Empirical Setting

The U.S. waste and recycling industry generates approximately $80 billion in annual revenues.[1] In recent years the industry has experienced significant merger activity including several large acquisitions between vertically integrated, national competitors. However, solid waste companies tend not to be homogeneous in their degree of vertical integration across geographies. As a result, each of these mergers exhibits a variety of vertical supply chain configurations both pre- and post-merger across their relevant local markets, making it an excellent application for further study of the welfare impacts of mergers that have both horizontal and vertical aspects.

The vertical supply chain in the solid waste industry is primarily comprised of waste collection operations or "haulers" and waste disposal facilities. Haulers collect municipal solid waste (MSW) from businesses and residences and must dispose of it at a lawful disposal site, predominantly landfills. Waste disposal (upstream) is a required input into waste collection services (downstream). Some haulers are vertically integrated and operate their own disposal facilities. Vertically-integrated haulers typically prefer to dispose of waste at their own disposal facilities and may also sell a portion of their disposal capacity. Disposal customers include private waste haulers without their own disposal assets (independent haulers) as well as local governments that collect their citizens waste themselves. Due to strict laws and regulations that govern the disposal of MSW, there are no reasonable substitutes for MSW disposal. Thus, mergers that combine hauling and disposal assets may incentivize the merged entity to raise its hauling rivals cost of disposal in order to benefit its own collection operations. Whether or not the merged entity is both able and incentivized to undertake such action depends upon the extent of its market power in the local disposal market, the merging parties profit margins in each line of business and their intensity of hauling competition with prospective disposal customers.

[1] Waste Dive, https://www.wastedive.com/news/public-companies-increased-control-of-74b-us-waste-industry-in-2018/556079/

In 2020, Waste Management, the largest waste management company in the U.S., acquired Advanced Disposal Services (ADS), previously the fourth largest company, for $4.6 billion.[2] GFL Environmental also acquired WCA Waste Corporation for $1.2 billion in 2020.[3] Republic Services, the second largest waste management company in the U.S., acquired Santek Environmental in 2021.[4] These three merged companies along with Waste Connections, the third largest waste management company in the U.S., are estimated to control over 60% of available landfill capacity nationally and also rank among the top haulers nationwide.[5] Concentration in local markets varies substantially, however, in both the upstream and downstream markets.

Concerns about vertical competitive effects were raised in both the Republic-Santek and the Waste Management-ADS transactions. Both the Solid Waste Agency of Lake County, IL and the Solid Waste Agency of Northern Cook County submitted comments in opposition to the proposed asset divestiture from Waste Management-ADS, stating that a vertically integrated competitor was needed to maintain competition in their local market post-merger.[6] In the DOJ complaint filed in the Republic-Santek case, vertical competitive effects were alleged to arise from the combination of their integrated assets in the Chattanooga area.[7]

Our application in progress further identifies local markets in which these acquisitions result in: 1) only horizontal combinations of assets, 2) only vertical combinations of assets, and 3) combinations of vertically integrated assets in the presence of existing integrated competitors to analyze the welfare effects from mergers with complex vertical arrangements. The next sections present preliminary results on the merger of vertically integrated assets in the presence of other integrated and unintegrated rivals in the context of Republic and

[2] Competitive Impact Statement: U.S. and Plantiff States v. Waste Management, Inc. and Advanced Disposal Services, Inc., https://www.justice.gov/atr/case-document/file/1330596/download

[3] Waste 360, https://www.waste360.com/business/breaking-gfl-acquires-wca-waste-corp-121-billion

[4] Competitive Impcat Statement: U.S. and State of Alabama v. Republic Services, Inc.and Santek Waste Services, LLC, https://www.justice.gov/atr/case-document/file/1382626/download

[5] Waste Business Journal, https://www.wastedive.com/news/public-companies-increased-control-of-74b-us-waste-industry-in-2018/556079/

[6] See Comments by SWALCO and SWANCC : U.S. and Plaintiff States v. Waste Management, Inc., and Advanced Disposal Services, Inc., https://www.justice.gov/atr/case-document/file/1377646/download.

[7] See U.S. and State of Alabama v. Republic Services, Inc. and Santek Waste Services, LLC, https://www.justice.gov/atr/case-document/file/1382031/download

Santek's merger in the Chattanooga area.

0.1 Combination of vertically integrated assets: Chattanooga

The Competitive Impact Statement (CIS) filed by the DOJ in association with the Republic-Santek merger describes the alleged lost competition in the "Chattanooga, Tennessee and North Georgia area", subsequently referred to as the Chattanooga Area, due to lost horizontal competition in MSW disposal and small-container commerical waste (SCCW) collection as well as raising rivals costs in the SCCW collection market by raising the MSW disposal costs of independent haulers. The CIS notes that Republic and Santek combined served approximately 73 percent of the SCCW collection market with three other significiant competitors. In MSW disposal, the CIS identifies only one other significant competitor and Republic and Santek as serving approximately 82 percent of the market, disposed of either directly in the merging parties landfills within the area or passing through their transfer stations in Chattanooga before ultimately being disposed of in the parties landfills elsewhere. Thus, pre-merger both parties were large, vertically integrated competitiors in the Chattanooga Area.

In addition, another large, vertically integrated waste company existed in the market at the time of the merger, Waste Connections, which was the parties' sole competitor in the MSW disposal market. Waste Management and ADS owned collection assets in the area but were not vertically integrated in this market, as demonstrated by MSW disposal data discussed in Section0.1.1.[8] We treat Waste Management and ADS as a single, merged entity regardless of whether the data source predates the merger consumation since the merger was completed before the filing of the CIS for the Republic-Santek merger. The final significant participant in the SCCW collection market is a major regional firm that is not identified by

[8]Firms that are national competitors and vertically integrated in other markets are known to enter contracts with each other to dispose of waste on advantageous terms that may make them effectively vertically integrated. Ignoring these contracting relationships may underestimate the number of effectively vertically integrated competitors in the market.

name in the CIS.

0.1.1 MSW Disposal Volume Data

Data on MSW disposal comes from data collected by TDEQ (Tennessee Department of Environmental Quality) on Class 1 landfill ownership, Class 1 Solid Waste Origin Reports, and waste disposal by county for 2019. This data identifies the origin county and destination landfill, including owner and operator information, for all MSW produced in Tennessee as well as waste volumes passing through transfer stations in Tennessee. The MSW disposal market definition follows that outlined in the DOJ CIS and attributing share to the company owning the final disposal landfill (i.e., ignoring transfer stations which are an intermediate disposal site only). Thus, the total market quantity is defined as all MSW volumes originating in Hamilton county.

Disposal volumes are measured in tons and have been combined across landfills owned by the same firm. The TDEQ data identifies landfills owned or operated by Republic, Santek, Waste Connections, and three market participants each with less than 0.5% share receiving MSW volumes originating in Hamilton County.[9] These three fringe participants have been excluded from the analysis. After rescaling, the resulting market shares are Republic, 28.4%, Santek, 54%, and Waste Connections, 17.6%.

Using this data in conjunction with information on collection market volumes, discussed in Section 0.1.3, the supply relationships between the upstream disposal market participants (*Republic, Santek, and Waste Connections*) and downstream collection market particpants (*Republic, Santek, Waste Connections, WM-ADS, and "Regional"*) can be inferred under the assumption that vertically-integrated haulers first dispose of waste at their own disposal facilities and then sell any residual disposal capacity to rival haulers. Santek and Waste

[9]The City of Chattanooga and Marion County landfills are municipally owned and operated, accounting for less than 1% combined. Global Envirotech is a privately-owned transfer station that sends its 0.03% share to an out of state landfill in GA.

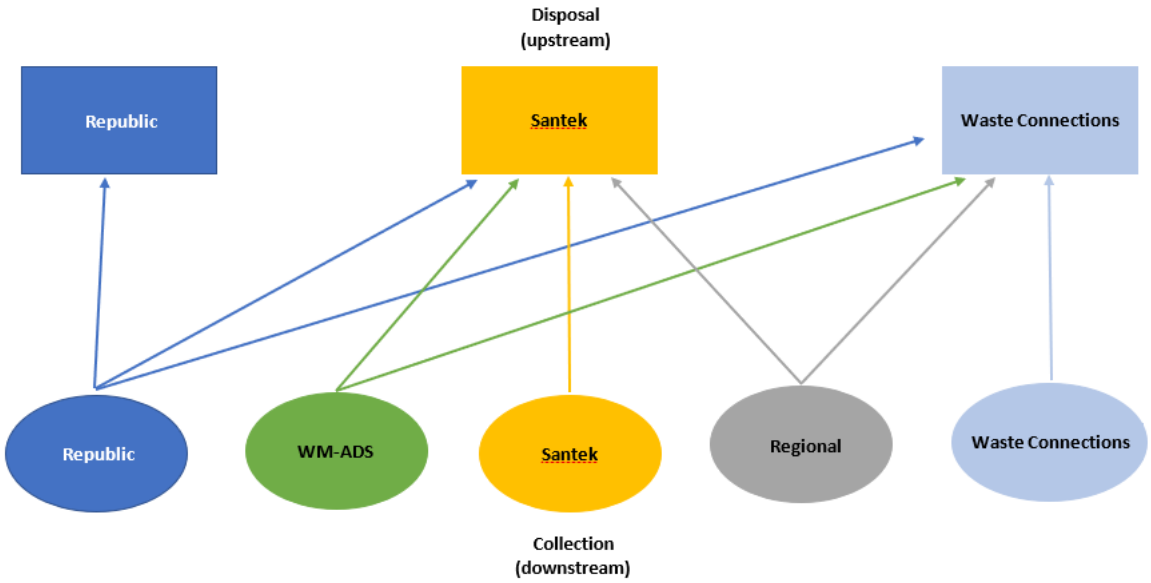

Figure 1 Chattanooga Area MSW Disposal and Collection Market

Connections exhibit excess disposal capacity. However, Republic's collection volumes are estimated to exceed their ability to self-supply disposal in the Chattanooga market. As a result, Republic will need to puchase additional disposal from Santek and Waste Connections, presumably at a higher marginal cost. We assume that this disposal is purchased from both Santek and Waste connections according to their share of available excess MSW disposal capacity of 63.8% and 36.2%, respectively. We further assume that WM-ADS and Regional purchased disposal capacity from both Santek and Republic according to these shares. The resulting relationships between the upstream and downstream market participants are captured in Figure 1.

0.1.2 MSW Disposal Price Data

MSW disposal prices are collected from the 2019 Waste Business Journal's Directory of Waste Processing & Disposal Sites. The measure of price reflected is the "gate rate", which is the posted price at the landfill, measured in $/Ton.[10] Republic and Santek both operate

[10]Disposal prices for large customer's may be bilaterally negotiated instead of paying the gate rate.

multiple landfills in the market with different prices. The price used in the analysis for each is the volume weighted average for their landfills.

0.1.3 Collection Market Share Data

The CIS states that in the Chattanooga Area the post-merger HHI for SCCW collection would be approximately 5,551 post-merger with an increase of 2,660 points and that the combined market share of the merging parties is 73%. Taking these figures as given we can recover the collection market shares under the assumptions that 1) the merging parties are of equal size, and 2) the non-merging parties are of equal size. After rescaling, this produces downstream market shares for Republic, 37.6%, Santek, 37.6%, Waste Connections, 8.3%, WM-ADS, 8.3%, and Regional, 8.3%.

However, the market shares required for implementation of the Sheu and Targain (**add ref**) framework are expressed as upstream-downstream market participant pairs. Following the discussion of supply relationships in Section 0.1.1, vertically-integrated pairs without capacity constraints (i.e., Santek disposal-Santek collection, Waste Connection disposal-Waste Connections collection) are assigned their full collection share. Capacity constrained, integrated firms (Republic disposal-Republic collection) are assigned their collection share up to their available capacity with the remainder allocated by residual disposal share to pairs with the respective upstream firms (i.e., Santek disposal-Republic collection, Waste Connections disposal-Republic collection). Unintegrated firms' collection shares are distributed among the upstream suppliers with available capacity by residual share as well.

0.1.4 Cost, Margin and Elasticity Data

Collection and disposal margins are calculated for Republic from data on revenue by line of service and components of cost of operations in the company's 2019 annual report. The data is reported at the company level and is not specific to the Chattanooga Area, but revenues

are reported by collection segment.

Collection costs in $/Ton are estimated from Republic and Waste Management 2019 10k financial statements. These costs are reported at the company level across all segments. The estimated share of these costs attributable to the Chattanooga market, based on the number of markets in which the companies operate, is divided by the tons disposed for each company. Santek, Waste Connections, and Regional do not publically produce comparable financial statements. Instead, we assume that the cost structure is the same for the vertically-integrated companies, taking into account their individual tons disposed, and that WM-ADS and Regional share the same cost structure in this market due to their lack of internal disposal capacity.

A survey of demand elasticity estimates for the collection market are present in Bel and Gradus (2016) with an average of -0.34. These estimates are not specific to the SCCW market, but available evidence suggests that the commerical segment should be more inelastic than other segments such that analysis using these estimates would tend to be conservative for estimating the size of merger induced price effects.[11]

0.1.5 Chattanooga Area Results

[11]Bel, G. and R. Gradus, 2016, Effects of unit-based pricing on household waste collection demand: A meta-regression analysis, Resource and Energy Economics, 44, 169-182.