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## THE EMPLOYMENT COSTS OF REGULATION

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**Abstract**

Concern over the impact of regulations on employment is not new, but the efforts of federal agencies have never focused effectively on jobs. While it is generally meaningless to include a simple job count as part of a regulatory impact analysis, agencies have chosen not to estimate the likely economic cost of job displacement. This decision is not based on empirical evidence that job displacement is costless. In fact, the evidence is quite strong that job displacement of any type is very costly for individuals, families, and communities. The intentional dismissal of employment impact remains a real shortcoming of agency efforts to promote only those regulatory changes where the benefits are worth their costs. In addition, the accumulated effects of thousands of regulations can impact job and wage growth, as well as raise long-term unemployment rates. For this reason, the impact of the overall level of regulation on employment should be estimated routinely.

**JEL Codes**

J0, J2, L5

**Keywords**

Employment, unemployment, regulation

**The Employment Costs of Regulation**

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It is certainly true that economies couldn't function without some sort of regulation (for example, regulations establishing and enforcing property rights). And it is clear that regulations can improve economic performance by helping to correct market failures such as the existence of significant externalities, information asymmetries, or public goods. It is also certainly true, however, that regulation has an economic cost that should not be ignored. Significant economic literature indicates that poorly designed regulation can stifle economic growth.[1] Because of this, beginning as far back as 1971 US federal agencies have been increasingly subject to requirements designed to ensure that expected benefits of regulatory changes outweigh their costs.[2] Although the use of economic methods to evaluate the likely impact of regulatory changes has expanded over the years, there remain strong critics of the quality and use of regulatory impact analyses conducted by federal agencies.[3]

Concern over the impact of regulations on jobs and job growth is not new, but the efforts of federal agencies to forecast the likely impact of regulatory changes have never focused effectively on labor market impacts. Part of the difficulty is that the empirically most important impacts on labor markets—the macroeconomic effects and the dynamic effects—are very hard to forecast. Instead, agencies have focused their analysis on the overall static, economic efficiency impacts of regulatory changes. This analysis, particularly when using concepts like changes in

[1] Some recent examples of literature reviews on the empirical analysis of the impact of regulation are Parker and Kirkpatrick (2012b), Crafts (2006), and Iraldo et al. (2011).
[2] See Hahn (1998) for a brief discussion of the history of government analysis of the likely benefits and costs of regulatory changes.
[3] Some recent examples include Hahn and Dudley (2007), Hahn and Tetlock (2008), Ellig and Morrall (2010), and Fraas and Lutter (2011).

consumer and producer surplus, implicitly includes the economic benefits and costs of the permanent reallocation of labor resulting from regulatory changes.

What agencies have not done in forecasting the effects of regulatory changes is examine the economic cost of job displacement. This approach is not based on any empirical evidence that job displacement is costless. In fact, the evidence is quite strong that job displacement of any type is very costly for individuals, families, and communities. Instead, it is based on the theory that labor markets are somehow much more efficient than other markets and periods of unemployment are short and relatively painless. Although the lack of effective methodologies for forecasting the macroeconomic and dynamic impacts of regulation may be the biggest problem facing regulators, the intentional dismissal of the cost of job displacement remains a real shortcoming of agency efforts to promote only those regulations where the benefits are worth their costs.[4]

**The Economic Impact of Regulation**

Regulations can have an impact on labor markets in a number of ways. First, regulations can have temporary or transitional effects. If a regulation raises the cost of production, resulting higher prices can reduce demand for regulated products or services and therefore limit employment in regulated industries. They may also cause job loss in other industries as purchasers of higher-priced regulated goods or services deal with higher costs of production or, in the case of consumers, with diminished buying power. They may also lead to temporary demand for labor in compliance activity as new equipment is installed or new processes are developed.

[4] Masur and Posner (2012) also make the argument that agencies should incorporate the cost of job displacement into benefit-costs analyses by predicting and monetizing the economic loss.

Second, regulations can have a longer-run impact on economic efficiency as labor is more permanently redistributed to new uses. Most of this shifting labor results in lost economic efficiency as labor resources are used for compliance rather than for production, and as workers displaced from jobs in regulated industries must find employment elsewhere. Overall economic welfare can, of course, be improved if the value of regulatory benefits outweighs these efficiency losses.

Third, regulations can impact the functioning of labor markets—through better or worse matching of worker skills with employment demand—and produce certain macroeconomic effects, such as labor force participation, the potential unemployment rate, or relative wage rates.

Fourth, regulations can produce dynamic effects that impact economic growth through such areas as international competitiveness, entrepreneurship, the ability to develop and market new products, new firm creation and growth, innovation, levels of competition in markets, or growth of productivity. All of these dynamic effects impact job quality and wage growth.

One of the difficult issues in assessing the likely impact of a specific, proposed regulatory change is that most empirical studies rely on using broad regulatory indicators and economy-wide outcomes such as GDP or productivity growth.[5] Although empirical work makes it clear that a specific regulation or regulatory change will impact such outcomes, it is difficult to estimate directly. As Parker and Kirkpatrick (2012b) explain, data limitations make it "difficult, and sometimes impossible, to provide robust quantitative evidence of a causal relationship between a regulatory policy change and the impact on economic outcomes such as economic growth."[6] In reports authored by federal agencies on the likely impact of proposed regulatory changes, called

[5] Other outcomes include GDP volatility, the productivity level, the rate of technological progress, entrepreneurship, and new firm creation and growth. See Parker and Kirkpatrick (2012b) for a survey of many of these studies.
[6] Harrington and Morgenstern (2004) also note that, while a number of studies have focused on whether the intended benefits of regulation were actually realized, there are few that estimate the economic cost of specific regulations.

regulatory impact analyses (RIAs), it is often understandably assumed that the macroeconomic and dynamic impacts of an individual regulation are small or difficult enough to make them impossible to forecast.[7] Instead, they focus primarily on the long-run economic efficiency impact using concepts like market surplus and—on some of the transitional impacts—appropriate discounting to account for timing differences. The lack of consideration for both the macroeconomic effects and the indirect dynamic costs of regulation may be significant.

For example, a recent study by the Swedish Agency for Growth Policy Analysis (2010) concludes that "the indirect economic costs that ensue from a heavy regulatory burden on a country's enterprises are considerable and probably more important than the direct costs related to complying with the rules." The concern, then, is that an economy can suffer a "death of a thousand cuts" where the accumulation of regulations seriously impacts economic outcomes despite economic analysis that finds that each individual regulation has a minimal negative effect. For this reason, it is important that consideration of the overall level of regulation should be considered and estimated routinely. While this is not practical for every regulatory change, it is possible for agencies to evaluate the likely impact of all their regulatory requirements on the US economy.[8]

The primary tool for federal agencies conducting an RIA has been the benefit-cost analysis (BCA). Because this approach requires placing monetary value on aspects of human well-being with no existing market prices, its use can be complicated and controversial. Nevertheless, the ability of BCAs to systematically organize and evaluate public policy of all

[7] In their guidelines for preparing regulatory impact analyses, the Environmental Protection Agency (EPA) makes this point: "While regulatory interventions can theoretically lead to macroeconomic impacts such as growth and technical efficiency, such impacts may be impossible to observe or predict" (EPA 2011).
[8] This approach would also allow agencies to take the additive effects of regulatory changes into account. In other words, the blood loss from the 999th cut may be significantly higher than from the first few cuts for specific industries.

types has led to its use by a wide range of government agencies since the 1930s. The goal of this approach is to express and quantify both the benefits and costs of regulation in common units, generally in current dollars. It requires identifying alternatives in a way that allows for their fair comparison—adjusting for occurrences of benefits and costs at different times—and converting the impact into dollar terms. BCAs have remarkable flexibility and are a fairly standard approach to many different types of economic impact analyses; they also serve a wide range of policy issues in addition to assessing regulation changes.

Because broad macroeconomic and dynamic effects are so difficult to forecast, BCAs typically use a longer-run comparative static approach, which works through comparing two "states of the world." First is the baseline view of the world without the policy in place. Often the baseline can be a description of the current state of the relevant parts of the economy. It can focus on a single industry, a set of interconnected industries, or perhaps even the entire economy. Alternatively, the baseline could be an estimate of the likely future state of the economy without the policy change. The second state of the world is an estimate that matches the baseline description except with the regulation in place. Again, it would be either a description of the likely current state or future state of the impacted portion of the economy. The analysis then becomes a comparison of these two situations with respect to some measure of well-being or welfare where the units are dollars.

True to its name, the comparative static exercise in a BCA is done in two parts. The first part is a measure of the benefits of the regulation. There may be direct benefits to individuals from regulation. For example, a proposed environmental regulation that reduces exposure to potentially harmful emissions may increase health benefits. In a comparative static framework, this might involve a comparison of health outcomes with the regulation in place versus likely

outcomes without it in place. After estimating the reduction in the number of bad outcomes (e.g. hospital admissions), the change in outcomes is valued in dollar terms. Real market prices are ideal for estimating the economic value of these benefits, but there are not markets for most beneficial outputs of regulation. For the same reason, there may not be employment effects to estimate. At times, there may also be some market-based benefits that lower prices for consumers by allowing demand to be met with a lower use of scarce resources. When this is the case, employment effects can be estimated.

The second part of the BCA is an estimate of the likely economic costs of the regulation. Any comparison of the cost of production in relevant industries with and without the regulation in place includes the increased cost of production from compliance with the regulation, the lost sales from the resulting higher prices, and the loss to consumers from paying higher prices—all valued in dollar terms. The most straightforward (and perhaps least controversial) cost of regulation for economists is that resources must be used for compliance rather than for production. Compliance decreases productivity since regulated firms will require more resources for the same output or (as is more likely) will use more resources for lower output. In particular, labor is one such resource, and compliance employment lowers labor productivity in regulated industries and, *ceteris paribus*, is likely to lower wage growth. In addition, there may be constraints imposed on the production process of a regulated firm that also lowers productivity, thereby raising the cost of production.

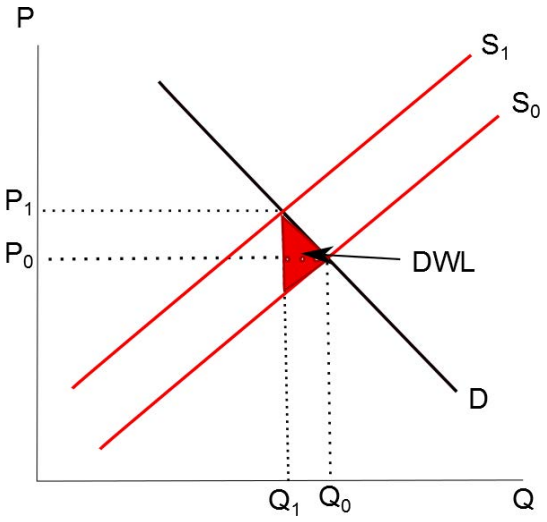
More than anything, a benefit-cost analysis is a count of resources saved or used by regulation changes. Valuation uses the concept of opportunity cost and, when possible, market prices are the preferred measurement. The most common method is to estimate changes in market surplus (both producer surplus and consumer surplus). Market surplus is a measure of the

value of the existence of a market by looking at the possible alternative uses of the resources employed in production, which is called producer surplus (e.g., the goods and services that would have been produced if labor had been employed elsewhere), and the possible alternative products that buyers would have to purchase to meet their needs, which is called consumer surplus (e.g., electrical power generated by dams rather than coal plants). Producer surplus is captured by resource owners as the difference between their returns in the industry and their returns in an alternate use. Labor is, of course, one of the important resources in any industry and the loss to workers is part of producer surplus. When applying this approach to the economic cost of regulation, declining output in a regulated industry reduces producer surplus as resources shift to other, less profitable industries, or else go unused. The surplus loss works through factor markets, which include labor resources, as displaced workers must find employment elsewhere at possibly lower wages, or else face unemployment. A dollar value of the total cost of this economic efficiency is captured by an estimate of the "deadweight loss."

This can be seen graphically in figure 1 below. The intersection of the supply (S) and demand (D) curves determine the equilibrium market price (P). A changing supply curve reflects increased industry costs from regulation compliance. Initial supply curve ($S_0$) resulted in equilibrium industry price $P_0$ and output $Q_0$. As compliance raises costs, the supply curve shifts ($S_0$ to $S_1$). The distance between the two lines along the P axis represents the increase in marginal cost due to compliance with the new regulation, which reduced quantity demand ($Q_0$ to $Q_1$) as prices rise ($P_0$ to $P_1$). The more sensitive buyers are to the price increase, the bigger the impact on sales. The combined producer and consumer surpluses are lower, and the overall economic

efficiency lost is represented by the deadweight loss (area DWL in the graph).[9] The size of the economic loss is greater if compliance adds more to the cost of production (i.e., the supply curve shifts up more) or if buyers are more price sensitive (i.e., the demand curve is flatter and causes a bigger decline in sales). More movement of the supply curve means that more resources (including potentially more labor resources) are used up in "nonproductive" ways. The use of extra resources for the same or less output is a decline in productivity.[10] For buyers, higher prices mean either higher costs of production (if they are other firms) or diminished buying power (if they are consumers). Both of these effects impact employment in other industries. The existence of more sensitive buyers (flatter demand curve) indicates the ability to shift to substitute products and a greater loss of "productive employment" (as opposed to "compliance employment").

**Figure 1. Surplus Loss from Increased Compliance Cost**



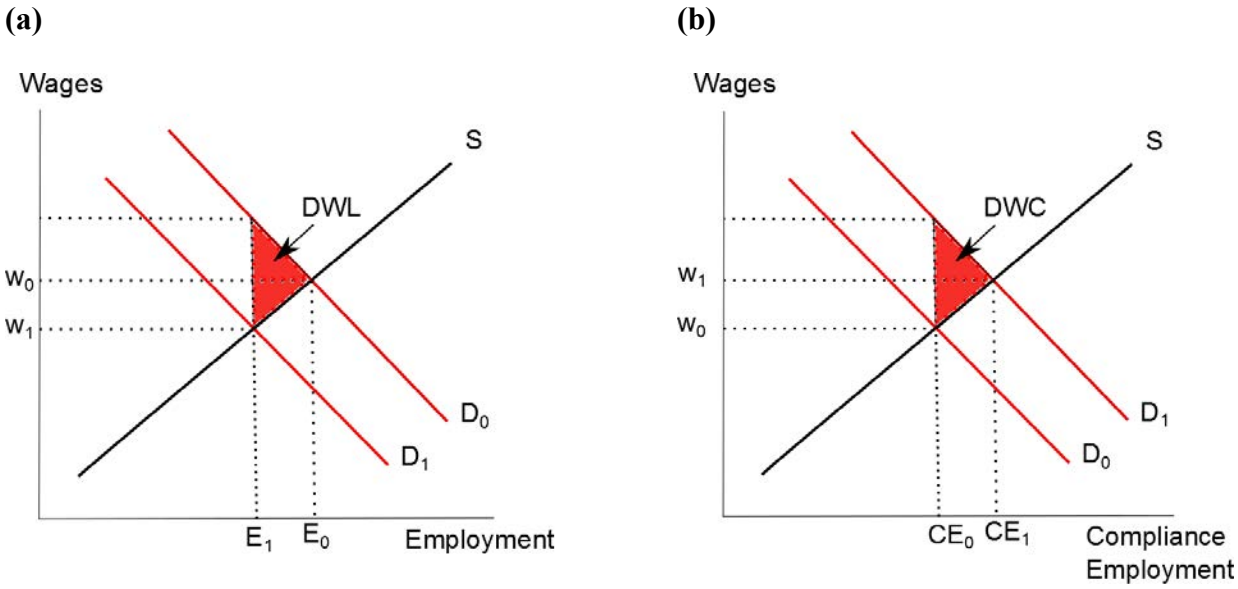

Note: Rising production costs for the firm shifts up the supply curve from $S_0$ to $S_1$. This reduces sales from $Q_0$ to $Q_1$.

[9] This analysis can be seen in most introductory economic textbooks. For a more detailed discussion of the use of market surplus in estimating the compliance cost of regulation, see chapter eight of the EPA guidelines for preparing RIAs (2011).

[10] Keep in mind that the benefits of regulation may be worth a decline in productivity in the regulated industry, which is precisely what the RIA addresses.

Since labor services are part of the cost of production in any industry, the long-run economic efficiency cost of the employment impact of a regulation is implicitly included in this deadweight loss. The employment cost is the result of two different factors. First, labor resources are shifted away from productive use in this industry to presumably less valuable uses elsewhere in the economy, which can be seen in figure 2(a) below. Because of lower sales, there is decreased demand for employment ($D_0$ to $D_1$) and, *ceteris paribus*, both the level of employment ($E_0$ to $E_1$) and the level of wages ($w_0$ to $w_1$) decline. As above, lower demand for labor creates a deadweight loss of area DWL.

**Figure 2. Surplus Loss from (a) Lower Production Employment and (b) Higher Compliance Employment**




Notes: (a) Rising production costs for the firm shifts down the labor demand curve from $D_0$ to $D_1$. This reduces employment from $E_0$ to $E_1$. The deadweight loss to the economy as a whole is area DWL. (The effect of regulation compliance works much like a tax on the firm. A similar analysis can be seen in many basic labor economics textbooks for the effects of a payroll tax on labor markets. See, for example, chapter four of Borjas [2012].) (b) Increased demand for compliance employment shifts out the labor demand curve from $D_0$ to $D_1$. The increase in compliance employment is from $CE_0$ to $CE_1$. The deadweight loss to the economy is area DWC.

Second, part of the economic efficiency cost is that compliance raises production costs through the use of additional resources per unit of output. Some of these additional resources may include labor resources used in compliance. That is, just as there may be lower "productive employment," there may be higher "unproductive employment" engaged in compliance work. The increase in employment brought about by government regulation is an economic cost as resources are pulled from other uses. Figure 2(b) shows the demand for compliance employment shifts from $D_0$ to $D_1$ and results in increased employment ($CE_0$ to $CE_1$). There is also a deadweight loss to the economy, represented by DLC. If the compliance activity is sufficiently labor intensive, then there may not be much of a net impact of employment.[11] However, both the decrease in "productive employment" and the increase in "unproductive employment" are economic costs.

As the Organisation for Economic Co-operation and Development's guide for conducting regulatory impact analysis states, the direct cost of regulation includes the cost of "employing additional staff to work on regulatory compliance" and of "employing consultants or other sources of expertise to help with regulatory compliance."[12] This is conceptually the same type of economic cost as with any other nonlabor resource and works in much the same way as a decrease in labor productivity for the firm (i.e., more labor resources must be used per unit of output produced by the firm).[13]

[11] See Morgenstern, Pizer, and Shih (2002) for an empirical estimate of the employment effects of regulation for four different industries. Although they estimate both the decrease in productive employment and the increase in unproductive compliance employment for these industries, they focus on the net impact on the level of employment and do not estimate the economic cost of each. As I discuss later, this seems to have led to a great deal of confusion by those estimating the net employment impact of regulation using their approach.
[12] See Organisation for Economic Co-operation and Development (2008).
[13] The basic economics of compliance employment is similar to the impact of an employment subsidy on labor markets. Again, see chapter 4 of Borjas (2012) for a discussion of this type of deadweight loss.

In addition to the direct impact of regulation on employment in the regulated industry, there can also be an indirect impact on employment through purchasers of the higher-priced regulated good or service. For regulated intermediate products, higher prices raise the cost of production by purchasing firms. These higher costs raise output prices and, therefore, reduce quantity demand. Lower sales translate to additional job loss. For consumer purchasers, higher prices lower their buying power. Reduced buying power broadly reduces quantity demand of many products and, therefore, can generate or contribute to more job loss. This is why an RIA should use a multimarket model to fully estimate the welfare cost of a regulatory change. If the effect is large enough that it will affect consumer spending broadly, a full economy-wide model (called a Computable General Equilibrium model) can be used.

An example of the use of a multimarket model to capture this effect is the Environmental Protection Agency (EPA) analysis of the proposed Toxics Rule affecting the electrical generation industry.[14] The EPA found that the price of electrical generation is likely to increase by 3.77 percent and lower US production of electricity by 0.3 percent. Further, when the EPA employed its multi-market model, it found that production was likely to decrease in 19 other industries that use electricity. The decline in output for each industry depends, of course, on energy intensity. These results are summarized in the first two columns of table 1. In column 3, I add the 2011 level of employment for each of these industries. For simplicity, if we assume that a 1 percent decrease in output results in a 1 percent decrease in employment, then we can calculate an industry-by-industry level of employment loss from the regulation, as in column 5.[15] When we do this, we find that for every one job lost in the electrical generation industry, 11 jobs are lost

[14] See EPA, *Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report* (2011b).
[15] The assumption that a 1 percent reduction in employment results from every 1 percent decline in output is not necessarily true for each industry. Since labor is a variable cost, the decline in employment may be much higher.

from the indirect effect on other industries. So, whatever deadweight loss is estimated for the electrical generation industry, there is substantially more in other industries.[16]

**Table 1. Short-Term Market-Level Changes for the Toxics Rule**

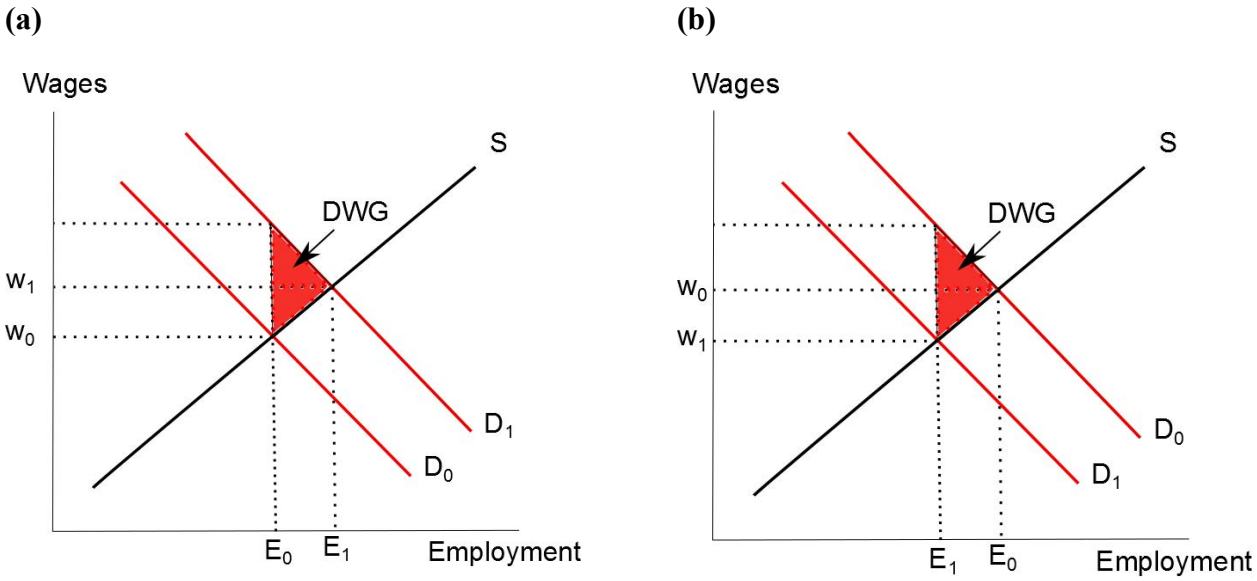
| | US Prices | US Production | 2011 Employment | 2011 Average Salary | Employment Loss |
|---|---|---|---|---|---|
| Energy | 0.77% | −0.12% | | | |
| Coal | −0.08% | −0.22% | 86,920 | $81,200 | −187 |
| Crude Oil Extraction | 0.02% | −0.23% | 164,889 | $153,284 | −386 |
| **Electric Generation** | **3.77%** | **−0.26%** | **395,813** | **$94,894** | **−1,033** |
| Natural Gas | 0.02% | −0.14% | 140,445 | $97,546 | −199 |
| Refined Petroleum | 0.01% | −0.01% | 110,885 | $103,274 | −12 |
| Nonmanufacturing | 0.00% | −0.01% | 7,360,873 | $51,461 | −883 |
| Manufacturing | | | | | |
| Food, Beverages, and Textiles | 0.02% | −0.02% | 2,056,733 | $41,182 | −473 |
| Lumber, Paper, and Printing | 0.04% | −0.02% | 1,193,892 | $47,030 | −275 |
| Chemicals | 0.01% | −0.02% | 782,344 | $83,686 | −188 |
| Plastics and Rubber | 0.03% | −0.03% | 633,526 | $46,617 | −165 |
| Nonmetallic Minerals | 0.05% | −0.03% | 363,900 | $49,007 | −106 |
| Primary Metals | 0.03% | −0.04% | 385,173 | $60,435 | −158 |
| Fabricated Metals | 0.03% | −0.02% | 1,341,675 | $50,268 | −215 |
| Machinery and Equipment | 0.00% | −0.02% | 1,053,850 | $63,360 | −158 |
| Electronic Equipment | 0.00% | −0.02% | 1,468,477 | $87,834 | −250 |
| Transportation Equipment | 0.00% | −0.01% | 1,386,172 | $69,430 | −152 |
| Other | 0.01% | −0.03% | 922,466 | $48,559 | −249 |
| Wholesale and Retail Trade | 0.01% | −0.01% | 20,209,892 | $37,827 | −1,617 |
| Transportation Services | −0.01% | −0.02% | 2,881,751 | $46,595 | −432 |
| Other Services | 0.01% | −0.01% | 64,108,545 | $48,242 | −5,129 |
| | | | | | |
| **Total Job Impact** | | | | | **−12,266** |

[16] As it turns out, later in the same report the EPA estimated that there would be a loss of about 21,000 production jobs in the electrical generation industry. If true, then the total direct and indirect job loss using my analysis would be over 250,000 jobs.

A similar analysis can sometimes be done for the benefits of regulation. Quite often the benefits are not market goods or services, and there is no significant employment impact of benefits.[17] For this reason, market prices are not available to help in the valuation process of these outputs. There are some standard methods of valuing these benefits, but it is less often the case that there are labor market impacts through regulation benefits. However, the concepts used in measuring the welfare benefits are the same as with costs. For example, if regulation improves the functioning of a market and increases production of a good or service, part of the deadweight gain from correcting the market failure works through employment. This can be seen in figure 3(a) as demand for employment shifts from $D_0$ to $D_1$ and results in increased employment ($E_0$ to $E_1$). The efficiency gain to the economy is represented by DWG.

[17] The EPA notes in its guide for conducting RIAs that "there are virtually no markets for environmental goods" (EPA 2011a).

**Figure 3. Surplus Gain from (a) Higher Employment and (b) Lower Employment**




Note: Increased demand for employment shifts out the labor curve from D0 to D1. The increase in employment is from E0 to E1. The deadweight gain to the economy is area DWG.

In a similar fashion, a regulation could have benefits that reduce the demand for a good or service in a way that would have beneficial labor market effects. Part of the surplus benefit would come from freeing labor resources for other uses. For example, if an environmental regulation lowers health risks for some portion of the economy, then part of the economic benefit could be a reduction in employment in the health care industry. This can be seen in figure 3(b). Decreased demand for the good or service (e.g., health care) lowers demand for labor ($D_0$ to $D_1$), and the level of employment declines ($E_0$ to $E_1$). As above, this creates an efficiency gain (DWG). Estimated in a BCA, both efficiency gains would be part of an industry-level market surplus gain.

**Two Wrongs Don't Make a Right: The Problem with Counting Jobs**

As demonstrated, the long-run employment effects of regulation benefits and costs from changes in economic efficiency are not simple. On the benefit side, if regulation improves the functioning of a market—for example, when competition is increased—then output in the industry can increase. If this expansion of output would require higher employment levels, then this "better" use of labor is an economic benefit. If regulation reduces demand for a product—for example, if health outcomes require less healthcare—then part of the gain is from lower levels of employment. On the cost side, if regulation requires increased compliance employment, then those new jobs are part of the regulation cost; but if regulation raises the cost of production in an industry, then employment loss will be part of the cost. For this reason, when estimating the long-run efficiency impact of regulation, estimating the employment impact by job counting makes no economic sense. In fact, the RIAs conducted by federal agencies typically assume that although jobs may shift around into different industries from regulation, the overall employment level in the economy is unchanged. Job counting, however, is precisely what the EPA has begun to do in its regulatory impact work.

It is now part of the EPA's published guidelines for conducting regulatory impact analyses to deal with the employment impact with two assumptions. First, it conducts a BCA under the assumption that there is no employment impact of the regulatory change. It justifies this assumption by saying that "employment impacts are not, in general, relevant for a BCA."[18] Second, in the same report, it makes an estimate of the number of net jobs likely to be created and lost in regulated industries.[19] The core of this methodology is the use of employment

[18] See section 9.2.3.3 "Impacts on Employment" of EPA (2011a).

[19] See, for example, economic impact analyses on the Mercury and Air Toxics Standards; Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste

multipliers estimated in a well-cited paper by Morgenstern, Pizer, and Shih (2002). The authors examine the effects of increased regulation in four different industries during the 1990s: pulp and paper mills, plastic manufacturers, petroleum refiners, and iron and steel. They empirically estimate the number of newly created regulation compliance jobs and the number of lost production jobs resulting from lost sales due to higher prices. They find that in these industries at that particular time, the compliance work was fairly labor intensive, so that the number of new jobs was close to the number of lost production jobs. Specifically, they find that the net change was 1.5 jobs per $1 million in pollution abatement spending.[20]

The EPA now uses this multiplier that shows a small net employment effect, applies it to any regulated industry, and always draws the same conclusion: "Employment impacts associated with the proposed rule are estimated to be small."[21] Such a remarkable statement, used in a number of different RIAs based upon this multiplier analysis, is simply not true.

First, the EPA analysis makes no estimate of the employment effect. The agency takes a small multiplier estimated 25 years ago, assumes it is somehow relevant for an entirely different set of industries, and applies it to current regulatory costs. The result will always be a small effect because it uses a small multiplier.

Second, it always concludes that employment effects are estimated to be small, because its methodology always assumes that the magnitudes of the decline in productive employment and the gain in compliance employment are likely to be nearly the same. Both the under-

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Incineration Units; National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters at Major Sources; Proposed Revisions to the National Emission Standards for Hazardous Air Pollutants Subpart S (MACT I and MACT III) for the Pulp and Paper Industry; and Final Revisions to the National Emission Standards for Hazardous Air Pollutants Subpart S (MACT I and MACT III) for the Pulp and Paper Industry.

[20] To be more precise, they find that there are 5.0 new compliance jobs created and 3.5 production jobs lost.

[21] See, for example, the work done for the proposed Utility MACT and NSPS toxic rule proposals.

employment of labor used in production and the over-employment of labor used in compliance are economic costs. Subtracting one from the other has no economic meaning and is contrary to even basic economic theory. As long as the EPA assumes no employment loss in its BCA and applies a small multiplier to count the meaningless "net employment change" in a regulated industry, it will always find small employment effects.

Third, there is absolutely no reason to believe that production workers who lose their jobs will be the same ones hired in new roles in regulation compliance. In other words, no matter the net number of lost jobs, there will be individuals who lose their work in the regulated industry.

**Estimating Employment Effects in a Benefit-Cost Analysis**

Perhaps the comparative static nature of BCAs accounts for the typical RIA assumption that labor displaced by regulatory changes is quickly reemployed with an unemployment period too short to measure. Economists generally refer to this as "assuming a full employment economy," since the comparative static exercise compares two different states of the economy where there is no involuntary unemployment. In reality, there is nothing preventing a BCA from dropping this assumption. For example, the Treasury Board of Canada's guide for using benefit-cost analysis in assessing the impact of regulations (2007) notes, "To the extent that the incomes of the workers fall for a period of time until they find other employment, there is a cost imposed on labor by the transition that should be included."

This is something that the EPA once realized but now seems to have forgotten. In the 2000 edition of its guidelines for conducting an RIA, it makes a similar statement:

> Workers who suffer transitional unemployment will usually find new jobs, and new plants and equipment installed in the future might require relatively less costly pollution control. These long-run changes should be considered as the yearly social costs of a policy are calculated into the future.[22]

EPA's current guidelines simply call employment impacts "not, in general, relevant for BCA" without further explanation.[23]

This practice is referred to as assuming "full employment." The full employment assumption makes more sense in BCAs when applied to many other areas than it does to regulatory impact. In estimating the economic impact of trade liberalization, for example, the analysis typically examines a permanent lowering of trade barriers where (1) the economic benefits to freer trade can continue for decades; (2) lower trade barriers are gradually phased in over many years and therefore labor is given time to adjust; (3) there are government programs, such a Trade Adjustment Assistance, that are designed to help ease the cost of temporary unemployment to displaced workers; and (4) trade liberalization increases economic growth, particularly in developing countries, and helps absorb displaced labor. In fact, unlike regulation, there is significant literature showing that the cost of trade to displaced workers is small relative to the long-run benefits.[24]

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[22] See p. 121, *Guidelines for Preparing Economic Analyses* (2000).
[23] See pp. 8–9, *Guidelines for Preparing Economic Analyses* (2011a).
[24] See Tarr and Matusz (2005) for a literature survey of the adjustment costs of trade liberalization.

Accounting for periods of adjustment is not foreign to BCAs, which routinely consider the timing of benefits and costs. In OMB's guidelines for conducting regulatory impact analyses, agencies are directed to compare regulatory alternatives by identifying "the potential benefits and costs for each alternative and its timing"[25] and to appropriately discount future benefits and costs.[26] Also, there typically is no regulation "phase in" period to give labor time to adjust to displacement, and there is no similar government program to help displaced workers. In fact, it is standard practice in regulation analysis to treat both the benefits and costs of regulatory changes on many non-labor inputs in production, as well as the benefits of regulation, in a different fashion. For example, the OMB requires that the timing of benefits and costs be taken into account and "differences in timing should be reflected" in the analysis. This is simply not consistent with the treatment of labor and makes sense only if labor markets adjust much more quickly than other markets.

**Empirical Evidence on the Cost of Worker Displacement**

The immediate impact of job loss includes lost wages, job search costs, and retraining costs. The evidence, however, clearly demonstrates that the economic cost of job loss goes well beyond its immediate impact. There is consensus, in a fairly large literature, that long-term earnings losses are significant and sustained over time. Most earnings losses even come after re-employment[27] and arise because of skill mismatches; losses are significant and sustained for workers with different lengths of job tenure, for workers in all major industries, and for workers of any age.

[25] See p. 7, US OMB (2011).
[26] It is also interesting to note, and relevant to the "net employment" methodology used by the EPA, that OMB's guidelines make the quite reasonable point that "those who bear the costs of a regulation and those who enjoy its benefits are often not the same people." They recommend that when distributional effects are important, the effects on particular groups should be quantified.
[27] See Farber (1999).

Recent work based on improved datasets has discovered that losses are greater and longer-lasting than previously estimated. For example, von Wachter, Song, and Manchester (2011) examine longitudinal data from Social Security records covering as much as 30 years of earnings. They examine job displacements during the 1982 recession and find that losses can last in excess of 20 years. Recent estimates by Davis and von Wachter (2011) also examine longitudinal Social Security records of high-tenure workers from 1974 to 2008. They find an average discounted loss of 1.4 years of earnings—when labor markets are functioning well—and a surprisingly large 2.8 years of earnings during periods of high unemployment (exceeding 8 percent).

Much of the literature has focused on workers with significant job tenure, but studies have also focused on a number of different types of job loss using data from a range of sources, including the Displaced Worker Survey,[28] the Panel Study of Income Dynamics,[29] the Health and Retirement Study,[30] and the National Longitudinal Survey of Youths.[31] Although workers of all tenure are significantly impacted, the loss is particularly large for displaced workers with significant job tenure, as can result when new regulations impact an industry for the first time.[32] Other work has shown that areas of the country where economic conditions are worse experience greater earnings losses; however, losses are large and long-lasting even in regions with strong economies.[33] Of particular importance for regulatory impact analysis, re-employment in the same industry seems to result in less job mismatch and

[28] This survey focuses on persons losing jobs where they had tenure with a company of at least three years.
[29] This is a longitudinal household survey that measures economic, social, and health factors over multiple generations. It has been ongoing since 1968.
[30] This is a longitudinal survey of people over the age of 50.
[31] These are longitudinal surveys of youth cohorts beginning when participants were 14–22 years old.
[32] See Kletzer (1989), Neal (1995), or Poletaev and Robinson (2008).
[33] See Jacobson, LaLonde, and Sullivan (1993) and Couch and Placzek (2010).

smaller earnings losses.[34] Further, while older workers may have larger earnings losses initially, younger workers may have more persistent losses.[35]

In addition to earnings losses, job displacement impacts other welfare-related outcomes such as future job stability, earnings volatility, health and mortality,[36] and even family outcomes—such as the educational and future labor market performance of children. Helliwell and Huang (2011) examine the impact of higher local unemployment rates and find evidence that "unemployment has significant spillover effects on those who are not themselves unemployed." They estimate that the total overall impact on others is twice as large as the impact on the unemployed themselves. In addition, a recent work by Krueger and Mueller (2011) finds evidence of a particularly large job displacement cost both during and after the great recession. Although hard to quantify, US agencies routinely estimate these types of impacts as part of their RIA, but only for purposes of identifying the benefits of health or environmental regulations—never with respect to the cost of unemployment.

A simple exercise is possible that relies on even an incomplete estimate of the economic cost of job displacement from regulatory changes. If we return to our example of the EPA regulatory impact analysis report on the Toxics Rule, we can apply the Davis and von Wachter (2011) dollar estimate of job displacement. In table 1, I have added the mean annual salary in each of the affected industries in column 4. Applying the 2.8 years of lost

[34] See Neal (1995) and Carrington (1993).
[35] See Couch (1998) and Chan and Stevens (2004) for studies on older workers, and Kahn (2010) and von Wachter, Song, and Manchester (2011) for studies on younger workers.
[36] See Burgard, Brand, and House (2007) and Sullivan and von Wachter (2009). The latter estimated a reduction in life expectancy of 1 to 1.5 years.

earnings, it appears that there is an additional $2 billion in earnings losses from the regulation not included in the analysis.[37]

The economic conditions in the macro-economy and in the impacted industries are likely to affect the costs of job displacement. The amount of labor market flexibility, credit market flexibility, the state of housing markets, and the unemployment rate will affect job displacement costs in the broad economy. Further, in the specific industry, compliance costs will be affected by the ease with which firms in other industries can absorb the occupations of the displaced workers, the industry's natural labor turnover rate, the uniqueness of the occupations in the industry, the specific industry skills that workers possess, the employment and occupation trends in the industry, and the regions of the country regulation impacts.

**Conclusion**

Federal agencies are required to provide regulatory impact analyses that assess the benefits and costs of significant regulatory actions. Although it is generally not possible to take macroeconomic and dynamic effects into account for specific regulatory changes, these effects may be the most important for an economy. Agencies do typically estimate the total long-run efficiency impact in benefit-cost analyses and, although the long-run employment effects may be implicitly included in economic efficiency estimates of lost market surplus, the employment effects could also be explicitly estimated with existing methodology. It is generally meaningless to include a simple job count in benefit-cost analyses, and recent efforts by the EPA to argue in regulatory impact analyses that there will always be a very small employment effect—because of the Morgenstern, Pizer, and Shih (2002) study—is misguided at best. Currently, it is common

[37] If the job loss is a much higher 21,000 jobs in the electrical generation industry, then the quarter million job loss overall becomes an earnings loss of over $40 billion that is not included in the analysis.

practice to ignore temporary employment effects of regulatory changes, but the evidence is overwhelming that job displacement does, in fact, cause significant and long-lasting declines in earnings. At the very least, federal agencies should characterize the workers likely to be displaced by regulatory changes, develop methodologies to estimate the likely costs of this displacement, and include them as part of a benefit-cost analysis.

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