Research Report

An Estimation of the Economic Costs of Social-Distancing Policies

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Preface

Many local and state officials are making social-distancing policy decisions based on the actions of other locations rather than through a decisionmaking framework that evaluates these measures and their reduction of the spread of coronavirus disease 2019. To help provide one piece of that information, RAND Corporation researchers developed a series of economic models aimed at filling in the gap and at estimating a rough order of magnitude of the economic consequences associated with a small set of social-distancing policies.

This report should be of interest to federal, state, and local decisionmakers interested in a better understanding of the economic trade-offs that are inherent when considering removing social distancing policies.

This research was jointly conducted by the Community Health Environmental Policy Program within RAND Social and Economic Well-Being and the Access and Delivery Program in RAND Health Care.

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Abbreviations

AHLA	American Hotel and Lodging Association
BEA	Bureau of Economic Analysis
CGE	computable general equilibrium
COVID-19	coronavirus disease 2019
IMPLAN	Economic Impact Analysis for Planning
NCES	nested, constant elasticity of substitution

Introduction

Many local and state officials are making social-distancing policy decisions based on the actions of other locations rather than through a decisionmaking framework that evaluates these measures and their reduction of the spread of coronavirus disease 2019 (COVID-19). To help provide one piece of that information, we have developed a series of economic models aimed at filling in the gap and at estimating a rough order of magnitude of the economic consequences associated with a small set of social-distancing policies. This work is based on readily accessible data and uses a simplified small, open-economy model of a metropolitan area. To the benefit of this analysis, these models can be quickly recalibrated to different locations and under different social-distancing policies.

Model

Our approach to the development of a computable general equilibrium (CGE) model is based on the work of Sue Wing, 2007; Rausch and Rutherford, 2008; and Nadreau, 2015. The Economic Impact Analysis for Planning (IMPLAN) Social Accounting Matrix for each state is used to calibrate the initial values of parameters within the model. We use 2016 data because they reflect the most-recent information to which we have we have ready access for the entire United States. The IMPLAN data provide calibration values for 536 different sectors. IMPLAN data are based on the national-level input-output tables developed by the Bureau of Economic Analysis (BEA) and then downscaled to the local levels using a proprietary algorithm. IMPLAN has been a staple of regional economics for the last 40 years. To deliver a manageable modeling process and ensure a clear interpretation of results, we aggregated the 536 sectors to 15 sectors (as recommended in the methodology implemented by Nadreau, 2015), but we also developed specific sectors that are likely to be affected by state and local social-distancing policies. Each sector is viewed as having a representative firm that is assumed to maximize profit, implying that it uses the least-cost combination of inputs needed to produce its output. It is further assumed that the firm is a price-taker in a competitive market and the sector is in equilibrium—i.e., the quantity supplied equals the quantity demanded. In addition to data on consumption and earnings for nine representative households by income level, IMPLAN also offers relevant data for both state and local governments and federal governments. Households are assumed to maximize utility, taking good and factor prices as given.[1] Finally, markets clear as prices adjust, with global prices assumed to be constant for imports and exports. Thus, we assume that each state or

1 Income in the IMPLAN data is total income from earnings from labor, land, capital and from government transfers.

metropolitan area is a small, open economy that does not affect global prices. Our approach is to build a static general equilibrium model of the economy of each state and then limit sector output by the impact of social-distancing policies. Our model is a standard general equilibrium model that has been used to estimate regional and national impacts of policy changes across a wide variety of settings. We provide a brief overview of the model and advise the reader to consult Sue Wing, 2007; Rausch and Rutherford, 2008; and Nadreau, 2015, for more details. We have provided our choices regarding key parameters in the text.

Firm's Problem

In the development of our calculation, we modeled the production in each sector i as a representative firm that has chosen its output to maximize profit at a given price. In our model, firms are assumed to be perfectly competitive, meaning that they do not set prices but respond to prices in their decisionmaking. The production process follows a nested, constant elasticity of substitution (NCES) function as described in Equation 1:

$$Y_{it} = \phi\left(\alpha\left(\beta K_i^{\rho} + (1-\beta)L_i^{\rho}\right)^{\frac{\eta}{\rho}} + (1-\alpha))\left(\sum_j\left(\theta_j X_{ij}\right)^{\gamma}\right)^{\frac{\eta}{\gamma}}\right)^{1/\eta} \quad (1)$$

where K_i is capital used in sector i, L_i is labor used in sector i, and X_{ij} are intermediate inputs produced by sector j that are used by sector i. We chose an NCES production function because of its flexibility and because Perroni and Rutherford, 1995, have proven that calibration of the NCES is possible for an arbitrary dimension—as long as the given Slutsky matrix is negative semidefinite, the function will have the appropriate convexity conditions to ensure an equilibrium. Other functional forms could be used.

We rewrote these production functions in the calibrated share form to allow for an easy calibration using the existing IMPLAN data. We assume that η is set so that the implied elasticity of substitution is zero (i.e., perfect complements); ρ is set so that the implied elasticity is one and results in a Cobb-Douglas production function; and γ is set to imply an elasticity of four.[2] Thus, the intermediate goods that are inputs in production are more substitutable than capital and labor. Additionally, the aggregate capital-labor input and the aggregate intermediate input are assumed to be perfect complements. Finally, α, β, and θ_j are expenditure-share parameters, and ϕ is a technological-adjustment parameter.

Consumer's Problem

The consumer's problem is quite similar to the producer's problem. We assumed that a representative household maximizes utility, receiving income from the factors of production

2 Rather than discuss the parameter values of $\eta, \rho,$ and γ, we opt to report the *implied* elasticities because these have more readily accessible meaning for economists. Our assumption of perfect complements in the uppermost nest implies that the functional form degenerates to a minimum operator of the inputs. These parameter choices are consistent with Nadreau, 2015.

(capital and labor), net sales of exports, transfer payments from either the federal or state governments, and investments in inventory. Households must balance their budgets and supply all factors inelastically. We discuss how households are affected by social-distancing policies in a later section. We assumed that the utility function is simply a Cobb-Douglas utility function, calibrated to the consumption data in the IMPLAN data. We normalize the amount of labor and capital to the 2016 levels using Equation 2:

$$U_i = \sum_i \alpha_i \ln(D_i) \quad (2)$$

where α_i is the budget share of good i in the benchmark data and D_i is household demand of good i.

Equilibrium

We calibrate the model to the initial conditions defined by the social accounting matrices produced from the IMPLAN data. The static model was written in the General Algebraic Modeling System using the Mathematical Programming System for General Equilibrium subsystem and uses the Path solver. An equilibrium is characterized by a set of goods and factor prices together with market-clearing levels of production and consumption.

Regions

We replicate the analysis for all 50 states and a national-level model. In future iterations, we will add metropolitan areas.

Sectoring

For the CGE model, we divide the economy into 13 sectors. For a social-distancing analysis, the key sectors with direct impacts are restaurants and bars, hospitality, education, air transportation, and nonessential retail. These sectors correspond to IMPLAN sectors as in Table 1.

Table 1. IMPLAN Sectors in Social-Distancing Sectors

Sector	Sector Stub	IMPLAN Sectors
Restaurants and bars	REST	501–503
Hospitality	HOSP	488–500
Education	EDU	472–474, 532, 534
Air transport	AIRT	408
Nonessential retail	NERT	396–399, 403–407

In addition to the five sectors identified, there are also sectors that correspond to agriculture, construction, utilities, fossil fuels, wholesale and retail trade, mining, food processing, manufacturing, services, and rest of the economy. These divisions follow Nadreau, 2015.

Social-Distancing Policies

We consider five main social-distancing policies:

1. Close schools.
2. Close schools, bars, and restaurants; and ban large events
3. Close schools, bars, and restaurants; ban large events; and close nonessential businesses.
4. Close schools, bars, and restaurants; ban large events; close nonessential businesses; and quarantine the most vulnerable.
5. Close schools, bars, and restaurants; ban large events; close nonessential businesses; and quarantine everyone except essential workers.

Using these policies, we map these interventions to five sectors within the economy:

1. education
2. restaurants and bars
3. hospitality (hotels, museums, amusement parks, etc.)
4. air transportation
5. nonessential retail.

We normalize the analysis to consider weekly durations. We assume that the impacts do not vary with time so that these results can be scaled to match the duration of the policy.

Our policy scenarios start with school closures and add policies in the order listed. That is, we begin with a baseline scenario of no action and accumulate increasing levels of social distancing. Our baseline levels of the impact of a policy are based on estimates derived from industry associations or lobbying groups, transfers from related sectors where little information is available, or related literature on previous social-distancing interventions that we use to calibrate a national model. In particular, for school closures, we calibrate the output reduction in the education sector to match the gross domestic product declines in Smith, Keogh-Brown, and Barnett, 2011. In addition to these baseline levels, we vary the level of impact around the baseline level to produce low-impact and high-impact scenarios for each of the policy scenarios in addition to the baseline.

Using Smith, Keogh-Brown, and Barnett, 2011, and the calibration of the national model, the baseline reduction in education output is set to 0.75. We vary this between 0.50 and 0.90 to analyze sensitivity. In addition, school closures induce a labor-supply reduction for those parents who now must stay home to care for their children. According to an analysis by Edwards et al., 2020, approximately 5.9 percent of households are single-parent families in which that parent works; 2.7 percent of that group have no in-home options for day care and 1.8 percent have a nonworking adult who might provide care but also might be part of the vulnerable population. Additionally, approximately 17.6 percent of households are two-parent families with both parents working; 8.5 percent of that group are without in-home care options. Thus, we estimate that approximately 10 percent of working adults could have long-term absenteeism, resulting in a 10-percent reduction of the labor supply. As discussed in Smith, Keogh-Brown, and Barnett, 2011, there could be large absenteeism stemming from those infected with the disease for those sectors not directly affected by social-distancing policies. Additionally, there will be labor-supply reduction directly and indirectly from COVID-19 resulting from both sickness and caregiving for those who are sick. As long as the infection rate remains low, social-distancing policies will likely have a dominant effect on the labor supply. In future iterations of this work, we will incorporate feedbacks between an epidemiological model and our model.

For the restaurants and bars sector, the National Restaurant Association has estimated that industry sales are likely to decline by 25 percent (Gangitano, 2020). The New York State Restaurant Association has estimated that sales likely declined by 58 percent in the first three weeks of March (Romeo, 2020). Using these two estimates, we set the upper bound on output to 60 percent (a rough average of the two associations) and use 40 percent and 75 percent as our low and high impacts. In addition, as we move to stay-at-home orders, we further reduce the baseline level to 25 percent and set 10 percent and 50 percent as our lower and upper bounds. We map the cancellation of large events to the hospitality industry, which includes hotels, amusement parks, casinos, and similar businesses. The American Hotel and Lodging Association (AHLA) estimates that roughly 70 percent of its workers will be laid off as a result of COVID-19 (AHLA, undated). We follow the estimates of the restaurants and bars for the larger hospitality sector because the most-extreme estimates match those of the AHLA.

In a recent survey of the retail sector, e-commerce platform NuOrder estimated that retail sales are likely to decline by 50 percent as a result of COVID-19. Groceries are part of retail, so our baseline level of output for nonessential retail is set to 40 percent with low and high values of 25 percent and 75 percent, respectively. Again, in the most severe policy, we further decrease this in line with the restaurant and hospitality industries (Binlot, 2020).

For the air transportation sector, we mimic the hospitality assumptions with one exception. Air transportation consists of both cargo and passenger traffic. According to Rodrigue, 2020, cargo revenue is roughly 25 percent of air transportation revenue. Therefore, we modify the hospitality numbers to reflect this by reducing the decrease by 25 percent. Thus, the baseline scenario for air transportation is 70 percent with low and high values of 50 percent and 80 percent, respectively. Additionally, we place a lower bound for air transportation of 30 percent in the most extreme case of social distancing.

Because of the general equilibrium nature of the model, there will be considerable reallocation of displaced labor to sectors that are not directly affected by social-distancing policies. As we reduce the output of a sector, its labor demand will fall and workers will reallocate to sectors that are not constrained by policy. Because factors are supplied inelastically, there is no unemployment implied by the model but wages fall—and they fall to a considerable extent in the more-extreme scenarios of social distancing, which can be thought of as unemployment, to a degree. Given the presumably short-term nature of social-distancing policies (most of which will likely be rolled back in a matter of months), we would not expect a fundamental restructuring of the economy. Therefore, we limit the increase in output to 50 percent of the baseline level. Table 2 provides a summary of the social-distancing scenarios considered in this analysis.

Table 2. Social-Distancing Scenarios

Portfolio ID	Scenario	EDUC	REST	HOSP	AIRT	NERT
1	No Action	1.00	1.00	1.00	1.00	1.00
2L	Close schools.	0.90	1.00	1.00	1.00	1.00
2B		0.75	1.00	1.00	1.00	1.00
2H		0.50	1.00	1.00	1.00	1.00
3L	Close schools, bars, and restaurants; and ban large events.	0.90	0.75	0.95	1.00	1.00
3B		0.75	0.60	0.75	0.80	1.00
3H		0.50	0.40	0.60	0.70	1.00
4L	Close schools, bars, and restaurants; ban large events; and close nonessential businesses.	0.90	0.75	0.75	0.80	0.75
4B		0.75	0.60	0.60	0.70	0.40
4H		0.50	0.40	0.40	0.50	0.25
5L	Close schools, bars, and restaurants; ban large events; close nonessential businesses; and quarantine the most vulnerable.	0.90	0.50	0.50	0.65	0.75
5B		0.75	0.25	0.25	0.50	0.40
5H		0.50	0.10	0.10	0.40	0.25
6L	Close schools, bars, and restaurants; ban large events; close nonessential businesses; and quarantine everyone but essential workers.	0.90	0.50	0.50	0.50	0.50
6B		0.75	0.25	0.25	0.35	0.25
6H		0.50	0.10	0.10	0.30	0.10

Results

We first present the national-level results to provide a baseline. Table 3 presents the income declines separated by household for all the scenarios. To put these raw income losses into perspective, we normalize by the baseline income in Table 4. Although much of the discussion within the popular media has focused on lower-income households, our analysis suggests that higher-earning households could experience a larger proportion of income decline from social-distancing policies. This might seem counterintuitive, but it stems from the incorporation of all sources of income, not only labor income. As we have seen in April 2020, the Small Business Association program to provide forgivable loans has been overprescribed. This suggests that the impact of social distancing is affecting not only labor income but also capital income and those who receive other nonlabor income. Because those who receive nonlabor sources of income are directly and indirectly affected by social distancing, their incomes are likely to decline substantially. The general equilibrium approach incorporates changes not only in labor income but also in nonlabor income that could be substantial portions of value added in different sectors.

This is also consistent with a *Financial Times*-Peterson poll that found roughly the same proportion of households reported that 73 percent would experience some income decline because of COVID-19, with between 19 percent and 29 percent experiencing significant declines (Fedor and Zhang, 2020). Importantly, none of the effects of the 2020 Coronavirus Aid, Relief, and Economic Security Act have been incorporated into this analysis. The focus is solely on the effects that social distancing could have on the economy without federal policy.

Table 3. Income Declines per Week, by Household Income ($ millions)

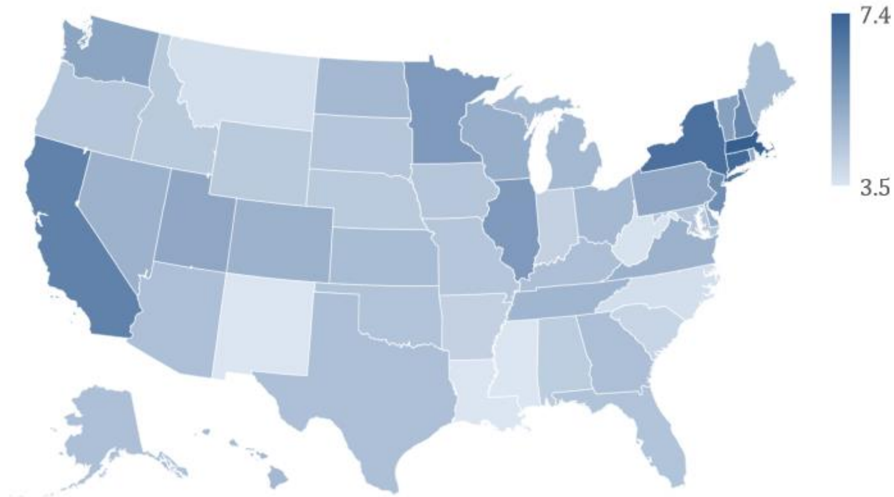
	Income Range, in Thousands									
Portfolio ID	**< 15**	**15–30**	**30–40**	**40–50**	**50–70**	**70–100**	**100–150**	**150–200**	**> 200**	**Total**
2L	100	300	400	500	1,300	2,000	2,500	1,500	3,100	11,600
2B	100	400	500	700	1,700	2,600	3,300	1,900	3,900	15,100
2H	100	500	700	900	2,200	3,400	4,400	2,500	5,000	19,700
3L	100	400	500	700	1,800	2,700	3,500	2,000	4,200	16,000
3B	100	600	800	1,100	2,700	4,200	5,300	3,100	6,300	24,200
3H	200	800	1,100	1,500	3,700	5,700	7,300	4,200	8,500	32,900
4L	100	600	800	1,000	2,500	3,900	5,000	2,900	6,000	22,600
4B	200	900	1,200	1,600	3,900	6,000	7,700	4,400	9,100	34,800
4H	200	1,100	1,500	2,000	5,000	7,700	9,900	5,700	11,700	44,900
5L	200	700	1,000	1,300	3,200	5,000	6,400	3,700	7,700	29,100
5B	200	1,100	1,400	1,900	4,800	7,300	9,500	5,500	11,400	43,100
5H	300	1,300	1,700	2,300	5,800	8,800	11,400	6,600	13,900	52,100
6L	200	900	1,200	1,500	3,800	5,900	7,600	4,400	9,100	34,600
6B	300	1,200	1,600	2,200	5,500	8,400	10,900	6,300	13,100	49,500
6H	300	1,600	2,100	2,800	7,100	10,900	14,000	8,100	17,200	64,200

Table 4. Percentage Income Declines, by Household Income

	Income Range, in Thousands									
Portfolio ID	**< 15**	**15–30**	**30–40**	**40–50**	**50–70**	**70–100**	**100–150**	**150–200**	**> 200**	**Average**
2L	0.4	1.2	2.2	3.2	4	4.5	5.3	6	9.8	4.6
2B	0.6	1.6	2.9	4.3	5.3	5.9	6.9	7.9	12.5	6
2H	0.7	2.1	3.9	5.6	6.9	7.8	9.2	10.4	16	7.9
3L	0.6	1.7	3.1	4.5	5.6	6.2	7.3	8.3	13.5	6.4
3B	0.9	2.6	4.7	6.8	8.4	9.4	11.1	12.6	20.1	9.7
3H	1.2	3.5	6.4	9.3	11.5	12.8	15.2	17.2	27.1	13.1
4L	0.8	2.4	4.4	6.3	7.9	8.7	10.4	11.8	19	9
4B	1.3	3.7	6.7	9.8	12.1	13.5	16	18.2	29	13.9
4H	1.7	4.7	8.7	12.7	15.6	17.4	20.7	23.5	37.4	17.9
5L	1.1	3.1	5.6	8.2	10.1	11.2	13.3	15.1	24.5	11.6
5B	1.6	4.5	8.3	12.1	14.9	16.6	19.7	22.5	36.4	17.2
5H	1.9	5.5	10	14.5	18	20	23.7	27.1	44.4	20.8
6L	1.3	3.6	6.7	9.7	12	13.3	15.8	18	29.1	13.8
6B	1.8	5.2	9.6	13.9	17.2	19.1	22.7	25.8	41.8	19.8
6H	2.4	6.7	12.4	17.9	22.2	24.6	29.3	33.4	54.7	25.6

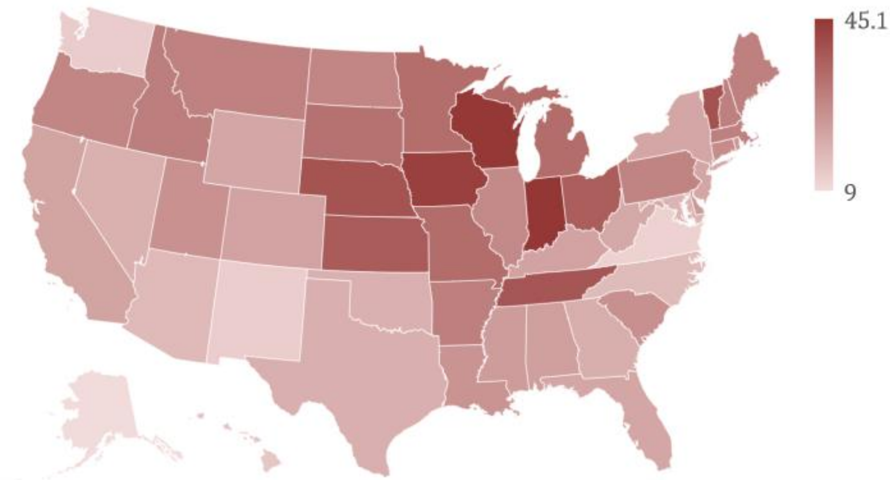
Our second set of results focuses on the distribution of impacts across states. Figure 1 shows the distribution of aggregate percentage losses across all states for the optimistic school-closure scenario (2L). This scenario incorporates low levels of impacts in the education sector but decreases the labor supply by 10 percent. These losses are largest for New York, Connecticut, Massachusetts, and California, with most states between 4 percent and 5 percent. This could be a reflection of higher per-capita incomes stemming through the labor supply reductions.

Figure 1. Aggregate Income Loss as a Percentage of Baseline Income by State for the Optimistic School Closure Scenario (2L)



At the opposite end of the spectrum, Figure 2 provides the distribution for the pessimistic stay-at-home order for the entire population. Most of the larger income losses are concentrated in the Midwest: Iowa, Wisconsin, Indiana, Nebraska, and Ohio. The effects of stay-at-home orders are in final-demand sectors, which suggests that these states produce relatively high amounts of final-demand goods, and that states like Virginia produce more intermediate goods and services that are not as affected by stay-at-home orders. By *final demand*, we mean not only personal consumption but also consumption by all institutions within the model, including federal, state, and local governments. We show the full set of results by each state in Table 5 of the appendix.

Figure 2. Aggregate Income Loss as a Percentage of Baseline Income by State for the Pessimistic Stay-at-Home Order for the Full Population (6H)



Conclusion and Next Steps

This analysis provides an initial assessment of the possible short-term economy-wide effects of social distancing. We recalibrate and modify an existing model to quickly implement economy-wide models on short time horizons. These results should be taken as rough order-of-magnitude estimates meant to help inform decisionmakers in accordance with the timeline of the crisis. Considerable effort would be required to further modify the model to better incorporate nuances of the economy. This presents an important trade-off, and we believe that the current model provides important information now, when it is needed. Additional modifications and nuances can be added over time. One key challenge is that resilience strategies and coping mechanisms might be available to some households but not to others. For example, households with more-flexible work schedules and the availability of telework would mean smaller labor supply impacts. Thus, we might be overestimating the impacts of these social-distancing measures, but we think that the choice of sectors affected by these policies might be understated. For example, we have considered only nonessential retail being affected by these policies. The difficulty with expanding the definition of nonessential businesses is twofold. First, there is no clear baseline definition of what is nonessential. Some governors have identified specific retail sectors as nonessential, but, to our knowledge, no one has specified which manufacturing or service industries are nonessential. Second, this lack of specificity creates a problem of compliance and enforcement. Retail has a public-facing front; other industries are not nearly as public and might continue operations even in the face of a nonessential business closure.

Another key challenge is that we have not factored in the larger macroeconomic environment in which the models are operating. For example, we do not consider the considerable decline in oil prices. Importantly, we have not included the demand-side shocks that are likely to occur as a result of people staying home. These shocks are different than the reduction in output that we have modeled and are associated with household behavior as a result of social-distancing policies.

There have been considerable federal efforts to mitigate the economic impacts of social distancing that need to be examined. The longer-term economic outcomes have not been considered but deserve attention. For example, we are assuming that the previous baseline would be achieved once these policies are removed. There could be substantial change in the economy because of this event that we have not considered. Additionally, there are dynamic effects of longer-term social distancing that might not be linear, as we have assumed. For example, business closures resulting from bankruptcy have not been considered, and these are likely to increase with the duration of these policies. Similarly, households might be able to rebound quickly from short disruptions but are likely to take much longer to recover if these policies are in effect for longer durations. These nonlinear impacts will be different depending on the resilience mechanisms available to households, and those mechanisms might vary by household income because of savings and paid time off. Our aim was to provide estimates of how the economic costs are distributed, not only across states, but also across alternative policies, so that decisionmakers charged with imposing and removing social-distancing policies have better information about the economic costs and benefits of these policies.

Appendix

Table 5. Percentage Losses in Income by State Under Social-Distancing Scenarios (weekly)

	2L	2B	2H	3L	3B	3H	4L	4B	4H	5L	5B	5H	6L	6B	6H
National	4.6	6.0	7.9	6.4	9.7	13.1	9.0	13.9	17.9	11.6	17.2	20.8	13.8	19.8	25.6
Alabama	4.2	4.4	4.9	4.5	5.3	6.7	4.9	6.4	9.6	5.5	8.4	11.2	6.7	11.1	22.2
Alaska	4.6	5.4	6.7	5.1	6.5	8.5	5.8	7.8	9.8	6.6	9.2	9.9	7.4	9.5	9.0
Arizona	4.6	4.9	5.4	5.0	5.8	6.9	5.5	6.6	9.8	6.1	8.6	11.9	6.6	10.2	16.4
Arkansas	4.1	4.3	4.6	4.4	5.1	6.5	4.8	6.2	10.1	5.4	8.8	16.6	6.5	12.8	29.1
California	6.4	7.0	7.8	6.9	8.1	9.8	7.5	9.5	12.8	8.4	12.1	15.5	9.4	13.9	21.3
Colorado	5.0	5.5	6.2	5.6	6.7	8.3	6.3	8.0	11.3	7.2	11.0	16.5	7.9	13.0	21.4
Connecticut	7.1	7.3	7.7	7.3	8.0	9.3	7.6	8.8	11.7	8.2	11.1	17.4	9.1	13.5	26.4
Delaware	5.1	5.4	5.8	5.5	6.3	7.7	5.9	7.4	10.8	6.6	10.5	19.2	7.7	12.6	23.7
Florida	4.5	4.9	5.4	5.2	6.5	8.1	6.3	8.7	13.0	7.5	12.7	16.9	8.5	14.2	20.8
Georgia	4.6	5.1	5.7	5.1	6.1	7.6	5.7	7.6	10.3	6.5	10.4	15.4	7.4	11.4	18.8
Hawaii	4.8	5.6	6.7	6.0	8.4	10.8	8.0	11.0	13.7	9.9	13.7	14.6	11.1	13.9	13.6
Idaho	4.3	4.5	4.8	4.6	5.2	6.4	4.9	6.0	9.2	5.4	8.1	15.2	6.3	11.8	29.4
Illinois	5.7	6.1	6.8	6.1	7.1	8.8	6.6	8.5	11.4	7.6	11.7	23.1	8.3	13.1	26.9
Indiana	4.1	4.5	5.1	4.6	5.5	7.3	5.2	7.4	12.3	6.0	10.6	23.5	7.6	15.3	45.1
Iowa	4.4	4.8	5.4	4.8	5.7	7.6	5.3	7.5	13.4	6.0	10.7	24.5	7.9	16.9	43.1
Kansas	4.7	5.0	5.4	5.1	5.9	7.6	5.5	7.2	12.3	6.1	10.4	20.0	7.8	15.2	36.9
Kentucky	4.6	4.8	5.2	4.9	5.7	7.0	5.4	7.0	9.9	6.0	8.7	11.5	7.1	11.0	21.5
Louisiana	3.5	4.0	4.7	3.9	5.0	6.7	4.6	7.0	11.0	5.4	9.4	13.2	6.9	12.5	24.7
Maine	4.7	5.0	5.4	5.1	5.8	7.2	5.4	6.9	11.1	6.0	10.1	18.8	7.3	13.5	28.8
Maryland	4.4	5.1	6.1	5.0	6.3	8.3	5.7	8.0	12.1	6.8	11.5	16.4	7.8	13.1	17.7
Massachusetts	7.4	7.9	8.7	7.8	8.9	10.7	8.4	10.3	13.9	9.3	13.8	22.7	10.3	15.8	28.8
Michigan	4.8	5.1	5.5	5.2	5.9	7.4	5.6	7.2	10.4	6.3	10.0	25.8	7.2	12.3	33.3
Minnesota	5.7	6.0	6.5	6.1	6.8	8.2	6.4	7.9	10.8	7.2	11.0	28.2	7.9	12.7	33.1
Mississippi	3.5	3.8	4.2	3.8	4.5	5.8	4.1	5.5	9.1	4.6	7.7	12.6	5.7	11.1	23.1
Missouri	4.4	4.8	5.3	4.8	5.7	7.4	5.3	7.3	11.3	6.2	10.2	19.8	7.5	13.8	33.3
Montana	3.7	4.1	4.7	4.2	5.1	6.7	4.8	6.9	12.1	5.6	11.2	21.5	6.8	14.4	28.7
Nebraska	4.3	4.7	5.4	4.8	5.9	8.1	5.4	7.8	14.4	6.3	11.5	22.2	8.5	18.1	38.7
Nevada	5.0	5.3	5.6	5.5	6.5	9.3	6.5	10.9	14.1	9.9	14.6	16.2	11.3	15.3	18.5
New Hampshire	6.3	6.5	6.8	6.6	7.3	8.6	7.1	8.7	11.9	7.8	11.4	19.6	8.9	14.0	29.0
New Jersey	6.0	6.4	7.0	6.3	7.2	8.6	6.7	8.3	11.1	7.5	10.6	17.2	8.1	12.0	20.7
New Mexico	3.5	4.0	4.7	3.9	4.9	6.5	4.4	6.3	9.0	5.2	8.1	11.0	6.1	9.5	12.2
New York	6.9	7.4	8.3	7.2	8.3	10.0	7.7	9.4	12.0	8.6	11.7	18.2	9.2	12.9	20.8
North Carolina	3.7	4.1	4.8	4.1	5.2	6.7	4.8	6.8	9.5	5.6	8.7	10.7	6.7	10.1	16.2
North Dakota	4.8	5.2	5.7	5.2	6.2	7.9	5.9	8.1	12.1	6.6	10.5	15.8	8.1	14.1	27.7
Ohio	4.8	5.1	5.6	5.2	6.0	7.6	5.6	7.4	11.4	6.4	10.4	22.9	7.6	13.8	36.6
Oklahoma	4.5	4.8	5.1	4.9	5.5	6.6	5.2	6.7	9.3	5.8	8.9	13.4	6.7	10.7	18.4

	2L	2B	2H	3L	3B	3H	4L	4B	4H	5L	5B	5H	6L	6B	6H
Oregon	4.4	4.9	5.5	4.9	5.8	7.4	5.4	7.2	10.1	6.2	9.5	22.5	7.1	11.3	27.8
Pennsylvania	5.3	5.8	6.4	5.8	6.8	8.5	6.3	8.2	11.7	7.2	11.1	20.4	8.2	13.4	28.3
Rhode Island	5.3	5.5	6.0	5.6	6.3	7.7	6.0	7.5	11.1	6.7	10.4	15.4	7.8	12.9	23.6
South Carolina	4.0	4.3	4.7	4.4	5.2	6.5	4.9	6.5	9.8	5.5	8.4	10.9	6.8	11.3	25.4
South Dakota	4.4	4.7	5.1	4.8	5.6	7.3	5.2	7.0	12.0	5.9	10.4	19.7	7.5	15.4	32.2
Tennessee	4.9	5.2	5.6	5.4	6.4	8.1	6.1	8.4	13.1	7.1	11.5	19.7	8.7	16.3	38.4
Texas	4.6	5.1	5.9	5.0	6.0	7.5	5.6	7.5	10.8	6.2	9.8	13.1	7.2	11.5	18.6
Utah	5.3	5.7	6.4	5.7	6.8	8.5	6.3	8.2	11.6	7.4	11.4	17.6	8.2	13.1	25.1
Vermont	5.5	5.8	6.2	5.9	6.6	8.2	6.3	8.3	13.3	6.9	11.7	30.6	8.5	16.2	39.0
Virginia	5.0	5.4	6.0	5.5	6.5	7.8	6.2	7.7	9.5	7.0	9.1	9.9	7.7	9.8	11.1
Washington	5.4	5.7	6.2	5.7	6.4	7.4	6.1	7.1	8.9	6.6	8.3	9.7	7.0	9.5	12.5
West Virginia	3.6	3.9	4.3	4.1	4.9	6.3	4.6	6.4	9.4	5.3	8.5	14.5	6.4	10.7	20.1
Wisconsin	5.1	5.3	5.7	5.4	6.2	7.8	5.8	7.6	12.7	6.5	11.1	27.5	8.0	16.2	44.9
Wyoming	4.3	4.7	5.3	4.6	5.5	6.9	5.1	6.6	9.2	5.7	8.2	16.4	6.5	10.6	20.6

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