The Right Tax? Macroeconomic and Industry Impacts of Proposed U.S. Tax Reform

Douglas S. Meade

25th International Input-Output Conference

June 19 – 23, 2017

Atlantic City

The Right Tax? Macroeconomic and Industry Impacts of Proposed U.S. Tax Reform

DOUGLAS S. MEADE*

Abstract *On June 24, 2016, House Republicans released a 35-page report on tax reform that would lower the corporate tax rate to 20 percent, provide full expensing for business investments, eliminate the deduction for net business interest expense, eliminate most tax preferences, and exempt active foreign business income under a 'territorial' system. The plan also includes border adjustments that would exempt export receipts and deny a deduction for import costs, following a destination-based approach to tax jurisdiction. Overall, the "Blueprint" is a type of destination-based business cash flow tax (DBCFT). In addition, the proposed reform allows for immediate expensing of investments, unless the investment components were imported. The proposed tax system is expected to have wide-ranging and varying effects on prices, real wages and the exchange rate. This paper presents an analysis of a simplified version of the business tax elements of the plan using the Inforum Lift macroeconomic interindustry model. We investigate impacts on sectoral production and employment, and key macroeconomic variables and offer some suggestions for analysis of similar plans which are likely to be proposed in the near future.*

1 Background

On June 24, 2016, House Republicans released a 35-page report on tax reform that proposed to lower the corporate tax rate to 20 percent, provide full expensing for business investments, eliminate the deduction for net business interest expense, eliminate most tax preferences, and exempt active foreign business income under a 'territorial' system. The plan also includes border adjustments that would exempt export receipts and deny a deduction for import costs, following a destination-based approach to tax jurisdiction. Overall, the "Blueprint" is a type of destination-based business cash flow tax.[1]

This study uses a dynamic interindustry macroeconomic model called *Lift* that embodies the potential responses of the economy by sector to the assumed changes in the Blueprint. The *Lift* model was designed as a tool for understanding dynamic effects of policy, technology and trade within the interdependent economy.

Lift is dynamic, so it is a long-term macroeconomic forecasting model. It includes most variables in the national accounts, in addition to financial, labor and demographic variables. Thus, in this sense, it is like other models such as that of IHS Global Insight, Macroeconomic Advisors, or Moody's Analytics.

Lift, however, is also an interindustry model, with detailed information on the relationships between industries, as well as the sales to consumers, investment, government and the rest of the world. More specifically, the general structure of *Lift* includes econometric equations for final demands, employment and value added, linked through an input-output (IO) framework at the core of the model. The IO structure is crucial to understanding how demand or price effects on

* Inforum, University of Maryland, 4511 Knox Rd. #301, College Park, MD 20740. Correspondence: meade@econ.umd.edu. Website: http://www.inforum.umd.edu.

[1] For more detail on the Blueprint, see Ryan (2016). The Blueprint also would reform the taxation of individual wage and investment income. This focus of this study is on the proposed changes in the taxation of business.

one industry cascade to other related or dependent industries. Personal and disposable income are derived from value added projections which are consistent with production and demand.

It is this dual capability—dynamic and interindustry—that makes *Lift* uniquely useful in answering policy questions where benefits and costs to different industries are important, or where the interaction of macroeconomic and industry behavior needs to be understood. The model has been used to explore impacts of tax policies, tariffs and free trade agreements, carbon taxes or cap and trade, infrastructure improvements, electrification of the vehicle fleet, port closures and other disruptions, immigration, defense impacts, health care projections, deficit reduction and many other questions.

No legislation exists yet for the Blueprint, which makes modeling it a challenge. Other studies that have been done recently examine various aspects of the tax and revenue aspects of the plan based on what has been made known so far and making assumptions about other provisions.

This study aims to address the lack of legislative specifics in a different way. In this study, we use *Lift* to model the business tax provisions of the House GOP Blueprint by first converting the Blueprint to what many academics and economists claim is economically the exact same thing. This simplified modeling approach relies on the **economic equivalence** between the business tax provisions of House GOP Blueprint and a plan that:

1. Repeals the corporate income tax and the individual income tax on business income earned by passthrough entities, i.e., sole proprietorships, partnerships, and S-corporations.
2. Adopts a destination-based subtraction method VAT with a wage deduction, taxable at a 20% rate for corporations and taxable at individual rates (with a cap at 25%) for passthrough entities. Losses would be carried forward with interest, but could not offset more than 90 percent of income before loss carryforward. The base of the subtraction method VAT would include net interest income; however, net interest expense would not be deductible. A research credit would be allowed as under present law.
3. Imposes a one-time tax on accumulated deferred foreign earnings at a rate of 8.75 percent to the extent held in cash and equivalents and 3.5 percent otherwise, payable over 8 years.

The simplified modelling approach further reduces the complexity of the analysis by:

1. Treating the 20% subtraction method VAT as equivalent to the combination of (1) a 25% retail sales tax on sales of goods and services to final consumers (including imports and excluding exports), (2) a 20% wage credit for employers, and (3) the current law research credit. The subtraction method VAT is imposed on the price inclusive of tax while a retail sales tax is imposed on the price exclusive of tax; consequently, a 20% tax inclusive tax rate is equivalent to a 25% (20%/(1-0.20)) tax exclusive rate.
2. Treating the individual tax rate applicable to the subtraction method VAT on non-corporate business as the same as for corporate business (i.e., 20%).
3. Assuming that companies with losses under the subtraction method VAT would be able to utilize them immediately.
4. Disregarding the one-time tax on accumulated deferred foreign earnings.

In this study, we develop a baseline for *Lift* that is consistent with the latest CBO Baseline Macroeconomic and Federal budget projections and two new scenarios[2]:

[2] This analysis is performed using comparison of alternate scenarios of possible paths of the U.S. economy from 2017 to 2026, which is also the current projection horizon of the CBO.

1. **Scenario A** - An alternative scenario that includes an economically equivalent version of the business provisions of the House GOP Blueprint with an immediate strengthening of the dollar in real terms, implemented through an immediate increase in wages.
2. **Scenario B** - An alternative scenario that includes an economically equivalent version of the business provisions of the House GOP Blueprint with a lagged strengthening of the dollar in real terms, implemented through a gradual increase in wages. This gradual adjustment could be explained by imperfect information, frictions, and delays in expectation formation, as well as fixed institutional arrangements.

Our assumption that both prices and wages adjust equally to the imposition of the Blueprint (whether immediately or over time) is economically equivalent, in terms of real after-tax business cash flow, to the scenario in which prices and wages remain unchanged but the dollar appreciates instead of the domestic price level. Both types of adjustment have the effect of increasing the dollar price of domestic goods and services relative to imports and exports.[3]

This analysis is ongoing, and we are developing a more complete analysis that explores the actual mechanism of the destination based cash flow tax, for which industry detail and the integrated macroeconomic and input-output accounts play a crucial role. Note that we are not yet considering the personal tax provisions of the plan, which provide tax cuts, and are expected to be stimulatory. Section 2 of the paper explains the business provisions of the plan in more detail. Section 3 describes briefly how the simplified plan was implemented in the *Lift* model. Sections 4 and 5 provide an overview of the macroeconomic and industry impacts revealed through the plan's implementation. Finally, section 6 concludes and discusses the mechanics driving the results.

2 Business Provisions of the House GOP Blueprint

2.1 General Provisions

Under the House Republican plan, the top US corporate income tax rate would be reduced from 35 percent to 20 percent. The corporate alternative minimum tax (AMT) would be repealed under the plan.

The plan moves towards a business cash flow tax by providing full expensing for business investment (in lieu of depreciation and amortization). Full expensing would apply for investments in both tangible property (such as equipment and buildings) and intangible assets (such as intellectual property), but would not apply to land.

The plan eliminates the current deduction for net business interest expense. Instead, businesses would be allowed to deduct interest expenses only against interest income. Taxpayers would be able to carry forward any disallowed net interest expense indefinitely for use as a deduction against future net interest income.

---

[3] See, Alan J. Auerbach, Douglas Holtz-Eakin "The Role of Border Adjustments in International Taxation," American Action Forum, November 28, 2016, available at: https://www.americanactionforum.org/research/14344/; and Alan J. Auerbach and Michael P. Devereux, "Consumption and Cash-Flow Taxes in an International Setting," Oxford University Centre for Business Taxation, May 14, 2014, available at: http://www.bi.edu/InstitutterFiles/Samfunns%C3%B8konomi/Papers/Spring%202014/Auerbach.pdf.

The Blueprint states that the plan generally would eliminate preferential business tax deductions and credits and specifically mentions eliminating the domestic production activities (Section 199) deduction.

The Blueprint is unclear on how inventory would be treated. The report states that the last-in, first-out (LIFO) method of inventory accounting will be retained and that the Ways and Means Committee will continue to evaluate options for a "more effective and efficient" treatment of inventory. However, retention of inventory accounting would represent a deviation from a cash-flow tax system. As such, for modeling purposes, we assume inventory accounting is repealed.

The plan would restrict the deduction for net operating losses ("NOLs") to 90 percent of net taxable income before NOL deduction in any given year, but would allow NOLs to be carried forward indefinitely and to be increased annually for the time value of money. NOL carrybacks would not be permitted.

2.2 Border Adjustment

The Blueprint would move the US tax system toward a destination-based tax by providing a border adjustment that exempts exports and taxes imports. In other words, receipts from exports of goods and services would be exempt from taxation but the cost of imports of goods and services would be nondeductible. For purposes of the border adjustment, it is assumed that foreign-source royalties and service income would be treated as exports under the plan.

2.3 International Taxation

The House GOP Blueprint would move the United States from its current "worldwide" system of taxation to a territorial tax system by allowing a 100-percent exemption for dividends received from foreign subsidiaries. No deduction or credit would be allowed for foreign taxes associated with exempt foreign dividends. The treatment of foreign branch income directly earned by US companies is not specified.

The plan would repeal Subpart F other than the foreign personal holding company income (FPHCI) rules, which would continue to play a role in preventing shifting of "truly passive income" to low-tax jurisdictions. The Blueprint notes that the destination-based approach to taxing cross-border income eliminates the tax incentive to move profits and jobs offshore so that the subpart F rules applicable to active business income are no longer necessary.

In addition to the territorial tax system, the Blueprint calls for a one-time transition tax on all deferred foreign earnings and profits of foreign subsidiaries of US corporations. In particular, under the plan, taxpayers would be deemed to repatriate accumulated not previously taxed foreign earnings. Accumulated foreign earnings would be subject to tax at an 8.75-percent rate to the extent held in cash or cash equivalents and at a 3.5-percent rate otherwise. Taxpayers would be able to pay the resulting tax liability ratably over an eight-year period.

2.4 Transition Rules

While the Blueprint does not specifically provide transition rules, the report states that the Ways and Means Committee will "craft clear rules to serve as an appropriate bridge from the current tax system to the new system."

3 Implementation in the *Lift* Model

3.1 Repeal of the Federal Corporate Income Tax

The *Lift* model includes detail on corporate profits for 66 private industries. NIPA data on corporate tax liabilities by industry are also included in the model. The rate of profits tax to NIPA profits has been calculated for each industry, and is held constant in the baseline for the period of the projection. Total domestic corporate profits tax liabilities were $553.8 billion in 2015, with $455.1 billion of federal, $60.3 billion of state and local, and $38.4 billion of corporate tax liabilities to rest of the world (ROW).

However, within this total figure of $455.1 billion, $110.4 billion are from the Federal Reserve, and though classified by the NIPA as 'corporate tax', they are in fact payments from the Federal Reserve into Federal receipts. These payments are not part of the federal corporate tax repeal.

In the Tax Plan scenarios, the rate of federal corporate (non-Federal Reserve) income tax is set to zero starting in 2017, but state and local and ROW corporate taxes, and Federal Reserve are left intact.

3.2 Imposition of a 20 Percent Tax-Inclusive National Sales Tax

To perform this step, estimates of retail sales and retail sales taxes have been developed for the four retail industries in the *Lift* model, based on Census Bureau Annual Retail Trade Survey (ARTS) data.

Retail sales are related to retail output. Note that output for both wholesale and retail trade in the model is measured as the gross margin of the trade industry. We assume that the margin ratio of the industry is constant in the forecast period. Current law state and local retail sales taxes are then related to retail sales, assuming the average rates holding in the last historical period. In 2014, which is the last year of data in the ARTS, total retail sales are $4,636 billion and total retail sales taxes are $162.5 billion, which implies an average sales tax rate of about 3.5 percent. Of course, these totals include many commodities not currently subject to retail tax, such as food.

We next impose a 20 percent (tax-inclusive) national retail sales tax (which is equivalent to a 25 percent tax-exclusive rate on baseline retail sales). Therefore, under the Blueprint, there would be two kinds of retail sales taxes: baseline state and local retail sales tax, and a new national retail sales tax. As an example, if the baseline retail sales is equal to $1000 and if the average state and local retail sales tax rate is 8 percent, then the baseline state and local retail sales tax would be $80. The new national retail sales tax would be $250. So the impact of the national sale tax on TOPI (taxes on production and imports) is an increase of $250. Of course, this assumes there is no change in retail sales under the Blueprint. However, if the tax plan dynamically expands the economy, then the level of retail sales under the Blueprint would be higher compared to the baseline line. As a result, the corresponding retail sales tax (both national and state and local) would be larger as well.

As this is modeled as a national retail sales tax, the additional revenues are specified to accrue to the Federal government. The tax increase is an increase in TOPI in the retail trade sectors. This has the effect of raising total value added in the retail sectors, and therefore the "price" of retail services. This price can be thought of as proportional to the amount of gross margin and commodity tax that a consumer must pay for the retail services of providing a certain bundle of goods and services. The result is that the average price of consumption rises. This is the deflator used to derive real disposable income, so real disposable income and total real consumption will fall, all else constant.

Sales taxes are also increased in other personal consumption categories not handled through retail trade. To implement these taxes, we first determine which industries are providing these goods and services, and then increase indirect taxes[4] in the Other retail row of the consumption bridge matrix enough to impose an increase of sales tax of 25% in each personal consumption category.[5]

Note that the imposition of the national sales tax affects the consumer prices only, not the producer prices, except in the retail sectors. However, the aggregate GDP deflator does rise, as TOPI is included in nominal GDP[6].

3.3 Implementation of a Wage Credit

The sales tax described above results in a rise in the personal consumption deflator. In both alternative scenarios, we assume that wage rates will adjust to the new price level, preserving the level of real wages. A 20 percent wage credit will be paid to firms, calculated simply as 20 percent of labor compensation. The wage credit will be paid by the Federal government to the business sector.

In the first alternative scenario (Scenario A), we assumed that wages would adjust immediately to the higher level of consumption prices. In the second alternative scenario (Scenario B), we assumed that they adjust gradually over a five-year period.

The wage credit is in effect a subsidy, that by itself would have the effect of reducing total industry value added and therefore the industry price. However, as labor compensation has increased as well, we have adjusted gross operating surplus so that total value added for each industry is unaffected. The cost of the wage credit is borne by the Federal government, as with a traditional subsidy.

3.4 Treatment of the R&D Tax Credit

Estimates of nominal research and development investment by industry are taken from the BEA *Fixed Assets* database, which includes investment by industry by type of asset, for equipment, structures and intellectual property. Data on the R&D tax credit taken by industry were obtained from tabulations from the IRS Statistics of Income (SOI) data. An equation for aggregate R&D investment was used to move the industry-level R&D. The tax credit rate was multiplied by this R&D figure by industry to estimate a projected R&D credit by industry. To implement the preservation of the current law R&D tax credit, it is also treated as a subsidy.

3.5 Removal of Passthrough Income Tax

Passthrough income includes income reported on IRS Schedules C, E and F. This is non-corporate income of partnerships, sole proprietorships and S-corporations. Although the NIPA provides historical estimates of proprietor income, they do not explicitly show the tax rate on this portion of personal income. In order to estimate the effect of the removal of this tax, we used the IRS Statistics of Income (SOI) data to derive the tax rates on passthrough and non-passthrough

---

[4] This is called "Taxes on Production and Imports (TOPI)" in the National Income and Product Accounts (NIPA).

[5] Several consumer categories, such as owner-occupied housing, did not have the tax imposed. Further details on the mechanics of implementing the sales tax are described in Appendix C.

[6] Viewed from the income side accounts, GDP can be formed as the sum of labor compensation, TOPI less subsidies, and gross operating surplus, which includes corporate profits, proprietors' income, depreciation, net interest and other categories.

personal income. These rates were then adjusted to be consistent with the personal federal income tax from NIPA used used in the *Lift* model.

3.6 Combination of the Policy Elements

The Simplified Blueprint scenario was built up in steps, by adding each one of the policy elements in the *Lift* model. The federal corporate tax was removed first. The national sales tax was implemented next. This sales tax increase leads to an increase in the consumption deflator. We explored two alternative scenarios with different responses of wages. In both scenarios, the wage credit is calculated as 20 percent of total labor compensation. The wage credit is modeled as a subsidy to each industry, and profits are assumed to change so that there is a zero net effect on value added. The R&D credit was implemented next, and finally the removal of the passthrough income tax.

3.7 Estimated Effects on Investment

The estimated effects on investment have been derived using the cost of capital formula described in the Appendix section E.9. On average, the user cost of equipment capital falls by about 7.5 percent from the baseline. Assuming a unitary elasticity of capital with respect to user cost, the long-run optimal stock would also rise by 7.5 percent. We have modeled this by letting aggregate equipment investment rise by 7.5 percent relative to the baseline. The user cost of non-residential structures is estimated to fall by about 13.2 percent. With a unitary elasticity, the net investment portion of non-residential structures will rise by 13.2 percent.

Of course, dynamic interactions in the model result in total fixed investment being below the baseline at the start of the projection, and above the statically calculated increase by 2026, due to changes in personal income, personal consumption, government budget, and other influences.

4 Macroeconomic Impacts

Each of the main elements in the simplified modeling approach described above was first run independently in the *Lift* model. First, the effect of only the repeal of the federal corporate income tax was implemented, next the imposition of the national retail sales tax, and so on. This step of analysis is not static, as the model was allowed to respond dynamically to the impacts. For example, by repealing the federal corporate income tax, the federal deficit goes up, financing requirements rise, interest rates rise, and this chokes back investment. However, in this first stage, the elements were not allowed to interact.

In the next step, the elements were combined, and the model was run to determine the impacts on GDP, the price level, the federal deficit, the unemployment rate and other macroeconomic variables. As described above, two alternate scenarios were run. The first, Scenario A, allows for immediate and full adjustment of nominal wages to the consumer price increase caused by the increase in sales taxes. The second scenario (B) assumes that wages adjust over a five year period.

Table 1 presents major aggregates of the model for selected years over the projection period 2017 to 2026. For each variable, the value in the CBO Baseline is shown in the first line, the second line represents the value of Scenario A, with immediate wage adjustment. The third line shows the value of Scenario B, with gradual wage adjustment. Table 2 presents the same information, but this time lines 2 and 3 for each variable are shown as differences from the baseline.

The top part of the tables summarizes the aggregate effects of each of the four policy elements. The line for the Federal corporate tax shows that according to the NIPA definition, there is still some corporate tax remaining, which is that paid by the Federal Reserve. The biggest increase is

that of total indirect taxes, which represents the additional sales taxes levied on consumer goods and services. The wage credit line reflects the different assumed paths of wage adjustment.

The second section of the tables shows nominal GDP, selected components of real GDP in 2009 dollars, the federal budget deficit and the average federal personal income tax rate. Real GDP declines from the base in both alternate scenarios in 2017 and 2018, more drastically in Scenario B. This is driven primarily by the decline in real personal consumption expenditures. Investment, which actually is higher than the base in both scenarios in 2017, falls relative to the base in 2018, in response to lower output by industry.

The net effect of the various policy elements on the federal budget deficit is positive in both scenarios. By 2026, the budget deficit is lower by more than $500 billion. This is the net effect of a large increase in indirect (sales) taxes, combined with a reduction in corporate taxes, a wage credit (subsidy) and a reduction in the personal income tax rate. The personal income tax rate reduction we have calculated includes only the reduction on taxes on passthrough income. Note that we have not modeled the changes to the personal income tax schedule in the House Blueprint.

The third section of Table 2 shows the impact on prices. The personal consumption deflator increases in both alternative scenarios by .23 in 2017, and .27 by 2026, an average increase of between 20 and 21 percent. The GDP deflator also increases, due to the increase in Taxes on Production and Imports (TOPI) in the retail trade sectors, rising by .16 in 2017 and up to .19 by 2026 in Scenario A. The change in the deflator in Scenario B is similar, but slightly higher by 2021. The aggregate imports deflators remains unchanged, whereas the aggregate exports deflator changes slightly, due to small changes in the mix of exports.

The last section of the table shows the impacts on jobs and the aggregate unemployment rate. The shock to real income, personal consumption and GDP is reflected in reductions in output across many sectors. Jobs by industry are closely related to output movements, through the productivity and average hours worked equations. In both alternate scenarios, unemployment reaches its peak in 2018, increasing to 6.2 percent in Scenario A and to 10.8 percent in Scenario B.

Figures 1 to 6 show comparisons for selected variables between the base (red), Scenario A (blue) and Scenario B (green). Figure 2.1 shows the extent of the increase in the personal consumption deflator. The imposition of the sales tax occurs fully in 2017, with no transition period. Firms are provided the wage credit based on total labor compensation paid in each industry.

Figure 1. Personal Consumption Deflator

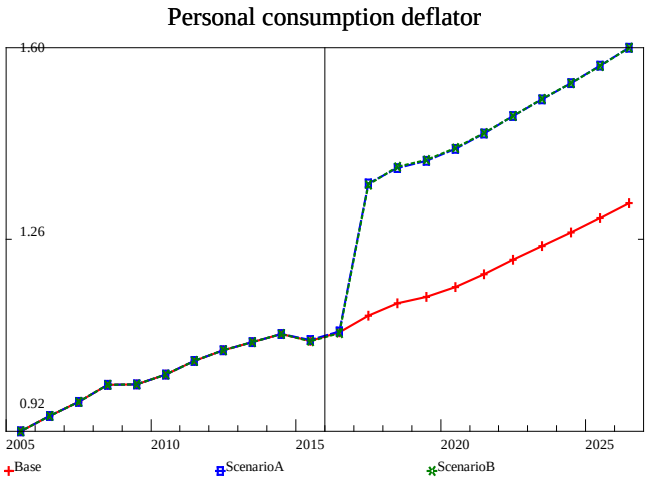
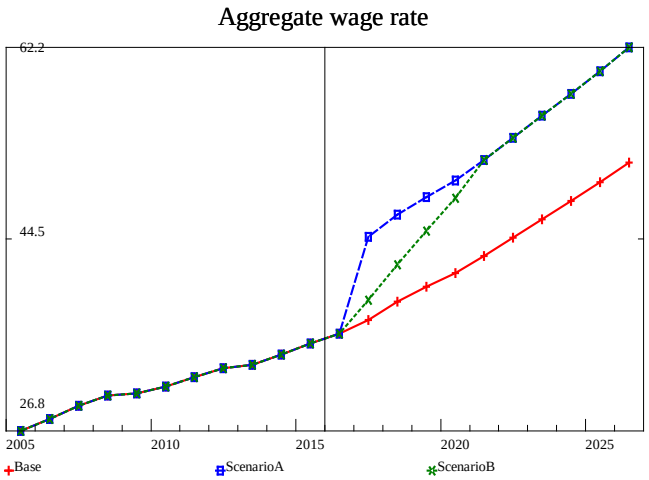


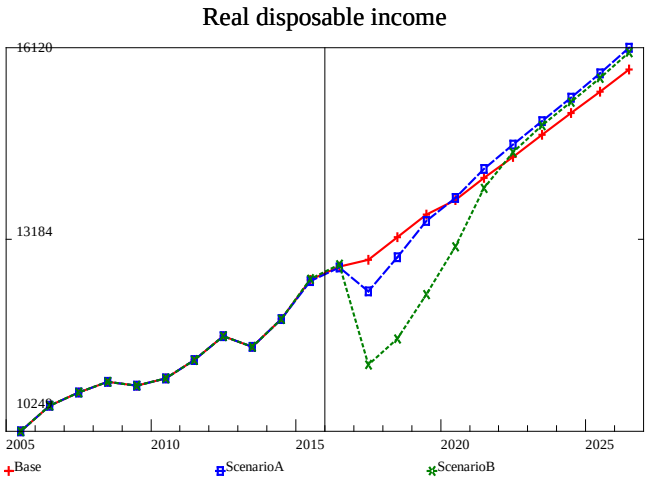
Figure 2 compares the path of the aggregate wage level in the base and the two alternate scenarios. In Scenario B, wages have adjusted to the amount of the personal consumption price increase by 2021.

Figure 2. Aggregate private wage (total compensation/total hours)



Personal income is the sum of labor compensation, proprietors' income, dividends, rental income, interest income and government social benefits. Disposable income is personal income less taxes. Real disposable income is deflated by the personal consumption expenditures deflator (Figure 1). Figure 3 shows the result of the combined assumptions on real disposable personal income. Note that the House Blueprint significantly increases business cash flow and the payout of dividends, and reduces the taxes on pass-through income.

Figure 3. Real disposable income



In Scenario A, wages have been adjusted to rise by the amount of the consumption price increase. However, other components of personal income, such as net interest, rental income and government social benefits have not been assumed to rise with the increase in price. Therefore, these components of personal income fall in real terms (after dividing by the increased consumption deflator). Overall, real personal income and real disposable income fall in 2017 and 2018 relative to Scenario A, but not nearly as much as the case (Scenario B) where wages adjust gradually.

Real personal consumption, roughly speaking is calculated as real disposable income less savings. We have assumed no changes in the average savings rate compared to the baseline, so the pattern of consumption is similar to that of real disposable income (figure 4).

Figure 4. Personal consumption expenditures

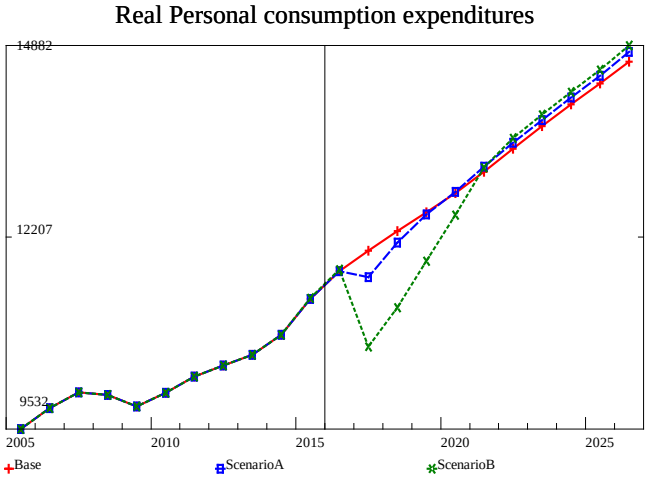


Figure 5 shows the resulting impacts on GDP. Personal consumption is a major part of GDP, but not all of it. Furthermore, several provisions of the Blueprint have stimulated investment activity for equipment and non-residential structures.

Figure 5. GDP

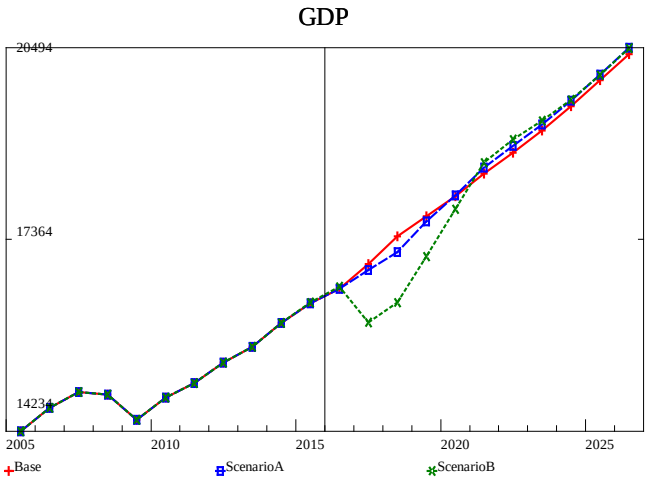
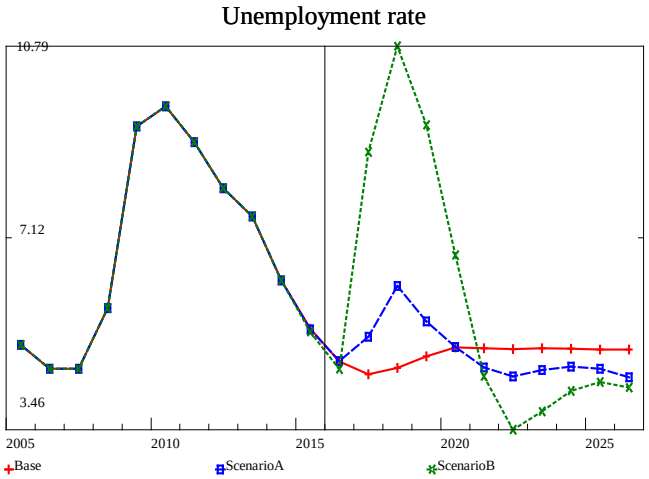


Figure 2.6. The unemployment rate



Finally, figure 6 shows the result for unemployment. Figures 3 through 6 indicate an economy that is stronger than the base case after 2020. This is partly due to the stimulus of investment and increased corporate cash flow (increased dividends). It is also a function of the model reacting to the previous period of below normal activity.

5 Industry Impacts

As for industry-by-industry conclusions, most industries experience job contraction relative to the baseline scenario. Several of the hardest hit are in the healthcare space—hospitals, ambulatory health services, and nursing and residential care. In Scenario A, these sectors experience peak job losses in 2018 of 5-6%. In Scenario B, job losses in these sectors increase to 15-20% in 2018. In addition to healthcare, the accommodations sector also fares poorly under the tax with employment decreases of 15% in Scenario A and 20% in Scenario B. Employment changes for these sectors, in large part, can be traced to decreased consumption of these services stemming from higher costs because of the modeled tax.

Although most industries experience job losses, employment in a handful of industries does increase. Support activities for mining experience significant job employment expansion (5% in Scenario A, 16% in Scenario B) due to increased investment in oil and gas drilling. Apparel and leather also experience job increases (9% in Scenario A, 15% in Scenario B). For this sector, while consumption decreases, output increases due to inventory build-ups.

The impacts on industry output and employment in *Lift* are a combination of impacts stemming from differences in personal consumption, equipment investment, construction, government and trade. Each of these major final demand components has a different distribution of demand by industry. For example, personal consumption includes consumer goods and services, and a relatively high proportion of imports. Equipment investment drives demand for durable goods, particularly industrial equipment, transportation equipment, communication equipment and computers. Structures investment drives demand for construction materials, such as steel, lumber, gypsum, asphalt and concrete.

In Scenario B, with the gradual wage adjustment, the shock to output and employment is much larger, with the maximum employment reduction occurring in 2018. Table 3 shows the declines in output by industry in 2018 in this scenario, ranked with the largest declines at the top. The largest decrease in output is Hospitals (-185.2 million). A few industries actually have more employment than in the base case, as shown in Table 4. The largest increase is in Mining support activities (+27 million).

The personal consumption equations in the *Lift* model are a system of equations for 83 personal consumption categories, which react to changes in real income, own-price and relative prices of other goods and services. This are linked to the commodity sectors in *Lift* through a matrix called the personal consumption bridge.

Table 5 shows the industries with the largest declines in employment in 2018. Note that the employment changes for any sector can be traced to the changes in output (production), which are in turn related to changes in the sources of demand, such as personal consumption, equipment and structures investment, and net trade. The relationship between employment and output is determined by the average hours worked per year per employee in each industry, and the labor productivity (output/hours worked). Due to different ratios of employment to output by industry, the industries with the largest output changes may not be the industries with the largest employment changes. Furthermore, both the average hours and the labor productivity functions also embody a cyclical response, so output and employment don't move exactly proportionately.

6 Conclusions and Next Steps

This analysis, while simplified, has been useful in attempting to quantify the potential effects of the Blueprint on both macroeconomic responses and industry-by-industry behavior.

As for macroeconomic response, Scenario A creates a near-term increase in unemployment, returning to the CBO forecast in 2020 and then staying marginally below the forecast through 2026. Scenario B creates a dramatic spike in unemployment to levels above post financial crisis highs in 2010, falling significantly below the CBO forecast in 2022, and then rising to a level close to Scenario A at the end of the projection.

Despite the adjustment in wages in Scenario A, there is a shock to employment in the initial year (2017). This is because personal and disposable income, adjusted for inflation, are lower than the base. There are other components of personal income, such as dividends, proprietors' income, rental and interest income, and government social benefits which are not fully adjusting to the

sales-tax induced price increases. By the end of the scenario total jobs have increased relative to the base, partly due to increases in equipment and nonresidential structures investment.

If wages were to fully adjust, as in Scenario A, the shock from the price increase could be significantly reduced. A more gradual adjustment such as in Scenario B would lead to a larger shock to income, personal consumption and GDP. In either case, it is not clear how other components of personal income could be expected to adjust to the price increase. For example, several categories of social benefits may benefit from cost of living adjustments, but it is unlikely that components such as rental income, personal interest income or dividends would necessarily adjust.

The manner in which we implemented the tax increase led to the result that consumer prices increased, but domestic producer prices did not. Therefore, in the two scenarios that we explored, there was not a large impact on the prices of tradeable goods, which means that the impact on exports was relatively small. Changes in imports followed the general changes in demand, falling relative to the base when personal consumption fell, but being slightly larger by the end of the simulation.

In both of the alternative scenarios, the economy eventually recovers from the shock, and moves to return to the long-run growth path. The alternatives overshoot the base slightly, so that GDP is higher, and unemployment lower than the base by the end of the simulation. Additional stimulus from the increase in dividends is partly responsible for this, as well as the fact that equipment and non-residential investment have increased.

The next step of this analysis will be to construct variables for both corporate and non-corporate tax base for the destination based cash flow tax, and estimate its impact on prices by industry. Note that this effect is conditional on what is assumed about the response of the trade-weighted dollar exchange rate to the new tax regime. Auerbach and others[7] have argued that the dollar will naturally appreciate by 20 percent in the presence of a 20% border tax on imports and an exclusion on exported goods and services. While theoretically attractive, such a proposition has not been verified empirically, so we will test the impacts both with and without the exchange rate adjustment, as well as model the effects of a more gradual adjustment. We expect the results to be similar at the macro level to the sales tax / wage-credit mechanism explored in this paper, but the industry impacts are expected to differ significantly.

[7] Auerbach and Holtz-Eakin (2016), Auerback and Devereux (2014).

References

Almon, Clopper (2011) *The Craft of Economic Modeling Part III: Multisectoral Models*, Fifth Edition, accessed at: http://www.inforum.umd.edu/papers/TheCraft.html

Alan J. Auerbach, Douglas Holtz-Eakin (2016) "The Role of Border Adjustments in International Taxation," American Action Forum, November 28, available at: https://www.americanactionforum.org/research/14344/.

Alan J. Auerbach and Michael P. Devereux (2014), "Consumption and Cash-Flow Taxes in an International Setting," Oxford University Centre for Business Taxation, May 14, available at: http://www.bi.edu/InstitutterFiles/Samfunns%C3%B8konomi/Papers/Spring%202014/Auerbach.pdf.

Bureau of Economic Analysis (2009) *Concepts and Methods of the U.S. Input-Output Accounts*, Accessed at: http://www.bea.gov/papers/pdf/IOmanual_092906.pdf.

Bureau of Economic Analysis (2016) *Concepts and Methods of the U.S. National Income and Product Accounts*, Accessed at: http://www.bea.gov/national/pdf/all-chapters.pdf.

Burman, Leonard, James Nunns, Benjamin Page, Jeffrey Rohaly and Joseph Rosenberg (2017) "An Analysis of the House GOP Tax Plan", *Columbia Journal of Tax Law*, 8:257, 258-294.

Congressional Budget Office (2016a) *The Budget and Economic Outlook: 2016 to 2026*, Washington, DC: Congressional Budget Office. Accessed at https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51129-2016Outlook.pdf.

_____ (2016b) *The 2016 Long-Term Budget Outlook*, Washington, DC: Congressional Budget Office. Accessed at: https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51580-LTBO-2.pdf.

McCarthy, Margaret Buckler, "LIFT: Inforum's Model of the U.S. Economy", *Economic Systems Research*, 3(1), 1991, 15-36.

Martin, Will (2017) "Trade and Economic Impacts of Destination-Based Corporate Taxes", IFPRI Discussion Paper 01606, February, Accessed at: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/131065/filename/131276.pdf

Meade, Douglas (2013b) *The Inforum LIFT Model: Technical Documentation*, November.

_____ (2016) *IdLift Users' Guide: Version 3.55*, October, IERF, Inc., College Park, MD.

Miller, Ronald E. and Peter D. Blair (2009) *Input-Output Analysis: Foundations and Extensions*, 2nd edition, Cambridge University Press, Cambridge, UK.

Nunns, Jim, Len Burman, Ben Page, Jeff Rohaly, and Joe Rosenberg (2016) *An Analysis of the House GOP Tax Plan*, Tax Policy Center, Urban Institute and Brookings Institution, Accessed at: http://www.taxpolicycenter.org/publications/analysis-house-gop-tax-plan/full.

Pomerleau, Kyle (2016) *Details and Analysis of the 2016 House Republican Tax Reform Plan*, Tax Foundation, July, Accessed at: http://taxfoundation.org/article/details-and-analysis-2016-house-republican-tax-reform-plan.

Ryan, Paul (2016) *A Better Way: Our Vision for a Confident America*, Accessed at: https://abetterway.speaker.gov/_assets/pdf/ABetterWay-Tax-PolicyPaper.pdf.

Table 1. Summary of Macroeconomic Impacts of House GOP Blueprint (Levels)
(Dollar amounts in billions)

Line 1: CBO Baseline
Line 2: Scenario A - Instantaneous Wage Adjustment
Line 3: Scenario B - Gradual Wage Adjustment

	2017	2018	2020	2023	2026
Policy Change (Billions of Dollars)					
Federal Corporate Tax	383	383	369	407	491
	76	72	74	79	94
	76	72	74	79	94
Total Indirect Tax	1,362	1,426	1,512	1,701	1,920
	4,179	4,363	4,670	5,304	5,988
	4,101	4,289	4,646	5,334	6,016
Wage Credit	0	0	0	0	0
	2,038	2,130	2,330	2,662	3,036
	1,692	1,825	2,211	2,685	3,041
R&D Credit	0	0	0	0	0
	12	12	13	13	13
	12	12	12	14	13
Federal Compensation	445	464	500	565	639
	537	560	603	683	771
	467	505	583	683	771
Macro Aggregates					
Gross Domestic Product (Billions of Dollars)	19,292	20,172	21,323	23,944	26,996
	21,960	22,809	24,462	27,615	31,166
	20,657	21,776	24,142	28,050	31,528
Real GDP (Billions of 2009$)	16,961	17,413	18,067	19,140	20,384
	16,865	17,159	18,080	19,238	20,494
	16,004	16,337	17,856	19,298	20,487
Real Exports (Billions of 2009$)	2,230	2,290	2,437	2,638	2,877
	2,229	2,285	2,429	2,626	2,860
	2,238	2,302	2,457	2,596	2,788

Table 1 (continued).

	2017	2018	2020	2023	2026
Real Imports (Billions of 2009$)	3,076	3,026	3,245	3,566	3,725
	2,998	2,982	3,243	3,577	3,738
	2,766	2,879	3,201	3,614	3,792
Real Personal Consumption (Billions of 2009$)	12,016	12,288	12,817	13,754	14,651
	11,647	12,128	12,839	13,834	14,787
	10,680	11,228	12,516	13,914	14,882
Gross Private Fixed Investment (Billions of 2009$)	2,889	2,944	3,162	3,402	3,635
	3,261	2,830	3,194	3,486	3,689
	3,278	2,792	3,238	3,542	3,678
Federal Budget Deficit (Billions of Dollars)	-786	-777	-952	-1,205	-1,506
	-618	-577	-670	-775	-993
	-553	-573	-691	-762	-985
Federal Personal Income Tax Rate (Percent)	13.0	13.3	13.8	14.0	14.5
	9.9	10.1	10.4	10.6	11.0
	9.9	10.1	10.4	10.6	11.0
Prices (= 1.0 in 2009)					
Personal Consumption Deflator	1.12	1.14	1.17	1.24	1.32
	1.35	1.38	1.42	1.50	1.60
	1.35	1.38	1.42	1.50	1.59
GDP Deflator	1.14	1.16	1.18	1.25	1.33
	1.30	1.33	1.35	1.43	1.52
	1.28	1.33	1.35	1.45	1.54
Exports Deflator	1.26	1.27	1.30	1.38	1.47
	1.26	1.27	1.30	1.39	1.48
	1.28	1.28	1.34	1.55	1.77
Imports Deflator	1.17	1.19	1.22	1.28	1.34
	1.17	1.19	1.22	1.27	1.34
	1.17	1.19	1.22	1.27	1.34
Total Employment (Thousands)	157,379	158,743	159,810	162,146	165,481
	156,234	156,219	159,804	162,824	166,370
	150,576	148,836	156,956	164,123	166,697
Unemployment Rate (Percent)	4.5	4.6	5.0	5.0	5.0
	5.2	6.2	5.0	4.6	4.5
	8.8	10.8	6.8	3.8	4.3

Table 2. Summary of Macroeconomic Impacts of House GOP Blueprint (Differences)
(Dollar amounts in billions)

Line 1: CBO Baseline
Line 2: Scenario A - Instantaneous Wage Adjustment
Line 3: Scenario B - Gradual Wage Adjustment
Lines 2 and 3 are shown as differences from the Baseline

	2017	2018	2020	2023	2026
Policy Change (Billions of Dollars)					
Federal Corporate Tax	383	383	369	407	491
	-307	-311	-295	-328	-397
	-307	-311	-295	-328	-397
Total Indirect Tax	1,362	1,426	1,512	1,701	1,920
	2,817	2,936	3,157	3,603	4,069
	2,739	2,863	3,133	3,633	4,096
Wage Credit	0	0	0	0	0
	2,038	2,130	2,330	2,662	3,036
	1,692	1,825	2,211	2,685	3,041
R&D Credit	0	0	0	0	0
	12	12	13	13	13
	12	12	12	14	13
Federal Compensation	445	464	500	565	639
	93	97	103	117	132
	22	41	84	117	132
Macro Aggregates					
Gross Domestic Product (Billions of Dollars)	19,292	20,172	21,323	23,944	26,996
	2,668	2,638	3,139	3,671	4,170
	1,365	1,604	2,819	4,106	4,533
Real GDP (Billions of 2009$)	16,961	17,413	18,067	19,140	20,384
	-96	-255	13	97	111
	-957	-1,076	-211	157	103
Real Exports (Billions of 2009$)	2,230	2,290	2,437	2,638	2,877
	-1	-5	-8	-12	-17
	8	11	20	-42	-89

Table 2 (continued).

	2017	2018	2020	2023	2026
Real Imports (Billions of 2009$)	3,076	3,026	3,245	3,566	3,725
	-77	-44	-2	11	13
	-310	-147	-44	48	68
Real Personal Consumption (Billions of 2009$)	12,016	12,288	12,817	13,754	14,651
	-369	-160	22	80	136
	-1,336	-1,061	-301	160	230
Gross Private Fixed Investment (Billions of 2009$)	2,889	2,944	3,162	3,402	3,635
	371	-114	31	84	54
	388	-152	76	140	43
Federal Budget Deficit (Billions of Dollars)	-786	-777	-952	-1,205	-1,506
	167	200	281	430	513
	233	204	261	443	520
Federal Personal Income Tax Rate (Percent)	13.0	13.3	13.8	14.0	14.5
	-3.2	-3.2	-3.4	-3.4	-3.6
	-3.2	-3.2	-3.4	-3.4	-3.6
Prices (= 1.0 in 2009)					
Personal Consumption Deflator	1.12	1.14	1.17	1.24	1.32
	0.23	0.24	0.24	0.26	0.27
	0.23	0.24	0.25	0.26	0.27
GDP Deflator	1.14	1.16	1.18	1.25	1.33
	0.16	0.17	0.17	0.18	0.19
	0.15	0.17	0.17	0.20	0.21
Exports Deflator	1.26	1.27	1.30	1.38	1.47
	0.00	0.00	0.00	0.01	0.01
	0.03	0.01	0.04	0.16	0.30
Imports Deflator	1.17	1.19	1.22	1.28	1.34
	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00
Total Employment (Thousands)	157,379	158,743	159,810	162,146	165,481
	-1,145	-2,524	-6	678	889
	-6,803	-9,907	-2,855	1,977	1,216
Unemployment Rate (Percent)	4.5	4.6	5.0	5.0	5.0
	0.7	1.6	0.0	-0.4	-0.5
	4.2	6.1	1.8	-1.2	-0.7

Table 3. Largest Output Declines in Scenario B Relative to the Base Case, 2018

	Industry	Change in Output, 2018
1	59 Hospitals	-185.2
2	58 Ambulatory health services	-118.6
3	42 Broadcasting	-95.3
4	52 Misc professional, scientific and technical services	-92.7
5	31 Other retail	-77.4
6	46 Insurance carriers	-70.2
7	60 Nursing and residential care	-64.2
8	27 Wholesale trade	-63.0
9	7 Construction	-59.7
10	66 Other services, except government	-57.2

Table 4. Industries with Increase in Output Relative to the Base

	Industry	Change in Output, 2018
1	5 Mining support activities	27.0
2	10 Apparel and leather products	18.8
3	20 Machinery	11.0
4	23 Motor vehicles, parts	6.8
5	18 Primary metals	6.0
6	9 Textile mills	3.0
7	48 Housing services	2.1

Table 5. Largest Employment Declines in Scenario B Relative to the Base Case, 2018

#	Industry	Base	Level	Difference	Percent Difference
1	58 Ambulatory health services	8,008	6,522	-1,487	-18.6
2	60 Nursing and residential care	4,609	3,631	-977	-21.2
3	59 Hospitals	5,517	4,660	-857	-15.5
4	66 Other services, except govt	9,632	8,998	-634	-6.6
5	31 Other retail	8,123	7,559	-564	-6.9
6	65 Food, drinking establishments	11,252	10,704	-548	-4.9
7	61 Social assistance	4,645	4,164	-481	-10.4
8	55 Administrative and support	9,454	8,984	-470	-5.0
9	64 Accommodation	1,954	1,554	-400	-20.5
10	57 Educational services	3,836	3,448	-387	-10.1