A GPS APPROACH TO ROAD USER CHARGES: WHERE WE ARE GOING AND WHY THE GOVERNMENT CAN SEE IT

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INTRODUCTION

Road users are not charged for driving on most of the four million miles[1] of roads in the United States and the external cost borne by the public is hurting society and the environment. The four million free roads in the United States drive the leapfrog development to rural areas, ecological loss, air pollution and global warming, traffic congestion and delayed travel, and an unhealthy dependence on foreign oil, and many other problems.[2] One study reported that road user externalities amount to $2.38 per gallon of gasoline consumed.[3] Advances in global

1. *Public Road Length – 2005: Miles by Functional System, Table HM-20, in* FED. HWY. ADMIN, HIGHWAY STATISTICS 2005 (2006), http://www.fhwa.dot.gov/policy/ohim/hs05/htm/hm20.htm.

2. NATIONAL RESEARCH COUNCIL, ASSESSING AND MANAGING THE ECOLOGICAL IMPACTS OF PAVED ROADS 1 (2005).

3. Ian W.H. Parry, Margaret Walls, & Winston Harrington, *Automobile Externalities and Policies*, RFF Discussion Paper, at 36 (Jun. 2006, rev. Jan. 2007), *available at* http://www.rff.org/Documents/RFF-DP-06-26-REV.pdf. .Another study found that externalities cost $378 to $739 billion per year, which is approximately $2185 to $4220 per vehicle. Michael H. Schuitema, *Road Pricing as a Solution to the Harms of Traffic Congestion*, 34 TRANSP. L.J. 81, 92 (2007) (citing CAMBRIDGE SYSTEMATICS, INC., FED. HWY. ADMIN., TRAFFIC CONGESTION AND RELIABILITY: LINKING SOLUTIONS TO PROBLEMS, FINAL REPORT 3–6 (2004), *available at* http://www.ops.fhwa.dot.gov/congestion_report_04/congestion_report.pdf). A more conservative study found that roads and drivers fail to pay an externality of $184 billion. Clifford W. Cobb, *The Roads Aren't Free: Estimating the*

information systems (GIS) may soon allow for targeted pricing of externalities caused by road users.[4] GIS-based mileage tax studies are being performed in several states;[5] U.K. Prime Minister Tony Blair recently proposed a GIS-based charge for Britain;[6] and the European Union continues its GALILEO and Egnos projects to develop a comprehensive 30-satellite constellation to allow, in part, deployment of GIS-based charging of transportation.[7] For the purpose of this article, I will call this new GIS-based road user charge system "GRUCS."[8]

Under a GRUCS, each vehicle has a global positioning system (GPS) unit which tracks the vehicles' locations and transmits data to a central GIS computer that compiles data, calculates a tax, and bills to the road user.[9] If successful, GRUCS will fully internalize road costs such as road wear and tear, dependence on foreign oil, national security, climate change, air pollution, sprawl, traffic and parking congestion, and reckless driving. Additionally, GRUCS could revolutionize automobile insurance, traffic violation citation, roadside emergency response, and evidence gathering in criminal prosecutions. Several proposals and research projects are currently underway to assess the technological viability.[10]

Full Social Cost of Driving and the Effects of Accurate Pricing 53 (Redefining Progress, Working Paper No. 3, 1998).

4. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES (2002).

5. Fed. Hwy. Admin., Value Pricing Pilot Program, http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projtypes/usagebasedvehchgs.htm (last visited Mar. 12, 2007).

6. 10 Downing Street, PM emails road pricing signatories, http://www.pm.gov.uk/output/Page11050.asp (last visited Mar. 11, 2007) (including Tony Blair's response to those opposing the petition); Daily Telegraph, The Road to Ruin?, *available at* http://www.telegraph.co.uk/ (difficult to find) (last visited Apr. 5, 2007).

7. COMM'N OF THE EUROPEAN CMTYS., GREEN PAPER ON SATELLITE NAVIGATION APPLICATIONS (Working Paper 2006), *available at* http://ec.europa.eu/dgs/energy_transport/galileo/green-paper/doc/com_2006_gp_galileo_en.pdf.

8. For readability and speakability, pronounce GRUCS as "grucks" (long-vowel sound).

9. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES 4 (2002). *See also* ANTHONY DOWNS, STILL STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION 8 (2004).

10. The Federal Highway Administration has funded relevant projects in Georgia, Minnesota, Oregon, and Washington. Fed. Hwy. Admin., Value Pricing Pilot Program: Usage Based Vehicle Charges, http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projtypes/usagebasedvehchgs.htm (last visited Apr. 1, 2007).

Such a targeted, all-knowing system has the potential for abuse and raises significant privacy concerns.[11] In George Orwell's *Nineteen-Eighty-four,* Oceania is controlled by the Inner-Circle through fear of severe, albeit ill-understood, penalties and manipulation of history, news, speech, and association.[12] The control by fear of penalties is akin to Jeremy Benthem's Panopticon, his proposed prison in which all prisoners can be seen from a single location. The knowledge that oneself is always under surveillance results in the individual regulating one's own activities – becoming a drone acting according to the perceived moral norms and governmental policies.[13] To most people, except perhaps Bentham, a Panopticon society is ghastly. As scholar Dorothy J. Glancy stated:

> [C]omprehensive surveillance tends to be socially destructive because it signals disrespect for the individual person by treating her as an object rather than a self-determining individual. In the

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11. Dorothy J. Glancy has provided the best legal analysis thus far concerning technology and privacy on the road. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295 (2004). Glancy discusses privacy in context of the most imminent new technological advancement, the confluence of existing information and databases under the Intelligent Transportation Systems (ITS) program of the Federal Highway Administration. The confluence includes traffic cameras, license plate recognition, toll tag transponders, vehicle black boxes, GIS, GPS units, telematics, dedicated short range communications, wireless communications, data archives, beepers, photo radar, and photo red light cameras. *Id.* at 299–319.

12. GEORGE ORWELL, NINETEEN-EIGHTY-FOUR (1949).

13. Jeffery H. Reiman explained in his law review article, *Driving to the Panopticon: A Philosophical Exploration of the Risks to Privacy Posed by the Highway Technology of the Future*:

> The Panopticon was Jeremy Bentham's plan for a prison in which large numbers of convicts could be kept under surveillance by very few guards. The idea was to build the prison cells in a circle around the guard post. All the prisoners would be silhouetted against light coming into the cells from windows on the outside of the circle. Their movements would be visible to a single guard in the center. The French philosopher Michel Foucault used Bentham's Panopticon as an ominous metaphor for the mechanisms of large-scale social control that characterize the modern world. . . .
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> As Bentham realized and Foucault emphasized, the system works even if there is no one in the guard house. The very fact of general visibility – being see able more than being seen – will be enough to produce effective social control. Indeed, awareness of being visible makes people the agents of their own subjection. Writes Foucault,
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> > He who is subjected to a field of visibility, and who knows it, assumes responsibility for the constraints of power; he makes them play spontaneously upon himself; he inscribes in himself the power relation in which he simultaneously plays both roles; he becomes the principle of his own subjection.

11 SANTA CLARA COMPUTER & HIGH TECH. L.J. 27, 28 (1995) (citations omitted).

> end, pervasive surveillance can distort the very nature of a human personality. It saps a person of dignity and self-respect by distorting the way the individual thinks of himself and for himself. The individual person becomes an object to be acted upon, rather than a morally responsible actor.[14]

Information from GRUCS and numerous other databases could be used by "Big Brother (law enforcement and intelligence agencies), Big Sister (civil transportation authorities) and a heterogeneous band of little brothers (private-sector entities such as advertisers, insurers, vehicle manufactures and the like)."[15] This article analyzes GRUCS's benefits and privacy issues according to these three siblings. The tension lies between whether GRUCS will create a more efficient, safer society or the create Orwell's "Thought Police" or "Inner Circle."[16]

The first section describes how GRUCS may function. The second section explains how GRUCS can better remedy social and environmental externalities and provide other benefits. The third section analyzes how the Fourth Amendment addresses the privacy issues and limits the use of GRUCS. This article leaves remaining for engineers, economists, policymakers, and entrepreneurs how to bring the technology to market.

I. HOW GRUCS MIGHT WORK

There are many ways that a GRUCS might be implemented and how its technology might function. First, this section will look at how current mileage-based studies using GIS technology operate. Second, this section will outline the more comprehensive work provided by David J. Forkenbrock and Jon G. Kuhl. Third, this section will provide some insight into variations of GRUCS.

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14. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 321 (2004).
15. *Id.* at 297 (citing GEORGE ORWELL, NINETEEN-EIGHTY-FOUR (1949); Thomas L. Friedman, *Little Brother*, N.Y. TIMES, Sept. 26, 1999, § 4 at 17).
16. GEORGE ORWELL, NINETEEN-EIGHTY-FOUR (1949).

Georgia, Minnesota, Oregon, and Washington have tested simple mileage-based taxes using GIS technology.[17] In Oregon, test participants were charged a tax for their mileage, instead of gas, each time they filled up at the gas pump.[18] An onboard GPS unit recorded each mile traveled then transponded the information to a specially designed gas pump, which would then print out a receipt for the tax incurred.[19] In Washington, the GPS unit recorded each time a test participant entered onto a pre-designated road (assigned by the test makers for its relative congestion), and the distance traveled.[20] This information was sent via satellite to a centralized computer system which then charged the test participant's online bank account. Updated information was also sent to an onboard digital read-out which notified the driver of each trip's cost.

David J. Forkenbrock and Jon G. Kuhl provide some insight in their book, *A New Approach to Assessing Road User Charges*, as to how a GRUCS might work in the future.[21] Here is a summary of their sketch. An onboard GPS receiver and computer would track a vehicle's location; the receiver would send the information via satellite, toll booth, or gas pump (possibly using radio frequency identification (RFID)), to a central GIS database (i.e. collection

17. Fed. Hwy. Admin., Value Pricing Pilot Program: Usage Based Vehicle Charges, http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projtypes/usagebasedvehchgs.htm (last visited Apr. 1, 2007).

18. *See* Oregon Road User Task Force, http://www.oregon.gov/ODOT/HWY/OIPP/ruftf.shtml; James M Whitty & Betsy Imholt, Oregon's Mileage Fee Concept and Road User Fee Pilot Program, Report to the 73rd Oregon Legislative Assembly (June 2005) http://www.oregon.gov/ODOT/HWY/OIPP/docs/2005LegislativeReport.pdf; Anthony M. Rufolo, Robert L. Bertini, & Thomas Kimpel, *Alternatives to the Motor Fuel Tax: Final Report, Special Report 561*, State of Oregon (Dec. 2001), *available at* http://www.oregon.gov/ODOT/HWY/OIPP/docs/561report.pdf.

19. Oregon Dep't of Transp., General Presentation, slide 6, *available at* http://www.oregon.gov/ODOT/HWY/OIPP/docs/ruftf_standard_presentaion.pdf.

20. Puget Sound Reg'l Council, Traffic Choices Study, http://www.psrc.org/projects/trafficchoices/ (last visited Apr. 4, 2007).

21. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES 4 (2002).

center); the collection center would calculate the appropriate charge; and then the collection center would bill the road user.[22]

Obviously there are numerous adaptations. First, the onboard computer could store data then send it whenever the driver fills up at a gas station or the computer could send the data real-time via satellite to the central collection center. Under this latter option, the computer could also store data and every so often the onboard computer and the central collection center could check for accuracies. As to billing, road users could possibly charge to a credit card at a gas pump (like in Oregon), or automatically withdraw from a special bank account (like in Washington). If road users are uncomfortable with either practice, bills could be paid online or mailed in hardcopy. If more specific data were included, such as vehicle weight or real-time emissions, special technological configuration or database structures may be required.[23]

Road users would want to ensure that the data being collected is accurate. One approach is to provide redundant testing. Mileage data could be compared with the actual odometer readings. If real-time emissions were charged, the onboard emissions testing unit could be regularly tested at one of the existing emissions testing facilities created pursuant to the 1990 Clean Air Act amendments. Another approach is to provide access to the data. The central collection center could produce personalized travel data for each driver, available online or mailed in print. A website interface could provide more nuanced information, such as providing detailed maps of where the driver has traveled and changes in the congestion charge. This would help road users make better travel decisions and might feel more confident in GRUCS.

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22. *Id.*

23. Data variations are many and would affect any GRUCS design. For example, location data can be several fold: distance traveled, exact travel routes taken, and time of day traveled. Data could also include the oil and gas levels, whether the headlights are on, whether a door is open, how loud the music is turned up, and whether a portable-device is in the charger. This author does not advocate for all such data to be transmitted, but there are advantages and disadvantages to each,

Important in any market is for the consumer to know the product's price. If roads are priced differently (either free versus charged or lower rate versus higher rate), providing real-time information of what entering a roadway may cost is imperative. Onboard computers with screens displaying maps and potential charges may be possible with the integration of the current technology of onboard GPS navigation systems such as telematics as OnStar.

Actual deployment of GRUCS to all vehicles on the road may be difficult because older vehicles will have to be retrofitted. There are a number of approaches that can be taken to overcome this problem. First, government can require GRUCS on only new cars, letting old cars continue to pay the gas tax instead. Second, GPS transponders can be put onto all new license plates, allowing for quick deployment of GRUCS. However, without an onboard interface to inform the driver of the charges, there might have less than enthusiastic acceptance. The lack of an onboard interface could be remedied through digital road-side signage, an individualized online account that logs past travels, and a 1-800 number that drivers could call to receive up-to-the-moment information about road pricings.[24] Third, government can buy travel data from operators of private telematics such as OnStar, synthesize the data, and then bill the road user. This, of course, would require all cars to have GPS telematics or navigational devices.

There can be multiple variations on which level of government implements, manages, and benefits from GRUCS. If a government is to create a comprehensive GRUCS, the most logical creator is the federal government. The federal government possesses the financial wherewithal, authority over interstate commerce and interstate highways, and the technological knowledge. However, states have carried out the test pilot studies, so the future of a federally created program is uncertain. It should be noted that a number of legal issues surface regarding

24. A 1-800 number would be less useful in municipalities and states that have outlawed the use of cell phones while driving. S.B. 5037, H.B. 1868, 60th Leg. (Wash. 2007) (to be codified at Wash. Rev. Code § 46.61), *available at* http://www.washingtonvotes.org/RollCall.aspx?ID=230708.

which governmental level, federal, state, or local, should create, implement, and regulate GRUCS; I will leave these issues for policymakers and future law review articles.[25]

Engineers, economists, and policymakers will determine the implementation method and technological applications. The remainder of this article focuses on the tension between the benefits of targeting externalities and creating a safer road and dangers that excessive targeting will infringe privacy rights.

II. USES OF GRUCS

The benefits of GRUCS are many. GRUCS can replace the current regulatory and tax structures with a more targeted charge pricing an individual road user's exact cost to society and the environment. Simultaneously, GRUCS may provide safer roads through advanced traffic violation fees and emergency response. Travel data may also be used in criminal investigations and prosecutions, also creating a safer society. Lastly, commercial applications exist for revolutionizing auto insurance and advertising.

(A) Big Sister: An Efficient Society

The principle use of GRUCS is to internalize the environmental costs of road use into the price of driving. The civil government (Big Sister), as opposed to the criminal investigatory and prosecutorial branches, is the branch that will harness the new regulatory and tax powers of GRUCS. Pigouvian tax theory holds that social costs of private action can be fully-internalized

25. If the federal government implements a complete GRUCS to all roads, a legal issue arises regarding the boundaries of the Commerce Clause. Most roads are meant for intrastate commerce, not interstate commerce. Is the fact that a road may be used for interstate commerce enough to overcome this jurisdictional hurdle? Is the fact that the road is used to access federal lands within a state enough? If the state implements GRUCS, a legal issue arises regarding how to treat out-of-state visitors. Should visitors receive a GPS transponder when they arrive in the state, or, alternatively, be subject to a gas tax? Depending on how either of these two issues is handled by the state, there may be legal issues regarding the Equal Protection Clause and Dormant Commerce Clause. If a local government implements a GRUCS, the state legal issues resurface in a more dramatic fashion. Additionally, it is conceivable that if a state implements a GRUCS that the state may wish to defer to certain rate charges, such as charges for wear and tear on rural roads, to local governments. The legal and technological limits to such political considerations have no easy answers.

into an existing market simply by assigning a tax equal to the marginal cost of the negative externality caused by the principle product or service.[26] There are a number of implications of a Pigouvian tax. First, although under pure economic theory a Pigouvian tax will result in efficient market allocation of the taxed activity,[27] there are circumstances where dedication of the generated revenue is merited.[28] Second, a Pigouvian tax may result in a "double dividend," where the social benefit is doubled because the net environmental benefit is greater than marginal tax cost and because revenue-neutrality is achieved by eliminating socially distortionary taxes.[29] Third, a Pigouvian tax fulfills the "polluters pay principle," where common to tort theory, the public sentiment is that thou who cause pain shall pay or, in some academic circles, compensate.[30] Fourth, a Pigouvian tax should achieve "lease cost abatement," as a tax on marginal use (or production), should result in market players seeking the least cost for achieving their desired utility.[31]

Using this understanding of the benefits of internalizing externalities, this subsection will address how the externalities of road wear and tear, energy independence and national security, climate change, tropospheric air pollution, nonpoint source pollution, sprawl, traffic and parking

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26. A.C. PIGOU, THE ECONOMICS OF WELFARE (1920).

27. Some scholars believe that the Pigouvian tax theory also incorporates the requirement to use the generated funds to remediate because Pigou discusses this in his seminal *The Economics of Welfare*. However, since Coase's scathing analysis of Pigou's work in *The Problem of Social Cost*, economists have generally dropped any suggestion that a Pigouvian tax necessarily requires the funds be dedicated for a reciprocal purpose. *See* Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960); *see also* Ronald Coase, *The Federal Communications Commission*, 2 J.L. & ECON. 1 (1959). Generally, for economic analysis purposes, the fact that polluter pays the externality's cost is sufficient to make the economy efficient. The exception is when the tax is given directly back to the polluter to cause the pollution, but even then the funds would have to be given back directly for that purpose and not as a general subsidy for the industry. *But see infra* note 28.

28. Just because the taxed economic activity achieves social efficiency does not mean that other related resource allocations have also achieved socially efficient levels. For example, farmers are typically not compensated for the aesthetic value to their property. To remedy this, road users could be charged an aesthetics tax when driving in the country-side, resulting in a socially-efficient allocation of number of drivers in the country-side. However, if the revenue is not given to the farmers, there will be an undercapitalization in farmland.

29. Janet Milne, *Environmental Taxation: Why Theory Matters*, 1 CRITICAL ISSUES IN ENVTL. TAX 3, 10–12 (2003).

30. *Id.* at 5.

31. For a discussion of least cost abatement, see *id.* at 10.

congestion, and accidents can be internalized into a road user charge. This subsection will first address the current tax and regulatory approaches employed to deal with these externalities, how GRUCS will achieve better results, and, where appropriate, how the GRUCS technology may need to be adapted to achieve those results.

(1) Road Wear & Tear

The most easily recognizable cost of road use is the wear and tear to the road. Most road wear and tear is covered by the revenue generated by fuel taxes. Thus, unlike many of the other road use costs, wear and tear is already substantially charged for. However, the fuel tax is a rather blunt instrument. One study indicated that a mileage tax, likely implemented with GPS technology, would be at least 25% more socially efficient than the optimally set gas tax.[32] This indicates that the benefits of GRUCS are far superior to the current gas tax for wear and tear.

The federal gas tax annually generates $40 billion for the National Highway Trust Fund to pay for road construction, rehabilitation, administration, and debt service.[33] The federal gas tax is presently set at $0.183 per gallon, charged to the refinery, terminal, or warehouse.[34] States impose additional gas taxes, ranging from $0.08 to $0.321 per gallon.[35] Because gas taxes are

32. The study focused on the optimal taxation of heavy trucks, showing that if the externalities of congestion, accidents, pavement damage, noise, energy security, and local and global pollution were full accounted for in a gasoline tax, the charge should be $1.12 per gallon, 2.5 times the current tax. However, the study found that the gas tax would be only 63–83% efficient compared to a mileage-based tax. Ian W.H. Parry, *How Should Heavy-Duty Trucks Be Taxed?*, RFF Discussion Paper, at 20 (Apr. 2006), *available at* http://www.rff.org/Documents/RFF-DP-06-23.pdf.

33. I.R.C. § 9507 (2006); FED. HWY. ADMIN., Status of the Federal Highway Trust Fund for the Fiscal Year Ending 9/30/2005, *in* HIGHWAY STATISTICS 2005 (2006), *available at* http://www.fhwa.dot.gov/policy/ohim/hs05/htm/fe10.htm.

34. I.R.C. § 4081(a)(2)(A)(i) (2006). For a short history on gas taxes, see Jeffery Brown, *Reconsider the Gas Tax: Paying for What You Get*, ACCESS, vol. 19 (2001), *available at* http://downloads.heartland.org/80212c.pdf.

35. Gaspricewatch.com, Gasoline Prices by State, http://www.gaspricewatch.com/usgastaxes.asp (last visited Apr. 1, 2007); *see also* Tax Policy Center, Motor Fuel Rates 2000-2006, http://www.taxpolicycenter.org/TaxFacts/TFDB/TFTemplate.cfm?Docid=345.

mostly set aside for road maintenance and construction,[36] the federal gas tax is only a Pigouvian tax to the extent that it charges for road wear and tear and not for other costs.[37]

The United States also has many toll roads which provide a more direct charge for road use than the gas tax.[38] Unfortunately this is not usually a politically viable option because of engrained public sentiment towards being able to freely use the road.[39] So a simple conversion to toll roads likely will not be successful without a reduction of road user taxes elsewhere.[40]

Fuel taxes and tolls fail to fully internalize road wear and tear because they fail to target each vehicle's weight and tire friction quotients.[41] A GRUCS charge that incorporated information about the vehicle weight, suspension type, and tire type would assign a more targeted price signal. This is important for encouraging drivers to choose shorter travel routes and to purchase and drive lighter vehicles. This likely will have a complimentary effect in reducing air pollutants as lighter vehicles generally have better gas mileage.

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36. I.R.C. § 9507 (2006); *see also* "What is the Highway Trust Fund?," http://www.nemw.org/HWtrustfund.htm. (last visited Apr. 1, 2007).

37. A study by Resources for the Future concluded that the socially optimal gas tax (if the gas tax remains) would be $1.01 per gallon. Ian W.H. Parry & Kenneth A. Small, *Does Britain or the United States Have the Right Gasoline Tax?*, RFF Discussion Paper (Mar. 2000, rev. Sept. 2004), *available at* http://www.rff.org/Documents/RFF-DP-02-12.pdf; *c.f.* Ian W.H. Parry, Margaret Walls, & Winston Harrington, *Automobile Externalities and Policies*, RFF Discussion Paper, at 36 (Jun. 2006, rev. Jan. 2007) (finding that externalities amount to $2.38 per gallon), *available at* http://www.rff.org/Documents/RFF-DP-06-26-REV.pdf. Note that one law review article suggests that not even all wear and tear is fully internalized because the current funding scheme is bound to leave a substantial deficit for future road construction and maintenance. Stephen McDonald, *Why VEETC is Not Enough: Protecting the National Highway Transportation Infrastructure*, 30 WM. & MARY ENVTL. L. & POL'Y REV. 731 (2006).

38. *See* Wikipedia, List of toll roads: United States, http://en.wikipedia.org/wiki/List_of_toll_roads#United_States. (last visited Apr. 1, 2007).

39. *Texas Legislature Revolts Against Toll Roads*, THENEWSPAPER.COM, Mar. 8, 2007, http://www.thenewspaper.com/news/16/1640.asp.

40. *See* Robert Poole & Peter Samuel, *The Return of Private Toll Roads*, PUBLIC ROADS Vol. 69, Issue 5 (2006), *available at* http://www.tfhrc.gov/pubrds/06mar/06.htm.

41. *See generally* Ian W.H. Parry, *How Should Heavy-Duty Trucks Be Taxed?*, RFF Discussion Paper (Apr. 2006), *available at* http://www.rff.org/Documents/RFF-DP-06-23.pdf.

(2) Energy Independence & National Security

Energy and national security experts often cite U.S. gasoline consumption as being partially responsible for the United State's dependence on foreign oil, engagement in Middle Eastern conflicts, and persistent terrorist threat.[42] The U.S. daily consumes 20.8 million barrels of petroleum with a 60.3% dependence on foreign petroleum.[43] This disparity is likely to increase as the U.S. consumption increases and domestic production falls relative to foreign production.[44] In the United States, transportation amounts for 69% of the annual consumption of petroleum.[45] Thus, a Pigouvian tax, either through an oil tariff, fuel tax increase, or GRUCS charge, could reduce our foreign oil dependence, cover the costs of engaging in national efforts to secure foreign oil, and cover the costs of protecting the homeland from terrorist attacks.[46]

(3) Climate Change

Global climate change is a long-term event that will occur over at least the next two centuries causing acute damage through rising sea levels, spread of sub-tropic diseases, desertification, more acute natural disasters, resulting in probably a five to ten percent decline of World GDP.[47] While this event is occurring and will continue to occur at drastic rates, the total economic and ecological threat is difficult to quantify. It is this inherent risk of the unknown that

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42. Daniel Yergin, *Ensuring Energy Security: Old Questions, New Answers*, FOREIGN AFFAIRS 69–82 (Mar./Apr. 2006). For more analyses on the potential for energy independence, see generally Joel Darmstadter, *Energy Independence: Fantasies, Facts, Options*, RFF Issue Brief, (Nov. 2006), *available at* http://www.rff.org/Documents/RFFIB%2006-02.pdf; Philip Sharp, *Congressional Testimony*, Resources for the Future (Jan. 10, 2007), http://www.rff.org/rff/News/Releases/2007Releases/SharpTestimony2-13-07.cfm.

43. U.S. Energy Information Agency, Basic Petroleum Statistics, http://www.eia.doe.gov/neic/quickfacts/quickoil.html (data for 2005, last updated Mar. 2007).

44. DIV. OF EARTH & LIFE STUDIES, NAT'L RES. COUNCIL., ABRUPT CLIMATE CHANGE: INEVITABLE SURPRISES 10 (2002), *available at* http://books.nap.edu/openbook.php?record_id=10136&page=10.

45. *Id.*

46. Whether the funds from this tax should be dedicated to national security efforts, such as port security, homeland security, the Iraq War, and peace efforts is another matter.

47. See Leah H. Martinez, *Post Industrial Revolution Human Activity and Climate Change: Why the United States must implement mandatory limits on industrial greenhouse gas emissions*, 20 J. LAND USE & ENVTL. LAW 404–10 (2005); SIR NICHOLAS STERN, STERN REVIEW: THE ECONOMICS OF CLIMATE CHANGE, ix (2006).

needs to be internalized into our energy markets.[48] A 90% scientific certainty pinpoints humans as the primary and likely only cause of this horrendous risk.[49] Traffic releases approximately 31% of U.S.-emitted carbon dioxide.[50]

Internalizing traffic's climate change cost will incentivize more fuel efficient technologies and conversion to alternative fuels. Additionally, internalization will aggregate funds to the government, thus either allowing mitigation of potential climate change damage or compensating society through federal general fund accrual. Internalizing climate change into the cost of traffic could be done several ways, such as creating a carbon or BTU[51] tax or raising the gas tax.[52] The CAFE standards provide a regulatory approach to limiting fleet-wide emissions and potentially a carbon cap-and-trade program could also control emissions.[53]

The benefit of GRUCS over these other approaches is GRUCS can target an individual's contribution to climate change by charging a fee charge based on the amount of emissions caused by a particular vehicle type. Vehicle type is important because different engine types may have different carbon emission rates relative to fuel efficiency. To implement this charge, each vehicle would need to be outfitted with an onboard emissions testing instrument.[54] This same onboard emission testing instrument could be used to charge for tropospheric air pollution as well.[55]

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48. Richard A. Posner, *Efficient Responses to Catastrophic Risk*, 6 CHI. J. INT'L L. 511, 516–19 (2006).

49. U.N. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, SUMMARY FOR POLICYMAKERS, fn.5 (Feb. 5, 2007), *available at* http://ipcc-wg1.ucar.edu/wg1/docs/WG1AR4_SPM_Approved_05Feb.pdf.

50. EPA, EMISSIONS INVENTORY 2004, at ES-10 (2004), http://yosemite.epa.gov/OAR/globalwarming.nsf/UniqueKeyLookup/RAMR5WNMK2/$File/04executivesummary.pdf.

51. BTU stands for "British Thermal Unit."

52. *See* Craig Hanon & James R. Hendricks, Jr., *Taxing Caron to Finances Tax Reform* (2006); U.S. Department of Treasury, *The Administration's Modified BTU Energy Tax Proposal* (Apr. 1993).

53. Energy Policy and Conservation Act of 1975, 42 U.S.C. 6363 (2007).

54. *See* Laura Sullivan, *OnStar Expands Services in Seventh Generation System*, TECHWEB, Jan. 11, 2006, http://www.techweb.com/wire/ebiz/175803747.

55. One study found that although the cost of imposing a carbon or mileage tax may outweigh the benefits when considered in isolation, when aggregated with other externalities the benefits of a climate change charge far

(4) Tropospheric Air Pollution[56]

"Transportation is the single largest source of air pollution in urban areas."[57] Tropospheric air pollution causes respiratory failure, cancer, and aesthetic discomfort.[58] After road wear and tear, air pollution is probably the second largest concern of federal policy, attacked through a number regulations and tax schemes. GRUCS provides the opportunity for a streamlined and more targeted approach.

The Federal government levies an additional tax on the sale of guzzler vehicles (less than 22.5 miles per gallon fuel efficiency) by producers and importers,[59] although this tax does not apply to light trucks, including sport utility vehicles.[60] Other tax provisions provide for several fuel-efficiency tax deductions and credits.[61] The Corporate Average Fuel Economy (CAFE) standards require manufacturers' fleets of passenger cars and light trucks to achieve a specified level of mileage per gallon.[62] The Clean Air Act also imposes requirements upon drivers to help alleviate oft-polluted regions by require vehicle emissions testing.[63] Some scholars have

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exceed the implementation costs. Ian W.H. Parry, *Are the Costs of Reducing Greenhouse Gases from Passenger Vehicles Negative?*, RFF Discussion Paper (Dec. 2006), *available at* http://www.rff.org/Documents/RFF-DP-06-14-REV.pdf.

56. Note that the U.S. Supreme Court recently ruled that Congress clearly intended "air pollution" in the Clean Air Act to include greenhouse gas emissions. Massachusetts v. EPA, 549 U.S. __ (2007). Because the externalities are inherently different between tropospheric and stratospheric air pollution, this article has given separate treatment to the issues.

57. K.S. Nesamani, Lianyu Chu, Michael G. McNally, & R. Jayakrishnan, *Estimation of Vehicular Emissions by Capturing Traffic Variations* (2006), *available at* http://www.its.uci.edu/its/publications/papers/JOURNALS/TRB_06-1629.pdf (presented at the 85th annual meeting of the Transp. Research Bd.)

58. Robert A. Reiley, *The Case for Regulating Ultrafine Particles under the Clean Air Act*, 14 PENN ST. ENVTL. L. REV. 483, 496–511 (2006).

59. I.R.C. § 4064(a) (2006).

60. I.R.C. § 4064(b)(1)(B).

61. I.R.C. §§ 30B, 30C, 40, 40A, 6426, 6427.

62. Energy Policy and Conservation Act of 1975, 42 U.S.C. 6363 (2007). For an assessment of the CAFE standards, *see* Paul R. Portney, Statement before the House Science Committee, *Effectiveness and Impact of the Corporate Average Fuel Economy (CAFE) Standards* (Feb. 9, 2005), *available at* http://www.rff.org/Documents/RFF_CTs_05_Portney.pdf.

63. Clean Air Act of 1990, 42 U.S.C. § 7401 et seq. A Sierra Club lobbyist opined that vehicle emissions testing amounts to taxes: "Smog checks are like taxes and the EPA in this case is about as popular as the IRS. But both of them are necessary." Jim Mayer, *State Given More Time to Devise Clean-Air Plan*, SACRAMENTO BEE, Nov. 25, 1993, at A1.

proposed adding individualized labels of environmentally-friendliness on new cars at dealerships.[64]

GRUCS, with onboard emissions testing, can fully internalize air pollution costs into a charge to road users. This is better than the current regulatory and tax framework because GRUCS can account for differences in vehicle type and age, which are indicators of emission rates. Additionally, GRUCS can amplify the charge when driving in a region of especially bad air pollution. Such targeting is likely to yield substantial economic efficiency gains.

There are a few implementation issues worth noting regarding emission charging. Emission testing seems to already be technologically feasible as General Motors has announced that OnStar[65] may have onboard emissions testing soon.[66] However, if onboard emission testing is financially impracticable market-wide, an alternative would be to setup localized emission testing facilities on freeway and highway onramps that could quickly test the emissions of each car and transmit the information to the onboard computer.

(5) Nonpoint Source Pollution

Roads and vehicles create nonpoint source pollution by leaking heavy metals, oils and grease, road salt, and methyl *tert*-butyl ether (MTBE) into neighboring soils and waters.[67] Although now phased-out by the gas companies, the highly volatile MTBE provides a telling

64. Katherine N. Probst, *Combating Global Warming One Car at a Time: CO2 Emissions Labels for New Motor Vehicles*, Resources for the Future (Mar. 2006), *available at* http://www.rff.org/rff/News/Features/Combating-Global-Warming-One-Car-at-a-Time.cfm.

65. OnStar is a telematic instrument that provides roadside emergency and navigation services through a national call-center. OnStar, http://www.onstar.com.

66. Laura Sullivan, *OnStar Expands Services in Seventh Generation System*, TECHWEB, Jan. 11, 2006, http://www.techweb.com/wire/ebiz/175803747.

67. EPA, *Controlling Nonpoint Source Runoff Pollution from Roads, Highways and Bridges*, EPA-841-F-95-008a (Aug. 1995), *available at* http://www.epa.gov/OWOW/NPS/roads.html; Gregory C. Delzer, John S. Zogorski, Thomas J. Lopes, & Robin L. Bosshart, U.S. Geological Survey, *Occurrence of the gasoline oxygenate MTBE and BTEX compounds in urban stormwater in the United States, 1991–95*, Water Res. Investigation Rep. 96-4145 (1996), *available at* http://sd.water.usgs.gov/nawqa/pubs/wrir/wrir96.4145/wrir.doc.html. Please note that most oil refineries no longer add MTBE, instead using an ethanol blend. Matthew L. Wald, *New Recipe For Gasoline Helped Drive Up the Price*, N.Y. TIMES, May 6, 2006, *at* A11.

example of the nonpoint source pollution problem. When MTBE reaches public groundwater, MTBE can cause kidney lesions and, in high dosages, cancer.[68] MTBE illustrates the real problems of nonpoint source pollutants and the need to remediate and charge for the pollution.

The Leaking Underground Storage Tank Trust (LUST) Fund is one approach Congress has taken.[69] A federal tax of $0.001 per gallon is assessed for the LUST Fund, which is then allocated to states to remediate the tanks.[70] While LUST focuses on the nonpoint source pollution problems caused by leaking tanks, the pollutants of which quickly disperse into groundwater, vehicles and roads can also pose substantial nonpoint source pollution risks. Road runoff from vehicles' leaking oil and from deicer applications in the winter provide, as well as accidents into adjacent critical environmental habitats, all provide inherent pollution risks which have no ascertainable point before they occur. Some regulations exist to lessen the dangers to the environment, such as environmental impact statement requirements for highway construction[71] and local and regional land use laws.[72]

One approach to the nonpoint source pollution problem would be to simply increase the gas tax, thereby decreasing the aggregate quantity of nonpoint source pollution. However, this is a blunt tax instrument which would not capture many important nuances that may affect when nonpoint source pollution occurs and where such pollution is most problematic.

A GRUCS charge could do much more for reducing nonpoint source pollution by making locational data into pollution probabilities — in other words, transforming nonpoint sources into

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68. EPA, Methyl Tertiary Butyl Ether (MTBE): Overview, http://www.epa.gov/mtbe/faq.htm#concerns (last visited Apr. 4, 2007). Other studies linked MBTE to serious DNA mutations in amphibians. A. R. Blaustein & P. T. J. Johnson, *Explaining frog deformities*, 288 SCI. AM. 60–65 (2003).

69. Resource Conservation & Recovery Act, 42 U.S.C. § 6901 (1986).

70. *Id.*

71. National Environmental Protection Act, 42 USC § 4321–4375 (1982); *see also* State Environmental Protection Act, Wash. Rev. Code § 43.21C (2003).

72. *See* Shoreline Management Act of 1971 (2005), Wash. Rev. Code § 90.58 (2006); Growth Management Act, Wash. Rev. Code § 36.70A (2006).

point sources. GRUCS allows a charge based on environmental risk considering vehicle type and for driving near critical environmental areas. Factors such as speed or recklessness of driving near critical environmental areas could also be included into the charge calculus.

(6) Sprawl

Freeways and road systems generally create patterns of development which lose touch with human needs and welfare.[73] Most often this pattern comes in the form of sprawl.[74] Sprawl's deadweight includes unnecessary development of agrarian land,[75] ecological value loss,[76] and urban decomposition.[77] Agrarian land, ecological values, and vibrant urban communities are undervalued by the market.[78] The aesthetic pleasure derived from looking at farms is not monetarily given to the farmer, the social intrinsic value of the environment is not given to the steward, and the complex vibrancy of mixed uses and good communication in an urban community are not readily financially recognizable by the residents and shop owners.[79] Additionally, social values have a much higher time value of money (i.e. lower depreciation) than that of an individual because of the collective nature of social values. Therefore, aesthetics and similar products have values that are much higher in the long-term; because the values are

73. HOWARD FRUMKIN, LAWRENCE FRANK, RICHARD JACKSON, URBAN SPRAWL AND PUBLIC HEALTH: DESIGNING, PLANNING, AND BUILDING FOR HEALTHY COMMUNITIES 221–22 (2004).

74. OLIVER GILLHAM, THE LIMITLESS CITY: A PRIMER ON THE URBAN SPRAWL DEBATE 3–23 (2002). For trends in sprawl, see BROOKINGS INSTITUTE, REDEFINING URBAN & SUBURBAN AMERICA: EVIDENCE FROM CENSUS 2000, Vol. I & II, (Alan Berube, Bruce Katz, & Robert E. Lang eds. 2005).

75. A. ALLAN SCHMID, CONVERTING LAND FROM RURAL TO URBAN USES 53–58 (1968); WOLFGANG ZUCKERMANN, END OF THE ROAD: THE WORLD CAR CRISIS AND HOW WE CAN SOLVE IT 35–36 (1991).

76. NATIONAL RESEARCH COUNCIL, ASSESSING AND MANAGING THE ECOLOGICAL IMPACTS OF PAVED ROADS 62–97 (2005).

77. OLIVER GILLHAM, THE LIMITLESS CITY: A PRIMER ON THE URBAN SPRAWL DEBATE 88–89 (2002).

78. *Id*.

79. For good materials discussing the problems of not pricing sprawl, see Clifford W. Cobb, *The Roads Aren't Free: Estimating the Full Social Cost of Driving and the Effects of Accurate Pricing* (Redefining Progress, Working Paper No. 3, 1998); REAL ESTATE RESEARCH CORP., THE COSTS OF SPRAWL: ENVIRONMENTAL AND ECONOMIC COSTS OF ALTERNATIVE RESIDENTIAL DEVELOPMENT PATTERNS AT THE URBAN FRINGE – DETAILED COST ANALYSIS (1974); JOSÉ MANUEL L. SANTOS, THE ECONOMIC VALUATION OF LANDSCAPE CHANGE: THEORY AND POLICIES FOR LAND USE AND CONSERVATION (Wallace E. Oates & Henk Folmer eds., 1998).

not represented in the marketplace, there is chronic under-investment in the social resources.[80] Lastly, sprawl self-perpetuates by creating greater dependence on the automobile which leads to more congestion, desire to live elsewhere, longer driving distances, and displacement of resource and ecological lands.[81]

A charge, whether by increasing the gas tax or through a GRUCS, would help internalize the cost of sprawl. One could argue that the road price, with regards to the sprawl externality, should actually increase as the roads enter more rural areas. A GRUCS charge would permit such an increase in order to internalize cost of sprawl that has actually occurred and to have a deterrent effect on demand for new residential housing and commercial development in fringe areas.[82]

Finally, like most externalities, but especially with sprawl, there is good argument to use charge-generated funds to change the pattern of sprawl. After a century of investing in free roads, the United States has established a transportation system that is highly economically inefficient because of subsidization and few externality internalizations. A public investment in mass transportation, preservation of farmland and nature, affordable housing, urban parks, and urban villages would help correct our currently inefficient infrastructure while reducing the individuals' transition costs to the new economy of vibrant urban communities and preserved open-space.

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80. See generally William S. Vickery, *Site value taxes and the optimal pricing of public services*, AM. J. ECON. & SOC., at (Dec. 2001); Kris Wernstedt & Jennifer Hanson, *Areawide Brownfield Regeneration through Business-Based Land Trusts and Progressive Finance*, Working Paper, Lincoln Institute of Land Policy (Jan. 2006).

81. For general, regional perspective on the costs of sprawl, see PATRICK MAZZA & EBEN FODOR, TAKING ITS TOLL: THE HIDDEN COSTS OF SPRAWL IN WASHINGTON STATE (Feb. 2000), *available at* http://www.climatesolutions.org/pubs/pdfs/sprawl.pdf.

82. The decision to build roads and housing developments is a bit more complex than simply a demand by road users. Long-term capital plans and land use plans have a significant affect on development, as does real estate mortgage rates and general market trends. However, capital plans and land use plans are largely created based on projected market trends, and in turn, market trends are largely predicated on the cost of purchasing and developing greenfields and the cost of driving to those fringe lands.

(7) Traffic Congestion

In urban areas of 1 to 3 million people, the average U.S. driver spends nearly 21 hours in congestion annually.[83] Of these people, 55.8% commute more than 20 minutes daily.[84] Much of this is lost productivity which could be spent performing higher value tasks.[85] Additionally, congestion slows transport time of goods and services for businesses.[86] Assigning road users congestion's cost would optimize social efficiency and reduce traffic congestion.[87]

Governments currently take various approaches to relieve traffic congestion. Foremost, government spends much of the federal gas tax revenue on road construction and maintenance, attempting to increase the road system supply.[88] Scholars argue that increasing road supply only encourages more drivers to use the road and the net effect is no reduction in congestion.[89] Government has also spent much money in recent decades to reduce demand by encouraging carpooling through HOV lanes[90] and increasing the supply of public transportation.[91] This too has its detractors, both because some believe HOV lanes are simply another way of increasing

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83. *See* ANTHONY DOWNS, STILL STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION 18 (2004) (citing DAVID SCHRANK & TIM LOMAX, THE 2001 URBAN MOBILITY REPORT (2001)).

84. *Id.* at 56 (citing U.S. Bureau of the Census (2000)).

85. "The Texas Transportation Institute estimated that congestion 'wasted' $67.5 billion dollars in seventy-five metropolitan areas in 2000 because of extra time lost and fuel consumed, or $505 per person, compared with what would have happened without congestion." *Id.* at 2. This is not to say that all congestion is lost-productivity. For example, some drivers may use their cell phones, talk with passengers, plan the day's activities, reflect on a meaningful idea, or pray, all of which have economic value. However, the question becomes, could people perform these activities better while not driving – and the obvious answer is yes.

86. *Id.* at 2.

87. For one of the best researches of congestion pricing, see Elena Safirova, Sebastien Houde, D. Abram Lipman, Winston Harrington, & Andrew Baglino, *Congestion Pricing: Long-Term Economic and Land-Use Effects*, RFF Discussion Paper (Sept. 2006), *available at* http://www.rff.org/Documents/RFF-DP-06-37.pdf.

88. FED. HWY. ADMIN., Status of the Federal Highway Trust Fund for the Fiscal Year Ending 9/30/2005, *in* HIGHWAY STATISTICS 2005 (2006), *available at* http://www.fhwa.dot.gov/policy/ohim/hs05/htm/fe10.htm.

89. ANTHONY DOWNS, STILL STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION 101–16 (2004).

90. *Id.* at 188–89; Committee on HOV Projects, Transportation Research Board, HOV Inventory, http://www.hovworld.com/inventory.htm; OLIVER GILLHAM, THE LIMITLESS CITY: A PRIMER ON THE URBAN SPRAWL DEBATE 100–01 (2002).

91. ANTHONY DOWNS, STILL STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION 117–51 (2004); Fed. Transit Admin., National Transit Database, http://www.ntdprogram.gov/ntdprogram.

supply (not decreasing demand), and because governmental subsidies are generally economically inefficient.[92]

More recently governments have begun to investigate new approaches to road use taxation to remedy congestion.[93] PRoGR€SS, a demonstration project of the European Commission, conducted cordon studies in the EU cities of Bristol, Copenhagen, Edinburg, Genoa, Gothenburg, Helsinki, Trondheim, and Rome.[94] Recently cordon pricing[95] has been employed in Oslo, Trondheim, Singapore, and London.[96] New York City, San Diego, and Orange County, California, have also increased fees for congestion.[97] Pilot studies in Oregon, Washington, and Minnesota focused on charging a mileage fee.[98] Washington's fee was more intuitive toward congestion pricing because it charged different rates based on time of day and road.[99]

GRUCS has the potential to do much more than simply charge mileage fees that change based on time of day or the highway being driven on. Instead of having predetermined rates based on time and location, GRUCS can impose a precise tax based on the real-time number of drivers per mile and on the real-time speed of travel.[100] Furthermore, GRUCS could

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92. *See* Global Subsidies Initiative, http://www.globalsubsidies.org.

93. FED. HWY. ADMIN., CONGESTION PRICING: A PRIMER (Dec. 2006).

94. PRoGR€SS stands for "Pricing ROad use for Greater Responsibility, Efficiency and Sustainability in cities." PRoGR€SS issued its final report in 2004. PRoGR€SS, Deliverable 9, Final Report (2004), *available at* http://www.progress-project.org/Progress/pdf/Main%20Project%20Report.pdf.

95. Cordon pricing charges a fee to vehicles entering or being in a defined area.

96. See Institute for Global Environmental Strategies, http://www.iges.or.jp/APEIS/RISPO/spo/pdf/bgp/4208_BGP_II8_RoadPricing_BG.pdf; Jeremy Lovell, *London congestion charge zone to double*, REUTERS, Feb. 16, 2007, *available at* http://today.reuters.co.uk/news/articlenews.aspx?type=topNews&storyID=2007-02-16T105456Z_01_L16904368_RTRUKOC_0_UK-BRITAIN-CONGESTION.xml.

97. Michael H. Schuitema, *Road Pricing as a Solution to the Harms of Traffic Congestion*, 34 TRANSP. L J. 81, 102–205 (2007). See also *Federal Officials Spending $59 Million to Push Congestion Tax*, THENEWSPAPER.COM, Nov. 11, 2005, http://www.thenewspaper.com/news/07/762.asp.

98. Fed. Hwy. Admin., Value Pricing Pilot Program: Usage Based Vehicle Charges, http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projtypes/usagebasedvehchgs.htm (last visited Apr. 1, 2007).

99. Traffic Choices Study, Puget Sound Reg'l Council, Toll Roads & Toll Rates, http://www.psrc.org/projects/trafficchoices/tollroads.htm (last visited Apr. 5, 2007).

100. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES 22 (2002).

dramatically reduce congestion by charging different rates per lane on multi-lane freeways.[101] Those drivers who want drive faster could pay more; those who are less time-sensitive could pay less. The assignment of different rates per lane would reflect willingness-to-pay for speedier travel.[102] In sum, GRUCS promises to drastically increase economic efficiency and decrease congestion.

(8) Parking Congestion

Parking, if unpaid for, is an externality borne by other drivers and society.[103] Free parking results in an over reliance on the automobile as the prime mode of transportation and excessive parking congestion in cities and traffic congestion on the roads.[104] The more congestion of cars, the less likely the neighborhoods are livable, the more likely the region will resemble sprawl.[105] Inner city congestion has been regulated since the 1960s through parking garages, parking lots, and on-street parking meters.

GRUCS might revolutionize parking fees.[106] For on-street parking and parking lots, instead of charging different rates per hour, which may or may not reflect congestion levels, GRUCS can charge a rate adjusted by the number of vehicles parked per block. Municipalities can enter time-limited, handicap, loading zones, other types of parking spaces into the GRUCS

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101. *Id.* at 22–23 (2002).

102. The differentials in willingness-to-pay can be thought of as externalities which go uncounted for on the open highway. This externality is akin to the "Prisoner's Dilemma" and "Nash's Equilibrium," standard economic theories.

103. DONALD SHOUP, THE HIGH COST OF FREE PARKING (2005).

104. *Id.*; ANTHONY DOWNS, STILL STUCK IN TRAFFIC: COPING WITH PEAK-HOUR TRAFFIC CONGESTION 192–93 (2004).

105. DONALD SHOUP, THE HIGH COST OF FREE PARKING (2005).

106. High tech has already entered in the parking meter market. Using RFID tags, some cities now allow drivers to simply pull-up to a parking spot and walk away. A transponder in the car registers the appropriate fee based on the parking spot, drawing down on a prepaid account. *Smart card-based parking payments live in California*, RFIDNEWS, Mar. 15, 2005, http://www.rfidnews.org/news/2005/03/15/smart-cardbased-parking-payments-live-in-california/. Parking meter companies are becoming quite innovative in using GPS tools for parking enforcement. *See* Ganis Systems, http://www.ganis-systems.com; IntelliPark, http://www.intellipark.com/. Full-blown deployment of centralized GIS programs interacting with onboard GPS units in order to meter parking is only a matter of time.

central computer. For inside parking garages, where GPS technology is not likely to work well, a similar rate scheme could be worked out based on the number of vehicles entering the garage, so long as the GRUCS knows the garage parking capacity. Thus, a GRUCS parking fee would substantially increase the economic efficiency of parking while simultaneously reducing the administrative costs of parking fee collection.

(9) Accidents

Since 1960, there have been about 40,000 fatalities annually on roads in the United States.[107] In 2000, total costs of traffic accidents, including quality-adjusted life years lost from injuries, property damages to automobiles, travel delays, medical costs, lost productivity in the workplace and at home, and insurance and legal expense, amounted to $443 billion — 4.3% of U.S. GDP.[108] In other words, accidents cost society 15.8 cents per mile traveled.[109] After considering that insurance covers some of these costs, an earlier study found that accidents amount to 2.2 to 6.6 cents per mile.[110]

This latter study found that a gas or mileage tax increase that internalized accident expenses would yield a 28% to 76% efficiency gain.[111] Thus, using GRUCS strictly for a mileage tax could achieve substantial economic gains. However, a mileage tax is a rather blunt tax instrument. If an accident tax were more nuanced and targeted, considering the extent of reckless driving, swerving, speeding, and so forth, the gains would be much more.[112]

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107. Ian W. H. Parry, Margaret Walls, & Winston Harrington, *Automobile Externalities and Policies*, RFF Discussion Paper, at 8 (Jun. 2006, rev. Jan. 2007), *available at* http://www.rff.org/Documents/RFF-DP-06-26-REV.pdf.

108. *Id.* at 9.

109. *Id.*

110. Ian W.H. Parry, *Comparing Alternative Policies to Reduce Traffic Accidents*, RFF Discussion Paper (Dec. 2003), *available at* http://www.rff.org/Documents/RFF-DP-03-07.pdf.

111. *Id.*

112. *See infra* 24, "Traffic & Parking Violations."

Last Thoughts on an Efficient Society

The fact we have lacked any true internalization of the external costs of road use has led to significant misallocations of resources. For example, more public and private investment has been made into automobile transportation instead of public transportation. This in turn has led to a misallocation of manufacturing facilities that focus on automobiles, which in turn has led to a misallocation of raw materials to automobiles (steel and electronics) and to the infrastructure (cement and asphalt for roads versus steel for rail). This misallocation of resources imposes a significant deadweight loss on society. Internalizing the several above mentioned externalities into a road user charge should help correct these misallocations, although not immediately. Significant capital expenditures are already sunk into the current infrastructure, undoing these allocations through operational charges will only take a marginal nibble, not a one-time bite, out of the problem.

A disadvantage of increasing road user charges is that the charges are likely to hit the poor the hardest. Often road use is required irrespective of income class. Increasing the cost of road use is likely to affecting a greater portion of a low income individual's net income more than a high income individual. Providing different rates for different lanes will provide some mitigation of this impact.[113] Additionally, revenue from GRUCS charges should be at least partially invested into public transit to provide transportation alternatives. By taking this steps, government will be in a better position to use GRUCS to internalize the costs of road wear and tear, energy dependence, climate change, tropospheric air pollution, nonpoint source pollution, sprawl, traffic and parking congestion, and accidents.

113. *See supra* 19–21, "Traffic Congestion."

(B) Big Brother: A Safer Society

Besides internalizing externalities to achieve social efficiency, law enforcement may use GRUCS to change administration of traffic and parking violations, to improve emergency response, and investigate and prosecute criminals. Not all of these uses are necessarily beneficial, but all are likely to create a safer society. This subsection discusses how GRUCS may be used in these three contexts.

(1) Traffic and Parking Violations

The threat and occurrence of reckless driving and traffic accidents are borne by society. Presently government attempts to achieve the most socially efficient outcome by policing the roads, catching violators, and charging caught violators with high penalties. However, most drivers who break the traffic laws go unpunished.[114]

GRUCS can charge a fee simultaneously with the violation, greatly increasing economic efficiency.[115] A GRUCS would record all speeding violations, all failures to yield to oncoming traffic, dangerous cutting in-and-out of traffic driving, and much more. Additionally, when a driver is uncharacteristically weaving, the GRUCS could cue the police when a driver is suspected of drunk driving. Such a system would greatly increase traffic enforcement and the objectivity of enforcement.[116] Traffic fines could escalate as speed increases over the speed limit

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114. Lior Jacob Strahilevitz, *"How's My Driving?" For Everyone (and Everything?)*, 81 N.Y.U. L. REV. 1699, 1723 (2006) (citing Bryan E. Porter & Thomas D. Berry, *A Nationwide Survey of Self-Reported Red Light Running: Measuring Prevalence, Predictors, and Perceived Consequences*, 22 ACCIDENT ANALYSIS & PREVENTION 735, 739 (2001)) , reports "that only 6.4% of motorists who admitted to running a red light recently have ever been ticketed for the practice, and the motorists are far more likely to have been involved in an accident than they are to have received a ticket for running a red light." See also Tina Wescott Cafaro, *You Drink, You Drive, You Lose: Or Do You?*, 42 GONZ. L. REV. 1, 8–9 (2006).

115. Canada has already started testing a GPS system to stop speeders. *See* Eric Peters, *Star Wars Speed Trap: GPS being used to catch speeders*, AOL AUTO, http://autos.aol.com/article/_a/star-wars-speed-trap/20060126172809990001.htm.

116. One law review article suggested using the "How's My Driving" program of commercial trucking for all drivers in order to increase enforcement of traffic laws. Lior Jacob Strahilevitz, *"How's My Driving?" For Everyone (and Everything?)*, 81 N.Y.U. L. REV. 1699, 1723 (2006). The article went on to suggest that using an

(or goes too slow). Traffic fines would also probably be much lower since nearly all violations would be recorded. Finally, a GRUCS could charge for parking violations when a vehicle parks in a proscribed location.[117] The safety of the roads would be greatly improved as well as the economic efficiency.

(2) Emergency Response & Rescue

A fantastic potential for GRUCS is in emergency response and rescue.[118] Whenever a vehicle drives off the road at high speeds, goes into a water body or other ecological resource, crosses the median, or collides with another vehicle, the GRUCS would notify emergency responders. A great deal of technological issues may need to be worked out to fully implement this application and to assure privacy protection. For example, we would not want to send emergency response to the pulled over cars of the couple making out at the local lookout or the hunter on a weekend expedition. Once these technological hurdles are overcome, GRUCS offers a far quicker response time for emergency services.[119]

(3) Criminal Prosecution

Government prosecution of crimes could be greatly aided by gaining the travel records of individuals. Suspects could be eliminated while others ascertained. Investigators and

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"OnStar approach" to a "How's My Driving" program could increase the quality of reporting even more because the GIS technology would know the other drivers on the road and could kindly ask those drivers to change their driving behavior. Is it too much of a stretch to simply allow the GIS technology itself to monitor driving itself and do the requesting through a road user charge?

117. In the case of time-limited parking, the GRUCS could charge an extra fee for each extra minute parked. In the case of handicap parking stalls, the GIS could register handicap-eligible vehicles and only allow those cars to park in preferred parking without a substantial surcharge.

118. Lior Jacob Strahilevitz suggests that a robust "How's My Driving" program with GIS technology could provide better response time than at present. Lior Jacob Strahilevitz, *"How's My Driving?" For Everyone (and Everything?)*, 81 N.Y.U. L. REV. 1699, 1749 (2006). Undoubtedly this is true. However, on a rural road with little traffic such a program would be of little solace.

119. For a discussion of tax approaches to emergency response, see Ian W.H. Parry, *Comparing Alternative Policies to Reduce Traffic Accidents*, RFF Discussion Paper (Dec. 2003), *available at* http://www.rff.org/Documents/RFF-DP-03-07.pdf.

prosecutors could use the information in many ways. First, investigators could analyze a suspect's travel record at the time a crime was committed. Second, investigators could conduct surveillance of a suspect, tracking the suspect's every move. Already prosecutors have the authority to place a GPS transponder on a suspect's vehicle to track his movements.[120] Third, investigators could conduct surveillance of everyone, checking travel records, possibly supplemented by other databases, for irregularities suggesting criminal behavior. These criminal investigatory uses promise to increase the rate of enforcement, reduce crime, and create a safer society.

Last Thoughts on a Safer Society

Although the primary purpose of GRUCS is to internalize externalities, the secondary uses offer great potential to create safer roads and to reduce vehicular deaths and injuries. Additionally, the privacy concerns aside, the database affords great opportunity to track criminal suspects and to increase the enforcement of the law. With GRUCS, Big Brother may cast a large shadow over privacy interests, but the benefits towards safety and security will also be significant.

(C) Little Brothers: A Commercialized Society

The corporate world, the Little Brothers, can use GRUCS data in several ways. These include auto insurance, advanced marketing, and ownership of the roads. This section will describe these potential uses, leaving the question of whether such uses are actually beneficial to the reader.

120. *Judge allows GPS evidence in Peterson case: Defense attorneys had argued that data weren't accurate,* CNN.COM, Feb. 17, 2007, http://www.cnn.com/2004/LAW/02/17/peterson.trial/index.html.

(1) Auto Insurance

Scholars have suggested for at least a decade now about implementing a mileage-based, or "pay-as-you-drive", auto insurance, away from the current periodic insurance.[121] The idea is similar to those mileage-based tax schemes piloted in Oregon and Washington where the drivers are charged for the insurance by the mile each time the driver fills up with gas. A transponder relays the GPS odometer reading to the gas pump and then the receipt includes the price of the insurance. Alternatively, the insurance charge could simply be added as part of a monthly bill sent by the GRUCS administrator. Similarly, Norwich Union in the United Kingdom already provides pay-as-you-drive insurance based on GPS technology.[122]

There are two significant reasons for shifting towards comprehensive pay-as-you-drive insurance. The first reason is to cover the substantial number of drivers who are uninsured. In 1996, the California Department of Motor Vehicles reported that 28% of California drivers went uninsured.[123] Some reports indicated the rate was as high as 60% in New Mexico.[124] The second reason is economic efficiency. Periodic-based insurance does not reflect the number of miles driven and therefore does not accurately reflect a driver's risk. Thus, under current periodic insurance programs a driver who drives only 20 miles per week is grossly over charged when compared with a driver who drives 800 miles per week. Additionally, a pay-as-you-drive insurance policy can be combined with GRUCS to factor in more precise and robust data, such

121. J. Daniel Khazzoom, *What We Know About Uninsured Motorists and How Well We Know What We Know*, RFF Discussion Paper (Dec. 1997, Rev. 2000), *available at* http://www.rff.org/Documents/RFF-DP-98-09-REV.pdf.; J. Daniel Khazzoom, *Pay-at-the-Pump (PATP) Auto Insurance: Criticisms and Proposed Modifications*, RFF Discussion Paper (Jan. 1999, Rev. May. 2000), *available at* http://www.rff.org/Documents/RFF-DP-99-14-REV.pdf; Ian W.H. Parry, *Is Pay-As-You-Drive Insurance a Better Way to Reduce Gasoline than Gasoline Taxes?*, RFF Discussion Paper (Apr. 2005), *available at* http://www.rff.org/Documents/RFF-DP-05-15.pdf.

122. Norwich Union, Pay-As-You-Drive Car Insurance, http://www.norwichunion.com/pay-as-you-drive/.

123. J. Daniel Khazzoom, *What We Know About Uninsured Motorists and How Well We Know What We Know*, RFF Discussion Paper, at 12 (Dec. 1997, Rev. 2000).

124. *Id.* at 21.

as a driver's recklessness in driving and frequency of violating traffic laws.[125] This would be far superior to current insurance policies that base premium on a driver's age, driving history, and vehicle model.

The insurance program could be administered either by a governmental agency or through the private enterprise. For this comprehensive auto insurance program to be provided by private actors, each driver would be required to purchase a contract from an insurance company, with the possibly one government-run program as a default insurer. Each time the driver filled-up at a gas station, the mileage charge would be routed to the driver's insurance account. If the insurance payments are rolled into a monthly GRUCS bill statement, the GRUCS administer could allocate the received monies to the appropriate companies.

(2) Marketing

There is enormous potential that GRUCS travel data will be shared with corporations to more effectively market products and services. Just as GRUCS allows targeted pricing of externalities, GRUCS also allows targeted marketing. Foremost, corporations will have a better sense of their customers' preferences. Secondly, there is seemingly unlimited potential for advertising. For conventional advertising, such as billboards, newspapers, mailers, and websites, GRUCS travel data creates much more customer data from which companies can send targeted messages.

The truly unconventional potential of GRUCS is the real-time advertising inside the car, either through the LCD screen of the onboard GRUCS device, a navigation system, or text and

125. *See GMAC Insurance and OnStar Create Innovative Insurance Products*, TELEMATICS UPDATE, Feb. 2, 2004, http://www.telematicsupdate.com/homepage2.asp?news=40334.

image messaging through PDAs and cell phones.[126] Companies will be able to alert the user that a McDonald's or a particular gas station is approaching.[127] A corporate database that draws from GRUCS conceivably can determine a driver's preferences by the types of places he stops and how frequently. Such a corporate database could determine when the next likely time the driver will want to stop at a particular store.

(3) Private Roads

With GRUCS, there is a strong possibility that roads will be transformed from public to private assets. The two current primal focuses of study by the Federal Highway Administration are improving intelligent transportation systems (one part of which is small-scale GRUCS), and public-private partnerships to fund highway construction and operation.[128] GRUCS is a complicated technology which may be most efficiently created through private development. Thus, the two Federal Highway Administration projects are likely to come to a confluence.

The confluence of the Federal Highway Administration's two projects will occur at about the same time that corporations have already made substantial inroads of their own into GIS onboard vehicles.[129] OnStar is now available on more than fifty vehicle models.[130] Similar

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126. Rachel Konrad, *General Motors to "push" ads to drivers*, CNET NEWS.COM, Jan. 8, 2001, http://news.com.com/2100-1023-250696.html.

127. *Id*. (providing this example: "Imagine this: As your fuel gauge nears empty and you begin searching for a gas station, a computerized voice takes over your car's stereo speakers and says, 'The BP station at the corner of Second Avenue and Main Street has gasoline that is $1.43 per gallon, 8 cents cheaper than any other station within 5 miles.'").

128. The Federal Highway Administration has a comprehensive program entitled "Public Private Partnerships." *See* Fed. Hwy. Admin., Public Private Partnerships, http://www.fhwa.dot.gov/ppp/. Additionally, 21 states have enabling legislation for such partnerships. *See* Fed. Hwy. Admin, PPP Legislation, http://www.fhwa.dot.gov/ppp/legislation.htm.

129. A robust industry in development and deployment of onboard GPS has developed. *See* Inrix, Inc., hytp://www.inrix.com/; TrafficMaster, http://www.trafficmaster.co.uk/ (owned by iTIS Holdings, http://www.itisholdings.com/probe.asp); Airbiquity, http://www.airbiquity.com/; deCarta, http://www.decarta.com/; Curious Software, http://www.curious-software.com/ (owned by Vizrt, http://www.vizrt.com/); Tele Atlas, ttp://www.teleatlas.com; Smartnav, http://www.smartnav.com/; Connexis, http://www.connexis.com/ (owned by Ygomi LLC, http://www.ygomi.com/; Econolite, http://www.econolite.com/; Iteris, http://www.iteris.com/.

130. OnStar, 2007 OnStar-Equipped Vehicles, http://www.onstar.com/us_english/jsp/equip_vehicles/07_vehicles.jsp.

telematic GPS products are in other cars as well.[131] "Black boxes" are installed in most cars and provide insurances companies with specific location, speed, and direction data at the time of a vehicular crash.[132] Some rental companies use onboard GPS to rent based on mileage and for driving over the speed limit.[133] Cell phones, many equipped with GPS tracking devices, provide the corporate world with data of our every movement.[134]

Finally, this confluence is apparent from the membership of the Board of Directors for the Intelligent Transportation Society of America (ITSA), the principal lobbying group for creating legal frameworks to allow the progression of synergizing transportation flow and navigation. The Board list reads like a who's who of the future of GRUCS, including leaders from the corporate world: Ygomi, Sprint, Mark IV Industries (the company develops mobile display screens), Automotive Services at American Automobile Association, Econolite Control Products, Traffic.com, Iteris, Heavy Vehicle Electronic License Plate Inc., Eberle Design, and TransCore; from the public sector: Utah Transit Authority, Metropolitan Transportation Commission in the San Francisco Bay Area, California Department of Transportation, Virginia Department of Transportation, ITS Joint Program at the Federal Highway Administration, and Office American Association of State Highway and Transportation Officials American Public Transportation Association; from the ivory towers: Johns Hopkins University, Virginia Tech Transportation Institute, Institute of Transportation Engineers; and even from the law

131. *Toyota Unveils Beefed-Up Wireless System With On-Star Like Capabilities and G-Sound*, AUTO CHANNEL, Apr. 14, 2005, http://www.theautochannel.com/news/2005/04/14/038857.html.

132. Joseph B. White, Will Your Automobile Become a Tattle-Tale? New Technology, Research Fosters Debate Over Crash Data and Driver Privacy, WALL ST. J., Mar. 26, 2007, available at http://online.wsj.com/public/article/SB117466302594446875-8kNYzmHGOXqb48gyvAB_FONQMYY_20080325.html; Dawn Love, Progressive's Black Box: Is Big Brother Good for the Industry?, INSURANCE J., Dec. 6, 2004, available at http://www.insurancejournal.com/magazines/southeast/2004/12/06/features/50322.htm.

133. *GMAC Insurance and OnStar Create Innovative Insurance Products*, TELEMATICS UPDATE, Feb. 2, 2004, http://www.telematicsupdate.com/homepage2.asp?news=40334.

134. Those cell phones without GPS still provide rudimentary triangulation of our location through multiple cell towers. Indeed, where mountain passes and skyscrapers make GPS problematic to use, cell phone towers will be able to complete the task for GRUCS. Thus, our whereabouts is nothing private these days and is bound to become even less private as technology sweeps away traditional notions of what is private and what is public.

enforcement field: the Chief of Police at the Metropolitan Transit Authority in Harris County, Texas.[135] GRUCS is already being formed with the biggest Big Brother – Big Sister – Little Brothers partnership of all at ITSA.

So we know the merging of the private and public spheres is likely to occur. How are we to characterize our public roads after merger? Private development and administration of GRUCS transforms a publicly assessed tax into a privately assessed charge. Whether or not the road is actually owned by the private entity does not matter. A private charge means use of the road is a private enterprise not a public one.

The political pretext to create a GRUCS is almost certain to be to internalize externalities. Thus, whether GRUCS is administered publicly or privately matters naught. If privately administered, the government would still be obliged to regulate the private entities to charge users for the externalities and to receive the generated funds. A profit margin, however, will be required for private administrators to obtain sufficient capital to fully deploy GRUCS.

Last Thoughts on a Commercial Society

Greater connection to information should be embraced. This information will allow for more efficient and broader coverage of auto insurance and more informed and timely decision-making regarding convenience restaurants, stores, and vehicle maintenance. Additionally, by harnessing private markets to develop and administer GRUCS, deployment may be less expensive. Whether we, as a society, want our Little Brothers to be harnessing the powers of GRUCS is for the political arena and future debate.

135. ITSA, Board of Directors, http://www.itsa.org/board_directors/c13/Inside_ITSA/Board_of_Directors.html.

Summary of Uses

There are numerous uses and benefits to GRUCS. This article provides an extensive, but not exclusive list of priorities. While under Pagouvian theory all externalities should be internalized to achieve a better, more efficient society, the technological advancement, administrative costs, and political desires will dictate when and which externalities are internalized. In addition the benefits of internalizing externalities, there are several uses of GRUCS in emergency response, law enforcement, and commercial applications. The benefits of these uses, whether creating a more efficient society, creating a safer society, or providing more information for commercial use, must be balanced against their costs, namely the privacy concerns.

III. FOURTH AMENDMENT LIMITS TO GRUCS

The privacy concerns arise for three reasons: the exactitude and robustness of data which GRUCS accumulates, potential misuse by the government, and the Panoptican effect on society. The Fourth Amendment provides the chief constitutional protection from infringement of privacy:

> The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.[136]

"Modern legal analysis conventionally divides [privacy] interests into two categories: autonomy privacy (or decisional privacy) interests and informational privacy (or data privacy

136. U.S. Const. amend. IV.

interests)."[137] Although this distinction is not always followed, it provides a good overview of the various privacy interests at stake.

Autonomy privacy interests are "interests in making intimate personal decisions or conducting personal activities without observation, intrusion or interference."[138] Justice Douglas stated that the most to least protected of autonomy privacy interests are as follows:

> First is the autonomous control over the development and expression of one's intellect, interests, tastes, and personality. . . .
>
> Second is freedom of choice in the basic decisions of one's life respecting marriage, divorce, procreation, contraception, and the education and bringing of children. . . .
>
> Third is the freedom to care for one's health and person, freedom from bodily restraint or compulsion, freedom to walk, stroll, or loaf.[139]

Douglas's division of privacy interests both illustrates what "autonomous" means and the interest types that will be most likely protected against infringement. Driving constitutes the third and least of the interests and, therefore, is a least protected autonomy interest. If, however, the database is used to gain control over the second or first interests, which are more protected, the constitutionality of regulating driving becomes less likely.

Informational privacy interests are those that "preclude[e] the dissemination or misuse of sensitive and confidential information."[140] The California Supreme Court relevantly stated:

> A particular class of information is private when well-established social norms recognize the need to maximize individual control over its dissemination and use to prevent unjustified

137. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 321 (2004) (citations omitted) (quoting MICHAEL FOUCAULT, DISCIPLINE AND PUNISH: THE BIRTH OF THE PRISON 202–03 (Alan Sheridan trans., Vintage Books 1979).

138. Hill v. NCAA, 865 P.2d 633, 654 (Cal. 1994).

139. Doe v. Bolton, 410 U.S. 179, 211–13 (1973 (Douglas, J., concurring) (emphasis omitted).

140. Hill v. NCAA, 865 P.2d 633, 654 (Cal. 1994).

> embarrassment or indignity. Such norms create a threshold reasonable expectation of privacy in the data at issue.[141]

Although the Supreme Court does not strictly adhere to the autonomy and informational privacy distinction, this distinction is relevant. Criminal investigations are more likely to implicate autonomy privacy interests while civil government's data use is more likely to implicate informational privacy interests.

Finally, before jumping into the Fourth Amendment analysis of data use by Big Brother, Big Sister, and the Little Brothers, it is worthwhile to discuss the so-called "right to travel." At one time road users were thought to have an unencumberable right to travel.[142] If this right continued to persist today, GRUCS would quite likely significantly infringe the traditional notion that drivers had an "absolute" right to travel at the beginning of the Twentieth Century.[143] However, the right to travel is not as strong now. Governments may impose speed limits and require licensing of vehicles and drivers.[144] Although the Fifth and Fourteenth Amendments have been interpreted to confer a Substantive Due Process right to travel, this right has been typically confined to the right to travel between states, not the right to travel on a road.[145] This section attempts to provide some insight as to how the right to travel, if revived, might affect future jurisprudence of the Fourth Amendment, a heretofore unvisited question by the Supreme Court in the context of GRUCS, where appropriate.[146]

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141. *Id.*

142. "The rule of open travel on the roads was viewed as superior to freedom of speech, freedom of religion, and freedom of press throughout the late 1800s." Roger I. Roots, *The Orphaned Right: The Right to Travel by Automobile, 1890–1950*, 30 OKLA. CITY U. L. REV. 245, 249 (2005) (citing DAVID M. RABBAN, FREE SPEECH IN ITS FORGOTTEN YEARS (Arthur McEvoy & Christopher Tomlins eds., 1997)).

143. Swift v. City of Topeka, 23 P. 1075, 1076 (Kan. 1890).

144. Roger I. Roots, *The Orphaned Right: The Right to Travel by Automobile*, 1890–1950, 30 OKLA. CITY U. L. REV. 245, 259–61 (2005).

145. Shapiro v. Thompson, 394 U.S. 618, 629–30 (1969) (holding that a state cannot enact laws making emigration to or immigration from another state difficult).

146. For more inquiry into privacy and the right to travel, see Andrew Askland, *What, Me Worry? The Multi-Front Assault on Privacy*, 25 ST. LOUIS U. PUB. L. REV. 33 (2006).

Section III analyzes how the Fourth Amendment is implicated by Big Brother's use of GRUCS, then Big Sister's use and sharing, and finally the Little Brothers' use. This section is not meant to provide a particular resolution to the privacy concerns, but will provide suggestions as to how government may mitigate the privacy concerns and not violate Fourth Amendment rights.

(A) Big Brother: Criminal Investigation & Prosecution

Although internalizing externalities is the prime function of GRUCS, the privacy concerns swell around criminal investigatory uses. GRUCS's targeting of externalities may provide a vast database including past travel distances, locations, driving style, traffic violations, vehicle model, and pollution emissions. Additionally, GRUCS data may be interfaced with cell phone usage, Wi-Fi internet access, credit purchases, bank accounts, tax records, business ownership, property ownership, and criminal history. From this information, a person's activities could not only ascertained, but also forecasted with reasonable precision. Criminal investigators will want to use this information to apprehend and prosecute suspects. Additionally, criminal investigators may want to troll the database to discover potential criminal activities. Thus, we must find the constitutional boundaries within which GRUCS for investigatory purposes can be used. This subsection will first analyze individual surveillance jurisprudence, second analyze dragnet surveillance jurisprudence, third discuss jurisprudence that requires surveillance to be narrowly tailored to its objectives, and finally make concluding thoughts.

(1) Individual Surveillance

If law enforcement officials use GRUCS to investigate crimes, the police may run into the problem Chief Justice Rehnquist warned of when he cautioned, "dragnet type law

enforcement practice [might violate constitutional protections of privacy]."[147] Discussion of modern privacy case law begins with *Katz v. United States*.[148] In *Katz*, Justice Stewart held that the defendant justifiably relied on the privacy of a public phone booth and that the government's electronic listening and recording violated this privacy.[149] This violations constituted a "search and seizure" within the Fourth Amendment. Justice Harlan's concurrence is of particular importance, in which he stated:

> My understanding of the rule that has emerged from prior decisions is that there is a twofold requirement, first that a person have exhibited an actual (subjective) expectation of privacy and, second, that the expectation be one that society is prepared to recognize as 'reasonable.' Thus a man's home is, for most purposes, a place where he expects privacy, but objects, activities, or statements that he exposes to the 'plain view' of outsiders are not 'protected' because no intention to keep them to himself has been exhibited. On the other hand, conversations in the open would not be protected against being overheard, for the expectation of privacy under the circumstances would be unreasonable.[150]

Justice Harlan both recognized the previous plain view doctrine and then created a two-part test including objective and subjective elements. The two-part test requires first that the defendant actually has an actual expectation to privacy, determined on factual circumstances. Thus, the presumption in inquiry is that no privacy expectation exists. If the defendant proves an expectation does exist, then the defendant must prove this expectation must be reasonable. The Court in *Smith v. Maryland*[151] expanded on the objective "reasonable" prong, stating "the application of the Fourth Amendment depends on whether the person invoking its protection can claim a 'justifiable,' a 'reasonable,' or a 'legitimate expectation of privacy'"[152]

147. United States v. Knotts, 460 U.S. 276, 284 (1983).
148. Katz v. United States, 389 U.S. 347 (1967).
149. *Id.* at 359.
150. *Id*. at 361 (Harlan, J., concurring).
151. Smith v. Maryland, 442 U.S. 735 (1979).
152. *Id.* at 740.

In *United States v. Knotts*,[153] the Court was presented with the question whether narcotics officers could place a "beeper" inside a five-gallon container of chloroform, a precursor chemical to the manufacture of illicit drugs, in order to track the defendant to his cabin.[154] A beeper is "a battery-operated one-way transmitter that continuously emits an electronic signal that is inaudible at the place from which the signal is transmitted."[155] When the container was put in the defendant's car, the officers followed the suspect maintaining both visual surveillance and a monitor that received the beeper signals.[156] Justice Rehnquist held that "monitoring the beeper signals [did not] invade any legitimate expectation of privacy."[157] Although the beeper aided the officers in locating the container on the suspect's property, and an individual's residence is "'accorded the greatest protection available,' . . . there [was] no indication that the beeper was used in any way to reveal information as to the movement of the drum within the movement of the drum within the cabin, or in any way that would not have been visible to the naked eye outside the [defendant's] cabin."[158] Although "scientific devices . . . enable[] the police to be more effective, [the Supreme Court has] never equated police efficiency with unconstitutionality . . . ."[159] Thus, *Knotts* stands for the proposition that police do not violate an individual's privacy so long as the technology employed merely does what "naked-eye" surveillance and routine police work could have done.[160]

153. United States v. Knotts, 460 U.S. 276 (1983).
154. *Id.* at 278.
155. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 315 (2004).
156. United States v. Knotts, 460 U.S. at 278.
157. *Id.* at 285.
158. *Id.* at 284–85 (citing Br. for Resp., at 26).
159. *Id.* at 284.
160. This makes sense. Enforcement agencies are fiscally constrained from performing complete police oversight. If technology merely replaces otherwise necessary human resources, no new privacy interests are implicated. Note that the Electronic Communications Privacy Act of 1986 permits law enforcement officials to use electronic tracking devices, such as beepers, outside the home jurisdiction. Electronic Communications Privacy Act of 1986, Pub. L. No. 99-508, 100 § 1848 (codified as amended in scattered sections of 18 U.S.C.); 18 U.S.C. § 3117 (2001); United States v. Gbemisola, 225 F.3d 753 (D.C. Cir. 2000), cert denied, 531 U.S. 1026 (2000).

In *United States v. Karo*,[161] the Court modified its *Knotts* decision. Justice White held that "the monitoring of a beeper in a private residence, a location not open to visual surveillance, violates the Fourth Amendment rights of those who have a justifiable interest in the privacy of the residence."[162] A search warrant was required to monitor the beeper in the home.[163] The logic is that police would have violated the defendant's Fourth Amendment protections if they entered the house without a search warrant, so they could not likewise observe (with a beeper) certain facts of the inside of the house without a search warrant.[164]

In addition to allowing law enforcement to use beepers to track illicit activity outside the home, courts have also allowed the use of GPS tracking devices in crime investigations and prosecutions.[165] GPS tracking devices provide much more specific data by providing exact location data that is logged.[166] The court in the Scott Peterson trial in California upheld the police's attachment of a GPS tracking device to his car, which provided the prosecution a key piece of circumstantial evidence to demonstrate that Scott had driven to the beach of the San

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161. United States v. Karo, 468 U.S. 705 (1984).

162. *Id.* at 714.

163. *Id.* at 718. In *Olmstead v. United States*, the Court created the "property-based" concept whereby the Fourth Amendment is violated if property is "trespassed." 277 U.S. 438, 464–66. *See also* Stephen E. Henderson, *Learning from All Fifty States: How to Apply the Fourth Amendment and Its Analogs to Protect Third Party Information from Unreasonable Search*, 55 CATH. U. L. REV. 373, 377 (2006); Stephen E. Henderson, *Nothing New under the Sun? A Technologically Rational Doctrine of Fourth Amendment Search*, 56 MERCER L. REV. 507, 511–21 (2005).

164. *Id.* at 715–18. The merits of the Court's opinion are quite debatable. Why is the monitoring the location of a beeper, while inside a house, any different from monitoring a beeper while in a car on the open road? Without the defendant's consent or a search warrant, a forced entry of both the house and car would violate the Fourth Amendment. Following the *Knotts* opinion, monitoring the beeper is not a forced entry but visual surveillance. According to the *Knotts* logic, the visual surveillance is not of the inside of the car or house, but where the beeper goes. If there was full police staffing, the police could always follow defendants to their house, stakeout across the street until they leave, then continue the tracking. In essence, although the police never actually sees the inside of the house, the police are 99% positive that between the time the defendant enters and leaves the defendant is actually in the house. Why should the fact that the beeper comes to a rest inside a house cause surveillance to stop absent a warrant?

165. *Judge allows GPS evidence in Peterson case: Defense attorneys had argued that data weren't accurate*, CNN.COM, Feb. 17, 2007, http://www.cnn.com/2004/LAW/02/17/peterson.trial/index.html.

166. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 316–17 (2004); see also April A. Otterberg, *GPS Tracking Technology: The Case for Revisiting Knotts and Shifting the Supreme Court's Theory of the Public Space under the Fourth Amendment*, 46 B.C. L. REV. 661 (2005).

Francisco Bay where he launched his boat the day his pregnant wife Laci disappeared.[167] However, there were a couple momentary errors in the GIS records which showed Scott was in a completely different location for a split-second.[168] The defense objected to allowing the evidence gathered from the GPS tracking into the case based on accuracy grounds, which the judged denied. As the court did not directly address the Fourth Amendment concerns, this remains an open question. However, one would presume that even the defense attorney thought the Fourth Amendment provide privacy protection in this context.

In sum, the Fourth Amendment cases illustrate that GPS transponders may be used to track criminal suspects outside of their homes. In the GRUCS context, each vehicle will be tracked regardless of whether the individual is a criminal. The main question now becomes whether investigators can constitutionally obtain GRUCS travel data of criminal suspects without a search warrant. In the foregoing cases investigators themselves attached the beepers and GPS transponders. With GRUCS, investigators would have to obtain the travel data from the GRUCS administrator. Whether courts will extend *Knotts*, or instead apply the third-party doctrine discussed below, to such sharing of information is an open question.

(2) Dragnet Surveillance

Besides the use of GRUCS to investigate particular suspects, law enforcement may attempt to use GRUCS to daily scan the entire travel logs, complimented with other databases, such as credit card purchases, of every citizen, in order to find probable criminal activities. Potentially computer programs could do this quite quickly. Certainly this type of surveillance is

167. *Judge allows GPS evidence in Peterson case: Defense attorneys had argued that data weren't accurate,* CNN.COM, Feb. 17, 2007, http://www.cnn.com/2004/LAW/02/17/peterson.trial/index.html.

168. *Id.*

precisely the "dragnet" concern of Justice Rehnquist.[169] The fact that GRUCS is primarily designed for internalizing externalities and not criminal investigatory purposes will not alleviate the Fourth Amendment hurdle. In *Edmond v. Goldsmith*,[170] Judge Richard Posner held that "[p]rogram-level justifications for searches in support of specific regulatory programs do not carry over to general criminal law enforcement."[171]

Ongoing surveillance would likely run afoul of *Berger v. New York*.[172] In *Berger*, police monitored a suspect for two months, all-day, everyday. The Supreme Court found the prolonged, continuous surveillance violated the privacy principle that a search must be "precise and discriminate" and "carefully circumscribed."[173] Certainly the police trolling through travel logs to find criminal activity or to bolster criminal prosecutions would violate *Berger*.

(3) Narrowly Tailoring Investigations

Remaining between the *Knotts* decision upholding individualized use of electronic tracking and the *Berger* decision disallowing prolonged, comprehensive surveillance is a large field of case law and a large void where case law does not apply easily to GRUCS technology. In this gap, the constitutionality of a criminal investigation using GRUCS data will largely depend on whether the investigation or surveillance is narrowly tailored to its purpose. In

169. United States v. Knotts, 460 U.S. at 284.

170. Edmond v. Goldsmith, 183 F.3d 659 (1999).

171. *Id.* at 662 (citing Chandler v. Miller, 520 U.S. 305; New York v. Burger, 482 U.S. 691 (1987); Michigan v. Tyler, 436 U.S. 499; Donovan v. Dewey, 452 U.S. 594 (1981); Abel v. United States, 362 U.S. 217 (1960); Michigan v. Clifford, 464 U.S. 287 (1984))). But the Fourth Amendment is not violated when evidence found against one criminal is discovered by a comprehensive dragnet designed to catch a different criminal. United States v. Davis, 143 F.Supp.2d 1302, 1306–08 (M.D. Ala. 2001). However, even if officers have probable cause to arrest specific individuals, the police cannot violate others' Fourth Amendment rights in order to affect that arrest. Steagald v. United States, 451 U.S. 204, 216 (1981). Interestingly, terrorist threats justify a comprehensive dragnet. *See* Goldsmith, 183 F.3d at 663 (Posner, J., stating "We may assume that if the Indianapolis police had a credible tip that a car loaded with dynamite and driven by an unidentified terrorist was en route to downtown Indianapolis, they would not be violating the Constitution if they blocked all the roads to the downtown area even though this would amount to stopping thousands of drivers without suspecting any one of them of criminal activity. When urgent considerations of the public safety require compromise with the normal principles constraining law enforcement, the normal principles may have to bend. The Constitution is not a suicide pact." (citations omitted)).

172. Berger v. New York, 388 U.S. 41 (1967).

173. *Id.* at 58.

Mendoza v. INS,[174] a case involving a sweep for illegal immigrants in historically Hispanic neighborhoods in El Paso by the U.S. Immigration Naturalization Service (INS), the federal district court stated:

> The critical factor is and always has been the amount of interference with individual liberty that results from an investigatory stop. The courts have determined that the intrusion is permissible when officer's discretion is minimized where detention is routine and brief, and especially where there is ample notice and knowledge of the purpose of the stop.[175]

From an administrative perspective, GRUCS would be routinely used. From an investigatory perspective, the investigatory stop would be less than brief — the driver would never be detained.[176] Additionally, drivers would have "ample notice and knowledge" that their car was outfitted with a GRUCS device. Thus, it is possible that a court would uphold any use of GRUCS that did not violate *Berger*. However, while GRUCS would be used routinely to internalize externalities, GRUCS would be used less routinely for criminal investigations. Thus, citizens would likely have a reasonable expectation of privacy regarding their travel data.

Even if the police use GRUCS in a discriminate manner, the police may run afoul of *Karo*.[177] According to *Karo* all data regarding whether a vehicle is parked in a closed household garage would have to be avoided or ignored by police investigators.[178] GRUCS provides location data that is much more specific than beepers provide. While investigators can ignore beeps emitting from inside a house by turning off the beeper monitor, it is less clear how investigators can let their eyes ignore the GPS coordinates in the GRUCS travel log that pinpoints a suspects' vehicle to be in the house garage.[179] There may be possible procedural

174. Mendoza v. INS, 559 F.Supp. 842 (D.C. Tex. 1982).
175. *Id.* at 848 (citing United States v. Martinez-Fuerte, 428 U.S. 543, 557–60 (1976)).
176. Also brief because the individual would never be detained for interrogation, unlike a police road block.
177. United States v. Karo, 468 U.S. 705 (1984).
178. *Id.* at 718.
179. *See supra* note 164.

safeguards, such as automatic redaction of all home-related data, but redaction would probably be equally problematic.

(4) Consent to Search

The Supreme Court held in *Schneckloth v. Bustamonte*[180] that, in a criminal context, consent to a search destroys one's right to privacy.[181] Under GRUCS, road users necessarily must submit to the system in order to drive. However, road users have enjoyed thousands of years of travel without exacting government surveillance. Courts are quite likely, in this circumstance, to superimpose the right to travel at least in the criminal investigation context. Although road users would have the option to travel by foot, horse, bicycle, bus, or boat without government surveillance, the fact is the prime mode of transportation for the past eighty years has been by personal vehicles. GRUCS would be a substantial intrusion into an individual's personal sanctity while on the road with little viable option not to be subject to surveillance. Additionally, while a road user may consent to the primary purpose of GRUCS, to charge drivers for their costs, a road user should not be deemed to have also consented to a secondary use of GRUCS. This would be akin to allowing criminal investigators to come onto an individual's property just because he pays property taxes.[182] Thus, courts are unlikely to find that drivers have waived their privacy protections from criminal investigation simply by driving on the road tolled by a GRUCS.

Last Thoughts on Big Brother's Investigations

From this discussion of the Fourth Amendment and Big Brother, a few conclusions can be made. First, investigators cannot troll through a GRUCS database in search of criminal

180. Schneckloth v. Bustamonte, 412 U.S. 218 (1978)
181. *Id.* at 248–49; *see also* Zap v. United States, 328 U.S. 624, 628 (1946).
182. The author recognizes that this is not a perfect analogy.

activities. Second, investigators cannot simply obtain more data than necessary when investigating a particular suspect and, thus, investigators can only obtain data regarding the suspect and data relevant to the crime.[183] Third, although investigators can attach GPS transponders to vehicles in order to track criminal suspects without a warrant, less clear is whether investigators can do the equivalent by obtaining a suspect's travel data from the GRUCS administrator without a search warrant. If *Knotts* is extended from investigators' use of beepers to use of GRUCS, investigators are not likely to need a search warrant. If, however, the third-party doctrines of the Fourth Amendment are applied, as described below, the result may be different.

A future court's decision on these matters is likely to be infused with equitable principles based on whether it considers the use of GRUCS to be a dragnet program. For example, the *Mendoza* court, in holding the INS action violated the Fourth Amendment, exclaimed, "It is offensive to the Court's sense of justice that any one of us could have been caught in one of the indiscriminately thrown dragnets in El Paso on January 29 while enjoying mariachi music and tostados."[184] Surveillance that is not narrowly tailored enough for the judge's conscience is likely to be found to violate the Fourth Amendment.

The best option to protect individuals' safety is to require police to obtain judicial warrants in all circumstances in order to search a particular suspect's travels. Legislatures, when establishing a GRUCS, should specify that police investigators can only obtain a judicial warrant to view GRUCS data with a showing of probable cause. While courts may require this anyways,

183. Although evidence against a defendant was permissible in *United States v. Davis* even though the evidence was collected pursuant to a road block aimed to catch a different criminal, the road block was "appropriately and narrowly tailored" for the circumstance. *See* United States v. Davis, 143 F.Supp.2d 1302, 1308. In GRUCS, there is no exigency to search other people's records to find the criminal's records.

184. Mendoza v. INS, 559 F.Supp. at 848.

such progressive protection of individual's privacy will assure public acceptance of GRUCS to internalize externalities and increase emergency response time.[185]

(B) Big Sister: Civil Government Use of Driving Data

This subsection first discusses the privacy problems caused by administration of GRUCS, second analyzes the third-party doctrine of the Fourth Amendment, third analyzes the Fourth Amendments effects of poor database management, and finally makes concluding thoughts.

(1) Privacy Problems

The civil government is generally allowed to collect personal information as is necessary to carry out government functions of regulation and taxation. However, GRUCS both manipulates behavior through intense, targeted charging of externalities and through the Panopticon effect created by the threat of criminal investigator's use of the collected data. This manipulation is reminiscent of the Orwellian "doublespeak" where free-thought and free-choice were controlled in Oceania.[186] Additionally, the highly technical calculation of the charge using emission rates and variable congestion factors make GRUCS, and the ill-equipped political process to perform such technical rate settings, seem so manipulative that the road user loses "becomes an object to be acted upon . . . ,"[187] rather than a free-acting individual. This manipulation and control over free thought is precisely the privacy interest afforded the most protection by the Fourth Amendment, according to Justice Douglas.[188] However, absent reference to specific sensitive issues, such as medical doctor-patient relationships,[189] or specific

185. *Id.*
186. GEORGE ORWELL, NINETEEN-EIGHTY-FOUR (1949).
187. *Supra* note 14. For an Orwellian example of fee manipulation, see GEORGE ORWELL, NINETEEN-EIGHTY-FOUR 56–57 (Signet Classic 1977) (1949).
188. Doe v. Bolton, 410 U.S. 179, 211–13 (1973 (Douglas, J., concurring) (emphasis omitted).
189. *See* Harold Edgar & Hazel Sandomire, *Medical Privacy Issues in the Age of AIDS: Legislative Options*, 16 AM. J.L. & MED. 155, 158 (1990).

statutes to the contrary, government is generally not constrained from giving information to other parties.[190]

(2) Third-Party Doctrine

Not only can civil government directly obtain information, it can also accumulate data from third-parties. In *United States v. Miller*,[191] the Supreme Court enunciated the so-called "third-party doctrine" of the Fourth Amendment jurisprudence. In applying the "reasonable expectation" prong to search of third-party information, the Supreme Court held that the Fourth Amendment does not protect privacy interests because when an individual

> reveal[s] his affairs to another, that the information will be conveyed by that person to the Government. . . . [T]he Fourth Amendment does not prohibit the obtaining of information revealed to a third party and conveyed by him to Government authorities, even if the information is revealed on the assumption that it will be used only for a limited purpose and the confidence placed in the third party will not be betrayed.[192]

Thus, both law enforcement and civil government are free to purchase or otherwise obtain data from third-party vendors. This data can include cell phone records, bank account information, credit card purchases, insurance records, and other potentially personally sensitive information.[193]

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190. *See* Stephen E. Henderson, *Learning from All Fifty States: How to Apply the Fourth Amendment and Its Analogs to Protect Third Party Information from Unreasonable Search*, 55 CATH. U. L. REV. 373 (2006).

191. United States v. Miller, 425 U.S. 435 (1976).

192. *Id.* at 443 (1976) (citing United States v. White, 401 U.S. 745, 751–52 (1971); Hoffa v. United States, 385 U.S. 293, 302 (1966); Lopez v. United States, 373 U.S. 427 (1963)).

193. Government has already engaged in several other data mining activities, such as the Pentagon's politically unsavory Total Information Awareness program that aimed "to amalgamate a mammoth database of existing commercial and governmental information and to develop computing capability sufficient to analyze that immense amount of data in order to spot suspicious behavior." Additionally, the Multistate Anti-Terrorism Information Exchange (MATRIS), aimed to combine commercial and state databases; the program's software was written by Scient, now owned by LexisNexis. Stephen H. Henderson, *Learning from All Fifty States: How to Apply the Fourth Amendment and its Analogs to Protect Third Party Information from Unreasonable Search*, 55 CATH. U. L. REV. 373, 390–91 (2006).

The third-party doctrine will be of particular relevance if civil government implements GRUCS by aggregating existing private data accumulated by telematics such as OnStar or by onboard navigation systems. The third-party doctrine essentially gives such a GRUCS structure rubberstamp approval.

However, there may be limitations to the third-party doctrine. Stephen E. Henderson conducted a fifty-state survey of whether states, through their state constitutions and judicial interpretation, provide protection individual with privacy protection from data aggregation from third-parties by the government.[194] He found that eleven states reject the federal third-party doctrine;[195] ten states might reject the federal third-party doctrine;[196] and eighteen states affirmatively retain the federal doctrine.[197] Thus, in potentially at least 21 states, and possibly more, civil government must be careful to not aggregate data from commercial sources without consent of the individual. Whether an individual's decision to drive could fulfill the requirement of consent is yet to be seen.

Joseph Thai suggest a potential additional limitation to the third-party doctrine.[198] After reviewing *Kyllo v. United States*[199] and *Illinois v. Caballes*,[200] both Supreme Court Fourth Amendment cases, Thai concluded that if Justice Stevens's approach were followed in future jurisprudence, the affect on the third-party doctrine may be significant:

194. Stephen H. Henderson, *Learning from All Fifty States: How to Apply the Fourth Amendment and its Analogs to Protect Third Party Information from Unreasonable Search*, 55 CATH. U. L. REV. 373 (2006).

195. *Id.* at 395 (California, Colorado, Florida, Hawaii, Idaho, Illinois, Montana, New Jersey, Pennsylvania, Utah, and Washington).

196. *Id.* (Alaska, Arkansas, Indian, Massachusetts, Minnesota, New Hampshire, Oregon, South Dakota; Texas; and Vermont).

197. *Id.* (Alabama, Georgia, Iowa, Kansas, Kentucky, main, Maryland, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Oklahoma, Rhode island, South Carolina, Virginia, West Virginia, and Wisconsin).

198. Joseph Thai, *Is Data Mining Ever a Search under Justice Stevens's Fourth Amendment?*, 74 FORDHAM L. REV. 1731 (2006).

199. Kyllo v. United States, 533 U.S. 27 (2001).

200. Illinois v. Caballes, 543 U.S. 405 (2005).

> To wit, if the use of technology to detect only evidence of illegal activity is not a search, because any compromised privacy expectation in such activity is not legitimate, then the use of technology to detect evidence of more than that may constitute a search, because it may compromise legitimate privacy expectations in lawful activity. . . . *Caballes* implies that the Fourth Amendment governs technologically enabled inferences concerning the occurrence of lawful activities where one reasonably may expect privacy, regardless of whether those inferences are correct.[201]

Thus, Thai believes a knowledge standard may emerge, whereby one's reasonable lack of knowledge of the applied technology will permit the retention of Fourth Amendment protection. In the third-party context, for example, if a driver can validly claim ignorance that the a telematics service, such as OnStar, collects emissions data, the driver may be afforded privacy protection. However, this theory is highly suspect, as Thai admits,[202] and condemned.[203]

(3) Consent to System

The consent to search doctrine was first elucidated in the criminal law context[204] and has since also been applied by the Supreme Court in the civil government context.[205] Just as in the criminal context discussed above, a driver's submission to partake in the GRUCS system in order to drive may be construed as consent to give information to the civil government. A court is more likely to find consent in the civil context than the criminal because the primary purpose of GRUCS is to regulate and charge for driving. This contrasts with criminal applications of GRUCS because the police are using the data, obtained pursuant to the primary purpose, for a

201. Joseph Thai, *Is Data Mining Ever a Search under Justice Stevens's Fourth Amendment?*, 74 FORDHAM L. REV. 1731, 1754 (2006).

202. *Id.* at 1755–56.

203. April A. Otterberg, *GPS Tracking Technology: The Case for Revisiting Knotts and Shifting the Supreme Court's Theory of the Public Space under the Fourth Amendment*, 46 B.C. L. REV. 661, 686–87 (2005); Stephen H. Henderson, *Learning from All Fifty States: How to Apply the Fourth Amendment and its Analogs to Protect Third Party Information from Unreasonable Search*, 55 CATH. U. L. REV. 373, 388 (2006).

204. Schneckloth v. Bustamonte, 412 U.S. 218, 219–22, 248–49 (1978); *see also* Zap v. United States, 328 U.S. 624, 628 (1946).

205. New York v. Burger, 482 U.S. 691, 698, 717–18 (1969).

secondary use of investigation. Thus, a road user may consent to the road charge applications, but not the criminal applications of GRUCS.

A court could also possibly find that citizens do not consent to GRUCS because drivers, on the whole, do not have viable transportation substitutes. While certainly some individuals could walk, bike, or ride public transit, these options are not viable for everyone. Additionally, in each of these new transportation methods individuals give up a degree of privacy as in each case the individual exposes him- or herself to a greater degree to the public without the shelter of the personal vehicle. However, these arguments are likely to fail. GRUCS is designed to charge or tax individuals for their use of an otherwise public good, the road. In principle this is the same as buying a lollipop in a candy store or paying taxes. In neither situation does the consumer or taxpayer avoid paying what is due.

(4) Poor Database Management

Even if the consent doctrine applies in the administrative context, Big Sister may violate an individual's Fourth Amendment right to privacy by mismanaging data. Legislatures and agencies need to be cognizant of that poor data management may breach a degree of privacy infringement that an individual consents to. Concerns of poor management and privacy include:

> [1] the potential for identity theft and other improper disclosure and use of personal information when databases aggregating sensitive financial, health, and other personal information . . . ; [2] the potential for "function creep" when data disclosed or collected for one purpose are later used for another purpose . . . ; [3] the potential for erroneous and potentially non-transparent decision-making because of errors in databases; [4] the implications for personal autonomy of pervasive "Dataveillance" and targeted marketing; and [5] the potential for discrimination and harassment based on "false positives" resulting from the use of statistical

> patterns to predict everything from commercial behavior through health problems to criminal propensity.[206]

In *U.S. Department of Justice v. Reporters Committee for Freedom of Press*, the Supreme Court "established that individuals have an expectation of privacy in personal information stored on a comprehensive computerized database."[207] *Whalen v. Roe* requires that adequate safeguards be in place to protect against unauthorized access into the database,[208] although jurisdictions vary on the meaning of "adequate safeguards."[209] In the deployment of the GRUCS central database, legislators and administrators should limit rights to access, creating multiple security layers, encrypting the data, having warning systems for when security is breached, increasing public awareness about the protections, and providing procedural remedy when security is breached.

Final Thoughts on Big Sister

For both political and sociological reasons, government should provide the public with maximum information about how GRUCS works, about the nature of the internalized externalities (why the externality costs what it does), and regarding how road charges are calculated.[210] Information might include providing robust onboard video screens mapping out travel routes and predicting charges, individualized online internet accounts for road users to review travel history, secondary testing stations to insure onboard GRUCS equipment is

206. Katherine J. Strandburg & Douglas B. Burda, *The Frontiers of Privacy Law: Technology Marches on*, 866 PLI/Pat 481, 499–500 (2006).

207. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES 87 (2002); U.S. Dep't of Justice v. Reporters Comm. For Freedom of the Press, 489 U.S. 749 (1989), where the Court held that disclosure of contents of FBI rap sheet to third party could reasonably be expected to constitute unwarranted invasion of personal privacy even within the law enforcement exemption of Freedom of Information Act.

208. Whalen v. Roe, 429 U.S. 589, 607 (1977) (Brennan, J., concurring).

209. DAVID J. FORKENBROCK & JON G. KUHL, A NEW APPROACH TO ASSESSING ROAD USER CHARGES 88 (2002).

210. Protecting individuals' psyches is a potent reason not to pursue public-private partnerships to administer a GRUCS.

correctly calculating mileage and emissions, and an expedited administrative appeals process challenge and correct bill statements.

(C) Little Brothers: Corporate Marketing

The intertwining of technology, government, and corporations creates an interesting paradigm to of sharing of information between Big Sister and the Little Brothers.[211] Although the Fourth Amendment does not directly apply to private actors, legal privacy concerns still abound. First, the Fourth Amendment is implicated to private action through the third-party doctrine when corporations sell data to governments. Where the limits of the third-party doctrine exist for governments in purchasing data,[212] obviously the limits exist for corporations in selling the data. The second limits of corporate action infringing on privacy interests is in common law. The relevant torts fall into four categories: "(1) information collection, (2) information processing, (3) information dissemination, and (4) invasion."[213] Within these categories there are four principle torts, each of which was strongly shaped by Professor William Prosser:[214] (1) unreasonable intrusion upon seclusion ("intrusion"),[215] (2) appropriation of another name or likeness ("appropriation"),[216] (3) unreasonable publicity given to another's private life ("public disclosure"),[217] and (4) publicity unreasonably placing another person in a false light ("false light").[218] This article focuses on the constitutional limits rather than the common law or

211. *See supra* 29–31, "Private Roads."
212. *See supra* 45–47, "Third-Party Doctrine."
213. *Id.* at 489.
214. David J. Solove, *A Taxonomy of Privacy*, 154 U. PA. L. REV. 477, 546 (2006).
215. Restatement (Second) of Torts §§ 652B (1997); *see also* Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 354 (2004).
216. Restatement (Second) of Torts § 652C (1997).
217. *Id.* at § 652D.
218. *Id.* at § 652E.

statutory protections of privacy and, therefore, this article will not discuss these torts in greater detail.[219]

Summary of Fourth Amendment Limits

Charging for nearly all travel behaviors may change drivers from "morally responsible actors" into simple tax or toll payers, or worse yet, into drones simply reacting to the Panopticon effect.[220] Additionally, there is a concern that police may use the GRUCS database to conduct dragnet surveillance, searching through personal data to find crimes without just cause. This conceivably could be done without any citizen knowing about it if the data was never enterered into evidence of a prosecution. Thus, one could argue that GRUCS, because of its targeting and threat misuse, is hideous.

However, GRUCS will not be hideous if two conditions are met. First, one must believe that a significant governmental role is managing harms caused by private citizens, and thus targeting social and environmental externalities.[221] Citizens have a reasonable expectation that their government will take action to ensure other individuals will not impose externalities on society or individuals. Second, the charge must be narrowly tailored to the particular externality while providing strong privacy protections. Narrow tailoring with privacy protections should not create a significant chilling-effect on society.[222]

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219. For more information on privacy torts, see David J. Solove, *A Taxonomy of Privacy*, 154 U. PA. L. REV. 477 (2006); Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 353–62 (2004).

220. Dorothy J. Glancy, *Privacy on the Open Road*, 30 OHIO N.U. L. REV. 295, 321 (2004). One interesting story that illustrates how paying fees lessens moral responsibility is that of a daycare facility. The daycare imposed an extra fee for parents who picked-up their children late. The daycare then, to its chagrin, experienced an increase in the number of late pick-ups. The fee had replaced moral culpability, and the fee was set too low to make up the difference between moral culpability and its absence.

221. Brock W. Howell, Editorial, *Initiatives' Absolute Property Right World is Untenable*, VT. J. ENVTL. L., Nov. 2, 2006, http://www.vjel.org/editorials/ED10054.html.

222. *See* John S. Ganz, *It's Already Public: Why Federal Officers Should Not Need Warrants to Use GPS Vehicle Tracking Devices*, 95 J. CRIM. L. & CRIMINOLOGY 1325, 1358–61 (2005). Please note that this author does not come to the same conclusion as Ganz, that this chilling-effect is non-existent or not meaningful. Indeed, the Panopticon effect must have some relevance or scholars and debaters would not be so concerned.

Unfortunately, citizens are not likely to be completely assured that the police will not obtain GRUCS data or that their travel data will not be mishandled. In the end, policymakers must balance the need for targeting externalities against the threat of targeting individual's privacy by criminal investigations. Additionally, policymakers need to protect the GRUCS database from data theft. Policymakers should required strong database security, warrants to be issued for criminal investigations, quick and easy access for drivers to review their driving records, an information campaign to educate the public on how GRUCS works, and procedural remedies to correct errors in billing statements. Taking these steps are both wise pragmatically and to ensure that the government does not violate the Fourth Amendment.

CONCLUSION

The future of technology seems almost boundless, given Moore's Law of doubling technological efficiency every 18 to 24 months.[223] At such rates, conquering the external environmental and social costs of road use through GIS targeted at each individual seems like it will happen tomorrow. Indeed, GIS road user charge systems are likely to be in full development soon. This article provides some insight into GRUCS social benefits and uses and to what extent the current Fourth Amendment jurisprudence on privacy will allow the technology's deployment. Where the Constitution fails to protect privacy, the public should impose statutory and programmatic protections. The success of creating an environmentally effective and economically efficient road user charge system is dependent on congressional and public debates.

223. Gordon Moore, Intel, Moore's Law, http://www.intel.com/technology/mooreslaw/.