Impact of Revival Policy for Public Sector Productivity

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Abstract

The public sector's poor efficiency is a factor hindering Mongolia's development. Despite the poor efficiency, the number of employees in the public sector has expanded significantly during the last decade. To combat this issue, the Parliament of Mongolia has adopted a ten-year development policy, the "Revival Policy for Public Sector Productivity". This policy aims to increase the productivity in the public sector by digitalizing the public services, optimizing the structure of the public sector, eliminating the duplicated systems, improving the efficiency of state-owned enterprises, and decreasing corruption in the public sector.

This paper's objective is to evaluate the economic impact of the Revival Policy for Public Sector Productivity by utilizing a dynamic Computable General Equilibrium model calibrated to the 2018 SAM. We extend the PEP-1-t model with some additional features and variables for our analysis. Using the model, we simulate a positive productivity shock in the public sector and a decrease in corruption separately. We also simulate their combined effects. To quantify the effects, we develop a business-as-usual scenario, which simulates a balanced growth path of the Mongolian economy for the next 10 years and compare the policy scenarios to it.

The findings of the simulations imply that both the public sector productivity growth and decreased corruption have positive impact on the economy. The public sector efficiency improves in all policy scenarios as the labor shifts from the public sector to the private sector while the production of the public sector increases. The combined effect of the increased productivity in public sector and decreased corruption is also positive. However, due to decreased wage and decreased corruption income, household income decreases.

Keywords: productivity, CGE model, corruption, public sector

1. Introduction

The public sector's poor efficiency is a factor hindering Mongolia's development. Some indicators could reveal the poor efficiency of the public sector in Mongolia. For instance, according to the Government Effectiveness index[1] by World Bank, Mongolia scored -0.34 in 2020, much lower than the world median (-0.03). Despite the poor efficiency, the number of employees in the public sector has expanded significantly during the last decade. For instance, between 2011 and 2021, the number of public employees in the public administration sector increased by 29.2 percent. As a result, the public servants' share in the total labor force has increased by three percentage points to 18.6 percent during this period (NSO, 2022). A critical issue contributing to the public sector's poor efficiency is corruption, especially in public investment. According to the Transparency International, Mongolia ranked 110th out of 180 countries for Corruption Perception Index[2] with 35 points (0 represents highly corrupted while 100 represents very clean) in 2021. Moreover, according to the Mongolia's Business Environment (2020) survey by the Mongolian National Chamber of Commerce and Industry, the main obstacles for start-ups and small and medium businesses include public service bureaucracy and complicated approval processes of authorizing public organizations. It implies that the public sector inefficiency is causing difficulties in private sector development.

The Parliament of Mongolia adopted a ten-year development policy, the "New Revival Policy," in November 2021 (Parliament of Mongolia, 2021). The main objective of the policy is to ensure political and macroeconomic stability, accelerate public-private partnerships, create a favorable business environment, improve the environment for foreign and domestic investment, and implement fiscal reforms. The policy document defines six sets of problems hindering Mongolia's development and their solutions. One of the major six pillars of the policy is the Revival Policy for Public Sector Productivity. Under this pillar, the GoM declared six objectives which are as follows:

1. Digitalizing public services and decreasing state bureaucracy
2. Conduct a comprehensive analysis of the structure and organization of the government, give evaluations and conclusions, determine the optimal structure, and transfer some functions of the government to the private sector and professional associations.
3. The duplicated system of state control and inspection will be sorted out, planned inspections will be temporarily suspended, and the number of special permits and technical conditions required by state organizations will be reduced.
4. Improve efficiency and governance of state-owned enterprises and bring them under direct public control
5. The punishment policy for corruption and official crimes will be strengthened.
6. Not to be included in the list of countries with deficiencies in anti-money laundering and terrorist financing strategies issued by the Financial Sanctions Organization (FATF) and the

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[1] The index is calculated based on the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. For more detail, please refer to https://govdata360.worldbank.org/indicators/h273bb432?country=MNG&indicator=391&viz=line_chart&years=1996,2020

[2] CPI index is a composite index, a combination of 13 surveys and assessments of corruption, collected by a variety of reputable institutions. For more detail, please refer to https://www.transparency.org/en/cpi/2021?gclid=CjwKCAiAnZCdBhBmEiwA8nDQxfNSk_e5vtGXrXOy5ocJf6qAIP6Op9obFBFVoCNWKZeA0WiRf7QPjxoCec4QAvD_BwE

European Union's list of non-cooperative regions for tax purposes, as well as prevent any downgrades in Mongolia's credit rating.

In short, the first four objectives aim to increase the productivity in the public sector by digitalizing the public services, optimizing the structure of the public sector, eliminating the duplicated system, and improving the efficiency of SOEs. The fifth objective is aimed at decreasing corruption in the public sector. The last or sixth objective can be fulfilled once the previous objectives are met.

This paper's objective is to evaluate the economic impact of the Revival Policy for Public Sector Productivity by utilizing a recursive dynamic Computable General Equilibrium (CGE) model calibrated to the 2018 SAM. We extend the PEP-1-t model (Decaluwé et al., 2013) with some additional features and variables for our analysis. For example, firstly, we introduced a wage equation to the model. Secondly, we introduced an economy-wide, uniform TFP and a sector-specific TFP into the Constant Elasticity of Substitution (CES) production function. Thirdly, we disaggregated the investment account into private and public investment accounts in the SAM and modified the investment equations of the model. Finally, we made some extensions to the model to reflect corruption flows in the economy. Using the model, we simulate a positive productivity shock in the public sector and a decrease in corruption separately. We also simulate their combined effects.

The remainder of this report is structured as follows. Section 2 discusses the SAM and briefly outlines the model and its extensions. Section 3 presents the simulation results. Finally, section 4 concludes the report.

2. Data and Model

2.1. Main database – Social Accounting Matrix (SAM) 2018

We constructed the 2018 SAM using the Supply and Use Table (SUT), the balance of payments, and the government budget data. We made the following two modifications to the SAM:

1. Disaggregation of the investment account into private and public investments accounts, and
2. Augmenting the SAM with corruption flows.

To reflect the corruption flow in the economy, we made some modifications to the SAM. We made two assumptions when modifying the SAM. Firstly, we assumed that 10% of public investment directly goes to households as a bribe, and hence the original value of public investment decreases by 10%. Households receive additional income in a form of bribe, spend 20% of this remuneration on consumption and transfer the remaining 80% abroad, reflecting an idea of offshore account. Secondly, demand for imported goods and services decreases by the same amount as the decrease in public investment (which equals 80% of corruption income and 8% of original public investment). The second assumption is made to balance the SAM. The below figure depicts the assumed corruption flows in the economy.

Figure 1. Corruption flows in the economy

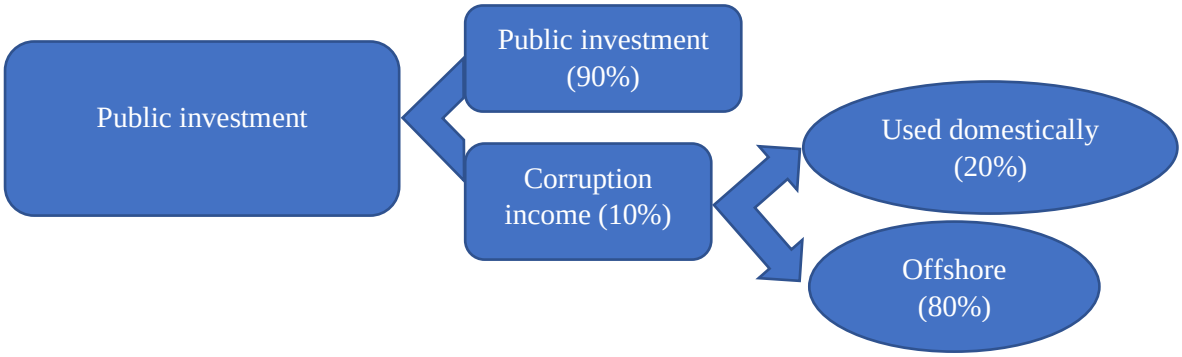


Table 1 shows the macro SAM as a share of nominal GDP, which was MNT 32.4 trillion in 2018. The numbers highlighted in red are the numbers which were changed compared to the original SAM to reflect the modifications related to the corruption flow in the SAM. Household consumption, government current expenditure, investment, exports, and imports were 54.9%, 11.7%, 39.0%, 58.0%, and 63.1% of GDP, respectively. The economy is more capital-intensive (50.0%) rather than labor-intensive (38.7%). The sum of value added in GDP is 88.7%, and the remaining 11.3% is from import taxes – TM (2.1%), commodity taxes – TI (8.8%), and net taxes on production (0.4%). The corruption income going to the households equals 0.6% of the nominal GDP. If there were no corruption flow, that 0.6% would be added to the investment demand for goods and services (now 5.5%), and household consumption and transfer to ROW would be lower. In addition, the imports would be higher.

Table 1. Mongolia Macro SAM 2018 (% of GDP)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**Labor**								1.4	38.7						40.1
2	**Capital**								0.3	50.0						50.3
3	**Households**	39.2	40.7		9.7				2.4					0.6		91.9
4	**Government**			5.3		14.1	2.1	8.8	0.7	0.4						31.4
5	**TD**			14.1												14.1
6	**TM**										2.1					2.1
7	**TI**										8.8					8.8
8	**ROW**	0.8	9.6	1.3	2.2						63.1					77.1
9	**Sectors**										134.	53.4				118.
10	**Dom/com**			54.4	11.7					98.9	15.7	4.5	23.3	5.5	10.2	224.
11	**Ex/com**								58.0							58.0
12	**INV/PRI**			17.4					14.0							31.4
13	**INV/PUB**				7.8				0.4							8.2
14	**VSTK**												8.1	2.1		10.2
15	**TOTAL**	40.1	50.3	91.9	31.4	14.1	2.1	8.8	66.4	185.	224.	58.0	31.4	8.2	10.2	

The micro SAM is a square matrix with 85 columns and 85 rows. The accounts of the SAM consist of 23 sectors and 24 commodities, two production factors (capital and labor), three types of institutions (households, government, and the rest of the world), three types of taxes (income tax, import duties and taxes on commodities) and savings (investment) accounts divided into public investment, private investment, and changes in inventories (Table 2). In the SAM, firms and households are combined into one agent named ‘Households’. In that sense ‘Households’ refer to the private sector.

Table 2. Accounts in the SAM

Sectors (23)		**Commodities (24)**	**Institutions (3)**
1	Agriculture	Agriculture	Households (H)
2	Coal	Coal	Government (GVT)
3	Export coal	Export coal	Rest of the world (ROW)
4	Oil	Oil	
5	Metal ores	Metal ores	**Taxes (3)**
6	Other mining	Other mining	Income taxes (TD)
7	Manufacturing	Manufacturing	Import duties (TM)
8	Coke and chemicals	Fuel	Taxes on commodities (TI)
9	Electricity	Construction	
10	Water	Trade	**Factors (2)**
11	Construction	Accommodation	Labor (Lab)
12	Trade	Transportation	Capital (Cap)
13	Transportation	Postal and courier service	
14	Accommodation	Energy supply services	**Savings-Investment (3)**
15	Information	Financial activities	Public investment (INV_PUB)
16	Financial activities	Real estate	Private investment (INV_PRI)
17	Real estate	Rent service	Changes in inventories (VSTK)
18	Professional activities	Professional activities	
19	Administration and support	Support services	
20	Public administration	Public administration	
21	Education	Education	
22	Health	Health	
23	Other activities	Waste	
24		Other services	

Production structure: Agriculture and trade sectors contribute most to total labor income, while the metal ores and coal export sectors contribute most to capital income. Water and agriculture sectors are highly intensive in labor while crude oil and coal (domestic and export) sectors are highly intensive in capital. The economy as a whole is relatively more intensive in the capital (Table 3).

Table 3. Production structure (%)

Sector	**Labor**	**Capital**	**Value added**	**Value added/**	**Factor intensity**	
					Labor	**Capital**
Agriculture	20.0	6.0	12.2	66.3	72.0	28.0
Coal	0.4	3.3	2.0	51.7	8.3	91.7
Export coal	1.4	12.2	7.5	51.7	8.3	91.7
Oil	0.2	2.1	1.3	38.5	8.3	91.7
Metal ores	9.1	18.5	14.4	52.2	27.6	72.4
Other mining	1.1	1.7	1.5	35.7	32.6	67.4
Manufacturing	6.4	10.0	8.4	33.2	33.1	66.9
Coke and chemicals	0.7	3.3	2.1	46.5	14.2	85.8
Electricity	2.4	1.5	1.9	24.8	56.1	43.9
Water	0.8	0.1	0.4	34.9	81.1	18.9
Construction	5.6	3.0	4.1	21.4	59.2	40.8
Trade	13.7	8.1	10.6	54.7	56.6	43.4
Transportation	7.4	3.6	5.3	38.4	61.7	38.3
Accommodation	1.6	0.7	1.1	33.0	64.1	35.9
Information	1.6	2.2	1.9	38.3	36.4	63.6

Financial activities	3.7	6.7	5.4	72.6	29.7	70.3
Real estate	0.5	10.9	6.3	78.7	3.2	96.8
Professional activities	2.1	1.0	1.5	36.6	63.0	37.0
Administration and support	1.1	0.7	0.9	31.1	54.4	45.6
Public administration	7.0	2.1	4.3	60.3	71.8	28.2
Education	7.8	1.3	4.1	73.3	82.0	18.0
Health	3.6	0.6	1.9	52.7	82.1	17.9
Other activities	1.7	0.3	0.9	47.4	80.7	19.3
Total					43.6	56.4

Trade structure: Table 4 shows the trade structure of the economy. Metal ore and coal exports account for more than half of total exports (59.5%), while imports of manufacturing and fuel make up the majority of total imports (76.2%). One can see that the import shares and import penetration rates are quite different from the original SAM 2018.

Table 4. Trade structure (%)

Commodities	Export shares	Import shares	Export intensity[3]	Import penetration
Agriculture	3.9	1.5	13.1	6.5
Coal	-	0.0	0.0	0.1
Export coal	24.3	-	100.0	0.0
Oil	5.4	0.0	98.4	1.6
Metal ores	35.2	0.0	100.0	100.0
Other mining	2.3	0.0	98.5	59.0
Manufacturing	9.5	61.8	16.6	60.5
Fuel	6.3	14.4	83.0	93.0
Construction	0.6	2.2	2.0	8.0
Trade	-	-	0.0	0.0
Accommodation	1.7	1.9	33.2	39.8
Transportation	5.3	5.0	23.6	25.7
Postal and courier service	0.0	0.0	0.0	0.1
Energy supply services	0.0	0.1	0.5	0.8
Financial activities	0.3	1.9	2.2	15.5
Real estate	0.5	0.7	3.6	5.8
Rent service	0.0	0.2	1.0	9.4
Professional activities	3.7	6.5	26.6	42.8
Support services	0.1	0.1	0.7	1.0
Public administration	0.1	0.3	0.6	2.9
Education	0.5	2.6	5.3	25.7
Health	0.2	0.6	2.6	10.6
Waste	0.0	0.0	0.5	0.9
Other services	0.1	0.1	2.6	4.2
Total	**100.0**	**100.0**		

Demand structure: Table 5 shows the demand structure for each commodity. Most of accommodation and real estate services are consumed by households. In contrast, more than half of the public administration products are consumed by government. Electricity, manufacturing, and mining commodities are mainly used as intermediate inputs for production. Trade is 100% a margin commodity

[3] Export excluding taxes and margins – i.e., at base prices.

while 25.2% of transportation is used as a margin. Whereas construction services are mainly used for investment purposes.

Table 5. Demand structure (%)

Commodities	Household consumption	Government consumption	Intermediate consumption	Margin	GFCF	Stock variation	Total Demand
Agriculture	23.9		48.0		18.8	9.3	100.0
Coal	1.1		62.2		0.0	36.7	100.0
Export coal					0.0	100.0	100.0
Oil					0.0	100.0	100.0
Metal ores			6611.4		0.0	-6511.4	100.0
Other mining	2.4		536.3		0.0	-438.7	100.0
Manufacturing	32.8	0.1	44.8		14.0	8.4	100.0
Fuel	14.3		81.7		0.0	4.0	100.0
Construction	0.7	0.0	26.6		72.7	0.0	100.0
Trade				100.0	0.0	0.0	100.0
Accommodation	63.0	0.1	36.9		0.0	0.0	100.0
Transportation	14.1	0.1	60.6	25.2	0.0	0.0	100.0
Postal and courier service	0.9		99.1		0.0	0.0	100.0
Energy supply services	10.8	0.0	89.2		0.0	0.0	100.0
Financial activities	24.7		75.3		0.0	0.0	100.0
Real estate	78.5		21.5		0.0	0.0	100.0
Rent service	1.4		40.9		57.7	0.0	100.0
Professional activities	18.0	5.3	76.1		0.6	0.0	100.0
Support services	16.0	0.2	75.0		8.8	0.0	100.0
Public administration	4.6	87.0	8.5		0.0	0.0	100.0
Education	49.0	47.5	3.6		0.0	0.0	100.0
Health	33.4	56.8	9.9		0.0	0.0	100.0
Waste	12.4	38.6	49.0		0.0	0.0	100.0
Other services	58.1	16.0	25.9		0.0	0.0	100.0

Structure of government income and expenditure: The main sources of government revenue are direct taxes (personal income taxes and corporate taxes) (44.9%) and taxes on products (16.8%). On the other hand, half of the budget was spent on purchasing goods and services while households received 30.8% of the budget as transfers. The remaining government revenue is recorded as savings in the SAM and is used to cover its capital expenditure (Table 6).

Table 6. Government budget (%)

-Government revenue		**Government expenditure**	
Transfers from- households	16.8	Transfers to households	30.8
Direct taxes /TD/	44.9	Transfers to ROW	7.1
Import duties /TM/	6.7	Public consumption	37.2
Export taxes	-	Savings	24.9
Net taxes on products /TI/	27.9		
Transfers from ROW	2.3		
Net taxes on production	1.4		
Total	**100.0**	**Total**	**100.0**

Structure of household (private sector) income and expenditure: Labor and capital are the primary sources of household income, and they jointly constitute 86.3% of total household income (Table 7). Households spend 58.8% of their income on consumption and pay 15.2% as direct taxes. Savings make

up 18.8% of total income, while transfers to the government and ROW are relatively small (5.7%). The households have a new income source, income from bribery, in the SAM.

Table 7. Household Income and Expenditure (%)

Household income		**Household expenditure**	
Wages	42.4	Consumption	58.8
Capital income	43.9	Direct taxes	15.2
Transfers from government	10.4	Transfers to the government	5.7
Transfers from ROW	2.6	Transfers to ROW	1.4
Corruption income	0.7	Savings	18.8
Total	**100.0**	**Total**	**100.0**

Investment/savings structure: The majority of total investment is financed by household savings[4], while rest of the world contributes 36.2% of total investment (Table 8). 58.9% and 13.8% of the total investment budget is dedicated to financing private and public investments (gross fixed capital formation). A relatively smaller portion of the public investment is allocated to households as bribes. It is 1.5% of the total investment in the economy.

Table 8. Investment/Savings Structure (%)

Source		**Allocation**	
Household	44.0	Private investment	58.9
Government	19.7	Public investment	13.8
Rest of the world	36.2	Change in inventories	25.8
		Corruption	1.5
Total	**100.0**	**Total**	**100.0**

2.2. Model extensions

We extended the PEP-1-t model (Decaluwé et al., 2013) with some features and variables for our analysis. For example, firstly, we introduced a wage equation to the model. Secondly, we introduced an economy-wide, uniform TFP and a sector-specific TFP into the Constant Elasticity of Substitution (CES) production function. Thirdly, we disaggregated the investment account into private and public investment accounts in the SAM and modified the investment equations of the model. Finally, we made some extensions to reflect corruption flows in the economy.

- **Wage equation**

The first modification is the introduction of a wage curve—i.e., the Phillips curve relationship between the unemployment rate and the real wage index. Equation 1 shows this relationship in general terms.

$$\frac{W_t}{PIXCON_t} = \frac{W_{t-1}}{PIXCON_{t-1}} \left(\frac{\bar{U}}{U_t}\right)^{\phi} \qquad (1)$$

where W_t, $PIXCON_t$ and U_t are nominal wage, consumer price index and the unemployment rate in period t, and $\phi \geq 0$ was an elasticity parameter. $\bar{U}$ is a constant which is a product of the long-term unemployment rate (U_N) and the growth rate of the real wage.[5] When $t = 1$, values in $t - 1 = 0$ indicate the base-year ones. According to Equation 1, the real wage and unemployment rates are

[4] Note that the SAM does not have firms, implying that household savings cover the private sector's savings.

[5] In the balanced growth path simulation, one may write $\bar{U} = U_N \times X_t^{1/\phi}$ where the latter is the growth rate of the real wage such that $U_t = U_N$. In the simulations below, we set $\bar{U} = 7\%$. Consequently, we found that the unemployment rate converged to 6.6% over time and the real wage was updated in accordance with Equation 1.

determined within a period. The unemployment rate converges from U_0 to U_N over time, and the parameter ϕ controls the speed of convergence as well as indicates the slope of labor supply curve within t. The intuition of Equation 1 is that wage-setters care about real wages and update the nominal wage on the basis of actual inflation but also consider current labor market conditions through the unemployment rate.

Given (1), labor supply was written as follows:

$$LS_t = LS_P(1 - U_t) \qquad (2)$$

where LS_t and LS_P are labor supply in t and potential labor supply respectively. As we describe below, the potential labor supply grows at the exogenous population growth rate. The labor supply within a period, on the other hand, is not fixed as the unemployment rate moves around its natural rate. For instance, when $U_t > U_N$, we find that $LS_t < LS_P(1 - U_N)$. In that case, the real wage in t decreases (or grows relatively slowly) from $t - 1$ which, in turn, reduces (or increases relatively slowly) producers' costs. Hence, the demand for labor increases. This process continues until $U_t = U_N$. The opposite happens if $U_t < U_N$.

- **TFP extension**

We introduced two different TFP variables, economy-wide uniform TFP (TFP_t) and sector-specific TFP ($TFP_{j,t}$), in the model. The TFP is augmented as labor-augmenting technology progress in the production function as in the equation 3.

$$VA_{j,t} = B_j^{VA}\left[\beta_j^{VA}(TFP1_t TFP_{j,t} LDC_{j,t})^{-\rho^{VA}} + \left(1 - \beta_j^{VA}\right)KDC_{j,t}^{-\rho^{VA}}\right]^{-\left(\frac{1}{\rho_j^{VA}}\right)} \qquad (3)$$

The economy wide uniform TFP grows at 3.4% a year, taking the average historical value. For sector specific TFP, it is 1 for all sectors and we apply a shock on sector specific TFP when we give public sector productivity growth.

- **Extensions related to the separation of public investment from total investment**

We divided investment between public and private sectors. In the PEP-1-t model, public investment is calibrated from public service capital stock in the base-year, which could be different from public investment in the budget data. Therefore, we introduced a variable, IT_TR_t, which was calibrated to account for the difference.

$$IT\_TR_t = IT\_PUB_t - \sum_k \sum_{pub}\left(IND_{k,pub,t} \times PK\_PUB_t\right) \qquad (4)$$

where IT_PUB_t is public investment in the budget data, pub is a set of sectors providing public services, k is type of capital, $IND_{k,pub,t}$ is an additional (or new) stock in (k, pub), and PK_PUB_t is an investment price index. In our model, IT_PUB_t and $IND_{k,pub,t}$ were exogenous so that IT_TR_t was endogenous.

Given IT_PUB_t investment in the public sectors, IT_PR_t is determined as:

$$IT\_PR_t = IT_t - IT\_PUB_t - \sum_i\left(VSTK_{i,t} \times PC_{i,t}\right) \qquad (5)$$

where IT_t is total investment, $VSTK_{i,t}$ is stock variation of commodity i, $PC_{i,t}$ is a consumer price of commodity i. IT_t is determined as:

$$IT_t = SH_t + SG_t + SROW_t \quad (6)$$

where SH_t is private savings, SG_t is government savings (revenue over current expenditures), and $SROW_t$ is foreign savings.

- **Extensions related to corruption**

We made some assumptions to incorporate corruption flows in the model. First, some portion of the public investment is spent as bribes (equation 7).

$$Corruption_t = corrate_t \times IT\_PUB_t \quad (7)$$

where $Corruption_t$ – corruption amount, $corrate_t$ is corruption rate, and IT_PUB_t is public investment. We assumed that the corruption rate ($corrate_t$) is 10 percent of public investment.

The remaining portion of public investment is spent for the investment purpose (equation 8).

$$PC_{i,t} INV_{i,t}^{PUB} = \gamma_i^{INVPUB} IT_t^{PUB} (1 - corrate_t) \quad (8)$$

where $PC_{i,t}$ is price of commodity i, $INV_{i,t}^{PUB}$ is public investment demand for commodity i, γ_i^{INVPUB} share of commodity i in total investment demand.

Public investment expenditure finances the creation of new physical capital in the public sectors. Due to corruption, only the remaining portion after corruption can be used to create new capital:

$$IT_t^{PUB}(1 - corrate_t) = PK_t^{PUB} \sum_{k,pub} IND_{k,pub,t} + ITtrans_t \quad (9)$$

where PK_t^{PUB} is price of new capital in public sector, $IND_{k,pub,t}$ is capital demand by public sector, $ITtrans_t$ is investment transfer variable for transferring between public and private investments.

Second, the corruption income goes to the private sector, the households in our model. Therefore, households receive income from four sources: labor, capital, transfers from other agents, and corruption (equation 10).

$$YH_{h,t} = YHL_{h,t} + YHK_{h,t} + YHTR_{h,t} + Corruption_t \quad (10)$$

where $YH_{h,t}$ is household total income, $YHL_{h,t}$ is household labor income, $YHK_{h,t}$ is household capital income, $YHTR_{h,t}$ is household transfer income, and $Corruption_t$ is the amount of bribes.

Third, a portion of the corruption income is transferred to the rest of the world – i.e., neither saved, consumed, nor taxed. We assume that the households transfer 80 percent of the corruption income directly to the rest of the world (equation 11). The remaining 20% of the additional income from corruption is spent on consumption and savings. Which means that households do not make transfers or pay taxes from this additional corruption income.

$$Offshore_t = 0.8 * Corruption_t \quad (11)$$

where $Offshore_t$ is the transfers from households' corruption income to the rest of the world. Thus, this portion is deducted from the household disposable income – households do not consume, save, or pay taxes from this portion of additional corruption income.

$$YDH_{h,t} = YH_{h,t} - TDH_{h,t} - TR_{gvt,h,t} - Offshore_t \quad (12)$$

where $YDH_{h,t}$ is household disposable income, $TDH_{h,t}$ is direct taxes paid by households, and $TR_{gvt,h,t}$ is transfer from households to government, and $Offshore_t$ is the amount of transfer that goes to the rest of the world from corruption income of households.

Due to this assumptions and changes in the SAM, some calibrations of parameters and equations are changed as follows:

- The share of transfer from households to government in total household income is defined as a share of income deducted by corruption:

$$tr1O_h = \frac{TRO_{gvt,h} - tr0O_h}{(YHO_h - CorruptionO)} \qquad (10)$$

  where $tr1O_h$ is an initial value of share of transfer from households to government in total household income, $TRO_{gvt,h}$ is an initial value of amount of transfer from households to government, and $tr0O_h$ is an initial value of intercept variable in transfer function.

- Households do not make transfers from the additional income of corruption as:

$$TR_{gvt,h,t} = PIXCON_t \;\; tr0_{h,t} + tr1_{h,t}(YH_{h,t} - Corruption_t) \qquad (11)$$

  where $TR_{gvt,h,t}$ is value of amount of transfer from households to government, and $PIXCON_t$ is Consumer Price Index.

- Households do not pay taxes from the additional income of corruption as:

$$TDH_{h,t} = PIXCON_t^{\eta} ttdh0_{h,t} + ttdh1_{h,t}(YH_{h,t} - Corruption_t) \qquad (12)$$

  where $TDH_{h,t}$ is amount of direct taxes paid by households, $ttdh0$ is intercept variable in the direct taxes function, and $ttdh1_{h,t}$ is direct tax rate.

- The rate of direct tax paid by households is defined as a share of income deducted by corruption:

$$ttdh1O_h = \frac{TDHO_{gvt,h} - ttdh0O_h}{(YHO_h - CorruptionO)} \qquad (13)$$

- Households consume a particular portion of the additional remuneration from corruption and transfer the remaining portion to the rest of the world (to their offshore accounts)

$$YROW_t = e_t \sum_i PWM_{i,t} IM_{i,t} + \sum_k \lambda_{row,k}^{RK} \left(\sum_j R_{k,j,t} \;\; KD_{k,j,t}\right) + \sum_{agd} TR_{row,agd,t} + \sum_l \lambda_{row,l}^{WL} \sum_j WTI_{l,j,t} LD_{l,j,t} + Offshore_t \qquad (14)$$

  where $YROW_t$ is income of rest of the world, $PWM_{i,t}$ is import price index for commodity i, $IM_{i,t}$ is import volumes of commodity i, $\lambda_{row,k}^{RK}$ is share of capital remuneration distributed to RoW, $R_{k,j,t}$ is rental rate of capital k in sector j, $KD_{k,j,t}$ is capital demand by sector j, $TR_{row,agd,t}$ transfer from domestic agencies to RoW, $\lambda_{row,l}^{WL}$ is share of labor remuneration distributed to RoW, $WTI_{l,j,t}$ is wage of labor l paid by sector j, and $LD_{l,j,t}$ is labor demand for labor l in sector j.

3. Scenarios and simulation results

3.1. Simulation scenarios

This paper considers the following 4 scenarios.

1) Business-as-usual (BAU) scenario

This scenario is a BAU scenario which serves as a baseline for comparison with the other scenarios. The BAU scenario reflects the balanced growth path of the Mongolian economy for the next 10 years. As its name suggests, this scenario assumes no shock in the economy, and the economy goes through a "balanced growth path" where all variables grow at the same rate (sum of population growth and uniform TFP growth) and the prices remain constant which maintains the structure of the economy.

2) Alternative scenario – 1 (SIM1)

This scenario aims to analyze the effect of productivity growth in public services. Model closure remains as in the BAU scenario. However, there is a shock to reflect the productivity improvement. Specifically, total factor productivity in the public administration sector grows by 5% every year.

3) Alternative scenario – 2 (SIM2)

This scenario aims to analyze the impact of decreased corruption on the economy. Model closure remains as in the BAU scenario again. To reflect the decreased corruption, we imposed a shock on the corruption rate (the percentage of public investment that goes to households as corruption income). Specifically, the corruption rate decreases by 10 percent each year. The initial corruption rate is 10% - i.e., 10 percent of total public investment is corruption. This rate decreases to 9% in the first year and becomes 8.1% in the second year and so on. Thus, a lesser portion of the public investment becomes corruption every year – i.e., corruption declines gradually.

4) Alternative scenario – 3 (SIM3)

This scenario analyzes the combined effects of the previous two scenarios. Thus, it includes all shocks in the previous scenarios at the same time. In order words, it evaluates the economic impact of full implementation of the Revival Policy for Public Sector Productivity.

3.2. Simulation results

Alternative scenario – 1 (SIM1)

This sub-section discusses the impact of increased public sector productivity on the overall economy and sectors. The increased productivity in public sector has positive impact on the macroeconomy as both nominal and real GDP increase compared to the BAU scenario. As productivity increases every year in this scenario, the macro impact gets stronger year-by-year. Due to labor movement within the economy, which will be discussed further in this section, nominal wage decreases. As labor income is a significant part of household income, decreased wage leads to decreased household income. As households have less income, their savings decrease as well. As a consequence of decreased household income, government income decreases due to smaller income tax base which eventually leads to decreased government savings. As both household and government savings fall, total investment falls as well. On the other hand, export and import increase slightly. The consumer price index decreases as the price of public services decreases. Overall, the impact on macroeconomic variables gets stronger in

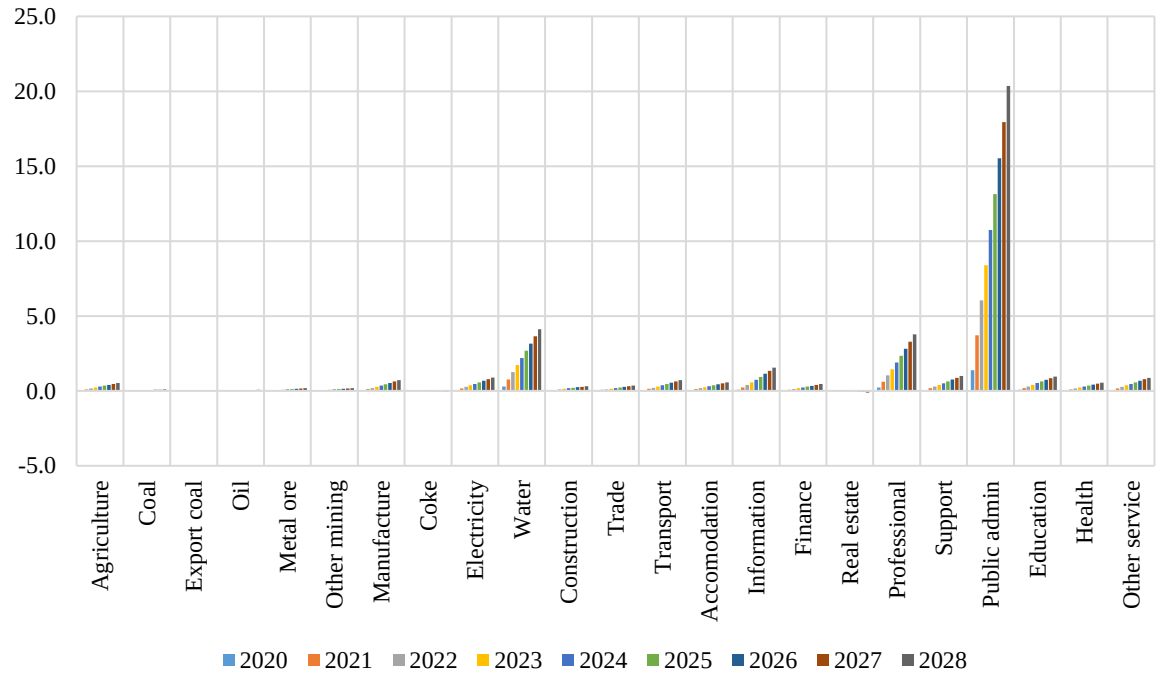
time – i.e., the magnitude of effects increases over time. Hence, the economy doesn't come back to the steady state (balanced growth path).

Table 9. Macro-economic impact: Deviation from the baseline scenario (%)

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Nominal GDP	0.08	0.22	0.36	0.50	0.64	0.78	0.93	1.07	1.21
Real GDP	0.19	0.51	0.82	1.13	1.45	1.76	2.08	2.39	2.71
Consumer Price Index	-0.02	-0.06	-0.10	-0.14	-0.18	-0.21	-0.25	-0.28	-0.32
Total Investment	-0.02	-0.05	-0.08	-0.11	-0.14	-0.17	-0.20	-0.24	-0.27
Exports	0.02	0.05	0.08	0.11	0.14	0.17	0.20	0.23	0.26
Imports	0.02	0.04	0.07	0.10	0.13	0.15	0.18	0.21	0.24
Household income/savings	-0.03	-0.09	-0.14	-0.19	-0.25	-0.30	-0.35	-0.41	-0.46
Real households' income	-0.01	-0.02	-0.04	-0.05	-0.07	-0.09	-0.10	-0.12	-0.14
Government income	-0.01	-0.04	-0.06	-0.09	-0.11	-0.13	-0.16	-0.18	-0.20
Government savings	-0.02	-0.06	-0.09	-0.13	-0.17	-0.21	-0.25	-0.29	-0.33
Nominal wage	-0.08	-0.21	-0.35	-0.48	-0.61	-0.74	-0.87	-0.99	-1.12

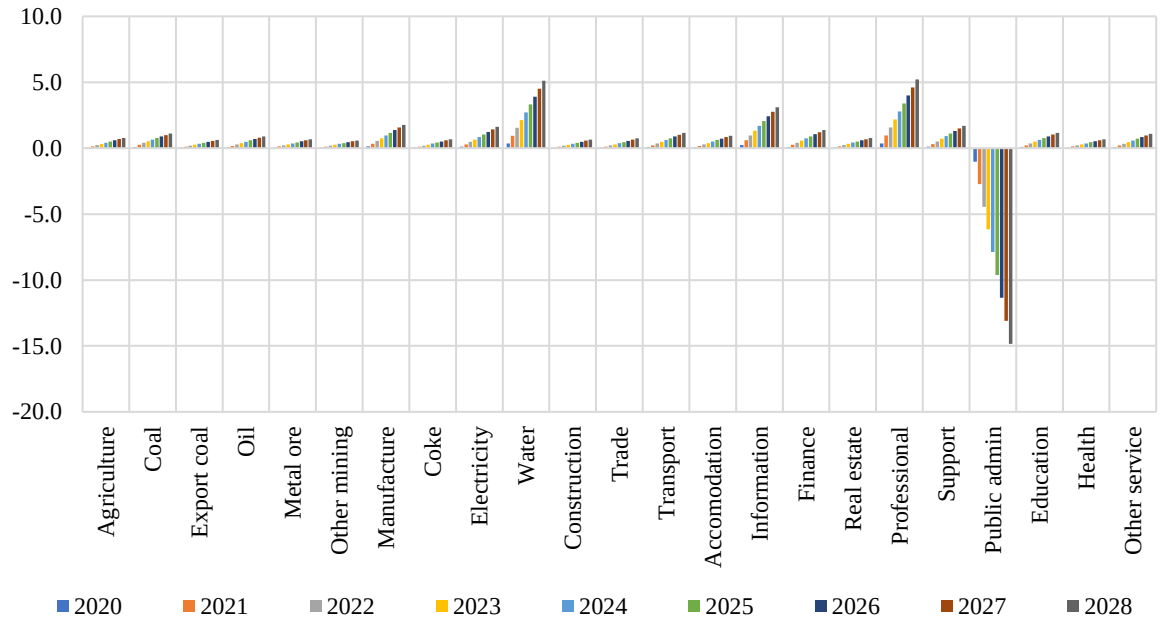
Output of public administration sector increases sharply (by 20% compared to BAU in 2028) as it receives the direct impact of the shock. Production in other sectors increase as well as a result of increased intermediate consumption by the public administration sector. The magnitude of the impact increases over time.

Figure 2. Impact on sectoral production: Deviation from the baseline scenario (%)



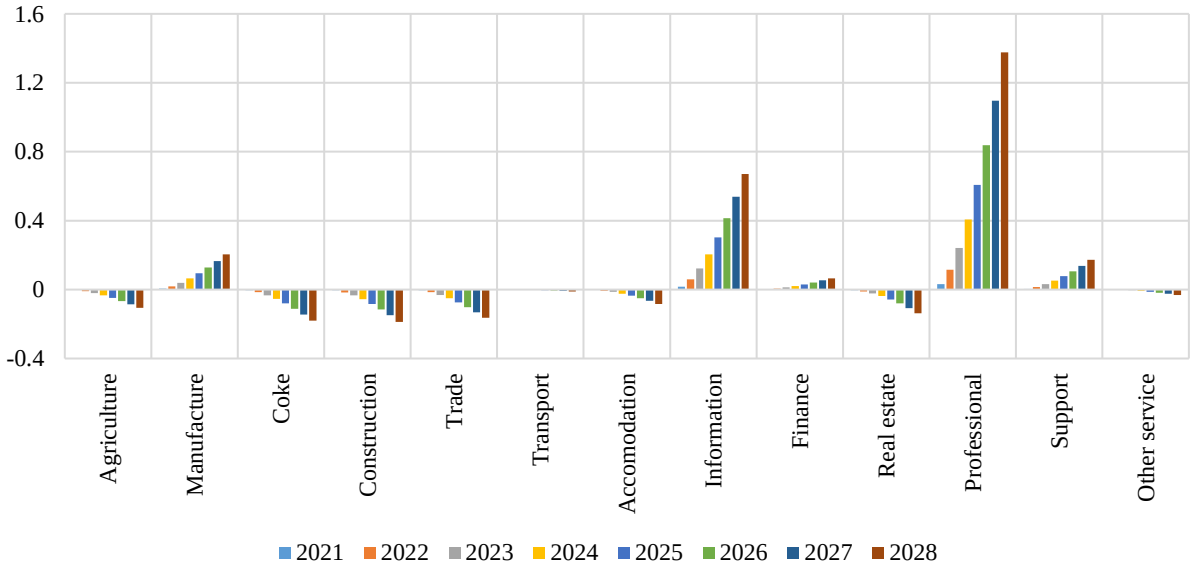
As the public administration sector becomes a more productive sector, it needs less workers. Thus, labor moves away from the public sector and goes to other sectors. As a result, labor demand in all sectors except public administration increases.

Figure 3. Impact on sectoral labor demand: Deviation from the baseline scenario (%)



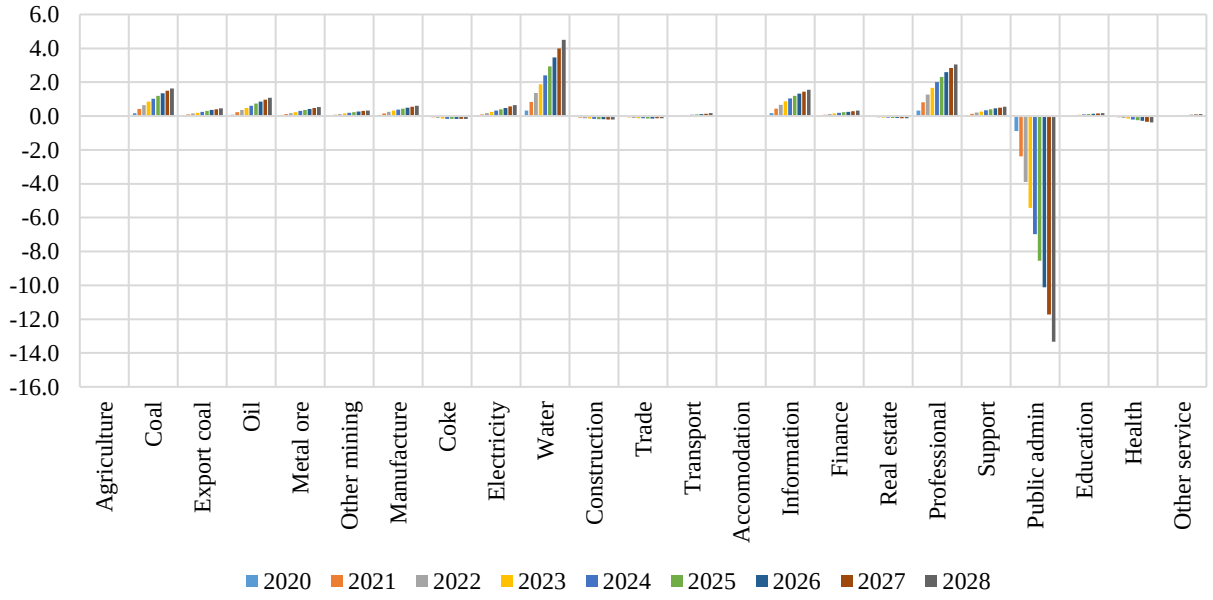
As production increases in all sectors, some sectors need more capital to meet the increased output. Thus, capital demand increases in manufacture, information, finance, professional services, and support services. On the other hand, capital demand in other sectors decreased due to increased labor demand. This is due to the substitution effect between labor and demand. In other words, some sectors decrease their capital demand and substitute it with incoming labor to meet their increased production.

Figure 4. Impact on sectoral capital demand: Deviation from the baseline scenario (%)



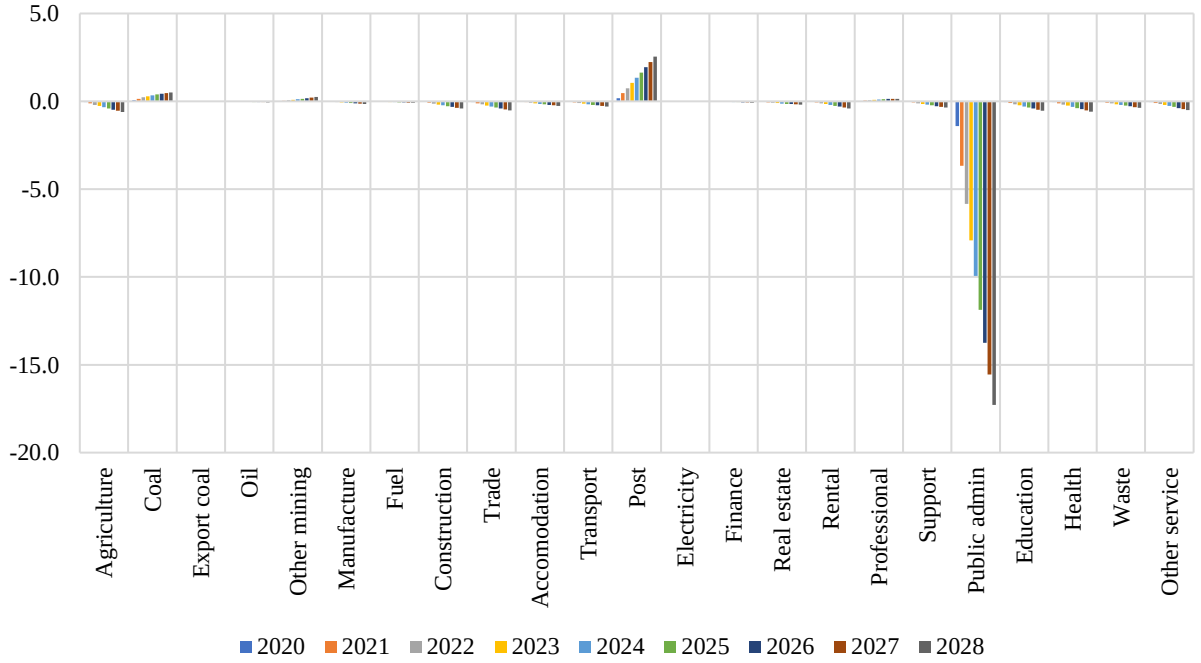
Rental rate increases in most sectors while it decreases in public administration sector. As mentioned before, the public administration sector sends its labor away. This makes capital a relatively more abundant factor. Thus, rental rates fall in this sector. On the other hand, other sectors receive labor making capital a relatively scarce factor. This leads to increased rental rates in these sectors.

Figure 5. Impact on rental rate: Deviation from the baseline scenario (%)



The expansion in the public sector leads to relatively cheaper public services while some products and services such as postal services become relatively expensive. There is almost no change in prices of other products and services.

Figure 6. Impact on price: Deviation from the baseline scenarios (%)



Alternative scenario – 2 (SIM2)

Due to the decreased corruption rate as shown in **Figure** 8, corruption income of households decreases compared to the BAU. For instance, it decreases to MNT 125 billion by 2028 as opposed to MNT 350 billion in the BAU scenario (Figure 7).

Figure 7. Corruption income, billion MNT

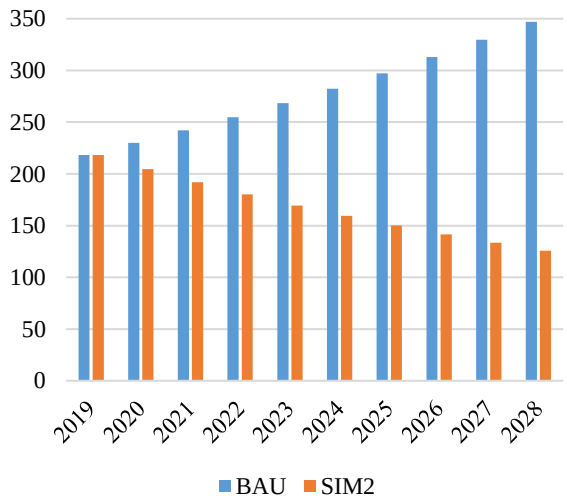
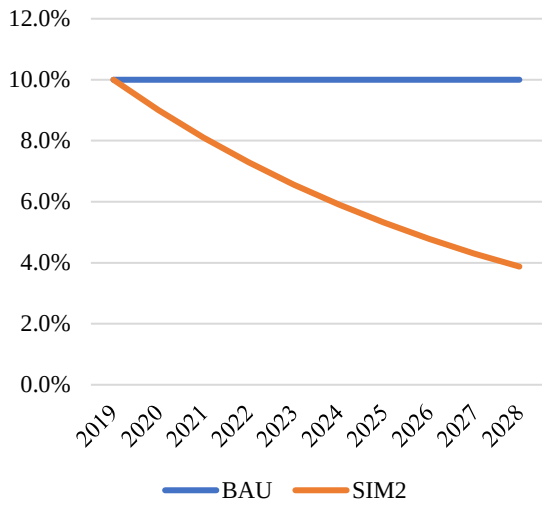


Figure 8. Corruption rate, %



The decrease in corruption negatively affects the household nominal income immediately. However, household disposable income increases as the amount of money they send to their offshore accounts decrease along with corruption. This translates into increased private consumption and savings. Additionally, as the income tax base expands, government revenue from direct taxes increases. As a result, government savings also increase. This leads to increased investment. GDP increases compared to the baseline thanks to increased consumption and investment. Similar to the alternative scenario 1, the macroeconomic effects get larger over time, which also means the economy doesn't converge to the steady state.

Table 10. Macro-economic impact: Deviation from the baseline scenario (%)

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Nominal GDP	0.01	0.03	0.06	0.10	0.15	0.21	0.27	0.34	0.41
Real GDP	-0.03	-0.04	-0.02	0.01	0.07	0.14	0.22	0.31	0.40
Consumer Price Index	0.03	0.04	0.05	0.05	0.04	0.02	0.00	-0.02	-0.05
Total Investment	0.04	0.08	0.13	0.17	0.22	0.28	0.33	0.39	0.45
Exports	-0.02	-0.03	-0.04	-0.03	-0.03	-0.01	0.00	0.02	0.05
Imports	0.07	0.14	0.20	0.26	0.32	0.38	0.43	0.48	0.53
Household income	-0.04	-0.07	-0.09	-0.11	-0.12	-0.12	-0.12	-0.12	-0.11
Household disposable income	0.02	0.04	0.07	0.09	0.12	0.15	0.18	0.21	0.24
Real household income	-0.01	0.00	0.02	0.04	0.08	0.12	0.17	0.23	0.29
Government income	0.05	0.09	0.14	0.19	0.23	0.28	0.32	0.36	0.41
Direct taxes income	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36
Government savings	0.15	0.31	0.49	0.68	0.89	1.10	1.32	1.55	1.78
Nominal wage	0.07	0.13	0.20	0.26	0.32	0.38	0.44	0.51	0.57

As a result of the corruption decrease, private investment increases while public investment decreases. This leads to the investment structure shift shown in Table 11. The share of private investment slightly increased while share of public investment decreased slightly.

Figure 9. Impact on investment

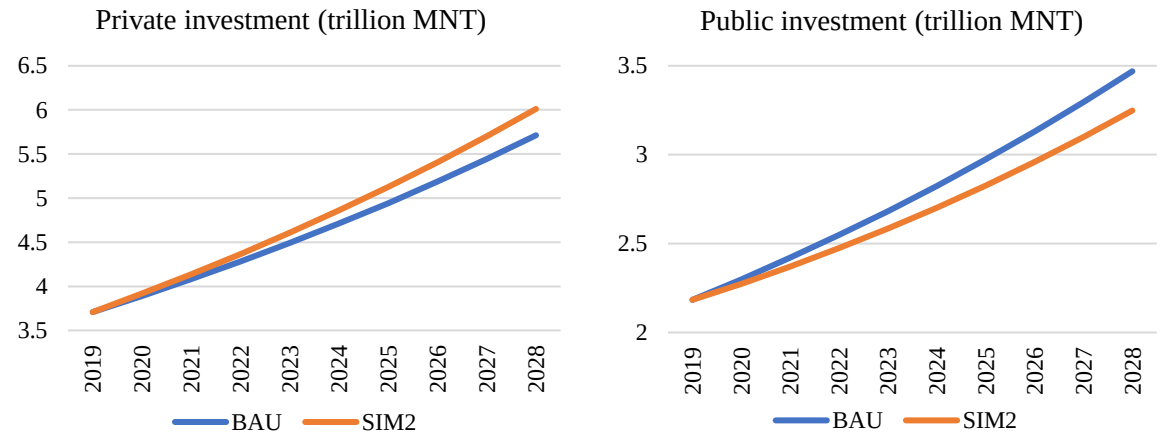
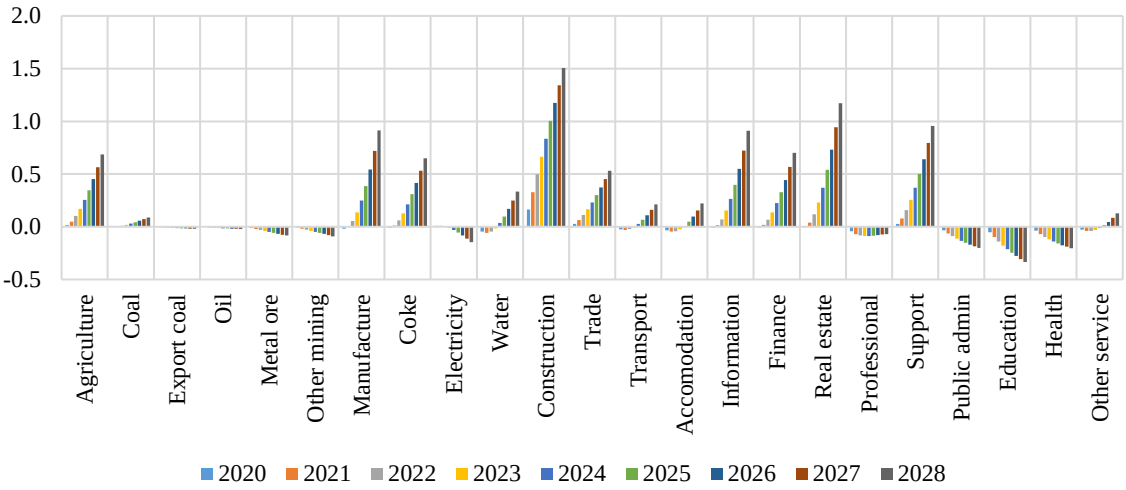


Table 11. Impact on investment structure

	Share of private investment		**Share of public investment**	
	BAU	SIM1	BAU	SIM1
2020	29.0%	29.0%	17.1%	17.1%
2021	28.9%	29.1%	17.1%	16.9%
2022	28.8%	29.2%	17.1%	16.7%
2023	28.8%	29.3%	17.1%	16.6%
2024	28.7%	29.4%	17.1%	16.5%
2025	28.6%	29.5%	17.1%	16.4%
2026	28.6%	29.5%	17.1%	16.3%
2027	28.5%	29.6%	17.1%	16.2%
2028	28.4%	29.6%	17.1%	16.1%

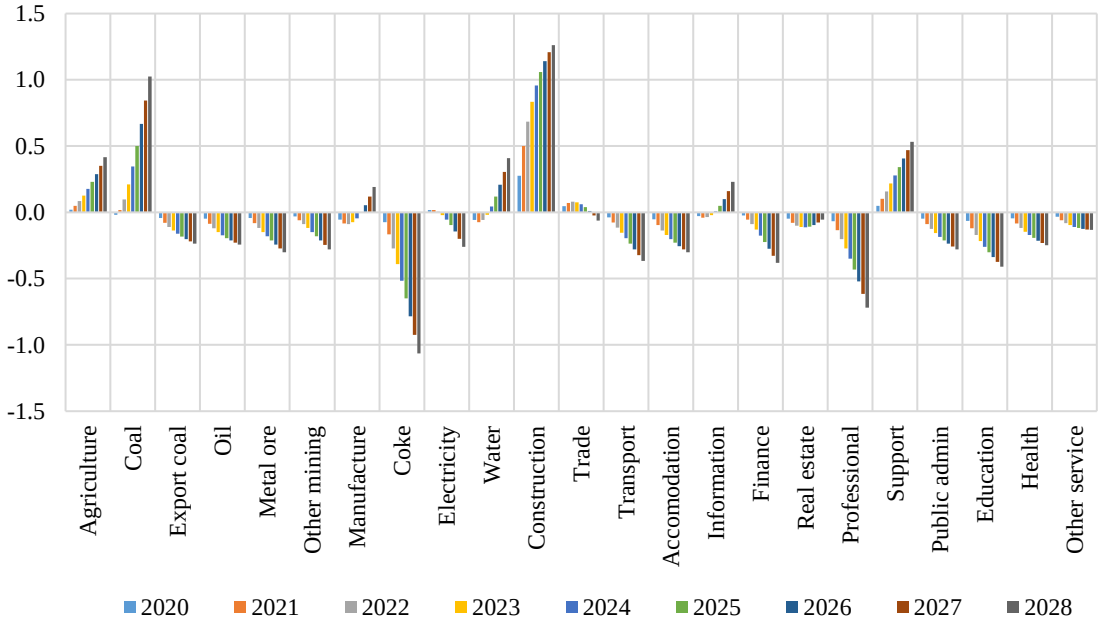
Production increases in most sectors while it decreases in public administration, education, and health sectors. The sector that benefits most from the decreased corruption is construction. This is due to the increased investment as construction is the main investment product. The sectoral effects are also divergent as the magnitude increases over time.

Figure 10. Impact on sectoral production: Deviation from the baseline scenario (%)



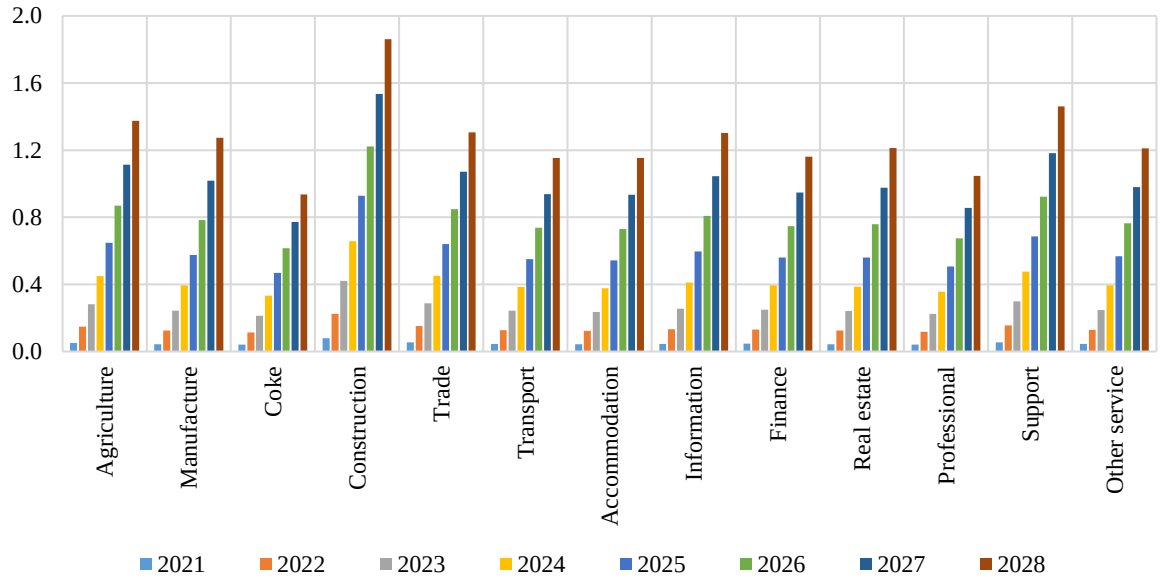
Labor demand decreases in most sectors while it increases most in the construction sector due to increased production in construction sector. Some sectors experience a decline in their labor demand even if their production increases. This is due to the substitution of factors – i.e., they are substituting labor with capital to increase their production.

Figure 11. Impact on sectoral labor demand: Deviation from the baseline scenario (%)



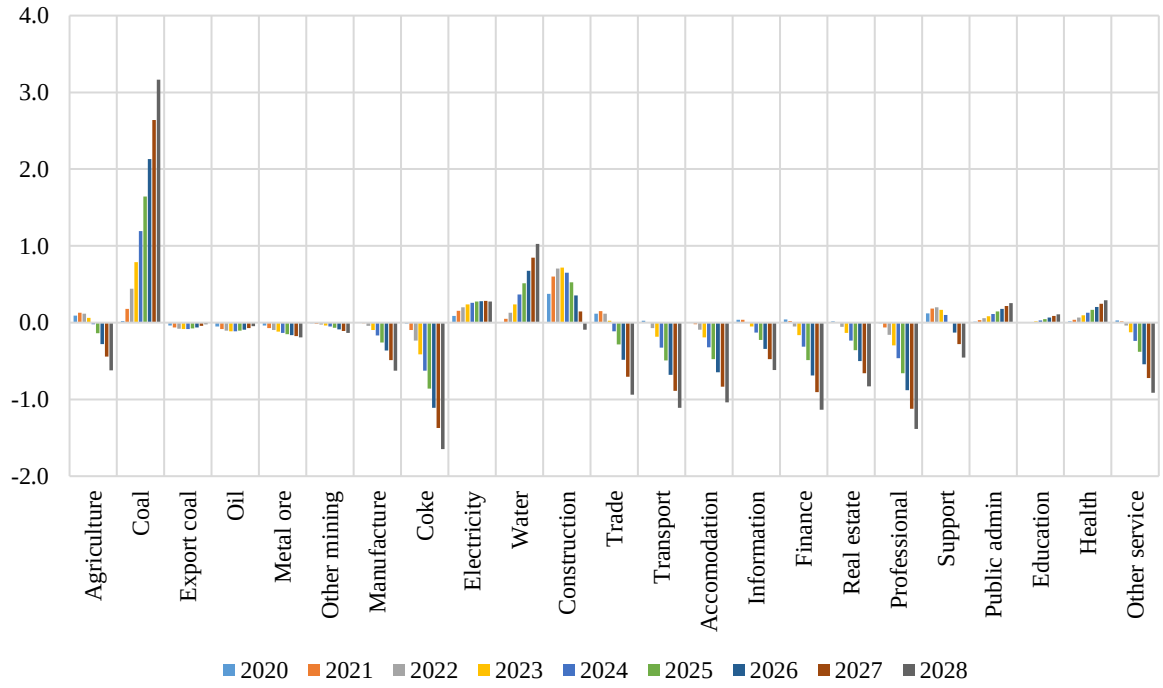
Capital demand increases in all sectors due to increased production and decreased labor demand in some sectors. There is no change in capital demand of mining and public sectors as it is defined exogenously in the model.

Figure 12. Impact on sectoral capital demand: Deviation from the baseline scenario (%)



Rental rate decreases in most sectors as capital becomes a relatively abundant factor due to increased capital demand and labor movement. Sectors which had increased labor demand, such as coal and construction, experienced increased rental rate as labor becomes relatively abundant factor in these sectors.

Figure 13. Impact on rental rate: Deviation from the baseline scenario (%)



Alternative scenario – 3 (SIM3)

Overall, the combined effect of the increased productivity in public sector and decreased corruption is positive. Real GDP is 3 percent higher than BAU by 2028. Due to a combined effect of decreased wage

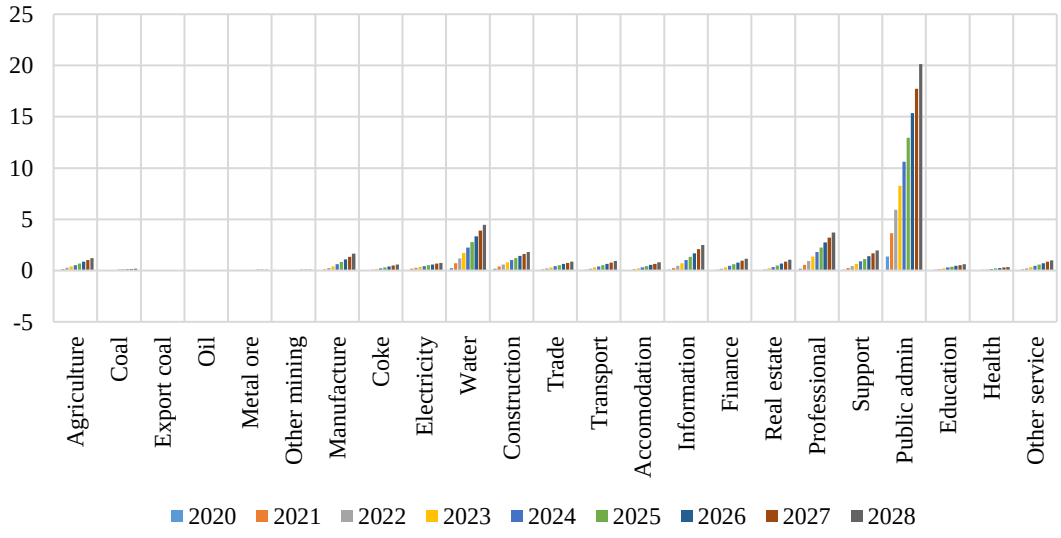
and decreased corruption income, household income decreases. Household disposable income also decreases but by smaller amount thanks to decreased offshore. This translates into decreased private consumption and savings. On the other hand, real household income increases due to decreased consumer prices. Similar to scenario 1, nominal wage decreases due to the labor movement across sectors. Even if direct tax income decreased, government revenue increases as production and product taxes increase, and consequently government savings also increases. Even if private savings declined, total investment increases thanks to increased government savings.

Table 12. Macroeconomic impact: Deviation from the baseline scenario (%)

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Nominal GDP	0.09	0.25	0.42	0.60	0.79	0.99	1.20	1.41	1.63
Real GDP	0.16	0.47	0.80	1.15	1.52	1.90	2.29	2.70	3.11
Consumer Price Index	0.00	-0.02	-0.05	-0.09	-0.14	-0.19	-0.25	-0.31	-0.37
Total Investment	0.02	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18
Exports	0.00	0.02	0.04	0.07	0.11	0.15	0.20	0.25	0.30
Imports	0.09	0.18	0.27	0.36	0.45	0.53	0.61	0.69	0.77
Household income	-0.07	-0.16	-0.23	-0.30	-0.37	-0.42	-0.48	-0.53	-0.57
Household disposable income	-0.01	-0.04	-0.07	-0.10	-0.13	-0.15	-0.18	-0.20	-0.22
Real household income	-0.01	-0.02	-0.02	-0.01	0.01	0.04	0.07	0.11	0.15
Government income	0.03	0.05	0.08	0.10	0.12	0.14	0.16	0.19	0.21
Direct taxes income	0.01	0.00	-0.02	-0.03	-0.05	-0.06	-0.07	-0.09	-0.10
Government savings	0.13	0.26	0.40	0.55	0.72	0.89	1.07	1.26	1.45
Nominal wage	-0.01	-0.08	-0.15	-0.22	-0.29	-0.35	-0.42	-0.49	-0.55

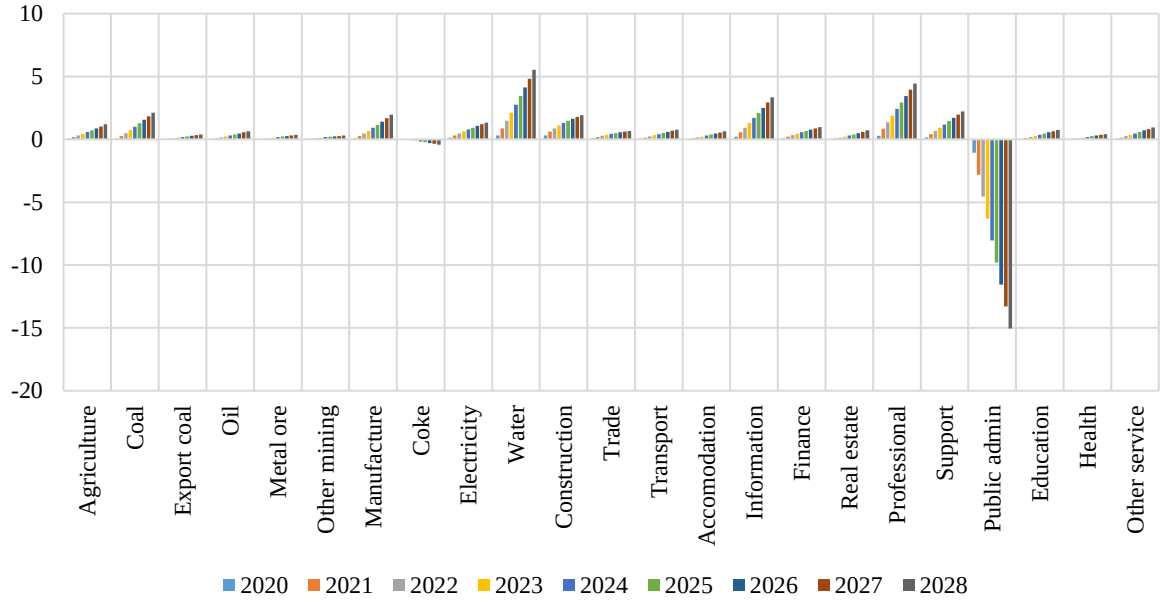
The impact on sectoral production is similar to Scenario 1. It means that the sectoral impact of public sector productivity shock dominated the sectoral impact of corruption decrease. The output of public administration sharply increases while production in other sectors increases up to 5%. The impact on some sectors is negligible.

Figure 14. Impact on sectoral production: Deviation from the baseline scenario (%)



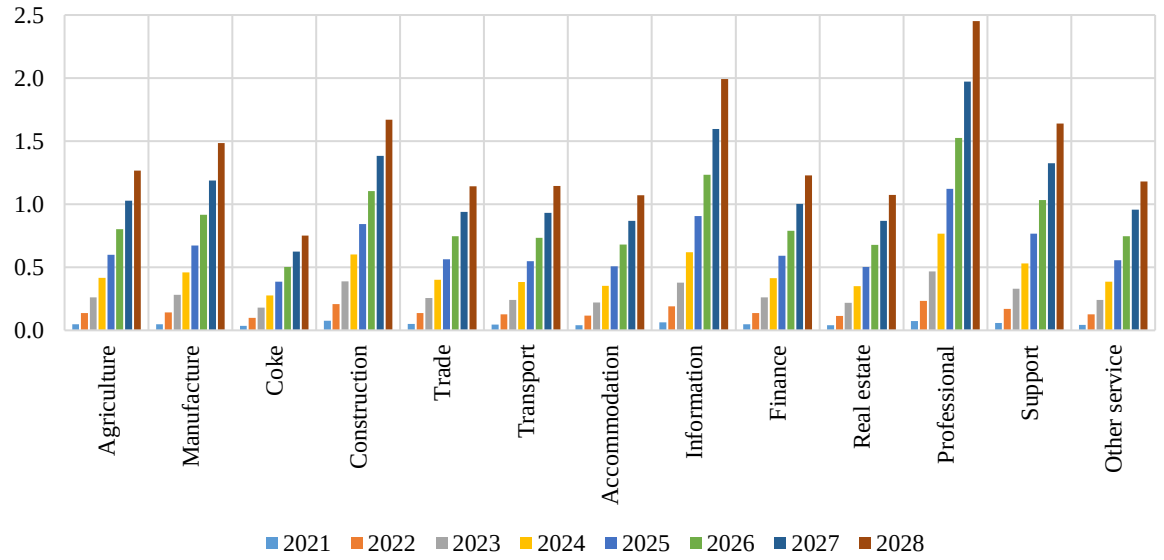
The labor movement observed in Scenario 1 is also observed in Scenario 3 – i.e., Labor moves away from the public sector and is absorbed by other sectors. This shows that the impact on labor demand is much stronger in Scenario 1 compared to Scenario 2.

Figure 15. Impact on sectoral labor demand: Deviation from the baseline scenario (%)



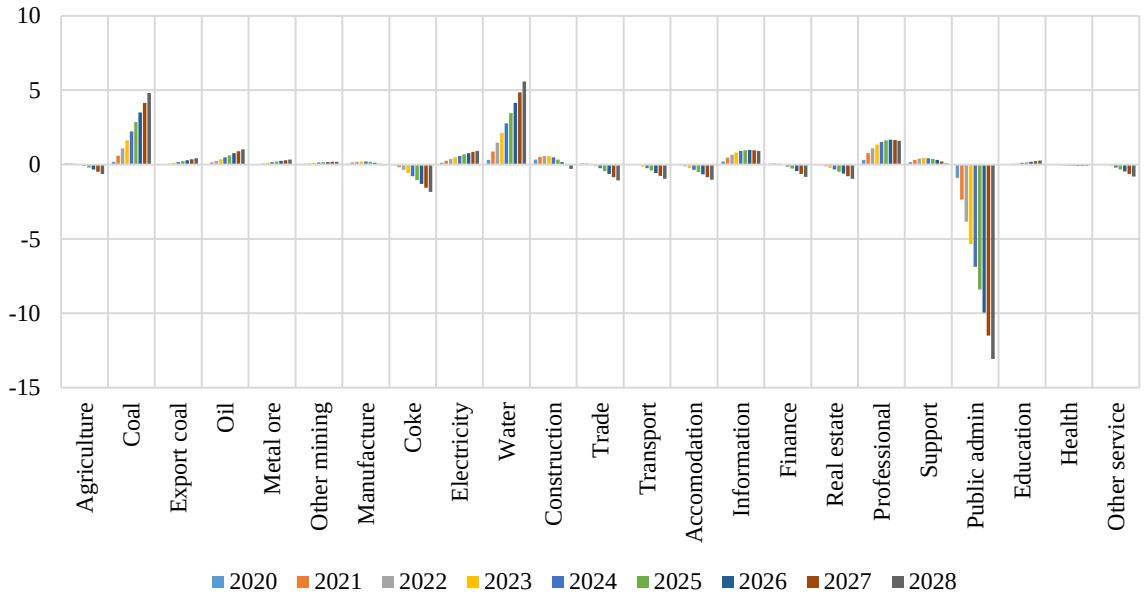
Capital demand increases in all sectors. Even if some sectors receive labor, the increases in production push the capital demand up. This effect was observed in Scenario 2 as well. There is no change in capital demand of mining and public sectors as it is defined exogenously in the model.

Figure 16. Impact on sectoral capital demand: Deviation from the baseline scenario (%)



Rental rate in public administration sector sharply decreases due to the huge outflow of labor which makes capital a relatively abundant factor. Rental rate increases in some sectors as they receive labor and capital becomes a relatively scarce factor.

Figure 17. Impact on rental rate: Deviation from the baseline scenario (%)



4. Conclusion

The Parliament of Mongolia adopted a ten-year development policy, the "New Revival Policy," in November 2021. One of the main six pillars of the policy is a Revival Policy for Public Sector Productivity which aims to increase productivity and decrease corruption in the public sector.

We evaluated the economic impact of the Revival Policy for Public Sector Productivity utilizing a recursive dynamic Computable General Equilibrium (CGE) model calibrated to a Mongolian SAM for 2018. We extended the PEP-1-t model (Decaluwé et al., 2013) with some features and variables for our analysis. The extensions include the wage equation, uniform and sector specific TFPs, separation of public investment from total investment, and corruption flow.

We run 4 simulations: a BAU scenario and three policy simulations. The BAU scenario reflects the balanced growth path of the Mongolian economy for the next 10 years. In alternative scenario 1, we analyzed the effect of productivity growth in public services. In alternative scenario 2, we evaluated the impact of decreased corruption on the economy. In the final scenario, the alternative scenario 3, we analyzed the combined effects of the previous two scenarios. We evaluated the impact of Revival Policy for Public Sector Productivity on the economy by comparing the results of three policy simulations to the BAU scenario.

Overall, the findings of the simulations imply that both the growth in the public sector TFP and decreased corruption have positive impact on the economy. The public sector efficiency improves in all policy scenarios as the labor shifts from the public sector to the private sector while the production of the public sector increases. The combined effect of the increased productivity in public sector and decreased corruption is positive. For instance, real GDP is 3 percent higher than BAU by 2028. However, due to a combined effect of decreased wage and decreased corruption income, household income decreases. Household disposable income also decreases but by a smaller amount thanks to decreased offshore. This translates into decreased private consumption and savings. On the other hand, real household income increases due to decreased consumer prices. Nominal wage decreases due to the labor movement across sectors. Even if direct tax income decreases, government revenue increases as

production and product taxes increase, and consequently government savings also increases. Despite the decreased private savings, total investment increases thanks to increased government savings.

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