benefits packages [21]. Therefore, the economic value realized from health is the effects it has on individual's productivity. Adopting the human capital theory, we assume that productivity is a function of individual knowledge (education), health and other factors such as wages of labour, investments (private or public), government policies etc. As health outcome gets better, a worker or an individual is fit to receive any training or education that can increase his productivity. In essence, if a worker or an individual is not only educated but has a good health history, the

productivity of such a worker or individual in both market and non market production activities would increase. A healthy worker is likely able to acquire more knowledge and technical-knowhow through education and be able to fully employ it to assigned production and labour activities. Since labour productivity is hinged majorly on health and education factors a depreciation in the health status of individuals and complete neglect of education would affect life expectancy rates, labour times, labour participation, labour skills and labour output (productivity).

[22], postulated that "preventive and therapeutic health care services may improve workers' productivity as well as increase their quality of life. If so, these services increase the stock of human capital, and consequently increase the productivity of labor services as well as the quality of life emanating from that stock. According to the [23], health is valued because it hinders sickness and time away from market and non market activities. The model yields a conditional labour supply which depends on health variable (among other things) because individuals or workers have to replenish their health endowment since health depreciates. In addition, since health is never in a state of perfection, continuous investments and individuals maintaining good health shocks through exercises, nutrition and health care service provides an effective and efficient labour force for generating and improving a nation's wealth through its productivity.

By extension, labour productivity contributes to output of any sector that puts it to use. In fact, Output is a function of labour productivity according to traditional production theories such as the prominent Cobb Douglass. The key determinants for output in these theories are capital and labour. More credence is being given today, to augmented labour as the world is fast becoming a knowledge-based driven economy. In the context of this study, it is therefore safe to say that industrial output is a function of labour productivity, which is in turn determined by health outcome. This relationship has been existent in the literature. Grossman's (1972, 2000) model for health demand provides insights into the relationship among health, human capital (labour) and productivity. Industrial growth connotes a healthy, educated and highly skilled labour force with improved technological advancements.

Empirical Evidence: Empirical Evidence abounds; that establish relationship between health outcomes and labour productivity and/or labour productivity and output in general. However, very few examined the relationship between health outcomes and labour productivity and/or

labour productivity and industrial output in particular are very few. Some of them include; [24] who examined the components of human capital and discussed its roles in achieving sustainable industrial development. They used a single-equation regression model of Malaysia's development of manufacturing sector covering the period from 1981 to 2010 for analysis. The results revealed that human capital significantly contributes to the share of gross domestic product (GDP) of manufacturing sector because the variable of employment has the highest elasticity. This was followed closely by labour productivity and human capital investment in education and health.

In Nigeria, [25] in their study on 'human capital investment and industrial productivity in Nigeria' observed that there is a clear-cut relationship between human capital investment and industrial productivity but the contribution of human capital to industrial performance has been less than satisfactory in Nigeria. This is because two explanatory variables (total expenditure on health and gross capital formation) used in the study revealed a negative relationship with the dependent variable (index of industrial production) which is contrary to the a priori expectations while the only positive explanatory variable (government expenditure on education) has a very low magnitude which implies little contribution to industrial productivity in Nigeria. Then, [26] analysed labour productivity effects of health capital in Nigeria. They used the Generalised Method of Moment (GMM) methodology and found out that investment in health capital augments productivity of the labour force.

Furthermore, [27], examined the effect of health capital on labour productivity in Nigeria. He used the neo-classical growth framework approach with the Ordinary Least Square method and the annual time series data from 1970-2013 to find out if health capital has any effect on labour productivity in Nigeria. The results indicate that increases in health via a vis education expenditures improves the health of labour force which in turn has effects on labour productivity in the country. He however recommended that increased health and labour expenditures at all levels of government would improve labour productivity in Nigeria.

[28], used both secondary and primary data to examine the impact healthcare expenditure, health status on national productivity in Nigeria. They discovered a weak casual relationship between the variables. [28] employed cointegration and granger causality techniques in determining the impact of health on economic growth in Nigeria using quarterly data that spans from 1995 to 2009. The study discovered that health outcomes in

Nigeria have positive significant relationship with economic growth in the long run. Granger causality tests showed a bi-directional causality between fertility rate, life expectancy, health expenditure and per capita GDP. [29], used also vector error correction model to explore the effect of health on economic development in Nigeria. Their work showed a similar result of positive relationship between health indicators and economic growth but a unidirectional causality from health indicators to economic growth. The above review shows that there seldom exist empirical works that analyse the relationship between health outcome, labour productivity and industrial output. Some that came close dwelt on economic growth and others that employed OLS failed to take into consideration the simultaneity problem that makes the OLS estimators not BLUE.

Methodology and Data: The study's objectives were ascertained with a simultaneous econometric model, given the simultaneous relationship that exists between labour productivity and industrial output. Simultaneous equation model was used to take care of endogeneity bias that exists among the three major variables; health output, labour productivity, and industrial output. The simultaneous equation model was estimated with the aid of a three stage least square (3SLS) estimation technique. The model is of three equations that makes health output, labour productivity, and industrial output as endogenous variables dependent on several other independent variables. The structural equations are specified thus:

$$HOP_t = \alpha_0 + \alpha_1 POPGR_t + \alpha_2 IOP_t + \alpha_3 REH_t + \alpha_4 LITR_t + \epsilon_t \quad (1)$$

$$LBP_t = \lambda_0 + \lambda_1 HOP_t + \lambda_2 IOP_t + \lambda_3 TLF_t + \lambda_4 LITR_t + \lambda_5 ELP_t + \mu_t \quad (2)$$

$$IOP_t = \beta_0 + \beta_1 LBP_t + \beta_2 INV_t + \beta_3 ELP_t + \beta_4 INT_t + \varphi_t \quad (3)$$

where;

HOP = Health Outcome (Life expectancy)

LBP = labour productivity

IOP = Industrial output

REH = Federal government recurrent expenditure on health

LITR = Literacy Rate

POPGR = Population growth rate

INV = Investment proxied by Gross Fixed Capital formation (GFCF)

TLF = Total labour force

ELP = Electricity production

INT = Interest rate

t = Time

$\alpha_0, \alpha_1 \dots \alpha_4, \lambda_0, \lambda_1 \dots \lambda_4$, and $\beta_0, \beta_1 \dots \beta_4$, are the structural parameters or coefficients.

The a priori expectation of all the explanatory variables in the model is positive, except population growth rate for the health outcome model and interest rate for the industrial output model.

From the foregoing therefore, we have 21 reduced form coefficients while the structural coefficients are 13. This reveals that our model is over identified. In line with the above finding we will use Three Stage Least Square (3SLS).

Data for the study were sourced from the Central Bank of Nigeria Statistical Bulletin, 2015, World Bank Development Indicator 2016 and Global Statistical Year Book, June 2016. The annual data spanned from 1981 to 2015.

Presentation of Results and Analysis: The study employed a simultaneous regression model with the aid of the three stage least square (3SLS) estimation technique to ascertain the effect of health outcome on labour productivity and the effect of labour productivity on industrial output. The 3SLS results show that the R square for the three equations are all higher than 90% hence suggesting that the model has a good fit. In fact, at least 90% of the dependent variables are explained by the independent variables. The Chi square Probabilities of 0.000 shows that the overall model is significant at 1% significant level. The results of the 3SLS estimation are presented below:

Probability Values in Parenthesis: Table 1 above shows that industrial output, population growth rate and literacy rate, significantly impacts on life expectancy; which is used as proxy for health outcome. industrial output and literacy rate have a positive relationship with health outcome and has a negative relationship with population growth rate. It is expected that as industrial output improves, health outcome improves if such increase in industrial output is reflected in industrial production that improves standard of living or the health of the populace. On the other hand industrial output can improve life expectancy via the proceeds that accumulate from production which may in turn improve standard of living. Inferring from Malthus theory of rising population and increasing food security, we could say that as the population increases, stress on health related resources increases and hence undermines health outcomes. This explains the negative relationship between population growth rate and health outcome, which constitutes a cause for concern in Nigeria given her already large and continuously increasing population. Note worthy is the fact that, health expenditure is not a significant determinant of health outcome even though it should have one of the most direct effects. This could be explained by the relatively low proportions of government expenditure as a ratio to total government expenditure in Nigeria.

The study further shows that life expectancy significantly impacts on labour productivity at 1% significant level, given the probability value of 0.000 which is less than 0.01. This results are expected a priori as induced from a micro perspective which posit that, 'the healthier a worker is the greater his productivity'.

Table 1: Estimation results from the simultaneous model

	Health Outcome	Labour Productivity	Industrial Output
Health Outcome		87.27767*** (0.000)	
Labour Productivity			11.12199*** (0.000)
Industrial Output	0.0003392*** (0.002)	0.0504208*** (0.000)	
Population Growth Rate	-10.66931*** (0.000)		
Health Expenditure	0.0099372 (0.210)		
Literacy Rate	0.1550153*** (0.000)	6.010754 (0.132)	
Total Labour Force		1.9655195 (0.417)	
Electricity Production		1.148102 (0.771)	15.22718 (0.836)
Investment			13.62105*** (0.000)
Interest Rate			-7.759799 (0.798)
Constant	10.93789*** (0.022)	-4269.823*** (0.000)	-576.388*** (0.0571)
RMSE	0.2681509	51.56239	931.139
R Square	92.94	98.98	97.44
Chi Square Probability	0.0000	0.0000	0.0000

*** implies variable is significant at 1% significant level and ** at 5% significant level

At the macro or aggregate level, this is expected to be the case; the higher the life expectancy of an economy, the greater its labour productivity. However, industrial output is equally a significant determinant of labour productivity given that high production necessitates high labour productivity. Both health outcome and industrial output have a significant positive/direct relationship with labour productivity. Noteworthy is the fact that, literacy rate, total labour force and electricity production have positive relationships with labour productivity but are not significant determinants of labour productivity.

Labour productivity and investment (proxied by gross fixed capital formation) were significant and positive determinants of industrial output in Nigeria. In line with theory, labour productivity should have a positive relationship with industrial output as is the case with the results. The study shows that a unit increase in labour productivity significantly increases industrial output by 11.12199. The study notes that electricity production is not a significant determinant of industrial output and this could be explained by the unreliable and inconsistent supply of electricity produced that cause most firms to rely on expensive alternative sources of power. Interest rate does not also have a significant impact on industrial output which is expected a priori, but not surprising in Nigeria given the fact that interest rates are too high and hardly dictates the rhythm of investments in most sectors especially the industrial sector that might have long gestation periods.

CONCLUSION AND RECOMMENDATIONS

This study examines the relationship between health outcome, labour productivity and industrial output in Nigeria with the aid of a simultaneous regression model. The study shows that health outcome significantly and positively impacts on labour productivity and labour productivity significantly impacts on industrial output as expected. Therefore health outcomes must be sustained to ensure labour productivity and labour productivity must be optimized to improve industrial output in Nigeria. Nevertheless, health outcome is not significantly influence by health expenditure due to the poor funding in the sector and population growth rate significantly and negatively affects it. This implies that governments at all levels pay attention to the proportion of health expenditure in their annual budgets. Fifteen years after, Nigeria has not been able to meet up with the 15% benchmark of health to total budget for health expenditure as agreed by the African Union in the 2001 Abuja

declaration. Other countries have met this benchmark and the results are evident in their health outcomes. There is need for policy to checkmate population growth rate. This is particularly important in Northern Nigeria that records the poorest states in the country yet have very large family sizes owing to their culture.

The results also suggest that electricity production is not a significant determinant of industrial output which is problematic given that it constitutes the engine for production. More conscious efforts must be made to regulate electricity production in the country to the extent that it plays a significant role on industrial output. Interestingly, literacy rate and total labour force are not significant determinants of labour productivity pointing to the fact that our educational system needs to be restructured to be industrial ready to meet the technology of this époque.

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Appendices

Appendix 1: Reduced form Model

$$\begin{aligned}
 \Pi_{10} &= \frac{\alpha_0 - \alpha_0\beta_1\lambda_2 + \alpha_2\beta_0 + \alpha_2\beta_1\lambda_0}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{14} &= \frac{\alpha_2\beta_1\lambda_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & V_{1t} &= \frac{\alpha_2\beta_1\mu_t + \theta_t\alpha_2 + \varepsilon_t - \beta_1\lambda_2\varepsilon_t}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{11} &= \frac{\alpha_1 - \beta_1\lambda_2\alpha_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{15} &= \frac{\alpha_2\beta_1\lambda_5 + \alpha_2\beta_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{30} &= \frac{\lambda_1\alpha_2\beta_4 + \lambda_2\beta_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{12} &= \frac{\alpha_3 - \alpha_3\beta_1\lambda_2}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{16} &= \frac{\alpha_2\beta_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{21} &= \frac{\alpha_1\lambda_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{13} &= \frac{\alpha_2\beta_1\lambda_4 - \alpha_4 + \beta_1\lambda_2\alpha_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{17} &= \frac{\alpha_2\beta_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{22} &= \frac{\alpha_3\lambda_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \\
 \Pi_{23} &= \frac{\alpha_4\lambda_1 + \lambda_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{30} &= \frac{\beta_0 + \lambda_0\beta_1 + \alpha_0\beta_1\lambda_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{36} &= \frac{\beta_2}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{24} &= \frac{\lambda_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{31} &= \frac{\alpha_1\beta_1\lambda_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{37} &= \frac{\beta_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{25} &= \frac{\lambda_1\alpha_2\beta_2 + \lambda_2\beta_2}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{32} &= \frac{\alpha_3\beta_1\lambda_1}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & V_{3t} &= \frac{\beta_1\lambda_1\varepsilon_t + \beta_1\mu_t + \theta_t}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} \\
 \Pi_{26} &= \frac{\lambda_1\alpha_2\beta_3 + \lambda_2\beta_3 + \lambda_5}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{33} &= \frac{\beta_1\lambda_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \\
 \Pi_{27} &= \frac{\lambda_1\alpha_2\beta_4 + \lambda_2\beta_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{34} &= \frac{\beta_1\lambda_4 + \beta_1\lambda_1\alpha_4}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \\
 V_{2t} &= \frac{\lambda_1\theta_t\alpha_2 + \varepsilon_t\lambda_1 + \lambda_2\theta_t}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} & \Pi_{35} &= \frac{\beta_1\lambda_5 + \beta_3}{1 - \beta_1\lambda_1\alpha_2 - \beta_1\lambda_2} &
 \end{aligned}$$