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Section 1: Overview of the GMSIM Model

A. Model Inputs

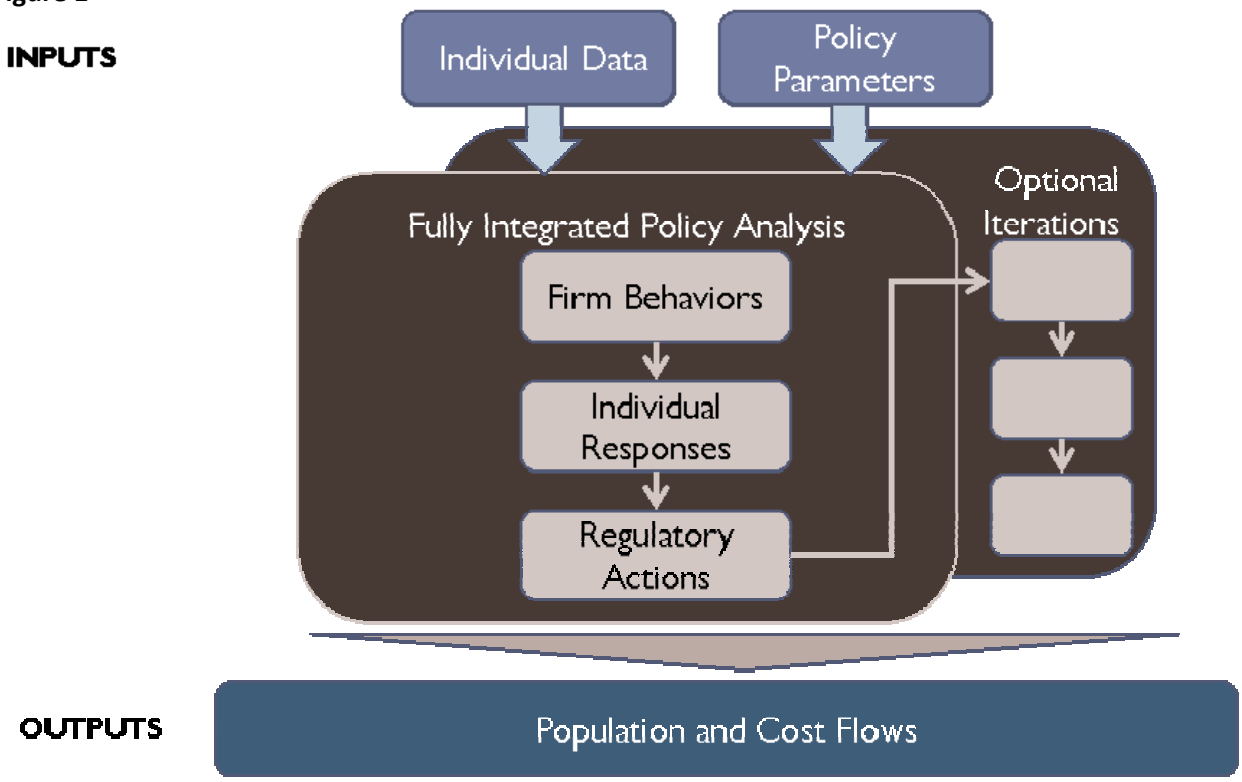
The GMSIM model takes in two sets of inputs, fixed information on individuals and varying information on policy parameters, to predict the effect of health market interventions on the movement of people and dollars within the U.S. healthcare system.

Data on individuals in the United States are derived from 2005 Current Population Survey (CPS) data containing information about 40,000 non-elderly individuals and household units. The demographics and income distribution are updated to 2008. The following sources supplement our data set: 1) Medical Expenditure Panel Survey - Insurance Component (MEPS-IC) for employer-sponsored insurance (ESI) and non-group insurance data, supplemented by state regulatory data; 2) public insurance eligibility and costs on a state-by-state level; 3) Taxsim program managed by Dan Feenberg of NBER; 4) data on firms and wages from Bureau of Labor Statistics (BLS); 5) data on undocumented immigrants provided by Dr. Jeffery Passel of the Pew Hispanic Center. Policy parameters are inputs which inform the change in price and eligibility of various forms of insurance.

B. Fully integrated policy analysis

The GMSIM model is a robust predictor of outcomes in the healthcare system because it is able to consider multiple policy changes in an integrated fashion by converting policy changes to price changes. This integrated approach produces three major advantages over traditional techniques. First, it is able to consider the impact on individuals downstream from the decisions that firms will make. Second, there is no need to artificially "stack" policies and consider one before another, as the model will compute the net effect of all policies on prices. Lastly, the model is disciplined in avoiding knife-edge cases, thereby reducing the effects from arbitrarily drawn distinctions.

Figure 1



The model integrates three key components in determining policy outcomes: the role of firm decisions, the role of individual responses, and the impact of regulatory actions.

Firm responses are frequently the largest mover of people and costs, and therefore careful consideration has been applied to model their behavior as realistically as possible. The model's fundamental starting point is that firm responses are a function of the characteristics of its workers. Therefore, the model uses unique data from the BLS to create "synthetic firms" which simulate the distribution of co-workers for a given individual. Firms change their likelihood to offer insurance, their employee contributions and their total plan spending as a function of average price effects on workers in the firm. For example, a subsidy to non-employer insurance has the effect of lowering a firm's likelihood of offering insurance, raising the employee's contribution to Employer Sponsored Insurance (ESI), and lowering the firm's spending on ESI overall.

Individuals are downstream of firms and respond to a new option set that is dictated by the government's direct policy changes and their firm's reaction to the government's policy change. The policy changes and firm decisions are converted into a series of changes in prices in the insurance market. Individuals then react to these price changes based on their health status, their income, their observed preference for insurance and their available option set of insurance choices.

Regulatory actions are usually applied after firms and individuals make their voluntary decisions. In the case of a mandate or auto-enrollment, we add additional movement beyond an individual's voluntary decision, or in the case of a firewall, we restrict voluntary movement. Regulatory reforms of insurance

markets can also lead to changes in market composition and therefore in market prices. The model is capable of integrating these market dynamics by iterating over several rounds of market prices until an equilibrium is found.

C. Outputs

The model estimates how insurance coverage and spending dollars will change due to the policy changes provided in the input. Baseline ex-ante population distribution and costs are estimated using CPS data. The model then aggregates where people move and why they move, whether it is due to a firm decision (as in the case of a change in ESI offering status) or an individual response. Based on these movements and the original policy's specifications on cost allocation between individuals, governments, and firms, the model determines the changes in costs. Finally, the model assumes that firms pass on all additional costs or savings from the government's policies to workers.

Section 2: Construction of Data set

A. Use of CPS data

The database for this analysis is the observations that can be matched up with both the February 2005 and March 2005 CPS. The March survey contains data on demographic characteristics, employment, income, and health insurance coverage, while the February survey adds information on employer insurance offering. The sample is restricted to those observations representing people who are less than 65 years old and are not covered though Medicare or through military insurance (CHAMPUS).

The data is organized into approximately 40,000 health insurance units. The main goal of this step is to create sets of people who are or could potentially be covered by a single health insurance plan. Spouses are grouped together and children are grouped with their parents. Health insurance dependents are placed in the health insurance unit of the person who holds that plan. Exceptions to the preceding include non-spouse dependents over 24, children earning enough income to file taxes separately, and people covering individuals outside of the household. One person in each household is designated as the primary source of insurance. This is the person who holds a family health insurance plan, or if there is none, to the person most likely to hold family insurance based on their employment and ESI offering status. If an observation has been dropped from the dataset, their contribution to household income and poverty status, etc. is still counted.

We ultimately assign each individual in the data set to one of four insurance types: employer-sponsored insurance, non-group insurance, Medicaid[1] or uninsured. Many individuals report multiple sources of insurance coverage, but GMSIM is designed to allocate individuals ex-ante to a single source of insurance. This is resolved by (a) splitting those who report public insurance and ESI coverage evenly between the two sources and (b) assigning people who report non-group coverage to nongroup only if that is the only coverage they report.

1 To correct for a CPS overcount, childless adults on Medicaid from New York and Massachusetts are weighted down, with childless adults on other forms of insurance or uninsured weighted up to hold constant the childless adults in these states.

The health insurance units in the GMSIM database are calibrated to represent the entire non-elderly population of the U.S. This occurs by adjusting the 2005 CPS weights to represent the 2008 distribution of insurance coverage by poverty level for both adults and children. In addition, the distribution of income is adjusted to match the 2008 income distribution. The income values are adjusted so that each percentile has the same mean income as is the case in the most recent CPS. GMSIM takes its taxable income and marginal tax rate calculations from TAXSIM.

While the model is ultimately estimated on individual observations, it is careful to avoid knife-edge cases by having all movements probabilistically represent the underlying set of individuals represented (in a weighted sense) by that observation. Therefore, ex-post, individuals may have their underlying weights split across different types of insurance. For example, an observation that ex-ante represents 8,000 uninsured individuals may ex-post represent 5,000 uninsured, 2,000 on ESI, and 1,000 on non-group insurance. Given the large weight represented by each observation in the CPS, allowing these probabilistic outcomes avoids distortions from knife-edge outcomes.

One final consideration includes information on employment. Each employed observation is assigned an integer firm size within the category they reported. Individuals who reported being self-employed and did not report that they hire other workers are assigned a value of 1. For other purposes, such as the self-employed tax deduction, all those reporting being self-employed are counted as such.

B. Construction of Synthetic Firms

A key aspect of modeling health insurance policy is appropriately reflecting the decisions of firms, since 90% of private health insurance is provided by employers. Economists model firm decision-making as reflecting the aggregation of worker preferences within the firm. The exact aggregation function is unclear, as reviewed in Gruber (2002); GMSIM assumes that the mean incentive across workers at the firm (e.g. the average subsidy rate for non-group insurance) is what matters for firm decision-making.

The fundamental problem faced by individual-based micro-simulation models is that data on individuals does not reflect the nature of their co-workers, so that it is impossible to exactly compute concepts such as the average price subsidy in a worker's firm. GMSIM addresses this problem by building "synthetic firms" in the CPS, assigning each CPS worker a set of co-workers selected to represent the likely true set of co-workers in that firm. The core of this computation comes from BLS data providing the earnings distribution of co-workers for individuals of any given earnings level, for various firm sizes and regions of the country. Using these data, GMSIM randomly selects 99 individuals in the same firm size/region/health insurance offering cell as a given CPS worker in order to statistically replicate the earnings distribution that the BLS data would predict for that worker. These 99 workers then become the co-workers in a worker's synthetic firm.

C. Imputation of Group and Non-Group Premiums

Information for health insurance premiums and health costs are imputed onto the observations from the CPS. Data on the state-specific mean premiums, as well as the national distribution of premiums, comes from the 2004 MEPS-IC (inflated to $2008 by assuming aggregate premium inflation of 34% since 2004), and are assigned to observations as follows:

- Each individual is assigned a cost index using age/sex/health rating factors provided by the Actuarial Research Corporation (ARC).
- An average of this index is taken within each observation's synthetic firm.
- Firms are then assigned an actuarial value of insurance based on the ranking of average household income within the firm; for large firms, actuarial value varies uniformly from 0.75 to 0.975, centered at .9; for small firms it varies uniformly from 0.7 to 0.95, centered at .85. This actuarial value further multiplies the index.
- The resulting index among firms that offer ESI is then matched up against the distribution of employer premiums from an unpublished Census Bureau file for each firm size to assign an actual premium level.
- Each worker is assigned a single and family premium, which is adjusted on a state-by-state basis using the 2004 MEPS-IC.
- Data from the MEPS-IC on the split of premiums between workers and firms is then used to determine employee contributions for both single and for family plans.
- For firms that do not currently offer ESI, special consideration must be made. The same index of firm health costs is calculated for these firms. These firms are assigned the premium that an offering firm with the same index would have gotten. These imputed premiums are used as hypothetical values for the non-offering firms. For certain parts of the modeling, it is necessary to know how many workers would have taken up the offer of ESI if the firm had been offering ex-ante. It is assumed that firms would have had the same take-up as the median among firms of comparable size.
- Data from the MEPS-IC are used to impute whether the firm has a Section 125 plan that allows for pre-tax payment of employee premium contributions.

Non-group premiums are imputed from the 2005 MEPS-IC, as follows:

- GMSIM's non-group premiums use the distributions of total medical spending by age group and health status among the MEPS sample of ESI insured adults. Those distributions are applied to the observations from the CPS to obtain values for medical costs that vary from low to high within each age group and health status. This produces a distribution of health costs in the CPS data that represents the real distribution, including the high-health-cost tails, which can be a driver of outcomes in some cases.
- This value is assigned to each individual as their "true cost" of insurance. Children get a "true" cost that is 50% of that of a 40-44 year old adult in excellent or very good health.
- To get the non-group premium, a load factor, which has a fixed component and a varying component, is added to the "true cost." The fixed load is equal to 15% of the average unloaded non-group cost of an adult aged 40-44 years old and on non-group ex-ante. The varying load is equal to 30% of the average unloaded non-group cost of the individual's own age group, which are separated into 5 year increments. Children (individuals under 25) are considered one age group.

- Figures are adjusted by state using variation in state ESI premiums, and inflated to $2008.
- A distribution of actuarial values ranging from 0.5 to 0.9 and centered on 0.7 is assigned based on each individual observation's own household income, such that poorer families buy cheaper coverage (lower actuarial values).
- The resulting non-group premium has been benchmarked against results for December 2006 from AHIP, and GMSIM's values match the age-specific means that they provide.

Imputed government spending for public insurance comes from Kaiser Family Foundation data. Spending per enrollee is imputed by state based on age, sex, and disability status.

The final set of imputed numbers used by GMSIM is out of pocket (OOP) costs for the uninsured. Out of pocket health spending for the uninsured varies by age, sex, and health. For the insured, the out of pocket costs are dependent on the actuarial value of the plan covering that individual and the "true cost" for that individual.

Section 3: Policy Options

GMSIM was originally developed to consider the impact of tax subsidies to non-group insurance, but over the past decade has expanded to consider a much wider range of policy options. This section reviews the options that have been considered to date and can readily be incorporated within the existing framework, but additional policy capabilities are constantly being added

- Expansion of public insurance entitlements, targeted to various combinations of demographic characteristics and income categories
- Subsidization of non-group insurance
- Reform of non-group insurance markets, such as a regulated insurance exchange.
- Introduction of and/or subsidization of new "pooling" mechanisms
- Subsidization of ESI at either the employee or employer level
- Reform of the existing tax exclusion for employer-sponsored insurance
- "Pay or Play" options that tax firms based on their spending (or lack thereof) on health insurance.
- Equity assessment, or "free-rider" taxes levied on firms whose employees take-up Medicaid or subsidized non-group insurance.
- Individual mandates or softer "auto-enrollment" options
- Medicaid exchange buy-in which enables those newly eligible for Medicaid to join the exchange and those previously on Medicaid to transfer to the exchange

- "Catastrophic", or "young invincible" high deductible non-group plans, which are evaluated as an alternative to a traditional non-group option or a regulated insurance plan purchased in an exchange.
- Expansion of ESI dependent coverage

Section 4: Firm Reactions

A. General aspects

There are four general aspects of modeling firm reactions in GMSIM.

- Firms react to both "direct" policies which apply to the firm, and "indirect" policies which apply to the workers within the firm. The former category includes employer credits, tax policies or pay or play policies. The latter includes any policy which changes the price of insurance options for individuals, including subsidies to a form of insurance or changes in eligibility for subsidized insurance.

- The reaction to indirect policies is based on the aggregation of the impacts of those policies on workers within the firm. Impacts are computed for each worker in the firm and then averaged to obtain a firmwide incentive.

- Any policy change puts "pressure" on a firm to react along one or more of three dimensions: the decision to offer insurance, the burden of sharing insurance costs between the employer and the employee, and the generosity of the insurance package provided (which affects both the assigned actuarial value of the policy and the cost of the policy). These pressures are added across all policy changes contained within the same run to get "net pressures."

- Firm reactions to these pressures are largely based on two empirical studies. Gruber and Lettau (2004) estimate the impact of changes in the tax price of insurance (the net income tax subsidy to a firm's employees) on a firm's decision to offer insurance and how much to spend on that insurance; the central finding from that paper is that the elasticity of insurance provision with respect to the tax price is -0.69 for firms below 100 employees; -0.2 for firms between 100 and 999 employees; and -0.1 for firms of more than 1000 employees. These elasticities will be referred to as the G-L elasticity and will vary by the company's size. Gruber and McKnight (2005) estimate the impact of tax price changes on how health insurance premiums are shared between employer and employees; their central finding is that each percentage point in tax subsidy to employers leads to roughly 0.3 percent more of the premium being born by employers.

B. Offer pressures

Policies that change insurance markets may impose either direct or indirect pressure on firms that offer insurance ex-ante to drop that insurance, or on firms that do not offer insurance to begin offering. These pressures operate through an offering equation with the following general form:

(% subsidy)*damp-down factor*G-L elasticity

Where the % subsidy is the extent to which the policy subsidizes either some outside option (in which case this is negative) or ESI itself (in which case positive). The damp-down factor is included to capture the substitutability of the subsidized option with ESI; for example, for subsidies to ESI, this factor is always one. The G-L elasticity is described above.

Indirect Changes

For changes that impact employees, such as tax credits for insurance or expansions in public insurance, the model computes the extent to which either ESI or some outside option is subsidized, and then aggregates that for the firm. The subsidization of the outside option accounts for both reductions in its price and differences between that outside option and ESI in the actuarial value of the plans.

Consider for example an expansion of public insurance, whether the insurance is free or the individual buys-in at a set cost. In that case the % subsidy would be computed as follows:

- Compute the percent of family members newly eligible for Medicaid
- The % subsidy rate for public insurance is the percent of the premium that the government will subsidize. If the individual was ex-ante eligible for Medicaid, then they do not face the new buy-in cost if there is one.

Alternatively, if the policy is a subsidy to non-group insurance, then the percent subsidy would be computed for each worker (including and accounting for differences in actuarial values between the non-group option and ESI), and then averaged across the firm to get an average % subsidy.

For policy changes that indirectly compete with ESI, the model accounts for the degree of substitutability through the "damp-down factor". These damp-down factors are:

- 1 if the subsidy goes to ESI or an ESI-like exchange
- 0.84 if the subsidy goes to a reformed non-group market (e.g. no health underwriting)
- 0.66 if the subsidy goes to a non-reformed non-group market
- 0.5 for expansions of public insurance

This ranking reflects the general principle in the model that ESI is the most valuable type of insurance, followed by ESI-like public exchanges, then reformed non-group markets (where individuals can be assured they will not be subject to discrimination based on their health), then unreformed non-group markets, and finally public insurance (which is assumed least preferred due to the stigma of public coverage, consistent with the fact that most of those with private insurance who are eligible for public coverage stay with their private insurance).

Additionally, if there is a mandate policy, it will result in a positive offer pressure. Since individuals will be required to take up a form of insurance if they are uninsured and many will prefer ESI over other insurance types, this will prevent the firm from dropping as much and induce them to offer to more individuals.

Direct Changes

When a firm is directly subsidized, for example through a credit to employers to offer insurance, then there is no damp-down, and the offer pressure is just the % subsidy to the firm from the credit times the G-L elasticity.

If there is a pay or play tax that is imposed on firms that do not provide a certain level of insurance coverage, the offer pressure depends upon the amount of money that the firm will need to pay if they offer ESI relative to the amount of money they need to pay if they do not offer ESI. The general form equation for this offer pressure is

A = Tax Penalty Per Worker if Not Offering
B = Firm's Expected Spending Per Worker if it were to Offer
Offer Pressure Due to Pay or Play = A/max(A, B) x GL Elasticity

B varies with the firm's expected takeup, which is a function of regulatory policies such as auto-enrollments or mandates, as well as with the regulated generosity, such as a mandatory minimum amount that a firm must spend per worker. A, the penalty that is levied if a firm does not offer, can vary with the size of the firm, the tax rate, and the tax base. The pressure to offer increases as the amount of the tax penalty relative to the expected cost of providing ESI increases.

To calculate B for firms that are not currently offering we impute an "expected takeup of ESI" based on the observed takeup of ESI in firms that are comparable and already offering. To this we further make adjustments if there is a mandate or an auto-enrollment, such that the expected takeup matches the assumed mandate or auto-enrollment effectiveness.

If there is an alternative assessment of firms, for example, a tax on firms based on how much the firm's workers are costing the government in Medicaid costs or exchange subsidies, the difference in how much the firm will spend in the offering and non-offering cases is used to calculate the offer pressure.

Indirect drop pressures due to a firewall or vouchers

Policies which subsidize options outside of ESI may restrict the access of those on ESI to the subsidies. The modeling described thus far ignores those restrictions, but GMSIM can also handle the impact of two forms of restrictions.

The first is a "firewall", which does not allow individuals offered ESI to be eligible for the non-ESI subsidies. This will reduce the population eligible for subsidies in a static sense; however, dynamically, it should lead more firms to drop insurance so that their employees can take advantage of these subsidies. To account for this, the model adds to the dropping pressure on firms the implicit demand from workers to switch out of the firm into the newly subsidized product (as they would be able to do without a firewall). This builds on the individual equation for switching out of ESI described below.

The second is a "voucher", which allows individuals offered ESI to take advantage of the outside subsidies, but they must bring their employer contribution with them to offset state costs. With a voucher, the additional drop pressure comes from the following logical sequence: Some employees are not taking up group insurance because it is too expensive; for these people, employers don't need to pay anything ex-ante. A new outside option is available. It is cheaper than ESI for some employees. A voucher is offered so that the employee may take the outside option if they are offered ESI, so now an employee who had previously not taken up group will want to take their employer's contribution to the outside option. This exerts an additional dropping pressure on firms who do not want to pay this additional cost

Reform of the Tax Exclusion of ESI

One policy of particular relevance that can be handled by GMSIM is reform of the tax exclusion of ESI. If the tax exclusion is simply removed, then this operates as an indirect (negative) subsidy to ESI which is equal to the marginal tax rate of the person who is no longer excluded, with a damp-down factor of one since it affects the cost of ESI itself to the individual. If the tax exclusion is capped, then the model assumes that the offering pressure is proportional to how "binding" the cap is, which is defined by dividing the cap by the level of overall (employer and employee) ESI spending ex-ante. So a cap of $10,000 on a policy costing $15,000 provides an offer pressure of 0.33*marginal tax rate, since one-third of the exclusion is removed.

Equity Assessment, or Free Rider Tax

GMSIM can also evaluate the effect of an equity assessment, also known as a free rider tax. This is a fine levied on firms whose employees do not take up ESI and who subsequently receives Medicaid or a subsidy in the non-group market. For each employee, there is an equity assessment cost set for the case where the firm offers ESI and does not offer ESI. These costs are set using the previously computed expected take-ups. These costs are then averaged over the entire firm, and the difference in the averaged costs is used to create an offer pressure. At the end of the model, the employee's ex-post status is used to compute the fines owed by the firm to the government.

C. CONTRIBUTION CHANGES

Contribution changes are a way for firms to change how much workers are required to spend on their ESI, and subsequently, are a way to allocate health related subsidies between health spending and wages. Like offer pressures, contribution changes are additive with respect to the various policy changes that can be made and are based on the average subsidy amount for a firm and vary with the regulatory restrictions placed on those subsidies (such as firewalls or vouchers).

General form equation

The general form equation for a contribution change is:

Firm's Average Equivalent ESI Subsidy Amount x Shifting Factor

The firm's average equivalent ESI subsidy is defined to be "what the subsidy amount translates to if it were given as a group credit." For employer or employee credits this is exactly equal to the subsidy amounts provided, but adjustments need to be made for non-group credits. The shifting factor serves as a way of allocating the new subsidy that is provided to the employee between health spending and wages. If p is the shift factor and an employee is subsidized $X on his health spending, then:

$X *(1-p) = actual subsidies and $X*(p) = wage change if |p|>0

If p>0, firms raise employee contributions, as in the case of an employee credit or non-group credit, and if p<0, firms lower employee contributions, as in the case of an employer credit. For employer credits, p = -30% and for employee credits p = 70%, based on the Gruber and McKnight research.

Non-group subsidy, Medicaid buy-in and regulatory adjustments

The contribution change due to a non-group subsidy involves some adjustments such that the average subsidy amount provided to non-group becomes comparable to a subsidy amount provided to ESI. First, the model computes the subsidy amount relative to what the non-group total plan cost would be in terms of boss share. That is, if $G is the government subsidy, $N is the total cost of the non-group plan, and $B is the boss' share, it calculates B_{delta} = ($G/$N) * $B. Any changes in the actuarial value of non-group are reflected in the subsidy amount as well, and this is multiplied by a damp-down factor to adjust for the riskiness of the outside option (where the exchange is not risky but unreformed non-group is risky).

The contribution change due to a Medicaid buy-in works similar to that of a non-group subsidy. The percent change term from the offer/drop pressure due to a Medicaid policy is multiplied by the firm's average boss share to calculate the equivalent ESI subsidy. This is then multiplied by the Medicaid damp down factor.

Finally, the model embeds information about various regulatory restrictions into the shifting factor because different members of a person's firm may be subject to different regulatory restrictions. The shift factor is 15% in the general case, 0% if there is a firewall and some employees are not allowed to take up the non-group or public credit if they are offered ESI (so there is no incentive for a firm to raise employee contributions), and 30% if there is a voucher (in which case the firm would like to shift as much of the cost to the employee as possible since that is picked by the government on the margin). The shift factor and the adjustments made to the subsidy amount are passed into a firm average to come up with an individual worker's average firm contribution change.

Note that even though each individual person's contribution change varies with the particulars of his/her subsidy and restrictions, each individual will get the firm's average contribution change, which is dependent upon the characteristics of the whole firm. This is because firms are not allowed to differentially shift contributions; therefore, the effects of different regulations affecting different populations are captured by first calculating individual contribution changes and averaging them at the firm level.

Pay or play

A pay or play policy will often require firms to spend up to a certain amount per individual. This affects contribution changes, because it means firms cannot change employee contributions such that the boss share is less than the government required amount. GMSIM deals with this condition by first allowing the rest of the contribution changes to flow through. If the other changes make it such that the boss share ex-post is going to fall below the government required amount, then there is an increase in both employer contributions and insurance generosity (through actuarial value) in equal measure to hit the pay or play target. In other words, the model assumes that any firm that offers insurance in a pay or play world would rather spend enough to hit the target rather than pay some tax.

Employer and employee tax exclusion reform

Employers will also change contribution amounts based on changes in health spending exemptions from taxes. A policy change may remove the tax exclusion of employer spending, employee spending, or both, and removing the employee exclusion only matters for firms offering a Section 125 plan ex-ante. The Section 125 plan enables workers to pay their health insurance pre-tax and the tax rate for the tax

exclusion removal can be capped or adjusted if wanted. In these cases, the model begins by computing the amount of the tax shield that is lost through the reformed exclusion. These changes affect contributions as follows:

- Remove exclusion on ***employer spending only***: employee contributions increase by up to 50% if Section 125 is applied, and up by 30% if there is no Section 125
- Remove exclusion on ***employer and employee spending***: employee contributions are unaffected if Section 125 is applied, and up by 30% if there is no section 125
- Remove exclusion on ***employee spending only***: employee contributions decrease by 70% if Section 125 is applied, and are unaffected if there is no section 125

D. SPENDING CHANGES

Spending changes happen when a firm decides to buy an ESI plan with a different total premium. It is distinct from contribution changes because we do not assume that an increase or decrease in the firm's burden corresponds with a decrease or increase in the worker's burden. For example, a firm may have a total plan worth $8000 ex-ante, where the firm pays $5000 and the worker pays $3000. Ex-post, the firm may decide it wants to reduce the plan's worth to $5000 and additionally shift $1000 of contributions to the worker. Then the firm pays $1000 ($1000 = $8000 - $5000 - $1000) and the individual pays $4000.

Spending changes may reflect a variety of different changes in the plan that is purchased. The simplest case is that a firm may alter the generosity of the plan (and thus its actuarial value). Other options may include buying a plan that has a different network of doctors and hospitals, or shopping around to get a better deal. The model assumes that 50% of the spending changes are due to altered generosity and so the actuarial value is changed proportionally to half of the change in spending. Consider a firm that previously bought a plan at $5000 with an actuarial value of 0.8, and increased spending by $1000. The price increased by 20% but the actuarial value would only increase by 10%, so the new actuarial value would be 0.88.

We assume spending changes happen only in the case of employer or employee credits or in the case of tax policy changes, and are additive similar to contribution changes and offer pressures. The general form equation for the spending change is

Firm's Average Subsidy or Tax Amount x Spending Factor

The spending factor is positive if there is an employer or employee credit (indicating an expansion in the overall generosity of an ESI plan) and negative in the case of a tax exclusion removal (indicating a contraction in the overall generosity of an ESI plan). The spending factor is 20% for an employer credit and 0% for an employee credit. If employer and employee tax exclusions are removed, the spending factor is -70% if there is a Section 125 and -40% otherwise. If only the employer tax exclusion is removed, the spending factor is -20% if there is a Section 125 and -40% if there is not. If only employee tax exclusions are removed, the spending factor is 0% regardless of Section 125 status.

In the case of an employee or employer credit, the firm's average subsidy amount is simply equal to the average amount of subsidy given to all the synthetic coworkers of an individual. In the case of a tax

exclusion removal, the spending factor is scaled by the amount of the firm's average tax shield which is being removed.

Section 5: Individual reactions

A. General Form

The general form equation for all individual takeups is:

Takeup = (Constant + Elasticity x % Price Change x Income Effect)*Income Adjustment

Where:

- Constant is a (often health-related) constant take-up parameter. When the constant is health-related, it is set to a minimum or maximum value for those at the 20th and 80th percentiles of the underlying distribution of the true costs of being uninsured.
- Elasticity is a case-specific elasticity
- % price change is the price change due to the policy which also incorporates changes in actuarial values. The price change always includes a term which compares the actuarial values of the ex-ante and ex-post options, multiplied by a constant for actuarial valuation. The price term also accounts for the fact that individuals may have turned down less expensive options previously, so that the price change is effectively smaller. The basic form of price change is:

  If moving from uninsured to a new alternative:

  [(new price in this alternative – old price in previous best alternative)/ old price in previous best alternative - (new AV in this alternative – old AV in previous best alternative)] –
  [(old price in this alternative - old price in previous best alternative)/old price in previous best alternative – (old AV in this alternative – old AV in previous best alternative)]2

  If moving from a given type of insurance to a new alternative type of insurance:

  [(new price in this alternative - new price in current coverage)/new price in current coverage - (new AV in this alternative – new AV in current coverage)] –
  [(old price in this alternative - old price in current coverage)/old price in current coverage – (old AV in this alternative – old AV current coverage)]

2 The logic in comparing to the old price of the previous best alternative is that, by being uninsured, the individual has revealed their preference not to choose this alternative. For example, consider someone eligible for ESI who sees an equal price decline in both non-group & group. If the model used the new price for group the result would end up with no price change for non-group, and a price change for group. This would assume group dominates, even for a person that revealed not to like it. Note that for moving to/from public, since price is zero always and AV is one always, one can compress the equation to just consider change in price of non-group or group.

- The income effect is included to capture the magnitude of the price change relative to income. Many models consider only percentage price change, but this is misleading if the base on which the percentage change is taken is small. Other models consider only the dollar magnitude of the change, but that is misleading if individuals care about the actual rate of discount implied by the policy. By incorporating both the percentage price change and the income effect term the model accounts for the size of any subsidy relative to both ex-ante prices and income. The form of the income effect is max(1, sqrt(price change)/(0.075*income)). This functional form allows for the fact that as price changes get larger, an additional dollar of price change is less important. The 0.075 multiplier was chosen by introspection to yield a sensible pattern of income effects. The income effect works as follows for particular scenarios:

    If uninsured: dollar income effect of choosing this alternative versus best alternative available ex-ante

    If some other form of insurance: dollar income effect of moving from ex-post form of insurance to the alternative form of insurance—so compare cost (and AV) of new ex-post option to that cost for existing ex-post option. For movement to public insurance, the income effect term incorporates in the savings gained from family members leaving the previous insurance alternative.

    Note that the equations for moving to uninsured & public are the same when the price of ESI or the price of non-group goes up. That is, in both cases the model looks to the internal price change—for ESI or non-group—and does not compare it to anything. This is because, for the uninsured, there nothing to compare to. For public insurance, the actuarial value and price do not change if the individual is ex ante eligible for Medicaid, so they just difference out

- The entire takeup equation is finally multiplied by an income adjustment term such that takeup falls as the remaining cost of insurance relative to income rises: the form of this term is: $(1-(X/\text{income}))^2$, where X is the post-subsidy cost of the new form of insurance. This term accounts for the fact that as income falls, individuals are less likely to take up subsidies which are less than 100%, as disposable income is needed for other expenditures that may be perceived as more urgent (such as food and housing).

Takeup equations are defined for any movement from one type of insurance coverage (uninsured, public, non-group and ESI) to another. In many cases, there are multiple takeup equations for a given movement depending on whether the individual is (a) ex-ante offered ESI, (b) ex-ante eligible for public insurance, or (c) neither. The reason is that individuals who are ex-ante offered ESI or eligible for public insurance, but choose not to pursue those routes to coverage, are revealing a lack of preference for insurance. Therefore, they are modeled as being less responsive to changes in the price of insurance.

For a given run of the model, there may be many competing takeups for an individual across different types of insurance due to different dimensions of the policy. For example, someone who is uninsured may be both newly offered group and has new subsidies to non-group insurance. A guiding principle of the model is to avoid assigning the individual to one or another of these options in a "knife-edge" fashion. However, the fact that there are multiple routes to insurance coverage means that a given individual, and all of the underlying population that they represent, can be

assigned to multiple types of new insurance with some probabilities. To address this issue, the model uses an "overlap" correction which assigns the probability of each option. It is simply the individual's probability of taking up a specific option multiplied by a probability equation that accounts for the mutual dependence of all of the options. In the case of two options, the equation is as follows:

Probability (option 1 or 2) = Pr(option1) + Pr(option2) – Pr(option1)*Pr(option2)

New Takeup = Pr(option 1) x Pr(option 1 or 2)

Consider the following example to calculate the probability of leaving Medicaid. There are 3 different reasons an individual would consider leaving Medicaid: 1) ESI costs are decreasing (in combination with gaining an offer if not offered ESI previously), 2) ESI costs are decreasing and this specific individual has family members on an ESI plan but was previously being ignored, or 3) non-group prices are decreasing. Let's say the probabilities are assigned as follows: Pr(1)=0.5, Pr(2)=0.1, Pr(3)=0.6. The takeup in each scenario would then be:

Pr(1, 2 or 3) = Pr(1) + Pr(2) + Pr(3) – Pr(1)*Pr(2) – Pr(1)*Pr(3) – Pr(2)*Pr(3) + P(1)*P(2)*P(3)

= 0.82

Takeup(situation 1) = Pr(1) * Pr(1, 2 or 3) = 0.41

Takeup(situation 2) = Pr(2) * Pr(1, 2 or 3) = 0.08

Takeup(situation 3) = Pr(3) * Pr(1, 2 or 3) = 0.49

B. SPREADSHEET WITH EQUATIONS & EXAMPLES

The accompanying spreadsheet "GMSIM Equations" has both a description of each behavioral equation incorporated into the model. The discussion below summarizes some of the key aspects of the modeling, but most of the details are left to the spreadsheet. This section explains how to use that spreadsheet.

The first four tabs of the spreadsheet are labeled "Ex-Ante Uninsured/Non-Group/ESI/Medicaid". These tabs contain descriptions of all of the key takeup equations that govern individual behavior. The columns in each sheet are:

- Ex-ante state (which corresponds to the sheet in which the equation is found, e.g. always uninsured for the ex-ante uninsured sheet)
- Ex-post state – this describes the movement that the equation is designed to capture – e.g. movement from uninsured to non-group
- Reason – this describes the change in the insurance environment which is precipitating the change – e.g. a decline in the price of non-group insurance
- Variable – this describes the relevant take-up variable in the code (for modeling purposes only – others can safely ignore)

- Ex-ante ESI eligible – as noted above, individuals have revealed a lower taste for insurance if they are ex-ante ESI eligible yet not insured
- Ex-ante Medicaid eligible – same issue
- Price Change – as per the equation above
- Elasticity
- Income Effect
- Constant
- Income Adjustment
- Odds of Move – this is the ultimate outcome of the equation above

The final tab, "Examples", is a useful means of exploring the structure of the equations through a specific example. The top of this sheet lays out the key parameters which are all changeable. The remaining rows then implement this specific scenario to all of the equations laid out in the previous spreadsheets. In this way the user can examine how the assumptions made for each equation translate to movements in particular examples. Essentially, the model itself is the translation and integration of these examples into a generalized set of code.

C. Movement from uninsured

The uninsured can move to three places: onto a type of non-group insurance, ESI, or public insurance. Each movement has multiple mechanisms which drive it.

There are three types of non-group movements considered in the model: to the existing non-group market; to a reformed non-group market where there is no differential pricing by health; and to an ESI-like exchange. The differences between these options are that as you progress from the first to the last (a) the option becomes more attractive in general, e.g. individuals prefer ESI-like options over non-group-like options, and (b) those who are sickest are particularly more likely to value the move from the first to the last for the extra insurance it provides. In particular, reformed and transformed non-group markets induce individuals, particularly less healthy individuals, to take coverage even with constant or rising prices. That is, there is a fundamental valuation among individuals to having a reformed or ESI-like environment to purchase insurance, even without a price reduction. For that reason, the uninsured might move to a reformed non-group market or a new exchange even with a rise in prices. Within each type of non-group insurance, movements will depend on ex-ante eligibility for both ESI and for public insurance. Those who turn down ESI are the least price sensitive; those who turn down public insurance are somewhat less price sensitive.

There is no study which directly presents estimates of the elasticity of movement from uninsured to non-group insurance. The most common reference is Marquis and Long (1994) who estimate a range from -0.33 to -0.4 from comparing non-group prices and coverage across areas. This estimate is likely biased downward due to the standard supply side bias that higher demand areas have both higher prices and higher quantities. The function used in GMSIM yields a central elasticity of -0.5 for the typical uninsured person facing a 50% reduction in the price of non-group insurance.

Uninsured individuals might move to ESI if they are newly eligible for ESI, or if they are already eligible and the price changes. The model assumes a very large constant takeup among those newly eligible reflecting the very high takeup of ESI even among those who pay large employee contributions for their

insurance. However, among those who are already eligible for ESI, changes in ESI prices have relatively modest impacts on coverage, consistent with the large body of evidence showing low price elasticity for the decision to enroll in ESI.

Finally, uninsured individuals might move to public insurance if they are made newly eligible. Once again, however, if they were already turning down an ESI offer, they are much less likely to move to public insurance.

D. Movement from group

Individuals in GMSIM generally prefer ESI to other forms of insurance coverage. Nevertheless, individuals may leave ESI for other categories of coverage for several reasons. The first is a decline in the price of non-group insurance. Some individuals will choose to substitute to non-group insurance when it is cheaper. For regular non-group insurance, this substitution is much more likely among the healthy; for reformed non-group or an exchange like option, it is equally likely for all, but the likelihood rises as the option being subsidized becomes more ESI-like. The second reason to leave ESI is because individuals become eligible for public insurance (the classic "crowdout" problem with private insurance). The third reason is if an individual is firm dropped and must leave the ESI plan. The last reason is because ESI becomes more expensive. In that case, movements will depend on the availability of other insurance coverage. Movement out of ESI will be relatively elastic when the enrollee has ESI available through a spouse; it will be much less elastic in other cases, reflecting the evidence on lack of price sensitivity for those offered ESI.

In terms of choosing values for these ESI responses, a starting point is the evidence on crowdout from ESI due to Medicaid expansions. Recent evidence in Gruber and Simon (2008) suggests that the odds of moving from ESI to public insurance due to new eligibility is roughly 0.12. The model is calibrated to hit that target for the low income workers who are likely to be in that range. Movements to non-group, reformed non-group, and the exchange are then calibrated to be successively higher. The model limits movement by assuming that a free ESI-like exchange would attract up to 60% of those who are on group.

In addition, the model must account for those who are dropped from ESI due to a policy change. Such individuals are viewed as having a preference for insurance than the ex-ante uninsured. Individuals in this case can move to a spouse's coverage, to non-group or to public insurance if eligible.

Finally, the model must account for movements off of group because the employee contribution has risen due to a new policy. The equations for leaving group due to a rise in the price of group parallel those for leaving group due to a reduction in the price of non-group.

E. Movement from non-group

There are four reasons an individual will want to move away from non-group. The first is new offering of ESI; ESI is assumed to be preferred to non-group insurance given the revealed preference in U.S. insurance markets. The second is a reduction in the price of ESI among those already eligible, which will attract some additional individuals from non-group insurance due to the attractiveness of ESI. The third is new eligibility for public insurance. Finally, if non-group prices increase due to a market reform that

could lead individuals to leave the non-group market for ESI, public insurance (if they were already eligible) or uninsurance.

The equations in this case follow the equations described above. For movement to public insurance, the model assumes a higher reaction (higher crowdout) than from ESI if individuals are not eligible for ESI; if individuals are eligible for ESI, the crowdout is similar.

F. Movement from public

There are four reasons that an individual would like to move off of public insurance. The first is a new offering of ESI, the second is a change in the price of ESI, the third is a change in the price of non-group, and the fourth is if a Medicaid buy-in exchange exists. Equations and logic here follow previous sections.

G. Other individual reactions

There are a number of other features of the individual takeup equations:

Changes in non-group spending in response to non-group subsidies

As with the firm response to subsidies through changing spending on ESI, individuals may react to a non-group subsidy by increasing, or reducing, their non-group spending. The reactions will be of four types and only apply for regular non-group:

Case 1: Already on non-group, and credit is below current spending levels: this reaction will parallel that of spending on ESI among those already on ESI. If the credit is a flat dollar credit (e.g. a $1000 credit towards non-group insurance), then non-group spending will rise by 20% of the credit amount; if the credit is a percentage credit (e.g. 50% of the cost of non-group), non-group spending will rise by 50% of the credit amount. The latter is much larger because a percentage credit is a marginal subsidy to more generous non-group insurance. As with employer spending, half of this increase will be assumed to come in the form of higher actuarial value, and half in the form of other spending.

Case 2: Already on non-group, and credit is above current spending levels: In this case individuals will be assumed to "buy-up" the value of their non-group policy in order to take advantage of this subsidy. In particular, the model assumes that individuals will increase their non-group spending by k*(credit - non-group cost), where k is the "buy up factor", with a default value of 0.75. Thus, in the base case, individuals will buy up three-fourths of the difference between their current cost and the credit amount. That buy up will once again come half in the form of higher actuarial value, and half in the form of more expensive product.

Case 3: Not yet on non-group, non-group credit is above what the individual is projected to spend if on non-group. In this case, the model undertakes the same calculation as in case 2 to get the new amount the individual would spend if on non-group. Then, for behavioral reactions, this is treated as a 100% non-group credit, with the actuarial value equal to the actuarial value the individual would buy up to.

Case 4: Not yet on non-group, for whom the non-group credit is below what they would spend if on non-group. In this case the model incorporates a "buy-down" to account for the fact that indivdiuals would actually pay attention to a credit that is less than they would spend. The motivation is as follows: suppose a young healthy individual has a non-group insurance cost of $2000 with an actuarial value of 0.8. Now suppose that individual is offered a $1000 credit. One way to model this would be as a 50%

credit, with the resulting implications for takeup. But individuals would be unlikely to just leave the $1000 on the table – why not just buy a 0.4 actuarial value product for $1000 rather than buying the $2000 product with a 0.8 actuarial value? Therefore, in this case, the model decreases non-group spending by z*(non-group cost – credit), where z is the "buy-down" factor, which is set to 0.5 in the base case. This buy-down only occurs if the subsidy is greater than or equal to half of the ex-ante non-group premium, otherwise the person will simply take up the subsidy without adjusting their plan. If the buy-down occurs, the actuarial value adjusts downwards depending on the spending change with a minimum reduction of half of the ratio of the spending change to the ex-ante non-group premium. The equation for the new actuarial value in the buy-down situation is as follows:

Ex-post non-group actuarial value = ex-ante non-group actuarial value * [(ex-ante non-group premium – (spending change* X)) / ex-ante non-group premium]

where X is a minimum of 0.5 and increases with a greater spending change.

Takeup of Credits if Already Insured

The effect of both non-group and employee credits on increasing insurance coverage are laid out above. But another major issue for cost projections is modeling how likely it is that individuals will take up those subsidies if they are already insured, e.g. the takeup of employee credits among those already employer insured. While this is "free money", the takeup of any such subsidy is always less than 100% since some people will not be aware of this credit.

Takeup of each of these credits is modeled as

= 0.67 + (0.5*0.28*Income effect + 0.5*0.28*-price change)

The notion is that a credit which is a 100% subsidy AND has an income effect of 1 will have a 95% takeup. As credits shrink either in percentage terms or relative to income, takeup falls, but never below 67%.

Spillover Effects if Family Members are on Medicaid or ESI ex-ante

If an individual was previously eligible for Medicaid and not on Medicaid ex-ante, but other family members were eligible for Medicaid ex-ante, then there is a small spillover effect which might induce the individual to move to Medicaid. The magnitude of the spillover effect depends on whether you were previously insured. The spillover effect, for an insured individual, takes the ordinary full takeup value (calculated as described in Section 5, Part A), and significantly dampens it by multiplying it by 0.1 if either an adult or a child was previously eligible and by 0.2 if both an adult and a child were previously eligible. If uninsured, the spillover effects result in a greater takeup than normal because the full takeup value is multiplied by 1.1 if either an adult or a child was previously eligible and by 1.21 if both an adult and a child were previously eligible.

The special scenario for movement to ESI affects individuals who have a new offer in the family when someone else in the family was offered ESI ex-ante. These individuals receive half the takeup that they originally would have had since they had the option to be on an ESI plan ex-ante but were not included. Additionally, those individuals who had family members on a plan but they were previously overlooked and ended up uninsured, now have the option to takeup the plan if the plan holder is taking up a credit or if ESI prices drop due to another policyholder.

Catastrophic, or "young invincible" insurance

The model can also evaluate the presence of a catastrophic non-group insurance option. The plans typically have a high deductible and low actuarial value. The premium for such a plan is set by rescaling an individual's ex-post non-group premium to the lower actuarial value of the catastrophic plan. This option is then evaluated against the standard non-group option on the basis of premium cost and expected out of pocket cost.

H. REGULATORY RESTRICTIONS

All regulatory restrictions are applied strictly after firm decisions and individual decisions. Three of the most common restrictions are firewalls, mandates and auto-enrollment.

In the case of a firewall, individuals are allowed to take up their preferred insurance type according to the equations defined in Section 5, Parts C-F. However, if there is a regulatory restriction preventing individuals from taking up a preferred insurance type due to stipulated characteristics (e.g. access to ESI, income level, access to public insurance, etc.), the takeup of that individual is nulled out from the restricted insurance type. This has the effect of keeping individuals on their ex-ante insurance status.

In the case of a mandate, the model begins with assumptions on the effectiveness rate of the mandate. The base case assumption has an effectiveness of 85% for ESI, 60% if previously eligible for public, 75% if newly eligible for public and 75% for all unsubsidized insurance types. Mandate effects are only applied after voluntary movements have already happened. For example, suppose that there are X number of uninsured people ex-ante and a mandate effectiveness of *e.* Y people move off of uninsured voluntarily, due to new subsidies or changes in eligibility for ESI and public. Then the effectiveness *e* gets applied to the population (X – Y) remaining uninsured. Therefore, unless a policy fails to move any people voluntarily off of uninsured status, the total percent of individuals moving off of uninsured should always exceed the effectiveness *e.* For those that choose to remain uninsured if the mandate is turned on, there is an option to enforce a penalty as an incentive to become insured. Illegal immigrants and those eligible for Medicaid are assumed not to pay. Additionally, there is a mandate affordability exemption in the case of an exchange with a firewall if individuals offered ESI have an ex post worker's share greater than their exchange cost. These individuals preferred to be uninsured over ESI, yet they are unable to take up the lower cost exchange due to a firewall, so they are exempt from the mandate.

Similar assumptions are applied to the effectiveness rate of auto-enrollment. Typically, auto-enrollment is applied to those who are employed and offered ESI, although it can also be used to auto-enroll employed, not offered ESI individuals onto non-group. Auto-enrollment is not used on the population that is not employed. Auto-enrollment works the same way as a mandate, with pre-defined effectiveness based on individual characteristics, and its effectiveness is only applied after voluntary movements have occurred. It differs from mandates mainly on two dimensions: 1) it assumes lower effectiveness rates (70% for those offered ESI and 50% for those not offered ESI - these are based on the literature on auto-enrollment into pension plans, which suggests that auto enrollment raises enrollment among those otherwise unenrolled by roughly 70%) and 2) it applies only to certain populations (the employed).

Auto-enrollment and mandates can be used simultaneously within a single run, however it is typically done so only on mutually exclusive population sets (e.g. such as a mandate on children and auto-enrollment for adults).

Section 6: Change in costs

A. INDIVIDUALS

Four major cost changes are calculated for individuals: wage changes, tax changes, premium spending, and out of pocket (OOP) spending.

Changes to wages depend on the following: 1) changes in ESI offering, 2) changes in ESI contributions and spending, 3) changes in individual's decisions to take up ESI when offered, 4) changes in tax policy, 5) vouchers, and 6) pay or play policies. The model assumes that a firm does not change the total amount they spend on compensation for their workers. So a firm fully compensates itself for any increases in ESI spending or taxes by decreasing wages. Similarly, when a firm sees decreases in spending, they increase wages.

A firm that drops ESI coverage will pass back the amount they had been spending on ESI to workers as wages. A firm that newly offers ESI coverage will pass back the amount they had been spending on ESI to all workers as wages. Therefore, increases in ESI offering result in decreased wages, and decreases in offering result in increased wages.

For those who are ex-ante on ESI and not dropped, their wages may additionally change by the contribution and spending adjustments made by the firm. If a firm decided to increase the workers' share of the premium or lower plan generosity, then the employees will get the difference back in wages. Similarly, if a firm chooses to lower the workers' share of the premium or increase plan generosity, then the additional firm spending will be deducted from wages.

When an individual voluntarily drops ESI coverage, the firm distributes the amount they were spending among all the workers in the firm as increased wages. If someone newly takes up ESI, all workers see a decrease in wages.

When any new costs are imposed on the firm, whether vouchers or pay or play penalties or taxation on ESI spending, the firm will decrease wages to cover those costs.

Changes in taxes paid are a function of the changes in their wages, changes in insurance coverage or costs, and changes in the taxability of health spending. Increased wages are taxed at the individual's marginal tax rate. Similarly, decreases in wages result in lower taxes. If an individual changes the type of coverage they have, or their costs change, this may change the amount of health insurance spending they deduct from their taxes. An individual's taxes may also change if there are changes in the tax status of their ESI spending, their firm's ESI spending, or their nongroup spending.

Change in total premium and OOP spending is a function only of where people have moved and what the new costs of premiums are. That is, if individuals have moved from lower cost options (such as public) to higher cost options (such as non-group), the total premium and OOP spending will go up.

B. Firms

There are two major sources of changes to costs for firms: 1) change in ESI spending and 2) additional costs from new regulations.

Change in ESI spending depends on the number of workers that are taking up ESI ex-post and the ex-post cost of ESI to firms. The first is calculated in Section 5, with all the movements to and from group and the second is calculated in Section 4, Part C and D, with contribution and spending changes. The model assumes that firms never make a profit, therefore if they spend less on premiums either because fewer people are taking up ESI or because the average amount of money per insured person has decreased, the additional money saved is accounted for in wage changes to the individual. Similarly, if firms end up spending more money ex-post, that should be reflected in lower wages ex-post to individuals.

Additional costs from new regulations generally happen either due to a voucher or due to a pay or play. In the voucher case, firms aggregate the amount of money spent per family (using the ex-post contribution definitions) by the number of families that are offered ESI and would like to move to voucher-eligible non-group or Medicaid if there is a buy-in option. When there is a pay or play policy in place, firms that do not offer ESI ex post pay a certain amount in taxes, as dictated by the pay or play schedule.

C. Government

There are three major components to cost changes for the government: 1) change in public insurance takeup, 2) addition of subsidies and credits being provided and 3) change in taxes collected.

Change in total public insurance costs depends on the change in number of people who are on public, the split between federal and state responsibility, and the cost of those newly moving on or off of public. Expanding public eligibility does not necessarily raise costs for the government – it depends on whether or not the public eligible population is also eligible for other programs or if they are firewalled from other programs because of their public eligibility. Two assumptions which carry their way through the code and affect public insurance are: a) when there is a mandate, a higher effectiveness of the mandate for public programs is assumed, and people who are dual eligible first choose public insurance to meet the requirements of the mandate, and b) assuming that all else is equal, when given a choice, individuals prefer non-public insurance to public insurance. That means in situations where an individual has a free non-group option versus a free public option and dual eligibility, there is movement of people from public to non-group. Depending on the generosity and the imputed costs, that population's movement will have an effect on the government's bottom line.

New subsidies are scaled by the number of families taking up those subsidies. The number of families receiving the subsidy includes both those newly moving into the subsidized insurance type and those who remain on their insurance type and are eligible for subsidies. These subsidies can also be shared between federal and state. If a voucher is offered, the amount that the government needs to pay for a family that is covered by a voucher is reduced by the amount that the firm would have paid for a single ESI plan for their worker. Depending on the policy, a firm may not be required to contribute more than what the government would have paid for that worker, even if their ESI contribution would have been more than that amount. Another factor that may impact the cost of exchange subsidies is the effect of ex ante uninsured being unobservably healthier than other people in the population. A correction for that is in place that reduces the costs of unsinsured people who move to an exchange by 15%.

Government tax collections can change due to two factors: 1) wage changes and 2) tax policy changes. The income and payroll tax rates do not change because of a policy. Therefore, all tax changes due to wage changes come only from changes in the wage base itself. The two most common tax policy changes which affect government tax collections are changes to the employer and employee tax exclusions and pay or play taxes. In the first case, the amount of ex-post firm and individual health spending, based on the ex-post number of people on ESI, is taxed according to the new health spending tax code. In some cases, there may be policies where the first $X of employer or employee spending is exempted. In that case, we calculate only the taxes collected on spending exceeding $X. In the second case, the pay or play amount calculated from Section 4, Part B based on the probability of firm offering is used to offset total government cost.

D. Exchange Costs

In policies with an exchange, the premiums are derived from the nongroup prices and vary depending on the composition of the exchange. For the underlying cost for someone to be on exchange, an altered version of the nongroup costs is used. This cost is what the nongroup premium would be if the age varying load were 10% rather than 30%. An age rated but not health rated exchange cannot use the underlying exchange costs as the premiums, since the underlying cost is health rated. So, an age rated premium is created based on age/sex factors provided by the Actuarial Research Corporation (ARC). That premium is adjusted uniformly so that the average premium matches the average underlying health cost. This adjustment is the point where adverse selection can kick in.

The adjustment requires that the average premium matches the average underlying cost for the set of people that make up the exchange. The cost of the exchange needs to be set before people can make their decisions. So a seed population is chosen comprised of all the people that are ex ante on nongroup and half of the people who are ex ante uninsured. The adjustment is performed so that this set of people will have the average premiums matching their average underlying cost. After individuals' decisions are made, the adjustment is redone using the population that actually ends up in the exchange. So if the exchange attracts unhealthy people, the exchange premium is higher for everyone.

At this point one final correction is made to the exchange costs. It is known that the uninsured have lower costs than the insured, but this in not incorporated in the exchange costs thus far. To correct for this, the uninsured who end up in the exchange have their costs decreased by 15%.