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WRESTLING WITH WAL-MART

Tradeoffs Between Profits, Prices, and Wages

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The benefits and costs of Wal-Mart's expansion across the United States have been hotly debated. Critics of the retailer have documented the extent to which Wal-Mart uses its market power to undermine its workers' compensation: squeezing suppliers and hurting local economies along the way. Supporters of Wal-Mart counter that price declines offered by the company more than compensate U.S. consumers for any depressing effect the company's expansion has on wages. Two recent opinion pieces, one in the *New York Times* and the other in the *Washington Post*, pushed back hard against critics of Wal-Mart, arguing that the retailer's low prices benefit low-income families more than its labor practices could possibly harm them.[1]

Another aspect of the Wal-Mart debate focuses on the subsidies (implicit and explicit) that Wal-Mart receives from government at various levels. Critics of the company argue that these subsidies essentially allow Wal-Mart to mask the true cost of its business model, and constitute a monetary transfer from taxpayers to the company's bottom line. Defenders of the company argue that most of the subsidies Wal-Mart and its employees receive from government programs are well-targeted, and perform exactly the task they were meant to. While this is as much a debate about politics and values as economics, there are insights that the latter discipline can provide. Our central findings in this paper are:

- A widely quoted figure from a study by the consulting firm Global Insight (GI) indicates that Wal-Mart's expansion has resulted in $263 billion in savings to U.S. consumers. We find this to be implausible. The statistical analysis generating this highly influential result fails the most rudimentary sensitivity checks.

- A robust set of research findings shows that Wal-Mart's entry into local labor markets reduces the pay of workers in competing stores. This effect is greatest in the South, where Wal-Mart expansion has been greatest.

- The current campaign to pressure Wal-Mart into raising its labor compensation practices does not have to impinge on the benefits accruing to consumers through price declines: sizable compensation increases could be fully paid for out of Wal-Mart's profits without affecting prices if the company either accepted the same profit margins that it obtained in the recent past, or accepted the lower profit margins that some of its competitors do. Further, even if

Wal-Mart passed all compensation increases through to higher consumer prices, this would result in less than a 4% increase in its prices. If the retailer's price advantage is even in the neighborhood of what its defenders claim, this would still leave it with a privileged competitive position.

- Assuming Wal-Mart will not choose to lower its profit margins to improve the quality of its jobs, there is a clear rationale for mandates such as the recently passed "pay-or-play" health care bill that requires large employers to either provide health coverage or pay into a state plan to do so.

Everyday low prices? A critique of Global Insight's report

Wal-Mart recently convened a seminar to discuss academic studies that examined its impact on local (and the national) economies. It also commissioned a study from the consulting firm Global Insight (GI). The GI report found by far the largest positive impacts of Wal-Mart on the economy, and its results have been those most cited by defenders of the company. For example, both op-eds noted above cited the work of economist Jason Furman, who uses the GI findings to argue that Wal-Mart's low prices saved consumers $263 billion in 2004, amounting to $2,329 per household. Based on this finding, and assuming any improvement in Wal-Mart's labor practices would lead to higher prices, Tierney's *New York Times* op-ed concluded with the question, "…why would anyone who claims to be fighting for social justice be so determined to take money out of the pockets of the poor?"

However, GI's estimate of Wal-Mart's dampening effect on inflation, on which Furman's numbers are based, is indefensibly large. This is contradicted by more careful research and reviewed here in a set of technical appendices. The GI conclusions rest entirely on their regression analysis of the effect of growing Wal-Mart square footage in a given metropolitan statistical area (MSA) on the measured consumer price index (CPI) (for a range of items) in that same MSA. We show the fragility of this model in a later section, but first identify a set of other problems with GI's results.

The internal consistency of GI's numbers on Wal-Mart and prices

GI reports that from 1985 to 2004, Wal-Mart lowered *overall* prices (as measured by the overall CPI) by a total of 3.1% and lowered commodity (goods) prices by 4.2%. However, in an unrelated portion of the text, GI correctly notes that "consumer prices for services are dominated by rents, imputed rents, utilities, medical services, and transportation—all areas outside of Wal-Mart's product offerings."

Services amount to 60% of the items in the CPI.[2] Thus, if the impact of Wal-Mart on service inflation is zero, the GI numbers on Wal-Mart's impact on prices are inconsistent. GI's finding that Wal-Mart's expansion led to a 4.2% decline in goods prices translates to only a 1.7% decline (not the reported 3.1%) in overall prices (4.2 * 0.4 = 1.7). In short, the two top-line findings of the GI report (Wal-Mart's effect on overall prices and on goods prices) are internally inconsistent with each other.

We found further inconsistencies when comparing the GI numbers on Wal-Mart's impact on food-at-home prices and overall goods prices. GI claims that Wal-Mart lowered food-at-home prices by 9.1% from 1985 to 2004. Given that food-at-home represents 21% of overall goods expenditures, this implies that food-at-home price declines would account for over 43% of the entire (4.2%) goods price decline (9.1 * .21 = 1.82; 1.82/4.2=.43).

Taking the GI method for assessing the benefit of Wal-Mart, we multiply the decline in food-at-home prices (9.1%) by food-at-home expenditures in 2004 ($400 billion). This implies a benefit of $36.4 billion stemming from food expenditures. Given that these (by dint of their share of the overall goods price declines) must exhaust 43% of the benefits (as noted above), this implies that the *ceiling* on overall benefits from Wal-Mart stemming from cost savings is $84 billion, less than one-third of the benefits claimed by GI (recall that $263 billion in cost savings noted above).

Other problems with GI's methods raise serious doubts regarding the reliability of their findings.

Sensitivity test of GI regression

Given the outsized number for Wal-Mart's impact on overall prices (relative to other examinations in the literature), we attempted to replicate Global Insight's econometric analysis of Wal-Mart's price impact for various commodities. Our success in approximating their results for overall CPI and food prices allowed us to understand their methodology and identify its flaws. Once we addressed these weaknesses, the statistical and practical significance of Wal-Mart's price effects effectively vanished.

While we did not have access to the data on Wal-Mart square-footage-by-MSA, we constructed a measure of Wal-Mart stores-per-capita-by-MSA. When we use this dependent variable to try to replicate the Global Insight findings by strictly following their estimating methodology, we are generally successful, suggesting that it is a good proxy for their dependent variable.

However, when we undertake some rudimentary sensitivity analyses of these results, the effect of Wal-Mart expansion on relevant prices quickly becomes impossible to detect. For a comprehensive description of our estimating methodology and results, see the **Technical Appendix 1**.

A couple of key features of our analysis can be described here, however. First, by progressively adding independent variables to the model's specification, we track how the "Wal-Mart coefficient" (i.e., the impact of Wal-Mart expansion, all else equal, on consumer prices) changes. A general rule for judging the robustness of an econometric finding is that it should remain statistically and economically significant even as other independent variables are added to a regression specification. The Wal-Mart coefficient fails this test. As other independent variables are added, it invariably loses significance, shrinks in magnitude, and becomes so unstable that it often flips from positive to negative. In short, the Global Insight finding does not survive rudimentary checks for robustness.

Second, we use the full possibilities afforded by a year-by-MSA panel from 1985-2004. The Global Insight report only uses the cross-sectional variation in prices and Wal-Mart expansion (i.e., it only looks at changes in these variables between 1985 and 2004). The pace of Wal-Mart expansion, however, has been rapid and uneven over this time, affording the possibility at looking at how "leads" and "lags" of Wal-Mart expansion condition the estimated price declines. When using these (quite standard) panel data estimating techniques, Wal-Mart expansion did not have a statistically significant impact on overall prices or prices of non-durable goods (presumably the area of greatest Wal-Mart impact) in any of the smaller sub-samples.

Correctly measured, Wal-Mart's impact on four CPI indices (including nondurable items, the bulk of Wal-Mart's sales) was negligible throughout our panel observations. The most complete models identified greater change in food prices during years *prior* to growth in Wal-Mart stores, rather than the actual time of expansion and subsequent years, making the causal argument that Wal-Mart entry drives down MSA prices hard to sustain.

Most strangely, and particularly damaging to the Global Insight findings, is that the most "robust" finding using the MSA-level CPI data we identified was that Wal-Mart reduced housing rent. This is obviously impossible, and Global Insight itself discounts the possibility that Wal-Mart expansion can drive down the prices of services that are not provided by the retailer (as noted above).

Overall, we find that the Global Insight methodology is fraught with specification and selection problems. Our analysis calls into question any findings of consumer savings from Wal-Mart's presence identified in the Global Insight study. More careful studies of the price impacts of Wal-Mart's expansion are undertaken by Hausman and Leibtag (2005) and Basker (2005). However, the magnitudes of these results have been exaggerated and/or used improperly by defenders of the company. For more on other studies of Wal-Mart's price effects and how GI's results stack up, see **Technical Appendices 2 and 3**.

Everyday low wages

A major concern in the debate over the economic impacts of Wal-Mart's expansion is the effect this has on workers' wages. Most would grant that prices are lower at Wal-Mart than in many competing stores (although the magnitude of

this price difference is often less than implied by company defenders). A key question, however, is whether or not some of the benefits of these price differences are implicitly clawed back by the ability of Wal-Mart to drive down wages not just of its own workers, but throughout the retail or merchandising sector as a whole.

Dube et al. (2005) use a statistical technique free of the selection bias that plagues many studies of Wal-Mart's effect on wages. If, for example, Wal-Mart chooses to open stores in low-wage areas, one would find a statistical association between Wal-Mart expansion and low wages, but the causal inference that Wal-Mart expansion led to low wages would be incorrect. Dube et al. (2005) measure wage growth in localities conditional on how far they are from Arkansas. This technique works because Wal-Mart's actual expansion pattern over the past 20 years was indeed a steady expansion radiating out from Arkansas, like a ripple from a stone dropped in water.

Dube et al. (2005) find that Wal-Mart expansion tends to generate employment that supplants competing merchandising jobs paying 18% more in urban counties. This leads to substantial downward pressure on wages, with Wal-Mart store openings leading to a 0.5–0.8% reduction in average earnings per worker in the general merchandising sector, and pay lowered by 0.8–0.9% for grocery workers.

In a paper submitted to the Global Insight conference, Neumark et al. (2005) report similar (but even larger) findings, using similar estimating methodologies. Neumark et al. (2005) focus on both employment and wage effects from Wal-Mart expansion. They find that this expansion reduces employment in retail in a given local labor market by 2-4%, and payrolls-per-employee in retail by another 3.5%. While there is some evidence that total employment (not just retail) in a given local labor market decreases following Wal-Mart expansion, total payrolls also decline following this opening: local residents earn less across-the-board after Wal-Mart's opening. This effect is most pronounced in the South, where Wal-Mart's expansion is strongest and has been occurring for the longest period of time.

Furman (2005) has argued that the Dube et al. (2005) and Neumark et al. (2005) studies do not take into account the price declines spurred by Wal-Mart expansion in inferring real (inflation-adjusted) wage impacts of Wal-Mart expansion. If prices fall faster than wages, Furman (2005) notes that the purchasing power of even retail workers could rise with Wal-Mart expansion. He compares the decline in retail wages documented by Dube et al. (2005), (around 0.65%), with the Global Insight findings on overall CPI reductions over the entire period of Wal-Mart expansion (3.1%) and argues that the purchasing power of even retail workers rises with Wal-Mart entry. He notes Basker's (2005) findings of a retail price decline of 7-13% stemming from Wal-Mart entry and comes to the same conclusion.

There are a couple of problems with this comparison. First, the Global Insight study simply is not reliable. The findings are internally inconsistent, and the only robust finding is that Wal-Mart expansion somehow is correlated with lower housing rents. The Basker (2005) study is more carefully done, but as discussed in Technical Appendix 2, provides far-from-general results. Second, the Neumark et al. (2005) findings referenced by Furman (2005) are incomplete: Furman (2005) only notes that "Neumark et al. (2005) find 'some evidence that payrolls-per-worker also decline, by about 3.5 percent, but this conclusion is less robust [than their findings on Wal-Mart's employment effects].'"

In fact, the most striking finding from the Neumark et al. (2005) paper is that total payrolls per person in a given MSA fall by over 5 %. This implies a decline in average payroll earnings for *everybody in a MSA* following the opening of Wal-Mart stores, and by quite a bit more than the numbers referenced by Furman (2005). Of course, part of the lower payrolls per person could be workers voluntarily choosing more part-time schedules or unemployment following Wal-Mart's expansion. This, we would argue, strains credulity.

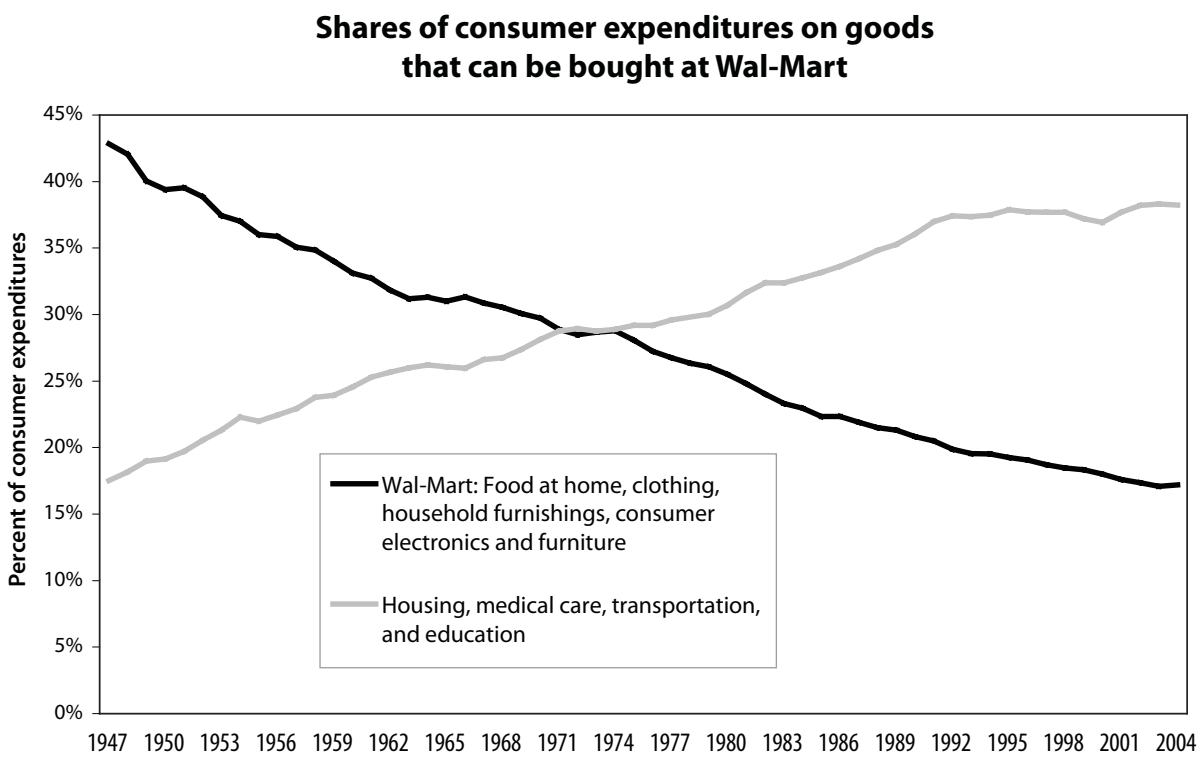
How long could lower retail prices win the fight against falling wages?

There is another point to be raised here about the implicit horse-race between prices and wages that underlines the Wal-Mart debate. Essentially, the defenders of Wal-Mart argue that the price-depressing effects of Wal-Mart outrun the wage-depressing effect, leading to rising purchasing power for American workers. However, the prices that are reduced through Wal-Mart's expansion constitute an ever-shrinking share of American families' expenditures.

Wal-Mart essentially gives people the ability to buy food, apparel, household goods and furniture at reduced prices. As can be seen in **Figure A**, the share of expenditure in each of these categories has shrunk over time. By contrast, the expenditure shares on health care, housing, and transportation for families have gone up over time. These cannot be bought at Wal-Mart, yet they constitute an ever-growing share of American household expenditures. In short, the benefits from the same price effect in Wal-Mart's product areas are shrinking over time. The real pressures on family income are coming from items that can't be bought at Wal-Mart. They can, however, be bought with higher wages.

The idea that encouraging Wal-Mart's expansion constitutes a progressive endeavor that will provide big benefits to poor Americans in the future is misguided; truly progressive policy should focus on the big-ticket items in most families' budget—health care, housing, and transportation—and should try to help them pay for these items.

FIGURE A



Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Do higher wages have to mean higher prices? How much higher?

There are a number of other issues that make the narrow debates regarding the "wages vs. prices" horse-race described in the previous section particularly uninformative. First, it is often assumed that a rise in compensation at Wal-Mart must come at the expense of higher prices. This isn't necessarily the case—some (or all) of it could come from reduced profit margins, and in this case, the cost-saving benefits would be preserved even as Wal-Mart employees saw higher living standards.

Supporters of Wal-Mart's expansion have pointed to huge cost differences between Wal-Mart and other retailers, and have argued that these differences are largely rooted in productivity differences between Wal-Mart and its competitors. If true, this would imply that there are large economic rents available to be split between the shareholders and workers of Wal-Mart. Few would argue that Wal-Mart employees have seen the lion's share of these.

Defenders of Wal-Mart often assert that the company operates with very small profit margins. To assess the validity

of these claims, there are two quick and easy comparisons that can be made regarding the ability of Wal-Mart to fund wage increases without raising prices: Wal-Mart's net profit margin was 25% higher in 2005 than it was in 1997, and 40% higher than Costco, a frequently contrasted competitor in the retail food business.

In 1997, Wal-Mart's net profit margin was 2.9%, while in 2005 this had risen to 3.6%. Costco, a competitor in the large-market food business, had a net profit margin of 2.0% in 2005. Measured against the standard of either its own performance in the recent past or its close competitors, Wal-Mart would seem to have room to raise worker pay without raising prices inordinately.

To get a feel for how much of a wage increase could be financed out of reduced profitability, one can imagine Wal-Mart having margins fall back down to their 1997 levels, which would also cut half of the difference between their margins and Costco's (2.8%). This would give the company $2.3 billion to plough into improved worker compensation without facing the need to raise prices. Wal-Mart currently has 1.3 million employees in the United States, so this translates to about $1,800 per employee. Of course, Wal-Mart has many employees, especially in the executive and managerial ranks, who are in less pressing need of higher compensation than others. If this money was restricted to improving only production and non-supervisory employees (and, assuming that this constitutes 85% of Wal-Mart's workforce, in line with this ratio for the entire retail sector), this would translate into just under $2,100 per employee. Based on data showing that average compensation in its stores is $10.41per hour and average working time is 30.5 hours per week, this means that just returning to its 1997 net profit margins would allow Wal-Mart to give its non-supervisory workers raises of 13% without raising prices.

Second, with no reduction in Wal-Mart's profitability, the relevant question becomes: how much of a price increase would the economy need to bear in order to attain a reasonable improvement in the working standards of Wal-Mart workers?

For illustration, consider two simple standards. The first would bring Wal-Mart's compensation in line with that of other large retailers. Earlier research (Dube 2005) indicates that this would require a 16.0% increase in wage and benefits costs for hourly workers. Currently, Wal-Mart's annual wage and benefit costs are estimated as $21.46 billion ($10.41 in hourly compensation for 1.3 million hourly workers working an average of 30.5 hours a week for 52 weeks a year). A 16.0% increase in wage and benefits costs for 85% of its employees amounts to $2.9 billion. Wal-Mart's annual sales in United States for the fiscal year ending in January 2005 were $286 billion (Wal-Mart 2005c). Thus, the added labor costs would amount to 1% of its sales, or just over a penny per dollar of sales.

Of course, large retailers' compensation does not make for a particularly high standard. This is especially true for health benefits, where the average hourly cost of health insurance paid by large retailers was estimated at $1.00/hour. Another set of standards could be based on the series of laws passed by states and localities mandating wage and benefit floors for large employers. Suffolk County in Long Island, New York recently mandated that big box retailers pay $3.00/hour for health benefits to their employees. A similar measure in New York City requires large employers selling groceries to provide between $2.50 and $3.00 an hour in health benefits. Finally, hourly cost for health benefits for unionized employers in the service sector nationally is $3.14/hour. Given this, as an alternative to average large retail compensation, we consider a $1.40/hour wage increase as before coupled with a $3.00 per hour increase in health benefits as a standard. The resulting $14.08/hour compensation is 35.3% higher than Wal-Mart's current hourly compensation cost. To match this standard, Wal-Mart's wage and benefit costs would have to rise by a total of $6.4 billion dollars or 2.2% of total sales.

This is clearly a high standard relative to their current pay practices and the raises the question: Is this too much to ask? This depends largely upon their actual price advantage. If Wal-Mart's prices were substantially lower than their competitors (as emphatically claimed by its defenders), then they could afford to increase labor compensation and still continue to offer large price advantages to consumers.

The previous discussion indicates that there is a range of estimates of how much Wal-Mart saves consumers. If Wal-Mart's price advantage was really as large as claimed by GI, Hausman and Leibtag (2005), and Basker (2005), then absorbing a labor cost increase would do only modest harm to either the retailer's profits or consumer savings. Only if the true price gap between Wal-Mart and its competitors is small will increasing labor compensation to higher standards

threaten profits or consumer savings. Of course, the consumer savings in such a case must result largely from labor cost differences, and, are hence akin to robbing Peter (Wal-Mart employees) to pay Paul (Wal-Mart consumers). Spurring compensation increases (either through legislation or through public pressure) is in a sense a true test of Wal-Mart's price advantage: if it's large, these increases can be easily funded; if it is not large and based only on the ability to pay lower wages, then such compelled compensation increases will level the playing field between Wal-Mart and its competitors, forcing them to compete on productivity improvements.

Wal-Mart's ability to absorb a large increase in prices also hinges crucially on whether that increase is unilateral or industry-wide. If somehow a policy, a pressure campaign, or unionization made Wal-Mart increase its compensation by 35%, but left other retailers untouched, Wal-Mart would have a difficult time expanding into new markets and perhaps even in holding on to its current markets. In contrast, policies or unionization that set standards for all big box retailers can successfully raise the bar for the retail sector without making the cost prohibitive for an individual company.

Besides, is this any way to run an economy?

A particularly contentious issue regarding Wal-Mart's impact on the American economy involves its employees' use of publicly financed programs like Medicaid and food stamps. A recent internal Wal-Mart memo revealed, for example, that 46% of Wal-Mart workers' children are uninsured or on Medicaid; this compares to 29% for large retail and 32% for all retailers. Critics of the company argue that this (disproportional) use is an implicit subsidy from taxpayers to a rich corporation. Supporters of the company counter that the lion's share of these subsidies benefit the low-wage workers at Wal-Mart and this is exactly the point of them.

On this point, both sides are right: subsidies to low-wage workers accrue to both the company they work for and the workers themselves, with most of the subsidies going to the workers. This, however, does not imply that it is inappropriate or economically harmful to either Wal-Mart consumers or employees to try to pressure the firm into increasing its compensation package, particularly with regards to health care. Part of this debate comes down to what policy makers should be concerned about: the primary or secondary income distribution. The primary distribution is the pre-tax and transfer array of incomes, while the secondary distribution includes the effect of taxes and transfers.

When it comes to offsetting the damage to the wage structure we document above, many policy analysts seem to believe that the sole intervention point is the secondary distribution. That is, they are quick to accept the primary distribution as an outcome that cannot and/or should not be altered. In their view, if the market is generating "too much" inequality, the government can offset this through redistributive fiscal policy. In Furman's piece supporting the Wal-Mart model, he advocates expanding the Earned Income Tax Credit (EITC) in precisely this spirit.

While there is merit in this view, this strategy makes U.S. workers and their households too reliant on the single instrument of fiscal redistribution (the expansion of transfer programs). While EITC expansion (for example) is clearly a viable policy remedy for lost earnings, there are reasons for not relying solely on this strategy.

First, we cannot ask American workers to rely exclusively on taxpayers and politicians continually ratcheting up their willingness to offset the degradation of the wage structure induced by Wal-Mart, not to mention globalization, the loss of manufacturing employment, union power, and so on.

This is an especially salient concern given the constraints on the federal budget caused by the current, and more importantly, the projected gap between future federal outlays and revenues under current policies. According to the U.S. Congressional Budget Office (2005), under plausible assumptions, that gap is expected to grow much wider in coming decades, largely due to the pressure of health care price increases and the continuation of current tax policies. We don't take this to mean that potentially useful policies like expanding the EITC should be off the table, but it does mean that any spending programs outside of defense/homeland security face a very steep challenge for at least the medium term. Wal-Mart defenders who argue that workers harmed by its practices should rely on government transfers to be made whole are essentially putting off help to this group until taxes can be raised.

Second, recent budget developments provide a particularly germane example. While Wal-Mart supporters argue that it's fine for Medicaid to pick up the health coverage of uninsured workers, the president has proposed $5 billion in cuts to Medicaid over the next five years and has proposed an additional $5 billion in cuts to programs for low-income people in his most recent budget. Further, in February of this year, Congress passed a budget reconciliation that included a $27 billion cut in Medicaid over 10 years. In other words, the tide is pushing hard against expanding these redistributive measures, and may be so for some time to come.

However, even if budgetary or political constraints were not as binding as they now are, it is still good policy to tap the full set of available options for offsetting the decline in living standards of workers in the low-end of the retail sector (or in any other sector, for that matter). Otherwise, we risk taxpayers subsidizing low-wage employers, as transfers through the EITC and Medicaid need to constantly be upwardly adjusted to offset wage losses. Imbalances in the primary distribution, such as those caused by Wal-Mart's disproportionate size and market power, are thus fair game, and a chief rationale for the economic justice movement against the retailer's labor practices.

The pressure from this movement has another important rationale: to avoid a "race to the bottom." Take, for example, recent debates regarding health care provision in retail services. In a 2003 grocers' strike in California, the owners of mainline grocers constantly invoked the cost-pressure from Wal-Mart's (and other superstores') expansion as rationale for their attempt to cut their contribution to employee health insurance. These competitive pressures threaten to create negative spillovers as Wal-Mart expands across the nation.

Conclusion

Wal-Mart does a lot right. It has expanded productivity by being more efficient and leaner than many other companies. Many of the benefits that accrue to U.S. shoppers from Wal-Mart's expansion could be preserved even if the retailer had to meet the expectations of its critics regarding what was fair in worker compensation. But defenders of the company too often set up false dichotomies: low prices or high wages; being able to shop at Wal-Mart or not. The real choice is less stark: a Wal-Mart that compensates its workers better or worse than at present.

Technical Appendix A: Sensitivity test of GI's findings

We examined 1986-2004 longitudinal panel data for the same 24 MSAs included in the Global Insight study. Our data differ from Global Insight's data in several ways. First, we calculated Wal-Mart stores per-capita in each MSA as an explanatory variable representing Wal-Mart's impact on prices. Second, we used each MSA's CPI for energy as a proxy for MSA electricity prices. Finally, we used the 1986-2004 period, as opposed to 1985-2004 period, as the public BLS data only provides CPI estimates by MSA going back to 1986.

We did not have access to Global Insight's observations of Wal-Mart square footage per-capita, nor the average electricity prices in each MSA (Global Insight cites average state prices rather than MSA-specific prices). While the authors of the Global Insight study cite electricity prices as a potentially important factor in the retail market, their use of the state average seems to undermine this intended level of precision (particularly among MSAs from the same state, such as Los Angeles and Oakland). Thus, we think that each MSA's CPI for energy provides an adequate substitute for our purposes. Moreover, as we will discuss below, our estimates using the closest proxy to the Global Insight methodology produces similar estimates for Wal-Mart's effect on prices. It is the problem with that methodology, and the non-robustness of the findings, that is of primary concern here.

The Global Insight authors did not use the full panel data to estimate the expected year-to-year changes in prices. Instead, they defined a base year and final year and excluded data from all years in between. They then ran multiple regressions to estimate each variable's effect on the change in prices from the base year to the final year. Specifically, they set base-year values for the unemployment rate at 1990, CPI for services at 1985, electricity prices at 1985, and Wal-Mart square footage per-capita at 1985. Their final-year values for these same variables were taken from 2004, the 2001-04 average, the 2001-04 average, and the 2002-04 average respectively. The dependent variables (CPI for all items and CPI for food at home) were set at the 1985 values for the base year and the 2005 values for the final year (Global Insight 2005, 52). The authors did not indicate why they chose to use disparate time indices for these variables (particularly the final-year average values for services, electricity, and Wal-Mart square footage per-capita). Indeed, we are unable to identify any legitimate rationales for such a procedure.

While unemployment data is only available from 1990 onwards for most MSAs, the proper method to deal with this would have been to either estimate a regression in change between 1990 and 2004 including unemployment as a control variable, or to estimate the 1985-2004 regressions without the unemployment control. Given that the bulk of Wal-Mart store openings occurred post-1990, it seems perfectly reasonable to start the sample in that year.

Replication

Temporarily setting aside these problems, we constructed specifications that (given the data differences described above) were as close as possible to the models provided in the technical appendix of the Global Insight report. These estimate the impact of Wal-Mart growth on the CPI for all goods and services, and for food at home. We restricted variables to artificial base- and final-year values to match the Global Insight regressions. Finally, as a prelude to our full panel data regressions, we also ran a MSA-fixed effect regression using the final and base years, with the dependant variable (CPI) in logs (specification 6). It is substantively the same as the regression in difference form (specification 4). But specification 6 provides a bridge between the regression in percent changes (using one year) that Global Insight performs, and the regressions using the full panel data that we perform in the next section.

The following variables were used in the regressions:

wmpop	Wal-Mart stores per capita
pop	Population
cpienergy	CPI for energy
*cpiservice*s	CPI for services
urate	Unemployment rate
m	MSA
t	Year (base year: 1986 or 1990; final year: 2001-04 average, 2002-04 average, or 2004)
cpiy	CPI for y (all items, food)
Δx_{mt}	Change in parameter *x* from year *t – 1* (base year) to year *t* (final year) in MSA *m*
$\%\Delta x_{mt}$	Percent change in parameter *x* from year *t – 1* (base year) to year *t* (final year) in MSA *m*

The regression specifications used in the replication were as follows, with corresponding tables in the Global Insight study listed for reference:

(1) Cf. Table 12 in Global Insight study, Appendix A

$$\%\Delta cpiy_{mt} = \alpha_0 + \beta_1 \Delta urate_{mt} + \beta_2 \%\Delta cpienergy_{mt} + \beta_3 \%\Delta cpiservices_{mt} + \Delta u_{mt}$$

(2) Cf. Table 13 in Global Insight study, Appendix A

$$\%\Delta cpiy_{mt} = \alpha_0 + \beta_1 \Delta urate_{mt} + \beta_2 \%\Delta cpienergy_{mt} + \beta_3 \%\Delta cpiservices_{mt} + \beta_4 \Delta wmpop_{mt} + \Delta u_{mt}$$

(3) Cf. Table 16 in Global Insight study, Appendix A

$$\%\Delta cpiy_{mt} = \alpha_0 + \beta_1 \Delta urate_{mt} + \beta_2 \%\Delta cpienergy_{mt} + \beta_3 \Delta wmpop_{mt} + \Delta u_{mt}$$

(4) Cf. Table 14 in Global Insight study, Appendix A

$$\%\Delta cpiy_{mt} = \alpha_0 + \beta_1 \Delta urate_{mt} + \beta_2 \Delta wmpop_{mt} + \Delta u_{mt}$$

(5) Wal-Mart stores per capita only

$$\%\Delta cpiy_{mt} = \alpha_0 + \beta_1 \Delta wmpop_{mt} + \Delta u_{mt}$$

(6) Cf. Table 14 in Global Insight study, Appendix A

$$\log(cpiy_{mt}) = \delta_0 + \beta_1 urate_{mt} + \beta_2 wmpop_{mt} + \Delta_m msa + u_{mt}$$

As the regression coefficients are not directly comparable to the Global Insight study (given we are using stores-per-capita, while Global Insight uses square-footage-per-capita), we also estimated the counterfactual change in prices if the number of Wal-Mart stores were kept constant at the base year. This "price reduction" effect—also reported in the Global Insight report—provides a direct comparison between the two studies.

Our replications (reported in **Table A1**) implied Wal-Mart price effects on all items (1.05%–5.45%) that are comparable to those obtained in the Global Insight results (3.1%), as was decrease in food prices (6.43%–10.27% versus

Table A1.
Determinants of percent change in CPI for all items by MSA (Global Insight parameters)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Δ Unemployment rate (1990 to 2004)	0.001	0.001	0.006	0.014	—	0.008
	(0.007)	(0.007)	(0.015)	(0.012)	—	(0.007)
Percent growth CPI energy (1986 to 2001-04 mean)	0.113	0.111	0.112	—	—	—
	(0.058)	(0.059)	(0.124)	—	—	—
Percent growth CPI services (1986 to 2004)	0.501	0.491	—	—	—	—
	(0.056)**	(0.059)**	—	—	—	—
Δ Wal-Mart stores per capita (1986 to 2002-04 mean)	(2.005)	(8.793)	(8.977)	(10.374)	(5.767)	
	—	-3.16	-6.386	-6.355	-6.284	-3.968
Constant	0.092	0.112	0.596	0.667	0.668	4.659
	(0.063)	(0.071)	(0.086)**	(0.035)**	(0.036)**	(0.039)**
Implied cumulative Wal-Mart price effect	—	-1.05%	-4.62%	-4.72%	-5.45%	-3.03%
Number of observations	24	24	24	24	24	48
R^2	0.82	0.83	0.2	0.16	0.11	0.99

Standard errors in parentheses; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Table A2.
Determinants of percent change in CPI for food at home within MSAs (Global Insight parameters)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Δ Unemployment rate (1990 to 2004)	-0.02	-0.024	-0.023	-0.005	—	-0.004
	(0.018)	(0.017)	(0.017)	(0.014)	—	(0.009)
Percent growth CPI energy (1986 to 2001-04 mean)	0.253	0.243	0.243	—	—	—
	(0.155)	(0.141)	(0.142)	—	—	—
Percent growth CPI services (1986 - 2004)	0.243	0.16	—	—	—	—
	(0.15)	(0.142)	—	—	—	—
Δ Wal-Mart stores per capita (1986 to 2002-04 mean)	—	-16.927	-19.144	-19.544	-18.988	-12.235
	—	(7.557)*	(7.350)*	(7.675)*	(7.385)*	(4.767)*
Constant	0.228	0.395	0.553	0.707	0.706	4.712
	(0.168)	(0.171)*	(0.098)**	(0.043)**	(0.042)**	(0.047)**
Implied cumulative Wal-Mart price effect	—	-8.96%	-10.06%	-10.27%	-9.98%	-6.43%
Number of observations	24	24	24	24	24	48
R^2	0.21	0.38	0.33	0.24	0.23	0.99

Standard errors in parentheses; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Global Insight's 9.1%). Thus, our use of stores per-capita did not seem to alter Global Insight's primary conclusions. Unlike Global Insight, we did not find estimates of the Wal-Mart effect to be statistically significant for any of the regressions on the CPI for all items. The Wal-Mart effect was significant at the 5% level for all of our regressions on CPI for food. However, the more control variables we left out of the specifications (unemployment rate, CPI for energy, and CPI for services), the higher the implied price effects of Wal-Mart stores per-capita. Moreover, the unemployment effect was *positive* for the regressions on CPI for all items. Global Insight did not arrive at similar sign changes for the unemployment variable. Finally, a log-level regression of prices on Wal-Mart openings yielded lower price effects.

Panel data analysis

Satisfied with our approximation of Global Insight's findings, we next sought to check for robustness of the specifications used in that study. Since many of the regressions below use the full panel data, to keep the "percent change in CPI" interpretation, the dependent variables are logarithms of CPI. These regression formulations should be compared with specification 6 in Table 1 and **Table A2** to understand the impact of alternative specifications and data range.

Our variables and specifications are defined as follows:

dXX	Dummy variable for year XX
wmpop	Wal-Mart stores per capita
urate	Unemployment rate[3]
cpienergy	CPI for energy
cpiservices	CPI for services
m	MSA

t	Year
$cpiy$	CPI for y (all items, durable items, nondurable items, food, or rent)
$wmpop_{t-2}$	2-year lead before store expansion
$wmpop_{t-1}$	1-year lead before store expansion
$wmpop_{t+1}$	1-year lag after store expansion
$wmpop_{t+2}$	2-year lag after store expansion

(1) 1986 and 2004 only

$$\log(cpiy_{mt}) = \delta_0 + \beta_1 wmpop_{mt} + u_{mt}$$

(2) 1990 and 2004 only

$$\log(cpiy_{mt}) = \delta_0 + \beta_1 wmpop_{mt} + \beta_2 urate_{mt} + u_{mt}$$

(3) 1988–2004[1]

$$\log(cpiy_{mt}) = \alpha_0 + \alpha_1 d90_t + \ldots + \alpha_{15} d04_t + \beta_1 wmpop_{mt} + \beta_2 urate_{mt} + u_{mt}$$

(4) 1988–2004[1]

$$\log(cpiy_{mt}) = \alpha_0 + \alpha_1 d90_t + \ldots + \alpha_{15} d04_t + \beta_1 wmpop_{mt} + \beta_2 urate_{mt} + \beta_3 \log(cpienergy_{mt}) + \beta_4 \log(cpiservices_{mt}) + u_{mt}$$

(5) 1988–2004[1]

$$\log(cpiy_{mt}) = \alpha_0 + \alpha_1 d90_t + \ldots + \alpha_{15} d04_t + \beta_1 wmpop_{mt} + \beta_2 urate_{mt} + \beta_3 \log(cpienergy_{mt}) + \beta_4 \log(cpiservices_{mt}) + \beta_5 wmpop_{mt-2} + \beta_6 wmpop_{mt-1} + \beta_7 wmpop_{mt+1} + \beta_8 wmpop_{mt+2} + \Delta_m msa + u_{mt}$$

(6) 1986–2004

$$\log(cpiy_{mt}) = \alpha_0 + \alpha_1 d88_t + \ldots + \alpha_{17} d04_t + \beta_1 wmpop_{mt} + \beta_2 \log(cpienergy_{mt}) + \beta_3 \log(cpiservices_{mt}) + \beta_4 wmpop_{mt-2} + \beta_5 wmpop_{mt-1} + \beta_6 wmpop_{mt+1} + \beta_7 wmpop_{mt+2} + u_{mt}$$

(7) 1988–2004[1]

$$cpiy_{mt} = \alpha_0 + \alpha_1 90_t + \ldots + \alpha_{15} d04_t + \beta_1 wmpop_{mt} + \beta_2 urate_{mt} + \beta_3 cpienergy_{mt} + \beta_4 cpiservices_{mt} + u_{mt}$$

Results from these seven regressions are reported in **Tables A3** to **A7**—where each table reports coefficients for a different outcome variable. As before, we compared the actual distribution of Wal-Mart's in 2004 to the counterfactual distribution using 1986 to estimate the cumulative impact on the various CPIs.

Except for the most underspecified model (specification 1), we found negligible Wal-Mart price effects (less than 1%) on the CPI for all items (Table 3). In fact, Wal-Mart presence was statistically insignificant as a predictor for all CPI changes in all specifications. The point estimate switched signs depending on the specification—showing lack of robustness as well as lack of statistical precision. Finally, the same pattern from our replication of the Global Insight study appeared in our fixed-effect modeling—the more specified the regressions, the lower the magnitude of implied Wal-Mart price impact.

Our analysis incorporated one- and two-year lag variables to accommodate any possible delayed effect of Wal-Mart expansion. Similar lead variables served to detect any "masked" effects that would have otherwise been attributed to growth in Wal-Mart stores per-capita. Linear combinations on Wal-Mart expansion during base years, one-year and two-year lags were not statistically significant for overall CPI, suggesting that more precise use of timing of Wal-Mart

store openings do not provide any solid evidence of price reduction using this type of data. However, leads were more likely to be negative than lags in sign, suggesting that the negative effect discerned in specification 1 is subject to both specification and selection problems.

Overall, our checks suggest that the magnitude and statistical significance of Global Insight's finding of substantial reduction in the CPI from Wal-Mart expansion is highly questionable. As this estimate formed the "hard core" of their subsequent macro-simulation, Global Insight's estimates of annual savings to consumers are without solid foundation.

The impact of Wal-Mart on food prices was a second pillar of the Global Insight report. When we extended the food-price analysis to the full panel, the negative effect remained in specifications (3) and (4), though the cumulative

Table A3.
Determinants of change in CPI for all items within MSAs

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wal-Mart stores per capita	-6.768	0.261	-1.32	0.109	0.038	-0.034	-9.593
	—	(3.286)	(0.983)	(0.298)	(0.672)	(0.749)	(50.671)
Unemployment rate	—	0.00531	0.00134	-0.00298	-0.00234	—	-0.523
	—	(0.00724)	(0.00131)	(0.00042)**	(0.00047)**	—	(0.070)**
Log CPI for energy	—	—	—	0.086	0.08	0.061	—
	—	—	—	(0.010)**	(0.010)**	(0.009)**	—
Log CPI for services	—	—	—	0.674	0.665	0.646	—
	—	—	—	(0.013)**	(0.014)**	(0.014)**	—
CPI for energy	—	—	—	—	—	—	0.123
	—	—	—	—	—	—	(0.012)**
CPI for services	—	—	—	—	—	—	0.585
	—	—	—	—	—	—	(0.010)**
2-year lead before store expansion	—	—	—	—	-0.213	-0.254	—
	—	—	—	—	(0.521)	(0.549)	—
1-year lead before store expansion	—	—	—	—	-0.211	-0.122	—
	—	—	—	—	(0.666)	(0.74)	—
1-year lag after store expansion	—	—	—	—	0.591	0.659	—
	—	—	—	—	(0.674)	(0.748)	—
2-year lag after store expansion	—	—	—	—	-0.132	-0.188	—
	—	—	—	—	(0.513)	(0.562)	—
S(base year, 1-year lag, 2-year lag)	—	—	—	—	0.498	0.437	—
	—	—	—	—	(0.512)	(0.56)	—
Constant	4.702	5.202	4.764	1.146	1.224	1.448	37.155
	(0.008)**	(0.045)**	(0.016)**	(0.066)**	(0.073)**	(0.076)**	(1.609)**
Implied cumulative price effect	-3.86%	0.14%	-0.71%	0.06%	-0.01%	-0.15%	-0.04%
Number of observations	48	48	364	364	316	360	364
R^2	0.99	0.99	0.98	1	1	1	1

Standard errors in parentheses; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

effect of Wal-Mart fell from 7% (in specification 1 which uses only the base and final year) to 2-3%. However, once we actually use the timing of Wal-Mart store openings by incorporating leads and lags in specifications 5 and 6, we find that the 2-year lead on Wal-Mart expansion had the largest negative coefficients (and statistically significant in spec. 6), suggesting that more meaningful changes in the food prices were found in years *prior* to the establishment of additional Wal-Marts in MSAs. The effect on two year post openings were never close to being significant. Overall, this implies that Global Insight's findings of substantial reductions in grocery prices were highly questionable, and likely driven by a combination of specification and selection biases.

As the nation's largest retailer, Wal-Mart generates most of its revenue from the sale of nondurable items. Wal-Mart's

Table A4.
Determinants of change in CPI for durable items within MSAs

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wal-Mart stores per capita	-7.266	3.443	2.489	2.302	0.969	-0.041	202.124
	(8.266)	(7.368)	(1.724)	(1.653)	(3.704)	(4.03)	(220.074)
Unemployment rate	—	-0.00615	-0.00729	-0.01246	-0.012	—	-1.516
	—	(0.01624	(0.00230)**	(0.00235)**	(0.00258)**	—	(0.304)**
Log CPI for energy	—	—	—	0.234	0.223	0.102	—
	—	—	—	(0.053)**	(0.057)**	(0.050)*	—
Log CPI for services	—	—	—	0.253	0.206	0.167	—
	—	—	—	(0.070)**	(0.077)**	(0.076)*	—
CPI for energy	—	—	—	—	—	—	0.255
	—	—	—	—	—	—	(0.052)**
CPI for services	—	—	—	—	—	—	0.133
	—	—	—	—	—	—	(0.044)**
2-year lead before store expansion	—	—	—	—	-0.285	1.483	—
	—	—	—	—	(2.879)	(2.9520)	—
1-year lead before store expansion	—	—	—	—	1.139	0.105	—
	—	—	—	—	(3.679)	(3.98)	—
1-year lag after store expansion	—	—	—	—	1.639	1.856	—
	—	—	—	—	(3.72)	(4.024)	—
2-year lag after store expansion	—	—	—	—	-2.228	-2.028	—
	—	—	—	—	(2.832)	(3.022)	—
S (base year, 1-year lag, 2-year lag)	—	—	—	—	0.381	-0.214	—
	—	—	—	—	(2.86)	(3.011)	—
Constant	4.676	4.779	4.78	2.539	2.783	3.427	84.075
	(0.017)**	(0.100)**	(0.028)**	(0.366)**	(0.402)**	(0.409)**	(6.986)**
Implied cumulative price effect	-3.81%	1.84%	1.33%	1.23%	1.80%	-1.41%	0.95%
Number of observations	48	48	364	364	316	360	364
R^2	0.7	0.73	0.85	0.87	0.87	0.86	0.86

Standard errors in parentheses; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

price effect on nondurable items was neither statistically nor substantively significant in any of our panel estimates; indeed the sign of the impact varied by specifications. The same was true with the impact on durable goods.

Ironically, we found the greatest implied Wal-Mart effects were on housing rent, which we conducted as a falsification exercise (as few would suggest that Wal-Mart reduces the cost of housing). The impact on rent in specification 1 was statistically significant at the 10% level, implying Wal-Mart reduced rents by 9%. (Note that this was the specification that produced the largest price reductions on grocery, close to that claimed by Global Insight.) Even more tellingly, we found that the negative effect and statistical significance remained even after using leads and lags (in specifications 5 and 6), suggesting a negative effect on rents two years after a store opening—with a cumulative reduction in rents of 2%.

Table A5.
Determinants of change in CPI for nondurable items within MSAs

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wal-Mart stores per capita	-3.545	0.014	0.869	0.531	-0.734	-0.612	6.839
	(3.359)	(2.918)	(0.791)	(0.709)	(1.637)	(1.706)	(108.091)
Unemployment rate	—	0.0016	0.00029	-0.00333	-0.0028	—	0.572
	—	(0.00643)	(0.00105)	(0.00101)**	(0.00114)*	—	(0.149)**
Log CPI for energy	—	—	—	0.178	0.168	0.145	—
	—	—	—	(0.023)**	(0.025)**	(0.021)**	—
Log CPI for services	—	—	—	0.116	0.125	0.083	—
	—	—	—	(0.030)**	(0.034)**	(0.032)**	—
CPI for energy	—	—	—	—	—	—	0.232
	—	—	—	—	—	—	(0.026)**
CPI for services	—	—	—	—	—	—	0.06
	—	—	—	—	—	—	(0.022)**
2-year lead before store expansion	—	—	—	—	0.705	-0.201	—
	—	—	—	—	(1.272)	(1.25)	—
1-year lead before store expansion	—	—	—	—	-0.497	0	—
	—	—	—	—	(1.626)	(1.685)	—
1-year lag after store expansion	—	—	—	—	0.693	0.661	—
	—	—	—	—	(1.644)	(1.704)	—
2-year lag after store expansion	—	—	—	—	0.655	0.537	—
	—	—	—	—	(1.252)	(1.279)	—
S (base year, 1-year lag, 2-year lag)	—	—	—	—	0.606	0.586	—
	—	—	—	—	(1.264)	(1.275)	—
Constant	4.645	5.129	4.696	3.355	3.395	3.931	84.428
	(0.007)**	(0.040)**	(0.013)**	(0.157)**	(0.178)**	(0.173)**	(3.431)**
Implied cumulative price effect	-2.03%	0.01%	0.47%	0.28%	-0.32%	-0.38%	0.03%
Number of observations	48	48	364	364	316	360	364
R^2	0.99	0.99	0.98	0.98	0.98	0.99	0.98

Standard errors in parentheses; *significant at 5%; **significant at 1%
Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Indeed, this was the only item where we found a "robust" reduction in prices after taking into account the timing of store openings over the full period. Most researchers would find such a finding to be of extreme concern, as it suggests that using MSA-level CPI data to discern price impact of Wal-Mart growth is not a valid exercise.

Table A6.
Determinants of change in CPI for food at home within MSAs

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wal-Mart stores per capita	-11.836	-4.248	-4.963	-4.475	-1.437	-0.992	-918.915
	(4.769)*	(5.619)	(1.290)**	(1.196)**	(2.723)	(2.876)	(191.029)**
Unemployment rate	—	-0.00175	-0.00178	-0.00519	-0.0057	—	-1.017
	—	(.0124)	(0.00172)	(0.00170)**	(0.00190)**	—	(0.264)**
Log CPI for energy	—	—	—	0.112	0.07	0.011	—
	—	—	—	(0.038)**	(0.042)	(0.036)	—
Log CPI for services	—	—	—	0.345	0.386	0.355	—
	—	—	—	(0.051)**	(0.057)**	(0.054)**	—
CPI for energy	—	—	—	—	—	—	0.201
	—	—	—	—	—	—	(0.045)**
CPI for services	—	—	—	—	—	—	0.268
	—	—	—	—	—	—	(0.038)**
2-year lead before store expansion	—	—	—	—	-3.127	-4.164	—
	—	—	—	—	(2.116)	(2.107)*	
1-year lead before store expansion	—	—	—	—	-0.219	0.005	—
	—	—	—	—	(2.704)	(2.84)	—
1-year lag after store expansion	—	—	—	—	1.071	2.203	—
	—	—	—	—	(2.735)	(2.872)	—
2-year lag after store expansion	—	—	—	—	-2.446	-2.456	—
	—	—	—	—	(2.082)	(2.157)	—
S (base year, 1-year lag, 2-year lag)	—	—	—	—	-2.813	-1.245	—
	—	—	—	—	(2.103)	(2.149)	—
Constant	4.692	5.259	4.76	2.609	2.643	3.254	70.747
	(0.010)**	(0.076)**	(0.021)**	(0.265)**	(0.295)**	(0.292)**	(6.064)**
Implied cumulative price effect	-0.0677	-0.0227	-0.0265	-0.0239	-0.0224	-0.0251	-0.0427
Number of observations	4800.00%	4800.00%	36400.00%	36400.00%	31600.00%	36000.00%	36400.00%
R^2	0.99	0.97	0.96	0.97	0.97	0.97	0.97

Standard errors in parentheses; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Table A7.
Determinants of change in CPI for food at home within MSAs

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wal-Mart stores per capita	-14.954	2.128	-3.848	0.599	0.202	-0.254	-105.923
	(8.721)+	(7.628)	(2.41)	(1.129)	(2.512)	(2.814)	(225.418)
Unemployment rate	—	0.00011	-0.00161	-0.00717	-0.00558	—	-1.501
	—	(0.01659	(0.00321	(0.00161)**	(0.00175)**	—	(0.311)**
Log CPI for energy	—	—	—	-0.067	-0.082	-0.152	—
	—	—	—	(0.036)	(0.039)**	(0.035)**	—
Log CPI for services	—	—	—	1.629	1.606	1.559	—
	—	—	—	(0.048)**	(0.053)**	(0.053)**	—
CPI for energy	—	—	—	—	—	—	0.016
	—	—	—	—	—	—	(0.054)
CPI for services	—	—	—	—	—	—	1.506
	—	—	—	—	—	—	(0.045)**
2-year lead before store expansion	—	—	—	—	2.409	1.83	—
	—	—	—	—	(1.952)	(2.062)	—
1-year lead before store expansion	—	—	—	—	1.419	0.775	—
	—	—	—	—	(2.494)	(2.779)	—
1-year lag after store expansion	—	—	—	—	-1.083	-1.955	—
	—	—	—	—	(2.522)	(2.81)	—
2-year lag after store expansion	—	—	—	—	-2.631	-1.929	—
	—	—	—	—	(1.92)	(2.111)	—
S (base year, 1-year lag, 2-year lag)	—	—	—	—	-3.512	-4.138	—
	—	—	—	—	(1.939)+	(2.103)**	—
Constant	4.77	5.295	4.846	-2.684	-2.567	-2.308	-54.503
	(0.017)**	(0.101)**	(0.039)**	(0.250)**	(0.272)**	(0.285)**	(7.155)**
Implied cumulative price effect	-8.55%	1.14%	-2.06%	0.32%	-1.98%	-1.88%	-0.46%
Number of observations	47	47	363	363	316	360	363
R^2	0.99	0.97	0.96	0.97	0.97	0.97	0.97

Standard errors in parentheses; + significant at 10%; *significant at 5%; **significant at 1%

Source: Authors' analysis of Bureau of Labor Statistics data, except for Wal-Mart store openings, which is obtained from www.walmartfacts.com.

Technical Appendix B: More on those "everyday low prices"

Hausman and Leibtag (2005)

Though the GI estimates are far too unreliable to offer insight into the question of Wal-Mart's impact on prices, some Wal-Mart defenders have cited the work of Hausman and Leibtag (2005) as being high-quality and still supportive of the view that Wal-Mart expansion leads to large consumer savings. Hausman and Leibtag do indeed find large cost savings from Wal-Mart on the price of food-at-home on their own so, even if GI's numbers are unreliable, shouldn't we trust the Hausman and Leibtag numbers?

Many economists have taken the Hausman and Leibtag numbers and presented these as the best estimate of Wal-Mart's cost savings, relying on the careful methodology and sterling reputation of the authors. The derivation of the Hausman and Leibtag numbers, however, needs to be explained more carefully in order to let readers judge how much weight to give them in this debate. They are not dollar figures for cost savings, as implied by some commentators in print (see Mallaby 2005). Rather, they are the "compensating variation" implied by Wal-Mart's entry into a geographic area: that is, they are the (unobserved) amount of income that you would have to pay prospective Wal-Mart shoppers to hold their economic welfare constant if Wal-Mart were to disappear.

While this approach has theoretical appeal and validity, it should not be conflated with directly measured savings, as measured by the direct and indirect effects on the CPI. Instead, as we discuss below, economists make a number of assumptions in this type of work that lead to much larger estimates of savings than can be observed by comparing price differences between Wal-Mart and its competitors. These assumptions may or may not be appropriate, but findings based on them lead to much higher estimates than the actual dollars saved to consumers.

Hausman and Leibtag actually estimate the price impacts of supermarket centers (SMCs) (Wal-Mart-type "supercenters" that sell groceries, and of which Wal-Mart has a (roughly) 75% market share) on food-at-home to be about 0.3% for each extra percentage point of market share claimed by SMCs. SMCs market share grew by about 15 percentage points between 1985 and 2004, so this ends with an estimate of food-at-home prices being 4.5% lower in 2004 due to the influence of SMCs, with Wal-Mart accounting for roughly three-quarters of this. Using the simple GI method of translating these price declines into consumer savings yields a figure of about $19 billion in 2004.

While these are not trivial savings, it is not this value that has been picked up in stories about the savings attributable to Wal-Mart. Furman (2005), for example, relies on this Hausman and Leibtag study to claim a $50 billion increase in consumer welfare stemming from savings on food-at-home expenditures.

Why, then, is the actual number on consumer savings so much smaller than what has been reported about the Hausman and Leibtag study? Because Hausman and Leibtag then take another step and posit that it's not just the gap between prices (and the concomitant competitive pressures) at SMCs and mainline grocers that lead to welfare gains. Instead, the expansion of SMCs, argue Hausman and Leibtag, should be treated as the *introduction of an entirely new good into the economy*, even when the products they sell are identical to those sold elsewhere.

Furman (2005) has praised Hausman and Leibtag for their "theoretically appropriate" approach to this issue and he's careful (unlike some other commentators) to not refer to this $50 billion as "consumer savings." It's true that the Hausman and Leibtag approach goes the farthest toward comporting with measurements of "consumer surplus" as taught in economics textbooks, but since the higher number includes theoretical, as opposed to actual savings, it stands apart from other numbers in this debate.

In other words, Wal-Mart clearly saves consumers money by offering goods at lower prices. It is this price difference, roughly $19 billion in 2004, that should be a readily acceptable value to those making this case. The higher num-

ber—$50 billion—includes a theoretical adjustment as to how much more consumers value Wal-Mart, and this higher value should clearly not be treated as directly comparable with other directly observable numbers that are floated in this debate (like GI's results).

Hausman and Leibtag argue (and Hausman has argued elsewhere) that the cost savings from the introduction of new goods needs to be incorporated into official measures of price change (like the consumer price index (CPI) measure of inflation, as compiled by the Bureau of Labor Statistics (BLS)). They propose a method for properly reflecting the economic welfare gains stemming from the introduction of new goods.

Essentially, Hausman and Leibtag propose to estimate demand functions for new goods and subsequently derive the "shadow prices" for them that would drive demand for these new goods to zero. They then insist that the difference between the observed price for a new good and this unobserved "shadow price" should be reflected in the CPI as part of the overall change in prices.

As an example, say that iPods came on the market for $400 in 2001. Hausman and Leibtag would then try to estimate the "shadow price" for iPods that would drive demand for them to zero. Say they found that this price was $1,200. They would then insist that an $800 decline in the price of iPods be reflected in the official CPI and would make calculations about the gain in consumer welfare assuming this $800 price decline.

Again, in many ways this method is "theoretically appropriate" in matching up to textbook conceptions of "consumer surplus." However, it goes far beyond the (relatively) simple observation and data collection that characterize the current construction of the CPI. Further, calculations based upon it are not comparable to most other numbers generated in the debate over Wal-Mart.

Lastly, it is far from clear that the expansion of Wal-Mart into new territories is best thought of as the introduction of an entirely new good. Wal-Mart tends to sell the exact same products that are available in other retail stores, and it's not clear that there is anything so inherently different about the shopping experience at Wal-Mart that it constitutes looking for economic gains over and above the observed price differences. In fact, it could well be the case that the opposite is true if shopping at Wal-Mart involves less help from sales staff or less convenient locations.

Basker (2005)

Basker (2005) also contributed a paper to the Global Insight conference on the impact of Wal-Mart expansion on retail prices. Basker finds that Wal-Mart entry reduces prices on a small range of retail items by 1.5-3.0% in the short-run (the quarter following Wal-Mart entry), and by 7-13% in the long-run (up to five years after entry). The large magnitudes of these price declines have been cited by many (see Furman 2005) as further evidence of the large economic benefits to be gained from Wal-Mart's expansion.

Basker (2005) uses an instrumental variables (IV) regression to examine how Wal-Mart entry affects the subsequent price of a basket of retail goods across a number of U.S. cities. Her instrument is a constructed variable of planned Wal-Mart openings in a given MSA for a particular time period. This helps attenuate the bias of looking at *actual* Wal-Mart openings, which may be correlated with openings occurring at times of high (or low) prices in a given city (say during an economic boom). Her best estimates of the impact of Wal-Mart entry on prices is derived from these IV regressions.

While Basker's (2005) findings are convincing, it's not clear that they are generalizable beyond the relatively narrow set of retail goods she tracks, for a couple of reasons. First, Basker (2005) obtains price data from the American Chamber of Commerce Research Association (ACCRA). She notes that ACCRA instructs its surveyors to "select only grocery stores and apparel stores where professional and managerial households normally shop. Even if discount stores are a majority of your overall market, they shouldn't be in your sample at all unless upper-income professionals and executives really shop there." She asserts that this implies that her results are a lower-bound on Wal-Mart's price effects, as the competitive pressure of Wal-Mart on directly competing discount retailers will be greater than on the upscale stores in ACCRA's sample. It's unclear if this is the proper assignation of bias: it could well be that the failure to include discount

stores *overstates* how much Wal-Mart can save retail shoppers in a given city. The items Basker (2005) selects for study are purposely those that are homogenous across stores. This implies that there will be competitive pressure on all stores selling these homogenous items, regardless of whether they are upscale or not (i.e., there is no cache factor to buying Revlon lipstick at Neiman-Marcus instead of Wal-Mart, one imagines).

Second, Basker's (2005) basket of goods under examination is very small. She examines the prices of only 10 items over time: aspirin, cigarettes, Coke, detergent, Kleenex, pants, shampoo, shirts, toothpaste, and underwear. She picks these items based on the probability that they would offer the best chance for Wal-Mart to provide lower prices (i.e., they were homogenous and were likely to be sold at Wal-Mart). This group of items—selected precisely for showing a large price impact of Wal-Mart—constitute only about x.x% of total expenditures in 2004.

Lastly, it should be noted that Basker's (2005) 7-13% finding is only for those goods whose prices respond in *a statistically significant fashion to Wal-Mart expansion*. Depending on the precise specification, she finds either two of 10 products saw significant price declines or four of 10 products. This fact, combined with the endogenous selection of products to examine, strongly suggest that one cannot just apply the 7-13% price decline figure to the entire retail sector.

Technical Appendix C: What is GI actually measuring and is it really comparable to other studies?

GI states in their executive summary that "these estimates [of Wal-Mart's effect on prices] are in line with other researchers' estimates of Wal-Mart's price effects," yet, they provide no citation to support this claim. In fact, a close reading of other research shows that GI's estimates are far out of line with what other researchers have found when estimating comparable effects to GI. Essentially, GI finds price effects that are five times as large as those derived from other works undertaking comparable research, such as the Hausman and Liebtag (2005) study referenced above.

As noted before, Hausman and Leibtag (2005) examines the price impact of the expansion of SMCs on the price of food-at-home. These SMCs include the various outlets owned by Wal-Mart that compete with mainline grocers. In an earlier paper, Hausman (2004) noted that the CPI *as currently measured* does not capture any of the price impacts of SMCs that stem from lower prices prevailing in their stores vis-à-vis identical items sold at mainline grocers. That is, the fact that food (say) is cheaper at Wal-Mart than other grocers is implicitly attributed to lower service provisions at Wal-Mart than other grocers, and the BLS does not allow the (levels of) price differences between Wal-Mart and other grocers to impact the *CPI-U food-at-home* measure at all. If prices *change* faster or slower in SMCs than traditional grocery stores, then the expansion of SMCs in the grocer's market can affect the measured inflation rate of food at home, but there is no effect on inflation from differences in price *levels* between SMCs and traditional markets that is reflected in the BLS food-at-home measure.

In an earlier paper, Hausman and Liebtag (2004) make a good case that this is an inappropriate treatment of the price difference between Wal-Mart and mainline grocers, citing rising market share of the former as evidence that the price difference is not wholly a function of poorer service. Using data obtained from the AC Nielsen Homescan panel dataset, Hausman and Leibtag (2005) calculate that, properly measured, the expansion of SMCs between 1998 and 2001 *should have* lowered the CPI for food-at-home by 0.43% per year owing to the price level differences between SMCs and mainline grocers. Hausman and Leibtag (2005) call this the "direct effect" of SMC expansion in geographic markets on CPI food-at-home prices.

The fact that the impact of Wal-Mart's lower price levels are not reflected in the CPI reveals an important problem with GI's analysis of the Wal-Mart price effect. Their statistical analysis purports to measure that effect by estimating a relationship between changes in the CPI and the expansion of Wal-Mart. This sounds plausible—it's reasonable to expect that the expansion of stores with lower price levels would lead to slower growth of inflation, particularly of the index for the relevant goods. But since these level differences are not reflected in the CPI—since the price index fails to pick up the impact of Wal-Mart's lower price levels—it is impossible for GI's regression model to derive a plausible direct effect. Based on this logic, we cannot know what they are picking up when they regress changes in the CPI on Wal-Mart's expansion, but it cannot be the direct effect of Wal-Mart on prices estimated by Hausman and Leibtag (2005).

Hausman and Leibtag (2005) also calculate an "indirect effect" of SMC entry on food-at-home prices *in mainline grocers*. This indirect effect stems from the competitive pressure that SMC expansion places on mainline retailers. To the extent that competitive pressures from Wal-Mart's expansion lead to price reductions by its competitors, this effect would be picked up by the CPI as measured, and thus by GI's regressions. However, GI's estimates of this effect are much higher than those of Hausman and Leibtag.

Hausman and Leibtag (2005) do not back out an implicit price effect stemming from the indirect impact of SMC expansion on grocer prices (perhaps owing to the insignificance of so many of the individual prices), but later sections of their paper indicate that they estimate the magnitude of consumer welfare benefits stemming from these indirect effects to be only about a quarter as important as the direct effects.

Hence, the number that is comparable between the Hausman and Leibtag (2005) and the GI study differs by an order of four. Further, since Hausman and Liebtag (2005) are estimating the impact of all SMCs on food prices, their estimates must be multiplied by Wal-Mart's SMC market share. If Wal-Mart has a market share among SMCs of 75% (which is what is implied in Hausman and Leibtag (2005) on page 3), this would imply that the GI estimates of Wal-Mart's impact on food-at-home prices are over five times larger than those estimated by Hausman and Leibtag (2005). In short, the GI finding on the price effects of Wal-Mart is decidedly *not* in line with what other researchers have found.

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Endnotes

1. See John Tierney's "The Good Goliath." November 29, 2005 edition of the *New York Times* and Sebastian Mallaby's "Progressive Wal-Mart. Really." November 28, 2005 edition of the *Washington Post*.
2. See http://www.bls.gov/cpi/cpiri2004.pdf.
3. Unemployment rates are only available from 1988 onwards for Cleveland-Akron, Ohio and Detroit-Ann Arbor-Flint, Mich. Unemployment rates are only available from 1990 onwards for all other MSAs.

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