The U.S. State Procurement War

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Very preliminary

Abstract

This paper examines the welfare effects of buy-local policies in U.S. state procurement. We exploit novel transaction-level data to show that state agencies allocate a larger share of expenditure to local firms than federal agencies purchasing similar products in the same location. Using a multi-region trade model with private and government demand, we compute each state's optimal preference for local suppliers. We find that, absent retaliation, states optimally treat local bids as 18 to 25 percent cheaper. Despite these large preferences, welfare gains are modest, at 0.14 percent in Virginia and 0.23 percent in California in consumption-equivalent units. Higher private consumption is partly offset by less efficient public goods and greater labor supply. Once other states reciprocate, the optimal preference is close to zero, and states that favor local firms gain by dropping those preferences if reciprocity adjusts. The findings highlight how retaliation removes the terms-of-trade motive for procurement protection.

JEL Classifications: F13; F15; H57; R13
Keywords: Government Procurement; Buy-Local Policies; Interstate Trade; Optimal Policy; Retaliation

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1 Introduction

Since the end of the Second World War, economic policies in the United States and elsewhere have promoted globalization and deeper economic integration. In recent years, however, governments have increasingly adopted policies that favor local production over the efficient allocation of economic activity across locations and free trade. National governments have led much of this shift, relying on a broad set of policy instruments, including tariffs (Fajgelbaum and Khandelwal (2026)), export promotion, and industrial policies (Juhász et al. (2025), Goldberg et al. (2024)).

This paper investigates a setting in which subnational governments also contribute to market fragmentation through their public procurement systems. Although the dormant Commerce Clause of the U.S. Constitution generally prevents states from discriminating against interstate commerce when acting as regulators, the *market participant doctrine* allows states to favor their own residents when participating in markets as buyers. This legal framework has facilitated the widespread adoption of buy-local policies in U.S. state procurement. Seventeen states and the District of Columbia actively apply price preferences to local firms in procurement auctions, effectively treating their bids as if they were lower than their actual prices. South Carolina's procurement code provides a representative example. When evaluating bids, procurement officers reduce the evaluated price of qualifying local bidders by 7 percent, thereby increasing their probability of winning the contract. If a local firm wins, however, the state pays the original bid price rather than the discounted price used in the evaluation.

Importantly, discrimination against out-of-state firms extends well beyond states that explicitly favor local suppliers. Most other states retaliate through *reciprocity provisions*, which impose equivalent disadvantages on firms perating in states that maintain explicit preferences. Texas provides a representative example. Although Texas does not impose a general price preference of its own, its procurement rules prevent state agencies from awarding contracts to out-of-state firms unless they underbid local competitors by at least the margin that Texas firms would face when bidding in the other firm's home state. Thus, a firm from South Carolina competing for a contract in Texas may face a reciprocal preference corresponding to South Carolina's 7 percent preference. We refer to this system of explicit local preferences and reciprocal retaliation as the "U.S. state procurement war".

The main objective of this paper is to analyze the economic consequences of the U.S. state procurement war. In particular, we address three questions: To what extent do buy-local policies affect the integration of procurement markets across U.S. states? What are the economic tradeoffs that state governments face when deciding how much to favor local

firms? What are the welfare consequences of these policies for individual states?

To answer these questions, we combine detailed data on state procurement policies and procurement transactions with a quantitative multi-region trade model in which both private firms and governments purchase goods and services from producers located in different states. Our empirical analysis draws on a new dataset of procurement transactions awarded by six state governments (California, Florida, Oregon, Texas, Vermont, and Virginia), together with information on procurement awarded by the federal government.

We begin by documenting differences in the geographic allocation of procurement expenditure between state and federal governments. Our data allow us to identify the location of the purchasing agency, the location of the supplier, and the type of goods or services purchased. We use this information to compute *sector-origin-destination-government type* procurement flows, which allows us to compare local expenditure shares by state and federal agencies operating in the same location and purchasing similar products. For example, we compare procurement awarded by state and federal correctional facilities located in Virginia. We find that state government agencies systematically allocate a larger fraction of their expenditure to local firms than comparable federal agencies. We complement this analysis by studying bilateral procurement flows across states using gravity regressions. These empirical patterns are consistent with buy-local policies contributing to the fragmentation of procurement markets within the United States.

We then develop a multi-region trade model to study the economic mechanisms through which buy-local policies affect state welfare. In our model, private firms produce differentiated goods and services that are traded across states and purchased by three types of final producers: private producers, state governments, and the federal government. State governments can favor local firms by applying a price preference to their purchases, which affects the geographic allocation of government demand without directly restricting purchases by the private sector. Households derive utility from private consumption and public goods provided by state and federal governments, and choose how much labor to supply. We use the model to study how buy-local policies affect interstate trade, wages, employment, the provision of public goods, and welfare.

The model highlights a tradeoff faced by state governments when favoring local firms. On the one hand, a buy-local policy shifts government demand toward domestic producers, increasing demand for local labor and raising local wages relative to the price of private consumption. The resulting increase in real income allows households to consume more privately produced goods. This mechanism resembles the terms-of-trade gains that motivate the use of import tariffs in standard trade models. Moreover, because labor supply is endogenous, higher wages induce households to work more, further reinforcing the expansion of local

economic activity. On the other hand, favoring local firms distorts government purchasing decisions away from the lowest-cost suppliers, reducing the efficiency with which public goods are produced. As a result, despite the increase in government revenues associated with higher corporate and labor income tax collections, the quantity of public goods provided to residents declines. The optimal buy-local policy balances the gains in private consumption against the efficiency losses in government procurement.

To characterize this tradeoff, we first consider a simplified version of the model with two regions, fixed labor supply, and no retaliation. We derive a closed-form expression for the optimal unilateral buy-local policy. The expression shows that the optimal policy depends on three features of the economy: the local expenditure share of the trading partner, what fraction of region overall imports is accounted for by the government, and the local expenditure share in the private sector. In the limiting case in which the government accounts for all imports, the optimal buy-local policy is only a function of the trade elasticity and local expenditure share of the trading partner, coinciding with the the optimal tariff derived by Gros (1987). In this case, the government can use its purchasing decisions to influence the terms of trade on all imports, and therefore buy local policies are a strong policy instrument. When private firms also import from the trading partner, however, the government controls only a fraction of total import demand. Because the buy-local policy is now a relatively weaker instrument, its optimal level is lower and negatively depends on the local expenditure share in the private sector. We refer to this force as *private-sector leakage*: when private buyers are more home-biased, they respond to the terms-of-trade gain from public procurement by importing more, which offsets that gain.

We next use the full quantitative model to compute the optimal unilateral buy-local policy for each U.S. state. We calibrate the model to reproduce differences across states in economic size, sectoral composition, and the geographic distribution of private and government purchases. We first consider an economy without buy-local policies and ask what each state would gain by unilaterally introducing a preference for local suppliers, assuming that other states do not retaliate. We find that states have incentives to introduce substantial preferences. The optimal preference parameter ranges from 0.75 to 0.82 across states, corresponding to treating local suppliers as approximately 18 to 25 percent cheaper when evaluating their bids. The magnitude of these policies varies across states in ways that cannot be explained by economic size alone. Consistent with our analytical characterization, the importance of procurement in interstate trade and the geographic composition of demand play an important role in determining the optimal degree of favoritism.

Despite the substantial magnitude of the optimal preferences, the resulting welfare gains are relatively modest. For example, introducing its optimal policy increases welfare in Vir-

ginia by 0.14 percent and in California by 0.23 percent, measured in consumption-equivalent units. These gains reflect the tradeoff highlighted by the model. The increase in private consumption contributes positively to welfare, while the reduction in the provision of state public goods and the increase in labor supply offset part of these benefits. Thus, although states have incentives to favor local producers when acting unilaterally, the resulting welfare improvements are considerably smaller than the changes in procurement preferences might suggest.

Finally, we investigate how these incentives change when other states retaliate. We introduce the observed system of reciprocal preferences into the quantitative model and recompute the optimal unilateral policy for each state. The results change substantially. Once retaliation is taken into account, the optimal preference is close to zero for virtually all states. To assess the implications of this finding for existing policies, we also consider an economy with the observed configuration of explicit preferences and reciprocity provisions. We find that states currently applying explicit preferences would increase their welfare by unilaterally removing them, provided that other states adjust their reciprocal policies accordingly. In contrast, if other states maintained their discriminatory treatment despite the removal of the original preference, the same states would be slightly worse off. These results show that retaliation fundamentally changes the incentives to favor local firms. Policies that may improve welfare when adopted unilaterally become undesirable once their effects on access to other states' procurement markets are taken into account.

Related literature. Governments buy a larger share of their inputs locally than private buyers do. Trionfetti (2000) and Brülhart and Trionfetti (2004) show that this discriminatory demand shifts production toward domestic firms and affects specialization and the terms of trade. Herz and Varela-Irimia (2020) and Mulabdic and Rotunno (2022) measure the resulting border effects and find that procurement is substantially more home-biased than private trade, across countries and across regions. García-Santana and Santamaría (2026) and Dahis et al. (2023) provide similar evidence that subnational buyers favor local suppliers more than national buyers do, in Spain and France and in Brazil.

Two recent papers evaluate buy-local policy at the national level, and in particular the Buy American Act, with different empirical strategies. Bombardini et al. (2026) measure the extent of the policy as a wedge that matches differences in import shares between the federal government and the private sector within narrowly defined sectors, and then quantify the aggregate employment and welfare effects of that wedge in a trade model. Acosta and Cox (2025) instead use exemptions and thresholds in the statute to classify federal contracts as more or less constrained, and estimate the cross-sectional fiscal multiplier of each type of

spending. Relative to Bombardini et al. (2026), we measure buy-local policies directly from state statutes. As in their paper, we quantify the aggregate effects of these policies, here for state governments. Differently from both papers, we characterize optimal buy-local policies under alternative patterns of retaliation.

Our paper also relates to the literature on optimal policy in trade models (for example, Gros (1987) and Broda et al. (2008)). Closely related is Ossa (2011, 2014, 2016), who derive optimal and Nash tariffs in quantitative trade models. Our comparison of unilateral preferences with preferences under retaliation is the procurement counterpart of that exercise. Johnson (1953) and Felbermayr et al. (2013) analyze retaliation, and Bagwell and Staiger (1999) show that reciprocity removes the terms-of-trade incentive, in line with our finding that the optimal preference is close to zero once other states reciprocate. Kennan and Riezman (1988) show that larger countries have a stronger incentive to impose a tariff. In our results the optimal preference is smaller in larger states, because private-sector leakage dominates.

2 Data

In this section, we describe the data used throughout the paper. We assemble these data from several sources. Appendix A documents the Census procurement measure and the tax rates used in the calibration.

Our empirical analysis draws on four main types of data: (i) project-level procurement data for six U.S. state governments; (ii) project-level procurement data for the U.S. federal government; (iii) cross-state data on U.S. state government finances; and (iv) cross-state data on buy-local policies governing U.S. state procurement.

2.1 State procurement from U.S. state government finances

To gauge the size of procurement awarded by state governments across all U.S. states, we use the U.S. Census Bureau's Annual Survey of *State Government Finances*, which reports revenue by source and expenditure by object and function for the United States and the 50 states. Moreover, our project-level procurement data are available only for a subset of states and are likely incomplete even for those states. We therefore can also use the Census survey as a benchmark to assess the coverage of our project-level data.

As in countries' national accounts, procurement expenditure is not reported as a separate item in government finance statistics. Public procurement refers to governments' purchases of intermediate goods and services—for example, printing paper or police-car repairs—and of capital goods—for example, computers or road construction. To capture this notion, we

construct state procurement as

$$\text{State procurement}_j = CO_j + CE_j - Z00_j, \tag{1}$$

where CO_j denotes state j's expenditure on *current operations*, which includes compensation of own officers and employees as well as spending on supplies, materials, and contractual services; CE_j denotes expenditure on *capital outlay*, which includes the purchase or construction of buildings and other improvements, the purchase of land, equipment, and existing structures, and payments on capital leases; and $Z00_j$ denotes total salaries and wages. Subtracting $Z00_j$ removes compensation of own employees, so that the measure only reflects purchases of supplies, services, and capital goods from the private sector. Because the measure is built only from current operations and capital outlay, it excludes Census categories classified separately as assistance and subsidies (cash transfers), as well as intergovernmental transfers.[1]

Figure 1 ranks the 50 states by this measure in 2022. The ratio runs from 3.98 percent of GDP in Nevada to 13.67 percent in New Mexico. The dashed line is the weighted mean, 6.38 percent, equal to total procurement divided by total GDP. It lies below the unweighted average because the larger states procure a smaller share of their GDP.

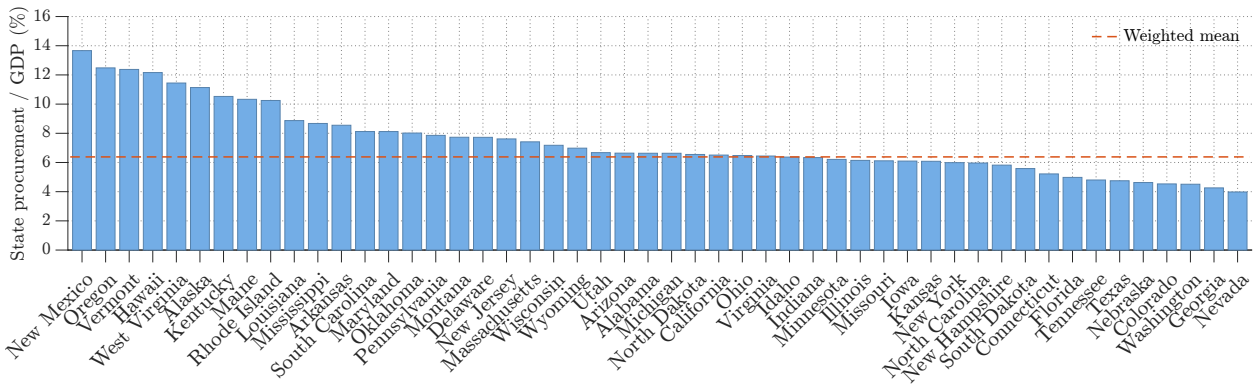


Figure 1. State procurement over GDP, 2022

Notes: The vertical axis is state procurement as a percent of state GDP in 2022. Procurement is current operations plus capital outlay minus salaries and wages, from the Census Bureau's Annual Survey of State Government Finances. GDP is the BEA all-industry total in current dollars. Each bar is one of the 50 states, ordered from the highest ratio to the lowest. The District of Columbia is excluded. The dashed line is the weighted mean, total state procurement divided by total state GDP.

2.2 Project-level procurement: U.S. state governments

Unlike federal procurement, there is no centralized, transaction-level database covering public procurement across U.S. state governments. Each state manages its procurement indepen-

[1] Appendix A.1 provides further details on the Census expenditure classification and on the particular items included in, and excluded from, our measure.

dently, and states are not required to report their procurement data to a central repository. As a result, assembling a comprehensive picture of state-level procurement requires collecting information state by state.

Nevertheless, many states publish detailed transaction-level procurement data through transparency portals and related public disclosure systems. We exploit these sources to construct a project-level dataset of state procurement. So far, we have collected data for California, Florida, Oregon, Texas, Vermont, and Virginia.

The years of coverage differ across states. Each series comes from that state's own disclosure system, and those systems do not release a common window of years. One state may be available for a long span and another only for a few recent years. When we compare the microdata with the Census, we therefore take both sides of the comparison over the years we observe for that state.

Over those years, the microdata account for a large share of Census procurement. We sum the value of the transactions in each state and divide by Census state procurement, measure 1, over the same years. The resulting share is x percent in California, y percent in Florida, y percent in Oregon, y percent in Texas, y percent in Vermont, and y percent in Virginia. The Census side of this ratio is the measure in Section 2.1: current operations plus capital outlay, minus salaries and wages.

Every transaction records the buyer, the purchase, and the seller. The buyer is the agency that places the order, together with the place where that agency is located. A purchase by the Virginia Department of Forestry, located in Charlottesville, is one example. The purchase record contains the value of the order and a product classification. Virginia, California, Texas, and Florida classify products with the United Nations Standard Products and Services Code (UNSPSC). Oregon and Vermont record a written description of the good or service. For those two states we assign each description to the nearest UNSPSC category with Facebook AI Similarity Search (FAISS). The seller is the establishment that supplies the order. Southern Police Equipment Co. Inc., of Richmond, Virginia, is one supplier to the Virginia state government. The establishment's location is what places the sale in a geography.

2.3 Project-level procurement: the U.S. federal governments

In contrast to state procurement, federal procurement data are centralized. We obtain transaction-level records on the universe of federal contracts from *USAspending.gov*, the source used by Cox et al. (2024). Each record links the awarding agency to the recipient, the product, and the place of performance. We assign each award to the state of the contracting office that issued it. The amount we record is the obligation on the order. Parent vehicles

set the terms of later purchases and typically do not themselves commit funds.

3 Buy local policies

A majority of U.S. states maintain procurement laws that explicitly favour in-state businesses over out-of-state competitors when awarding public contracts. These *buy-local policies*—which range from explicit price preferences to tie-breaking rules and reciprocity provisions—constitute one of the few legally sanctioned barriers to free interstate commerce in the United States (Matthijs and Parsons, 2022). Their stated objective is to channel public spending toward local firms, thereby boosting in-state economic activity and increasing tax revenue.[2]

That such policies exist at all is, at first sight, surprising. Article I of the U.S. Constitution grants Congress the power to regulate interstate commerce, and the Supreme Court has long interpreted this clause as imposing an implicit constraint on state action—the so-called *Dormant Commerce Clause*—even in the absence of federal legislation.[3] Under this doctrine, states are generally prohibited from enacting regulations that discriminate against or unduly burden interstate trade.

The legal basis for buy-local procurement policies rests on an important exception to this principle. In a series of rulings from the late 1970s and early 1980s, the Supreme Court developed the *Market Participant Doctrine*, which holds that the Dormant Commerce Clause constrains a state only when it acts as a *regulator* of private commerce, not when it participates in the market itself.[4] When a state enters the market as a buyer, seller, or employer, it is entitled to favour local firms just as any private actor might. The Court has affirmed this principle in the context of purchasing goods and services,[5] selling goods and services,[6] and procuring construction services and labour.[7] This legal framework has enabled the widespread adoption of buy-local procurement policies across U.S. state jurisdictions.

[2] In 2005, Indiana Governor Mitch Daniels justified his state's preference as follows: "When our tax dollars are spent on goods and services provided by Indiana-based businesses that employ Hoosiers, our State benefits from increased employment opportunities and more tax revenues."

[3] The Dormant Commerce Clause "prevents the States from adopting protectionist measures" (Constitution Annotated, REF) and "prohibits any state regulations that burden interstate commerce unnecessarily" (1995 Michigan Law Review, REF).

[4] The doctrine holds that "nothing in the purposes animating the Commerce Clause prohibits a State, in the absence of congressional action, from participating in the market and exercising the right to **favor** its own citizens over others." *Hughes v. Alexandria Scrap Corp.*, 426 U.S. 794 (1976).

[5] *Hughes v. Alexandria Scrap Corp.*, 426 U.S. 794 (1976).

[6] *Reeves, Inc. v. Stake*, 447 U.S. 429 (1980).

[7] *White v. Massachusetts Council of Construction Employers*, 460 U.S. 204 (1983).

3.1 Types of Buy-Local Policies

Buy-local policies in the U.S. are legally formulated as preferences. There are different types, broadly classified into price preferences, tie-break preferences and reciprocal preferences.[8]

The most common type are price preferences. In these preferences, the buy-local policy takes the form of an explicit or implicit price preference for local businesses. An explicit local preference generally takes the form of an obligation to accept as the winning bid the lowest qualified bid by a local firm, as long as it is not exceeding the lowest bid from a non-resident in more than a fixed percentage of the price. For example, an explicit local preference from the state of Arkansas establishes that:

> *"In the purchase of commodities by competitive bidding, all public agencies shall accept the lowest qualified bid from a firm resident in Arkansas. This bid shall be accepted only if the bid does not exceed the lowest qualified bid from a nonresident firm by more than five percent."*

The second most common buy-local policy is the tie-break preference, which takes the form of a tie-break rule to solve any ties in favour of the local firm. For instance, the law in the State of Minnesota establishes that *"Whenever a tie involves a Minnesota firm and one whose place of business is outside the state of Minnesota, preference shall be given to the Minnesota firm."* (Minn. Rule Part 1230.0900, subp. 2).

Buy-local preferences may also be implicit. For instance, the law in the state of Georgia establishes that *"The state and any department, agency, or commission thereof, when contracting for or purchasing supplies, materials, equipment, or agricultural products, excluding beverages for immediate consumption, shall give preference as far as may be reasonable and practicable to such supplies, materials, equipment, and agricultural products as may be manufactured or produced in this state. Such preference shall not sacrifice quality"* (50-5-61 a). Buy-local policies may apply to all sectors of the economy or apply to specific products and services. Several states have buy-local policies for coal, steel, recycled paper, construction services, agricultural products or food. The state of Illinois established the following buy-local policy for buying food products:

> *"When a State contract for purchase of food or food products is to be awarded to the lowest responsible bidder, an otherwise qualified bidder who will fulfill the*

[8] In addition to buy-local preferences, States also establish preferences for the award of procurement based on special characteristics of the bidding firm, such as ownership by veterans or other vulnerable social collectives like racial minorities or individuals with special needs; or the size of the firm, such as small-businesses. These are known as status-based preferences and we abstract from them in this paper if they are not tied to the geographical origin of the bidding firm.

contract through the use of local farm or food products may be given preference over other bidders, provided that the cost included in the bid or local farm or food products is not more than 10% greater than the cost included in the bid that is not for local farm or food products."

Finally, many states do not impose explicit or implicit buy-local policies of any kind but may establish reciprocity preferences. These reciprocity preferences are passed to ensure that resident firms compete with out-of-state firms in equal conditions. For example, the state of New Jersey establishes that the Director of the Division of Purchase and Property, charged with the responsibility for establishing contracts and issuing purchase orders, *"shall apply on a reciprocal basis against an out-of-State bidder any in-state preference that is applied in favor of that bidder by the state or locality in which the bidder maintains its principal place of business."* (NJAC 17:12-2.13(b)). This wide range of buy-local policies implies that a large share of interstate trade is subject to one or more buy-local policy restrictions.

3.2 Buy-Local Policies across states

In this subsection, we characterise the different types of buy-local policies across the United States, focusing on their coverage and strength. To analyse all existing state preference regulations, we use the NASPO State Procurement Profiles, a database that provides a comprehensive and independent dashboard indexing the state preference regulations and official portals of all 50 states (link). The NASPO State repository provides basic details about each piece of regulation that we complement with searches in the specific State legal code. Buy-local policies are common and well established across the United States. Figure 3a shows the strongest type of legal buy-local preference in each state, classified into explicit price policies, tie-breaking policies or reciprocal policies. As we can see, all US states have at least one type of buy-local policy in place.

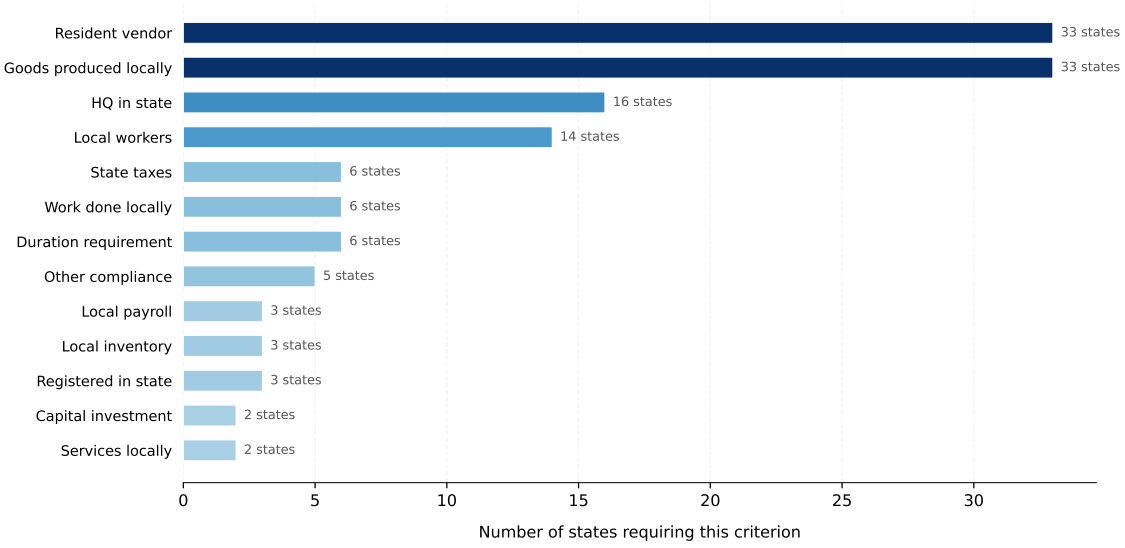
These policies may affect all sectors, or just a few. Figure 3b shows the sectoral coverage of each state. As we can see, 37 states have buy-local policies that apply to all sectors, while 10 states have buy-local policies applicable to only one or two sectors. Most laws apply to goods or to combinations of goods and services or goods and construction.

3.2.1 Local Business Definition

Buy-local policies target the location of local economic activity and for this reason include a definition of "local business". Although definitions across states differ, most regulations require a firm to be registered in the state, to hire employees in the state, or to make investments or pay taxes in the state to be considered local. We analyse the different criteria

in the law and categorise the most common ones. Figure 2 reports the most common criteria and the number of states requiring them to consider a firm a local business. The most common requirements are "residency" (being registered as a business in the State) and local production, required by 33 states. In addition, the location of the Headquarters in the State and the employment of local labour are the third and fourth most common criteria. The number of criteria required goes from 1 to 9 in our sample, with states with a larger number of buy-local policies in place also adopting a stricter definition of local business.

Figure 2. "Local business" Criteria



Notes: Criteria used to define "local business" in state procurement law, and the number of states requiring each criterion.

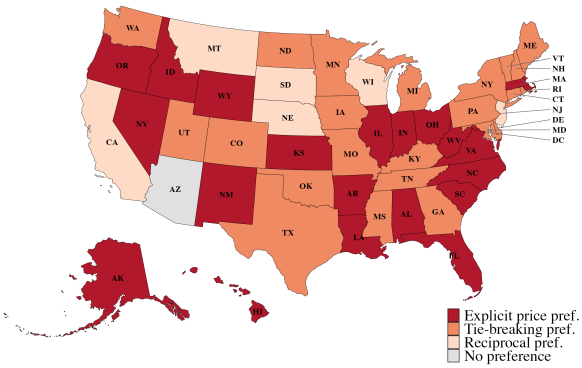
3.2.2 In-State Preferences, Tie-Break Preferences and Reciprocity Preferences

Out of the 50 states, 19 states have explicit buy-local preferences establishing a margin over the bid price, in percentage terms, that a state is willing to "deduct" from the bid of a local firm in order to classify the local bidder as the lowest cost bidder. This percentage discounts are not applied to the final bid price. For instance, in the case of the State of Arkansas (§ 19-11-259), a local firm bidding for a contract and offering a bidding price less than 5% higher than the lowest non-local tender will be awarded the contract. However, the State will pay the local Arkansas firm the price of the bid instead of the discounted price on which the contract was decided.

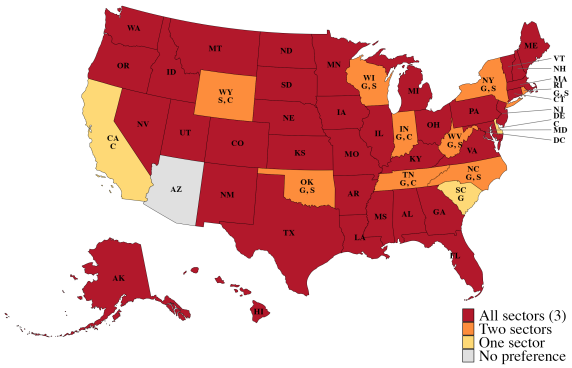
Figure 3c presents the spatial distribution of explicit buy-local policies in the U.S. The price percentage discounts of these explicit buy-local preferences range between 10% and

1%. As we can see, several states have explicit policies above 5%.

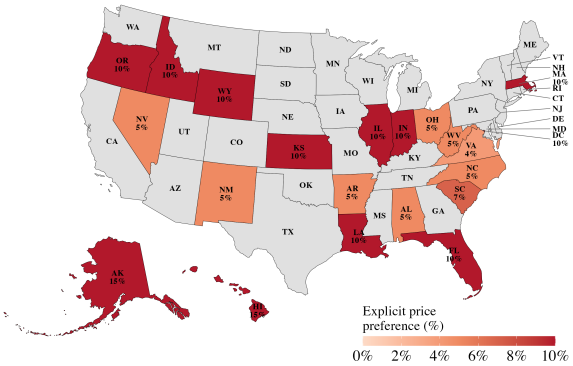
In addition to the explicit buy-local policies, states may have weaker but meaningful buy-local policies. For instance, 23 states establish a mandate for tie-breaks to be resolved in favour of a local producer. Finally, a majority of states (36 states) have reciprocity rules, that establish the adoption of a similar buy-local preference against out-of-state firms when the state of origin has an explicit buy-local policy. The widespread existence of explicit and reciprocal buy-local policies implies that a large share of inter-state procurement flows are subject to some kind of buy-local policy. These reciprocity rules mean that a large share of state procurement flows are exposed to some kind of buy-local policy.



(a) Strongest buy-local policy type



(b) Sectoral coverage



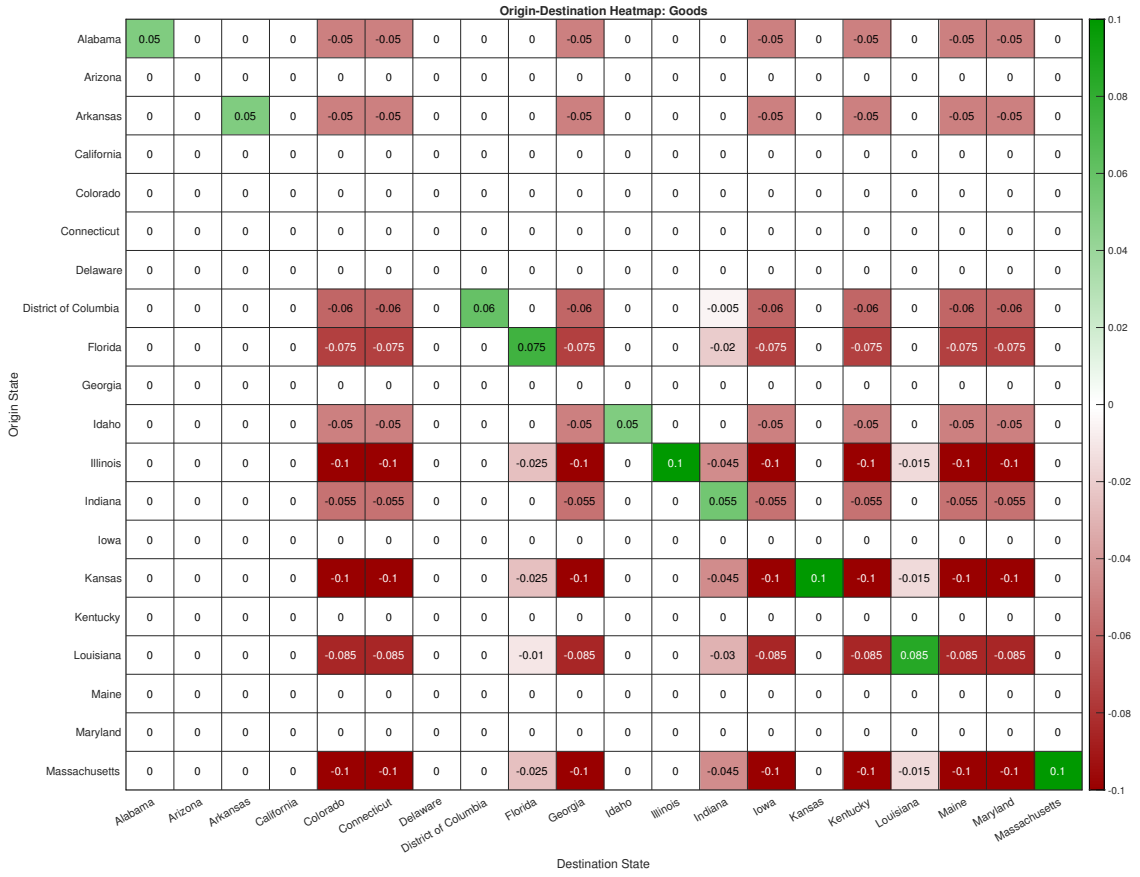
(c) Highest explicit price preference (%)

Figure 3. US state procurement preferences

Notes: Panel (a) classifies each state by its strongest buy-local policy type. Panel (b) shows the number of sectors (goods, services, construction) covered by buy-local laws; state labels indicate which sectors are covered when fewer than three. Panel (c) maps the highest explicit price preference percentage across each state's active procurement laws; states without an explicit numerical preference are shown in grey. Alaska and Hawaii are shown as scaled insets.

Figure 4 exemplifies the coverage of the policies by showing a sample of 20 states and their buy-local policies in the goods sector. As we can see, the diagonal represents the explicit buy-local policies. Arkansas, for instance, has a price preference of 5% for resident firms. When Arkansas is the buying state (Destination state), firms with origin in Arkansas have a 5% premium on their bidding price, making the buying agency perceive them as 5% cheaper than their submitted bid. However, firms from Arkansas are exposed to different rules when selling out of the state. When firms from Arkansas sell in Arizona, they do not face premiums or penalties (as indicated by the zero in the origin = Arkansas, destination = Arizona cell). However, when a firm resident in Arkansas bids for a goods contract in Colorado, they face a 5% penalty: they are perceived as 5% more expensive than local firms in Colorado (origin = Arkansas, destination = Colorado cell). Colorado does not have explicit buy-local policies. But it has a reciprocity policy in goods. This means that it applies a 5% discount on the local bidders when evaluating their bids against the bid from an Arkansas resident firm.

Figure 4. Effective bilateral price preferences in Goods



Notes: Effective bilateral price preferences in the goods sector. The diagonal shows each state's own in-state preference (green outlines); off-diagonal cells reflect reciprocity rules (red outlines).

4 Empirical Evidence

From the description and characterisation of buy-local policies presented above, it should be clear that most State governments in the U.S. use procurement policies to favour local businesses with the aim of boosting local economic activity. Buy-local policies are common across all states, while they are adopted with different strengths and scopes: from discretionary dispositions to explicit price advantages for local businesses, and from being applied to one specific good or service to being applied to the State economy as a whole. In this section, we study whether these aims to benefit local businesses leads to a biased purchasing behaviour by State governments.

In order to assess whether there is a local bias in State purchases, we will take the Federal government purchases as an unbiased benchmark. As described in our data section, the purchases of State and Federal governments overlap substantially in the kinds of goods and services procured. However, the Federal government should not have a systematic bias towards specific States, providing us with a useful comparison. Our approach to uncover the local-bias of State governments will be to compare the purchasing behavior of a Federal agency to a State agency in the same location when procuring a specific good or service. Conditional on the location and good or service procured, we will conclude there is a local bias if the State agency's local share of purchases is higher than the Federal agency share.

4.1 Local expenditure shares across government types

First, let us define the local share of procurement in a given sector as follows. The share of expenditure on sector s by agencies of government type g located in state d on establishments from state d is:

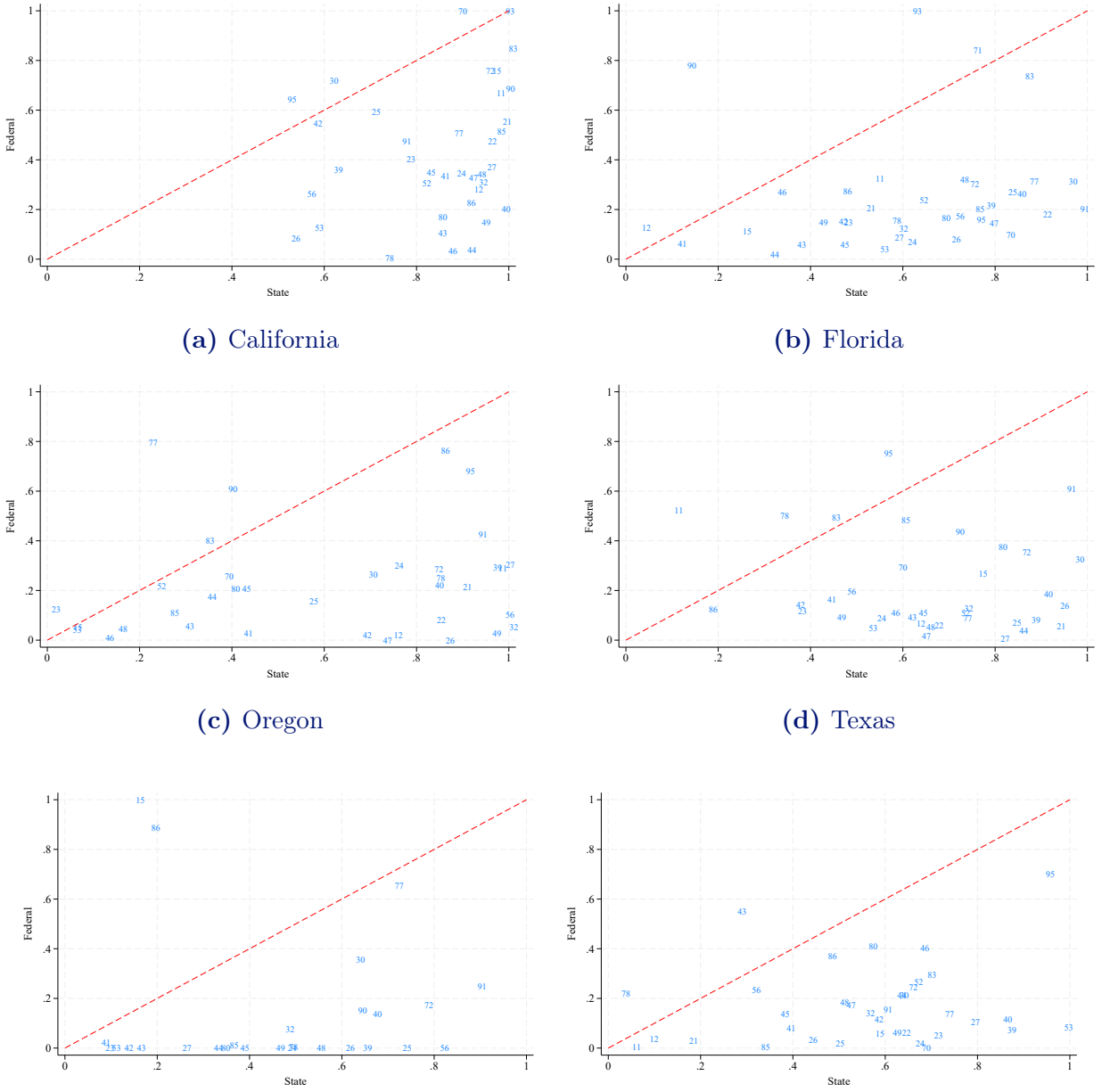
$$\lambda_{d,s}^{g} \equiv \frac{X_{dd,s}^{g}}{X_{d,s}^{g}},$$

where $X_{dd,s}^{g}$ is the Value of purchases awarded in sector s by agencies of government type g (State or Federal) located in state d to establishments from state d. And, $X_{d,s}^{g}$ is the value awarded in sector s by agencies of government type g located in state d.

We use our transaction level data to compute the local expenditure shares across government and sectors for the six states in our transaction level sample: California, Florida, Oregon, Texas, Vermont and Virginia.

Figure 5 displays the six scatter plots. For all States, the local share of the state government is higher than the local share of the Federal government in virtually all sectors, as we can see from the fact that all observations are below the 45 degree line. It is worth noticing two additional interesting patterns. First, larger states, such as California Texas,

Figure 5. Local procurement shares



(a) California

(b) Florida

(c) Oregon

(d) Texas

(e) Vermont

(f) Virginia

Notes: The figure shows the share of contract value awarded to local vendors within each product category and state. The sample is restricted to vendors located in United States and UNSPSC product categories purchased by both federal and state agencies.

have higher local shares for both government types, as we would expect given its large size and high productivity. Smaller states, like Virginia and Vermont, display much lower local shares in some of the sectors. Second, construction and services (labels 70 and above) seem

to display higher local shares on average across both government types, as expected from the lower tradability. However, it is almost always the case that the State local share of expenditures is higher within the sector regardless of the size of the State. This fact holds across goods (represented by labels 21- 52), construction (label 72) and services (labels 70, 78 and higher).

These figures, while informative, fail to control for important additional factors that could drive these patterns such as differences in the distance to highly productive establishments from a given state or the type of agencies making purchases for each government type. To take into account these factors, we now turn to the estimation of "gravity-style" regressions to confirm our findings.

4.2 Local bias across government types

To estimate the presence of a bias against non-local businesses by State governments we use the following regression:

$$\log X^{g}_{od,s} = \beta \times \mathbb{1}\underbrace{(o \neq d)}_{\text{non-local}} \times \mathbb{1}\underbrace{(g = s)}_{\text{state govt.}} + \text{FE}_{os} + \text{FE}^{g}_{ds} + \text{FE}_{od,s} + \epsilon^{g}_{od,s}$$

Where $\log X^{g}_{od,s}$ are the (log) of purchases in sector s by agencies from government type g located in state d from establishments in state o. The coefficient β on the double interaction dummy captures the difference in State government's purchasing behaviour, relative to the Federal government, when purchasing from "non-local establishments". A negative coefficient would indicate lower than expected purchases from non-local establishments given the behaviour of the Federal government. The regression includes origin-sector fixed effects FE_{os} to account for differences in productivity across establishments within a sector. To control for differences in expenditure shares across each government type by sector we include sector-destination-government type fixed effects, FE^{g}_{ds}. Finally, we include controls for distance-associated costs for each sector, to condition on the differences in tradability by adding origin-destination-sector fixed effects $\text{FE}_{od,s}$.

We first report our regression results aggregated by state with our unit of observation being the value of purchases from state o by government type g in state d and in sector s. Then, we run specifications at the establishment level, in which our unit of observation is the value of purchases from establishment j in state o by government type g in state d and sector s. Sectors are aggregated at the 2 digit level. We pool all the states together.

Table 1. Pooled destination - 51 origin

	(1)	(2)
Non-local × State	-3.128***	-3.059***
	(-16.39)	(-14.43)
Observations	16,606	9,604
R-squared	0.717	0.827
Sector x Origin FE	Yes	No
Origin x Destination FE	Yes	No
Sector x Destination x Buyer type FE	Yes	Yes
Sector x Origin x Destination FE	No	Yes

Notes: The unit of observation is sector-origin-destination-buyer type, where origin includes the 50 states and the federal district DC and destination includes California, Florida Oregon, Texas, Virginia and Vermont.

Table 1 reports the results, with two alternative sets of fixed effects on columns 1 and 2. According to our findings, State purchases from non-local establishments are statistically lower than Federal purchases. On average, the State governments buys 95% less from non-local origins than the Federal government.

This specification is subject to the following limitations that we try to address in the remaining of this section. First, as indicated before, the Federal government may use centralized purchases and then distribute the goods across different agencies located around the country. This would explain why local purchases are lower for the federal government. To address this challenge, we run our specification after dropping any transactions for which the awarding and funding offices coincide. The awarding office is the unit that executes the procurement, while the funding office is the unit that provides the budget. Requiring both to be the same reduces the role of centralized or assisted procurement carried out on behalf of other federal units. The results are reported in table 2, and confirm our previous findings.

Second, it could be that Federal and State agencies perform different tasks for which different goods and services are needed. If true, this would make the purchases of State and Federal agencies not comparable. In order to address this concern, we now estimate our regression in a subsample of selected agencies (both State and Federal) that perform closely related functions and whose demand is strongly tied to a specific geographic location. We select, for instance, agencies operating in the correctional sector, in Forestry and Parks, in agencies purchasing on behalf of penitentiary institutions, park or nature related agencies, in the Justice domain or in Defense. Using this sub-sample of strictly defined agencies, we repeat our estimation and report our results in table 3.

The results in the selected sample of agencies are considerably lower than in the full

Table 2. Pooled destination - 51 origin

	(1)	(2)
Non-local × State	-2.883***	-2.935***
	(-13.08)	(-11.96)
Observations	12,152	6,452
R-squared	0.719	0.816
Sector x Origin FE	Yes	No
Origin x Destination FE	Yes	No
Sector x Destination x Buyer type FE	Yes	Yes
Sector x Origin x Destination FE	No	Yes

Notes: The unit of observation is sector-origin-destination-buyer type, where origin includes the 50 states and the federal district DC and destination includes California, Oregon, Texas, Virginia and Vermont.

Table 3. Pooled destination - 51 origin

	(1)	(2)
Non-local × State	-2.213***	-2.207***
	(-12.09)	(-10.18)
Observations	7,236	5,525
R-squared	0.533	0.575
Sector x Origin FE	Yes	No
Origin x Destination FE	Yes	No
Sector x Destination x Buyer type FE	Yes	Yes
Sector x Origin x Destination FE	No	Yes
Domain FE	Yes	Yes

Notes: The unit of observation is sector-origin-destination-buyer type, where origin includes the 50 states and the federal district DC and destination includes California, Oregon, Texas and Virginia. The sample is restricted to state agencies and federal awarding offices operating in comparable functional domains. On the federal side, we retain only offices whose procurement primarily serves a geographically localized function within the state, excluding headquarters, centralized procurement offices, and offices with predominantly national or multi-state procurement responsibilities.

sample, indicating that some composition of tasks or purchases was driving part of our results. However, the State bias against non-local establishments is still very large and negative, statically different from the Federal purchasing pattern. On average, the State agencies operating in these selected domains purchase 90% less from non-local origins than the Federal agencies in the same domains.

Finally, it is possible that Federal and State governments do not purchase from the same

establishments. If Federal agencies have better information on or a wider network of suppliers, differences in the productivity and costs of suppliers could explain the divergence in purchasing behaviour. To understand this, we run a last set of regressions using our data at the establishment level which allows us to eliminate any effects coming from differences in the composition of suppliers across governments and to account for differences in productivity between the establishments that we observe selling to both State agencies and Federal governments. Notice that these regressions identify the interaction of (non-local)* State from the difference in value purchased by State versus Federal governments from the same supplier. Therefore, the sample is much smaller and selected to condition on establishments that sell at least to one State agency as well as to one Federal agency.

Table 4. Pooled destination - Establishment

	(1)	(2)	(3)
Non-local × State	-0.329***	-0.378***	-0.248*
	(-7.87)	(-6.29)	(-2.29)
Observations	312,628	67,673	8,583
R-squared	0.641	0.707	0.698
Origin × Destination FE	Yes	Yes	No
Destination × Sector × Buyer type FE	Yes	Yes	Yes
Establishment FE	Yes	No	No
Sector × Establishment FE	No	Yes	No
Destination × Sector × Establishment FE	No	No	Yes

Notes: The unit of observation is sector-establishment-sector-destination-buyer-type. Establishments are restricted to vendors located in the 50 U.S. states and the District of Columbia. Destination includes California, Florida Oregon, Texas, Virginia and Vermont.

Table 4 displays our estimation results. All regressions include state-sector-government type controls to account for differences in expenditure shares. Column 1 includes the same fixed effects as in the previous specifications together with establishment fixed effects to account for productivity differences. Columns 2 and 3 in turn include more strict establishment level controls by adding establishment-sector and establishment-sector-destination state to account for the comparative advantage or specialisation of establishments in a given sector or in a given sector-destination respectively.

Our results suggest that the State bias against non-local establishments is present even in the sample of establishments which sell to both State and Federal agencies. The results in this subsample abstract from participation differences (extensive margin) and are conditional on already selling to both government types (intensive margin). Conditional on selling to both types of agencies, State agencies purchase between 32% to 20% less from non-local

establishments than federal agencies.

The results reported in this section suggest that the procuring behaviour of State governments differs systematically from that of the Federal government. The State local purchasing share is higher in all sectors. In addition, State agencies buy less goods and services from non-local origins and non-local establishments.

5 Model

We consider the U.S. economy as consisting of multiple regions, sectors, and firms. Regions are indexed by r, o, and d; sectors are indexed by s. We allow for multiple sectors because the extent of buy-local policies is often sector-specific. Firms are indexed by j, and their mass is fixed in each origin–sector pair at $J_{o,s}$. Labor is the only factor of production, and the same within-state labor can be hired by firms or by either government; it can move freely across firms, sectors, and governments within a region but it is immobile across regions.

5.1 Setup

5.1.1 Households

Each state d is inhabited by a representative household consisting of L_d individuals who supply labor elastically. Households value three final consumption goods: a private good (p), a good provided by the federal government (g_f), and a good provided by the state government (g_s). Following Baxter and King (1993) and Fajgelbaum et al. (2019), preferences are defined over both private and publicly provided goods. As in Greenwood et al. (1988), the consumption composite enters the utility function linearly, so there are no income effects on labor supply.

Specifically, the preferences of the state d household are represented by

$$U(c_d, h_d) = c_d - \psi \frac{h_d^{1+1/\eta}}{1+1/\eta}, \qquad c_d = \left(c_d^p\right)^{\alpha_p} \left(c_d^{g_f}\right)^{\alpha_{g_f}} \left(c_d^{g_s}\right)^{\alpha_{g_s}}, \tag{2}$$

where the c_d^i denote per capita units of effective consumption of each final good and h_d per capita supplied units of labor. The α_i parameters capture the weight of private and government-provided goods in preferences, $\psi > 0$ governs the disutility of labor, and $\eta > 0$ is the Frisch elasticity of labor supply.

Effective per capita consumption of each good is

$$c_d^p = \frac{Y_d^p}{L_d}, \qquad c_d^{g_f} = \frac{Y_d^{g_f}}{L_d^{\chi_{gf}}}, \qquad c_d^{g_s} = \frac{Y_d^{g_s}}{L_d^{\chi_{gs}}}, \tag{3}$$

where Y_d^i denotes the equilibrium quantity of final good i produced in state d. The parameter $\chi \in [0,1]$ governs the degree of rivalry of the government-provided goods: $\chi = 0$ corresponds to a purely non-rival public good, while $\chi = 1$ corresponds to a fully rival private good.

Taking the provision of public goods $c_d^{g_f}$ and $c_d^{g_s}$ as given, the household chooses $\{c_d^p, h_d\}$ to maximize utility subject to the budget constraint

$$P_d^p \, c_d^p = (1 - t_d^{h,s} - t^{h,f}) \, w_d \, h_d + \pi_d \, (1 - t_d^{\pi,s} - t^{\pi,f}), \tag{4}$$

where P_d^p is the price index of the private good in region d and π_d denotes per capita pre-tax profits of firms operating in d. Labor income is taxed by the state at rate $t_d^{h,s}$ and by the federal government at rate $t^{h,f}$. Profits are taxed by the state at rate $t_d^{\pi,s}$ and by the federal government at rate $t^{\pi,f}$. The two federal rates, $t^{h,f}$ and $t^{\pi,f}$, are the same in every state. The state rates vary with d. The FOC of this problem is

$$\psi \, h_d^{1/\eta} = \alpha_p \frac{c_d}{c_d^p} \times \frac{(1 - t_d^{h,s} - t^{h,f}) \, w_d}{P_d^p}. \tag{5}$$

The left-hand side is the marginal disutility of labor. The right-hand side is the product of the marginal utility of private consumption, $\alpha_p \, c_d / c_d^p$, and the real after-tax wage, $(1 - t_d^{h,s} - t^{h,f}) w_d / P_d^p$. Labor supply rises with the real after-tax wage, with an elasticity governed by the Frisch parameter η. Corporate taxes reduce profit income. Because consumption enters utility linearly, they do not appear in the labor-supply condition.

5.1.2 Final producers

In each region d, three final-good producers supply the private, federal, and state final goods. The private producer uses only intermediate varieties. The two governments combine local labor with intermediate varieties. In all three cases, those varieties are nested in the same way: sectoral composites are CES aggregates of origin-specific bundles, and each origin-specific bundle is a CES aggregate of firm-level varieties. We first describe the private aggregator, and then the aggregators of the two governments.

Private final good. The private sector production follows a nested structure,

$$Y_d^p = \prod_s \left(Y_{d,s}^p\right)^{\theta_s^p}, \quad Y_{d,s}^p = \left[\sum_o \left(Y_{od,s}^p\right)^{\frac{\sigma_s - 1}{\sigma_s}}\right]^{\frac{\sigma_s}{\sigma_s - 1}}, \quad Y_{od,s}^p = \left[\int_{j \in J_{o,s}} \left(q_{od,s}^p(j)\right)^{\frac{\gamma_s - 1}{\gamma_s}} dj\right]^{\frac{\gamma_s}{\gamma_s - 1}} \tag{6}$$

Here Y_d^p is the private *final* good produced in region d; $Y_{d,s}^p$ is the *sector-s* composite used in that production; $Y_{od,s}^p$ is the bundle of sector-s goods sourced from origin o; and $q_{od,s}^p(j)$ is the quantity purchased from firm j in origin o and sector s. The parameters θ_s^p are expenditure

shares across sectors and satisfy $\sum_s \theta_s^p = 1$. Final private production uses no labor: its only inputs are these intermediate varieties. The parameter $\sigma_s > 1$ is the elasticity of substitution across origins within sector s, and $\gamma_s > 1$ is the elasticity of substitution across firms within an origin–sector pair. The set $J_{o,s}$ denotes the fixed mass of firms operating in origin o and sector s.

The private final producer chooses inputs to minimize cost subject to (6). Cost minimization yields the demand system

$$Y_{d,s}^p = \theta_s^p \frac{P_d^p}{P_{d,s}^p} Y_d^p, \quad Y_{od,s}^p = \left(\frac{P_{od,s}^p}{P_{d,s}^p}\right)^{-\sigma_s} Y_{d,s}^p, \quad q_{od,s}^p(j) = \left(\frac{p_{od,s}^p(j)}{P_{od,s}^p}\right)^{-\gamma_s} Y_{od,s}^p \tag{7}$$

with the associated price indexes

$$P_d^p = \prod_s \left(\frac{P_{d,s}^p}{\theta_s^p}\right)^{\theta_s^p}, \quad P_{d,s}^p = \left[\sum_o \left(P_{od,s}^p\right)^{1-\sigma_s}\right]^{\frac{1}{1-\sigma_s}}, \quad P_{od,s}^p = \left[\int_{j\in J_{o,s}} \left(p_{od,s}^p(j)\right)^{1-\gamma_s} dj\right]^{\frac{1}{1-\gamma_s}} \tag{8}$$

Here P_d^p is the price of the private final good in region d, $P_{d,s}^p$ is the price of the sector-s composite, $P_{od,s}^p$ is the price of the origin-o bundle within that sector, and $p_{od,s}^p(j)$ is the price charged by firm j.

Final goods produced by the federal government. The federal final good, g_f, uses the same origin and firm nests as in (6). The upper nest is different. The federal government combines its own labor with the sectoral composites,

$$Y_d^{g_f} = \left(L_d^{g_f}\right)^{\zeta_d^{g_f}} \prod_s \left(Y_{d,s}^{g_f}\right)^{\theta_s^{g_f}}, \qquad \zeta_d^{g_f} + \sum_s \theta_s^{g_f} = 1, \tag{9}$$

where $L_d^{g_f}$ is labor hired by the federal government in region d. The size of the federal government in a particular region is the total cost of producing its final good. In each state, the size of the federal government is $G_d^f = w_d L_d^{g_f} + \text{procurement expenditure}_d^{g_f}$. Minimizing the cost of (9) splits that total federal government expenditure into these two components,

$$w_d L_d^{g_f} = \zeta_d^{g_f} G_d^{g_f}, \qquad E_d^{g_f} = \sum_s \theta_s^{g_f} G_d^{g_f} = \sum_s P_{d,s}^{g_f} Y_{d,s}^{g_f}. \tag{10}$$

The parameter $\zeta_d^{g_f}$ is the labor share of the federal government in state d. This minimization also yields the unit cost

$$\left(\frac{w_d}{\zeta_d^{g_f}}\right)^{\zeta_d^{g_f}} \prod_s \left(\frac{P_{d,s}^{g_f}}{\theta_s^{g_f}}\right)^{\theta_s^{g_f}} = \left(\frac{w_d}{\zeta_d^{g_f}}\right)^{\zeta_d^{g_f}} P_d^{g_f} \tag{11}$$

where $P_d^{g_f}$ is the unit cost/price index of procurement. Federal final producers do not set a buy-local policy. Within each sector, demands and price indexes take the same form as for the private producer,

$$Y_{od,s}^{g_f} = \left(\frac{P_{od,s}^{g_f}}{P_{d,s}^{g_f}} \right)^{-\sigma_s} Y_{d,s}^{g_f}, \quad q_{od,s}^{g_f}(j) = \left(\frac{p_{od,s}^{g_f}(j)}{P_{od,s}^{g_f}} \right)^{-\gamma_s} Y_{od,s}^{g_f} \tag{12}$$

$$P_{d,s}^{g_f} = \left[\sum_o \left(P_{od,s}^{g_f} \right)^{1-\sigma_s} \right]^{\frac{1}{1-\sigma_s}}, \quad P_{od,s}^{g_f} = \left[\int_{j \in J_{o,s}} \left(p_{od,s}^{g_f}(j) \right)^{1-\gamma_s} dj \right]^{\frac{1}{1-\gamma_s}} \tag{13}$$

Final goods produced by the state governments. Unlike private and federal buyers, state governments may apply buy-local preferences when sourcing intermediate varieties. In practice, these preferences take the form of bid preferences: agencies treat bids from local firms as if they were cheaper than their posted amounts. For example, under a 10 percent preference a bid of \$100 by a local firm is evaluated as \$90; if that firm wins, however, it is paid the original bid of \$100.

We introduce these policies in the model through a *perceived-price factor* $\kappa_{od,s}$ on varieties from origin o purchased by the state government in destination d in sector s. Without loss of generality, we work with $\kappa_{od,s} = 1 - \text{bid preference}_{od}$. For example, $\kappa_{dd,s} = 0.90$ means that local varieties in sector s are perceived as 10 percent cheaper than their posted prices: if the price posted by a local firm is $p_{dd}^{g_s}(j)$, the percieved price will be $0.90 \times p_{dd}^{g_s}(j)$. This configuration allows $\kappa_{dd,s} \in (0, 1]$ and $\kappa_{od,s} \geq 1$ for $o \neq d$, so that buy-local policy can favor local suppliers, penalize non-local ones, or both.

The state governments' problem is sequential. Taking as given some level of overall expenditure $G_d^{g_s}$, they allocate it between labor and sectors to maximize the production of the final good:

$$Y_d^{g_s} = \left(L_d^{g_s}\right)^{\zeta_d^{g_s}} \prod_s \left(Y_{d,s}^{g_s}\right)^{\theta_s^{g_s}}, \qquad \zeta_d^{g_s} + \sum_s \theta_s^{g_s} = 1 \tag{14}$$

As in the case of the federal government, the optimal allocation of expenditure is

$$w_d L_d^{g_s} = \zeta_d^{g_s} G_d^{g_s}, \qquad E_d^{g_s} = \sum_s \theta_s^{g_s} G_d^{g_s} = \sum_s P_{d,s}^{g_s} Y_{d,s}^{g_s}, \tag{15}$$

which yields the unit cost

$$\left(\frac{w_d}{\zeta_d^{g_s}}\right)^{\zeta_d^{g_s}} \prod_s \left(\frac{P_{d,s}^{g_s}}{\theta_s^{g_s}}\right)^{\theta_s^{g_s}} = \left(\frac{w_d}{\zeta_d^{g_s}}\right)^{\zeta_d^{g_s}} P_d^{g_s} \tag{16}$$

where $P_d^{g_s}$ is the effective unit cost/price index of procurement.

A representative state agency in each sector then chooses quantities to minimize *perceived* procurement costs subject to delivering a target level of sectoral production and to the nested technology across origins and firms,

$$\min_{\{q_{od,s}^{g_s}(j)\}} \quad \sum_o \int_{j \in J_{o,s}} \kappa_{od,s}\, p_{od,s}^{g_s}(j)\, q_{od,s}^{g_s}(j)\, dj$$

$$\text{s.t.} \quad Y_{od,s}^{g_s} = \left[\int_{j \in J_{o,s}} \left(q_{od,s}^{g_s}(j)\right)^{\frac{\gamma_s - 1}{\gamma_s}} dj\right]^{\frac{\gamma_s}{\gamma_s - 1}}, \quad Y_{d,s}^{g_s} = \left[\sum_o \left(Y_{od,s}^{g_s}\right)^{\frac{\sigma_s - 1}{\sigma_s}}\right]^{\frac{\sigma_s}{\sigma_s - 1}} = \bar{Y}_{d,s}^{g_s}.$$

This yields a demand system analogous to that of private and federal buyers within each

sector, but evaluated at perceived prices $\kappa_{od,s}\, p^{g_s}_{od,s}(j)$:

$$Y^{g_s}_{od,s} = \left(\frac{\tilde{P}^{g_s}_{od,s}}{\tilde{P}^{g_s}_{d,s}}\right)^{-\sigma_s} Y^{g_s}_{d,s}, \quad q^{g_s}_{od,s}(j) = \left(\frac{\kappa_{od,s}\, p^{g_s}_{od,s}(j)}{\tilde{P}^{g_s}_{od,s}}\right)^{-\gamma_s} Y^{g_s}_{od,s} \tag{17}$$

with perceived price indexes

$$\tilde{P}^{g_s}_{d,s} = \left[\sum_o \left(\tilde{P}^{g_s}_{od,s}\right)^{1-\sigma_s}\right]^{\frac{1}{1-\sigma_s}}, \quad \tilde{P}^{g_s}_{od,s} = \kappa_{od,s}\left[\int_{j\in J_{o,s}} \left(p^{g_s}_{od,s}(j)\right)^{1-\gamma_s} dj\right]^{\frac{1}{1-\gamma_s}} \tag{18}$$

Because payments are based on posted rather than perceived prices, actual state procurement expenditure in sector s is

$$E^{g_s}_{d,s} = \sum_o \int_{j\in J_{o,s}} p^{g_s}_{od,s}(j)\, q^{g_s}_{od,s}(j)\, dj = P^{g_s}_{d,s} Y^{g_s}_{d,s}, \tag{19}$$

where $P^{g_s}_{d,s} \equiv E^{g_s}_{d,s}/Y^{g_s}_{d,s}$ is the true unit cost of delivering $Y^{g_s}_{d,s}$.

5.1.3 Firms

In each origin–sector pair o, s there is a fixed mass $J_{o,s}$ of establishments. All establishments operate a constant-returns-to-scale technology in which labor is the only factor of production. A establishment j located in region o and sector s has productivity $z_{o,s}(j)$ and hires labor $l_{o,s}(j)$ to produce varieties sold to final producers in all destinations. Its unit cost of production is $w_o/z_{o,s}(j)$. Varieties are subject to iceberg trade costs: delivering one unit of a sector-s variety from o to d requires shipping $\tau_{od,s}$ units, so the effective marginal cost of serving market d is $\tau_{od,s}\, w_o/z_{o,s}(j)$. Productivity is heterogeneous across establishments. We write

$$z_{o,s}(j) = \bar{z}_{o,s}\, \varepsilon_{o,s}(j), \tag{20}$$

where $\bar{z}_{o,s}$ is a sector–origin productivity shifter and $\varepsilon_{o,s}(j)$ is an idiosyncratic draw. Following the trade literature, we assume that $\varepsilon_{o,s}(j)$ is independently distributed across firms with a Fréchet distribution. The cumulative distribution function is given by:

$$F_\varepsilon(\varepsilon) = \exp\left(-T_{o,s}\, \varepsilon^{-\phi_s}\right), \qquad \varepsilon > 0, \tag{21}$$

where $\phi_s > 0$ is the shape parameter governing the dispersion of productivity draws and $T_{o,s} > 0$ is a scale parameter.[9] In our notation, larger ϕ_s implies less dispersion across establishments within sector s.

[9] In what follows we normalize $T_{o,s} = 1$. This is without loss of generality: the scale parameter is not separately identified from the mass of firms $|J_{o,s}|$, so allowing for $T_{o,s} \neq 1$ is equivalent to rescaling $|J_{o,s}|$ (see, e.g., Appendix B.1).

Because technology is constant returns to scale and demand in each buyer–destination market is independent, each establishment solves a separate pricing problem for every final-good producer i and destination d. Firm j in origin o and sector s chooses its posted price $p^i_{od,s}(j)$ to maximize profits in that market,

$$\max_{p^i_{od,s}(j)} \pi^i_{od,s}(j) = p^i_{od,s}(j)\, q^i_{od,s}(j) - \tau_{od,s} \frac{w_o}{z_{o,s}(j)}\, q^i_{od,s}(j),$$

subject to the demand schedule implied by the corresponding final producer,

$$q^i_{od,s}(j) = \left(\frac{p^i_{od,s}(j)}{P^i_{od,s}}\right)^{-\gamma_s} Y^i_{od,s}, \quad i \in \{p, g_f\}, \qquad q^{g_s}_{od,s}(j) = \left(\frac{\kappa_{od,s}\, p^{g_s}_{od,s}(j)}{\tilde{P}^{g_s}_{od,s}}\right)^{-\gamma_s} Y^{g_s}_{od,s},$$

where buy-local policies enter only for the state government. In both cases, payments are made at the posted price $p^i_{od,s}(j)$. The FOC yields the standard constant-markup pricing rule,

$$p^i_{od,s}(j) = \frac{\gamma_s}{\gamma_s - 1}\, \tau_{od,s} \frac{w_o}{z_{o,s}(j)}, \qquad i \in \{p, g_f, g_s\} \tag{22}$$

Establishments located in origin o pay corporate taxes on these profits. The federal corporate tax rate is $t^{\pi,f}$, common to every state, and the corporate tax rate of the state in which the firm operates is $t^{\pi,s}_o$. The total rate on profits earned in o is therefore $t^{\pi,f} + t^{\pi,s}_o$. Both taxes are proportional to profits, so they scale the firm's payoff and leave the pricing rule (22) unchanged. Per capita pre-tax profits of firms operating in d, which enter the household budget (4), are

$$\pi_d = \frac{1}{L_d} \sum_s \sum_o \sum_i \int_{j \in J_{d,s}} \pi^i_{do,s}(j)\, dj. \tag{23}$$

5.2 Decentralized equilibrium taking policies as given

In this section, we characterize the competitive equilibrium of the model taking policies as primitives. We first define the equilibrium and then characterize its (in)efficiency properties.

5.2.1 Equilibrium definition

Take as given preferences, i.e., Equation (2), technologies, i.e., Equations (6) and (9), trade costs $\tau_{od,s}$, Fréchet parameters ϕ_s, population L_d, firm masses $J_{o,s}$, and the policy vector $\left\{\kappa_{od,s}, t^{h,s}_d, t^{\pi,s}_d\right\}_{o,d,s}$ together with the federal tax rates $t^{h,f}$ and $t^{\pi,f}$. A *decentralized equilibrium* is a collection of:

- wages $\{w_d\}$ and firm prices $\{p^i_{od,s}(j)\}$
- price indexes $\{P^i_d, P^i_{d,s}, P^i_{od,s}\}$ for $i \in \{p, g_f\}$, effective state-government price indexes $\{P^{g_s}_d, P^{g_s}_{d,s}\}$, and perceived state-government price indexes $\{\tilde{P}^{g_s}_{od,s}, \tilde{P}^{g_s}_{d,s}\}$;

- household choices $\{c_d^p, h_d\}$ and effective public consumption $\{c_d^{g_f}, c_d^{g_s}\}$;
- final-good and firm-level quantities $\{Y_d^i, Y_{d,s}^i, Y_{od,s}^i\}$, $\{q_{od,s}^i(j)\}$ for $i \in \{p, g_f, g_s\}$;
- firm employment $\{l_{o,s}(j)\}$, government employment $\{L_d^{g_f}, L_d^{g_s}\}$, and per capita profits $\{\pi_d\}$;

such that, in every region d:

1. Households solve their utility maximization problem, i.e., Equation (5) holds.
2. Final producers solve their cost minimization problem, i.e., Equations (7), (8), (11), (10), (12), (13), (14), (15), (16), (17), (18), and (19) hold.
3. Firms solve their profit maximization problem, i.e., Equations (22) and (23) hold.
4. State and federal governments satisfy budget balance. Each government's spending in d is the sum of its wage bill and its procurement expenditure. Labor-income taxes are collected on household labor income in d, and profit taxes are collected on the profits of firms operating in d,

$$\begin{aligned} G_d^{g_s} &\equiv w_d L_d^{g_s} + E_d^{g_s} = t_d^{h,s}\, w_d h_d L_d + t_d^{\pi,s} \sum_s \sum_o \sum_i \int_{j \in J_{d,s}} \pi_{do,s}^i(j)\, dj, \\ G_d^{g_f} &\equiv w_d L_d^{g_f} + E_d^{g_f} = t^{h,f}\, w_d h_d L_d + t^{\pi,f} \sum_s \sum_o \sum_i \int_{j \in J_{d,s}} \pi_{do,s}^i(j)\, dj. \end{aligned} \tag{24}$$

5. The private final good clears with household demand, $Y_d^p = L_d\, c_d^p$.
6. Labor demand equals labor supply,

$$\sum_s \int_{j \in J_{d,s}} l_{d,s}(j)\, dj + L_d^{g_f} + L_d^{g_s} = L_d\, h_d. \tag{25}$$

For every *origin–destination–sector–buyer* cell, firm sales equal final-producer demand $q_{od,s}^i(j)$ by construction. With immobile labor and no interregional asset trade, goods-market clearing and budget constraints imply *balanced trade* for each region: a region d's value of exports equals its value of imports,

$$\sum_s \sum_o \sum_i \int_{j \in J_{d,s}} p_{do,s}^i(j)\, q_{do,s}^i(j)\, dj = \sum_s \sum_o \sum_i \int_{j \in J_{o,s}} p_{od,s}^i(j)\, q_{od,s}^i(j)\, dj. \tag{26}$$

5.2.2 Sources of inefficiency at the national level

We next characterize the sources of inefficiency in the decentralized equilibrium from the perspective of the aggregate U.S. economy, taking the policy vector $\{\kappa_{od,s}, t_d^{h,s}, t^{h,f}, t_d^{\pi,s}, t^{\pi,f}\}$ as given. Inefficiency can be summarized by four wedges. The first three are standard in the literature; the fourth—the wedge induced by buy-local policies—is the focus of Section 6.

First, monopolistic competition generates a *labor wedge*. Firms charge a markup over marginal cost, so the wage w_d falls short of the marginal product of labor. With endogenous labor supply, this depresses hours relative to the efficient benchmark. Distortionary labor income taxes $t_d^{h,s}$ and $t^{h,f}$ reinforce the same margin by widening the gap between the household's marginal rate of substitution and the social return to labor. This labor wedge has been largely emphasized in the literature (e.g., Chari et al. (2007) and Galí et al. (2007)). Corporate taxes do not enter this margin: they fall on profits, and preferences in (2) have no income effect on labor supply.

Second, because the within-origin elasticity γ_s may differ across sectors, markups $\gamma_s/(\gamma_s - 1)$ are generally sector-specific. The marginal product of labor is then not equalized across sectors: sectors with lower γ_s (higher markups) tend to produce too little, while those with higher γ_s produce too much. This *sectoral wedge* is the cross-sector misallocation from heterogeneous markups emphasized, for example, by Epifani and Gancia (2011) and Lashkaripour and Lugovskyy (2023).

Third, the mix of private, federal, and state final consumption need not satisfy the efficiency condition for allocating resources across these goods. In the decentralized equilibrium, the scale of federal and state provision is pinned down by tax rates through government budget balance, rather than by equating households' marginal valuations of private and publicly provided goods to their relative resource costs. Relative consumption of c_d^p, $c_d^{g_f}$, and $c_d^{g_s}$ generally fails to line up with preferences in (2). This is the classic public–private provision problem of Samuelson (1954): tax-financed government size need not deliver the optimal allocation across private and public goods.

And fourth, buy-local policies distort the origin composition of state procurement. When $\kappa_{dd,s} < 1$, state governments tilt expenditure toward local firms relative to an undistorted cost-minimizing allocation—a *local wedge* (see Section 6).

In Appendix B.4, we show that aggregate efficiency can be restored by (i) setting labor income taxes to zero, $t_d^{h,s} = t^{h,f} = 0$ for all d; (ii) implementing sector-specific production subsidies at rate $1/(\gamma_s - 1)$ to offset markups; (iii) financing the optimal mix of private and public goods with non-distortionary (lump-sum) taxes; and (iv) eliminating buy-local policies by setting $\kappa_{od,s} = 1$ for all origins, destinations, and sectors.

6 Theoretical analysis of Buy-local policies

This section develops theoretical results on buy-local policies. Subsection 6.1 characterizes how these policies distort procurement costs and sourcing. Subsection 6.2 derives a closed-form expression for the optimal unilateral buy-local policy of a single region in a simplified version of the model, and Subsection 6.3 computes that policy numerically in the full model.

6.1 The distortionary effect of Buy-local policies

Buy-local policies enter each sectoral agency's cost-minimization problem through perceived prices $\kappa_{od,s}\, p^{g_s}_{od,s}(j)$, while payments are made at posted prices $p^{g_s}_{od,s}(j)$. As a result, the perceived sectoral price index $\tilde{P}^{g_s}_{d,s}$ generally differs from the actual unit cost $P^{g_s}_{d,s} \equiv E^{g_s}_{d,s}/Y^{g_s}_{d,s}$. Because the labor share and the sectoral expenditure shares are pinned down by the Cobb–Douglas upper nest in (15), buy-local policies distort sourcing only within sectors.

Proposition 1 (Distortionary effect of buy-local policies) *Fix a destination d and sector s, and let $\{\kappa_{od,s}\}_o$ denote the vector of buy-local policies used by the state government in d. Let $P^{g_s}_{d,s}$ be the actual unit cost of the sectoral composite, as defined in (19), and let $P^{g_s*}_{d,s}$ denote the corresponding sectoral CES price index of posted prices (the undistorted ideal sectoral price index). Let $P^{g_s}_{d}$ be the aggregate effective price index of procurement defined in (16), and let $P^{g_s*}_{d}$ denote the corresponding aggregate Cobb–Douglas index of $\{P^{g_s*}_{d,s}\}_s$. Then:*

(i) If $\kappa_{od,s} = \kappa_{d,s}$ for all origins o—including the no-policy case $\kappa_{d,s} = 1$—then $P^{g_s}_{d,s} = P^{g_s*}_{d,s}$. A buy-local rule that treats all origins symmetrically within a sector therefore does not raise the true sectoral cost of procurement.

(ii) If $\kappa_{od,s} = \kappa_{d,s}$ for all origins o in every sector s, then $P^{g_s}_{d} = P^{g_s*}_{d}$, even if the common sectoral factors $\kappa_{d,s}$ differ across sectors. Aggregate procurement costs are then likewise undistorted.

(iii) If $\{\kappa_{od,s}\}_o$ is not constant across origins in some sector s, then $P^{g_s}_{d,s}$ strictly exceeds $P^{g_s*}_{d,s}$. In particular, a preference for local suppliers, $\kappa_{dd,s} < 1$ and $\kappa_{od,s} = 1$ for all $o \neq d$, strictly increases the true cost of procurement.

Proof: See Appendix B.2. ■

The intuition for parts (i)–(ii) is that a uniform buy-local factor within a sector acts like a common scale on *posted* prices. The agency treats every origin as equally favored or equally penalized, so relative perceived prices—and the associated within-sector expenditure

shares—coincide with those that would arise without any buy-local policy. Since the state continues to pay posted prices and does not reshuffle demand across origins, the true sectoral unit cost is unchanged. With Cobb–Douglas expenditure shares across sectors, the same conclusion aggregates: sector-specific but origin-symmetric policies leave $P_d^{g_s}$ undistorted.

The opposite logic applies to part (iii). When $\kappa_{od,s}$ differs across origins, the agency chooses expenditure shares under distorted perceived prices—for example, treating local varieties as cheaper than they truly are. The actual unit cost $P_{d,s}^{g_s}$ is then constructed from posted prices evaluated at those distorted shares. By the definition of cost minimization, that unit cost is always higher than the one obtained under the expenditure shares that arise in an economy without buy-local policies.

6.2 Optimal buy-local policy in a simplified economy

We next characterize the optimal buy-local policy in closed form in a simplified version of the economy. Throughout this subsection, the focus is the optimal unilateral policy under no retaliation. The simplified economy consists of two regions, o and d, and labor supply is fixed. There are only two final goods, a private good p and a state-government good g, combined by a Cobb–Douglas aggregator. Taxes are held fixed so that the size of government matches consumer preferences. Region d chooses its optimal buy-local policy. Region o imposes none, $\kappa_{oo} = \kappa_{do} = 1$, and does not retaliate. Subsection 6.3 then computes optimal buy-local policies numerically using the full model and under alternative forms of retaliation by other states.

Proposition 2 (Optimal buy-local policy) *Let's focus on the simplified economy mentioned above. Let's consider a social planner in region d that chooses κ_{dd} to maximize their consumers' utility. Let's assume that region o has no buy local policy in place, i.e., $\kappa_{do} = \kappa_{oo} = 1$, and that it does not retaliate. The optimal unilateral buy local policy at d is given by:*

$$\frac{1}{\kappa_{dd}} - 1 = \frac{1}{(\sigma - 1)\,\lambda_{oo} + \dfrac{Y_{od}^p}{Y_{od}}\left[\sigma\lambda_{dd}^p + (\lambda_{dd}^g - \lambda_{dd}^p)\right]}, \tag{27}$$

where $\lambda_{dd}^p \equiv 1 - \lambda_{od}^p$ and $\lambda_{dd}^g \equiv 1 - \lambda_{od}^g$ are region d's local expenditure shares in private and government expenditure, respectively; $\lambda_{oo} \equiv 1 - \lambda_{do}$ is region o's aggregate local expenditure share; Y_{od}^p/Y_{od} is the region d's private share in total imports.

Proof: See Appendix B.3. ■

Equation (27) makes clear that the size of the optimal buy-local policy depends on whether the government is a large importer in region d. Two limiting cases are useful. First, suppose

$Y^p_{od}/Y_{od} \to 0$. This is a situation where the government is large, accounting for all imports in the region. In that case the buy-local instrument affects *all* imports and is therefore a strong tool to affect terms-of-trade. The second term in the denominator vanishes, and (27) collapses to the classical optimal-tariff formula of Gros (1987),

$$\frac{1}{\kappa_{od}} - 1 = \frac{1}{(\sigma - 1)\,\lambda_{oo}}. \tag{28}$$

Optimal buy-local policy then coincides with the optimal tariff. Comparative statics are immediate: a higher elasticity of substitution σ or a higher local expenditure share in the passive region λ_{oo} makes it harder for d to affect the terms of trade, and therefore lowers the optimal buy-local policy.

Second, suppose $Y^p_{od}/Y_{od} > 0$. This is a situation where the government is relatively smaller, accounting only for a fraction of overall imports in the region. Buy-local policy is then a weak instrument. It distorts only public demand, while private imports remain undistorted and adjust through equilibrium prices. Relative to the Gros (1987) benchmark, the optimal wedge is therefore strictly smaller. The size of this "correction" is governed by two forces inside the bracket. The first, $\sigma\lambda^p_{dd}$, is a *private-sector leakage effect*: when private buyers are more home-biased (higher λ^p_{dd}), or when varieties are closer substitutes (higher σ), private demand reacts to the terms-of-trade gain engineered through public procurement by importing more, therefore offsetting them, so the optimal buy-local policy falls further. The second, $\lambda^g_{dd} - \lambda^p_{dd}$, is an *import-wedge effect*: when the government is already more home-biased than the private sector ($\lambda^g_{dd} > \lambda^p_{dd}$), further tilting public demand toward domestic goods is more costly, again reducing the optimal buy-local policy.

6.2.1 Additional remarks

The proposition above delivers a closed-form expression for the optimal unilateral buy-local policy in a transparent benchmark economy. Rather than repeating the full derivation here, we summarize the logic of the solution.

Approach. We solve the problem using a *dual approach* in the spirit of recent work on optimal trade and industrial policy that keeps relative prices explicit in the planning problem (Lashkaripour and Lugovskyy, 2023). The first step is to reduce the equilibrium to a single terms-of-trade object, $A \equiv P_{od}/P_{dd}$, which measures how many units of the domestic good region d must give up to obtain one unit of the foreign good in the active market. Conditional on A, trade balance, market clearing, and CES demand pin down all relevant allocations—$Y^p_d(A)$, $Y^g_d(A)$, and the associated import and export flows—as functions of fundamentals alone. Our strategy consists of letting the regional planner choose A to maximize a weighted

sum of private and public consumption, and then recovering the buy-local factor κ_{od} that implements that optimal A. This separation is useful because welfare can be evaluated for any candidate A without specifying κ_{od} directly; the policy variable enters only at the implementation stage. The full argument is given in Appendix B.3.

Two features of this benchmark are worth emphasizing. First, we treat the split between private and public expenditure as fixed: the share β_d of regional income allocated to the state government is taken as given, and the planner optimizes only over procurement margins. Under Cobb–Douglas preferences over the two composites, this is equivalent to assuming that the intratemporal private–public split is already efficient, so the residual problem is to maximize the real value of total consumption. Second, region o is passive throughout: it applies no buy-local policy and does not retaliate. This isolates the unilateral terms-of-trade motive that is the natural starting point for the analysis.

6.3 Optimal buy-local policy in the full model

We next characterize optimal buy-local policies in the full model. These policies are computed numerically. [Placeholder: describe the numerical procedure.]

We focus on two situations. Both start from a hypothetical economy in which no buy-local policies are in place.[10] In the first, we compute, for each state, the unilateral buy-local policy under the assumption that no other state retaliates. This policy is the counterpart of Equation (27) in the full model, and it captures the same notion of optimality as the optimal tariff in Gros (1987). In the second, we again compute the optimal buy-local policy of each state, but now under the assumption that the other states retaliate.

Optimal buy-local policy under no retaliation. We find that the optimal unilateral tariff equivalent, $\frac{1}{\kappa_{dd}} - 1$, averages 0.30 across states. It ranges from 0.21 in California to 0.33 in Vermont. Panel A of Table 5 reports this policy for a selected set of states, together with the components of Equation (27). For each state, these moments are measured in the equilibrium in which that state alone imposes its optimal buy-local policy.

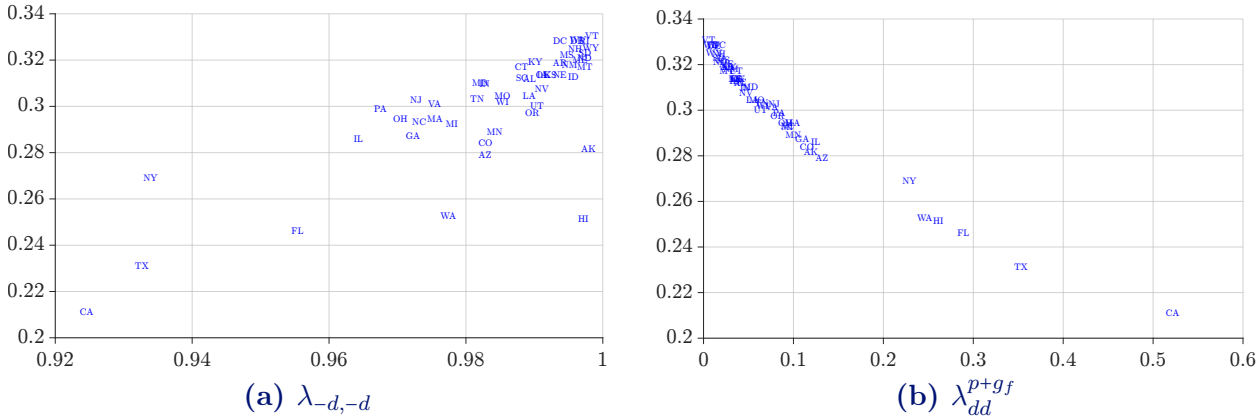
Table 5. Optimal unilateral policy in state d

	Panel A. Policy and shares					*Panel B. Welfare change (%)*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
State	$\frac{1}{\kappa_{dd}} - 1$	$1 - \frac{Y^{gs}_{od}}{Y_{od}}$	$\lambda_{-d,-d}$	$\lambda^{p+g_f}_{dd}$	λ^{g}_{dd}	Total	c^{p}_{d}	c^{f}_{d}	c^{s}_{d}	h
California	0.21	0.95	0.92	0.52	0.70	0.23	0.40	0.06	−0.11	−0.12
Texas	0.23	0.96	0.93	0.35	0.55	0.19	0.35	0.05	−0.11	−0.10
Florida	0.25	0.95	0.96	0.29	0.48	0.19	0.35	0.05	−0.12	−0.10
Colorado	0.28	0.95	0.98	0.12	0.25	0.12	0.24	0.03	−0.10	−0.06
Vermont	0.33	0.84	1.00	0.01	0.02	0.03	0.06	0.01	−0.02	−0.01
Average	0.30	0.92	0.98	0.08	0.18	0.13	0.25	0.04	−0.09	−0.06

Notes: Each listed state is evaluated in the equilibrium in which only that state imposes its optimal unilateral buy-local policy and every other state imposes none. Taxes are held fixed. Column (1) is the optimal tariff equivalent, averaged across construction, goods, and services, as in Figure 7. Column (2) is the share of the state's imports purchased by the private sector and the federal government, one minus the state government's share of imports. Column (3) is the share of expenditure in all other states that is sourced from those states. Column (4) is the state's local share of expenditure by the private sector and the federal government, weighted by their expenditure. Column (5) is the state's local share of state-government expenditure. Columns (6)–(10) are the consumption-equivalent welfare change, in percent: the total and the contributions of private consumption, federal consumption, state-government consumption, and hours worked. The last row is the unweighted average across all 50 states and the District of Columbia, with each state evaluated in its own unilateral equilibrium.

[10] In practise, we calibrate the economy following the same strategy described in 7.1 but under no buy local policies.

Three features of these equilibria are worth mentioning. First, the optimal policy is large in every state, even though buy-local rules are a relatively weak instrument. The share of imports purchased by the state government, $\frac{Y_{od}^{gs}}{Y_{od}}$, averages only 0.08, so the policy affects a small part of import demand. Second, there is substantial scope for private-sector leakage, especially in large states. Private local expenditure shares are, for example, 0.52 in California and 0.35 in Texas. Third, the policy opens a sizable gap between the local expenditure shares of the private sector and the state government, $\lambda_{dd}^{p+g_f}$ and λ_{dd}^{g}.[11]



(a) $\lambda_{-d,-d}$ **(b)** $\lambda_{dd}^{p+g_f}$

Figure 7. Optimal unilateral tariff: $\frac{1}{\kappa_{dd}} - 1$

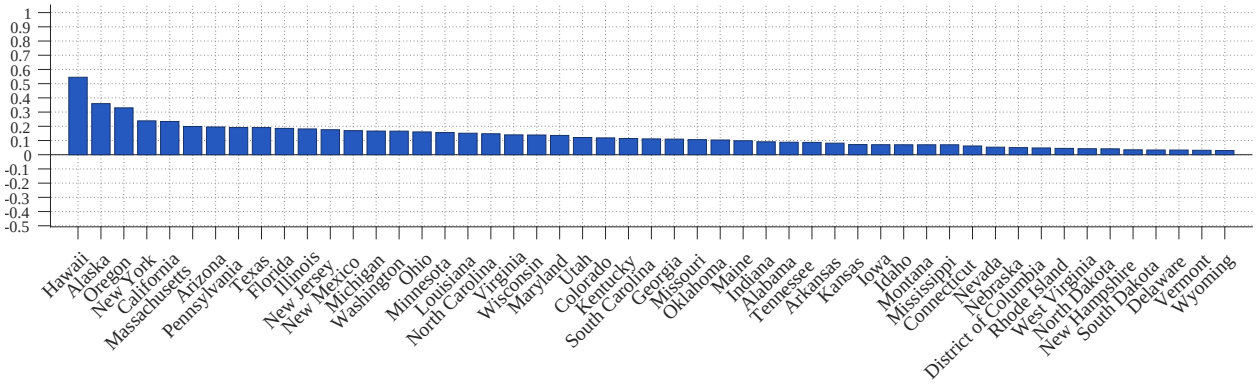
Notes: Each label is a state. The vertical axis is the optimal unilateral tariff equivalent, $\frac{1}{\kappa_{dd}} - 1$, averaged across construction, goods, and services. Government size is held fixed and other states do not retaliate. Each state's horizontal-axis moment is taken from the equilibrium in which only that state imposes its optimal policy. Panel (a) is the share of expenditure in all other states that is sourced from those states. Panel (b) is state d's local share of expenditure by the private sector and the federal government, weighted by their expenditure.

We next study the relationship between these optimal policies and states' size. Panel (a) of Figure 7 plots the optimal tariff equivalent against the local expenditure share of the rest of the United States, $\lambda_{-d,-d}$.[12] Larger states, those for which $\lambda_{-d,-d}$ is relatively low, e.g., California, have a significantly smaller optimal buy-local policy. The cross-state pattern somehow contradicts the usual comparative static of optimal tariffs. In standard trade models, and in this model when other terms are held fixed, a lower foreign local share strengthens the optimal tariff. Applying the formula of Gros (1987), $\frac{1}{(\sigma-1)\lambda_{-d,-d}}$, to the values of $\lambda_{-d,-d}$ in these equilibria gives a tariff equivalent of 0.36 in California and 0.33 in Vermont. This means that the standard Gros (1987) formula predicts very little variation in the optimal buy-local policy, as well as a positive relationship with states's size. Across states, however, a large size – and low $\lambda_{-d,-d}$ – comes together with a high local expenditure share of private

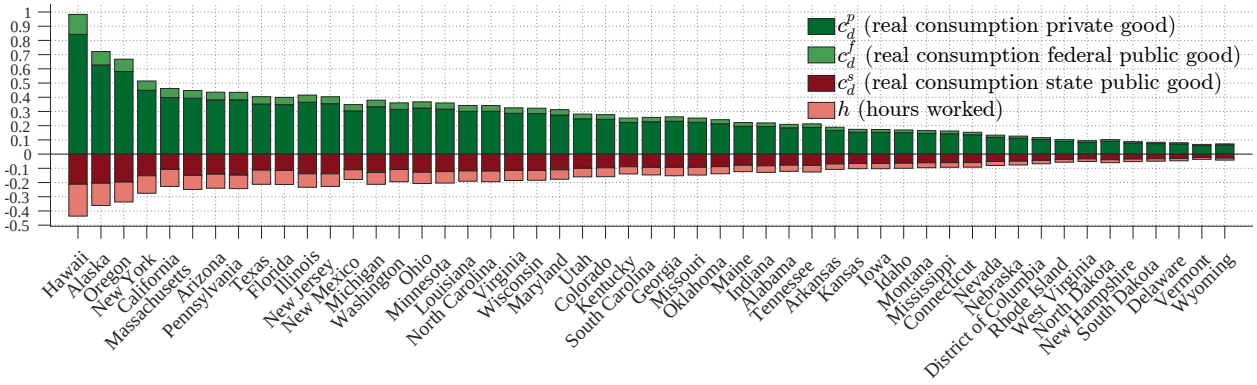
[11] Without the policy, this gap is closed to zero. The state government and the private sector then face the same prices and differ only in the sectoral composition of their purchases.

[12] This share is the counterpart of λ_{oo} in the simplified two-region model.

and federal purchases, $\lambda_{dd}^{p+g_f}$. Panel (b) shows this second relationship. The private-sector leakage, which is governed precisely by $\lambda_{dd}^{p+g_f}$, dominates, so the optimal buy-local policy declines with state size.



(a) Welfare change



(b) Decomposition

Figure 8. Welfare under the optimal unilateral policy

Notes: The vertical axis is the consumption-equivalent welfare change, in percent, from the equilibrium with no buy-local policies. Each state imposes its optimal unilateral policy and every other state imposes none. Government size is held fixed. States are ordered by the total welfare change. Panel (a) is the total change. Panel (b) splits it into private consumption, federal consumption, state-government consumption, and hours worked.

Panel (a) of Figure 8 reports the welfare change each state would obtain by implementing its optimal buy-local policy when no other state retaliates. Panel (b) decomposes that change into the effects coming from changes in real consumption of the good produced by the private sector, c_d^p, the good produced by the federal government, the good produced by the state government, and hours worked. Panel (b) of Table 5 shows all these moments for the set of selected states.

Welfare changes from implementing optimal unilateral policies range between 0.03% (Wyoming) and 0.54 (Hawaii), with the highest welfare increases exhibited by large/closed

states such as California (0.23%) and Texas (0.19%). The net increase in welfare is the result of a number of channels going in opposite directions. The positive effect is an increase in real private consumption, , c_d^p. By shifting demand toward local firms, the buy-local policy generates an increase in local wages, w_d, which is larger than in the private price index P_d^p. This increase in local real wages operates through the standard terms-of-trade effect of an import tariff, and also increases $c_d^{g_f}$, although by a smaller amount. In this model, this terms-of-trade channel is reinforced by the increase in hours worked, which decreases the *labor wedge* in the new equilibrium. The negative effect is a decline in real consumption of the good produced by state governments, $c_d^{g_s}$. Redirecting demand toward less productive local firms raises the true unit cost of state procurement, $P_d^{g_s}$ (see Proposition 1). That increase is substantially larger than the increase in state tax revenue. Because this revenue finances total state spending $G_d^{g_s}$, the higher procurement price index raises the unit cost of the state good and the quantity $Y_d^{g_s}$ falls.

7 Quantifying the U.S. state procurement war

The strategy of our quantitative exercise is as follows. We first calibrate the full model to the U.S. economy under the buy-local policies observed in the data. The remaining parameters are chosen so that the model matches the main moments of U.S. states, including the size of each state's government and the relative size of each state's GDP. We then use the calibrated economy to run a set of counterfactuals that remove these policies.

7.1 Calibration

We calibrate the model to 51 states, three sectors s (goods, construction, and services), and three final good producers (private sector, p, federal governments, g_f, and state governments, g_s). The parameters of the model are divided in four blocks: policy parameters, endowments and preferences, technology, and transportation costs.

Policy parameters. Buy-local policies, $\kappa_{od,s}$, are taken from the data, including the observed reciprocity rules, and imposed directly. Corporate income taxes, $t_d^{\pi,s}$ and $t^{\pi,f}$, are also taken from the data and kept at those values (see Appendix A.2). Labor income taxes, $t_d^{h,s}$ and $t^{h,f}$, start from the same sources and are then re-scaled so that government expenditure in the model hits the targets below. Budget balance in (24) gives state and federal expenditure in state d, and state GDP is the sum of that expenditure and private final expenditure.

The two objects we match are

$$\frac{G_d^{g_s}}{G_d^{g_s} + G_d^{g_f} + P_d^p Y_d^p} \qquad \text{and} \qquad \frac{G_d^{g_f}}{G_d^{g_s} + G_d^{g_f} + P_d^p Y_d^p}. \tag{29}$$

We re-scale $t_d^{h,s}$ in each state so that the first ratio equals observed state government expenditure over state GDP. Section 2.1 reports these ratios. We re-scale $t^{h,f}$ so that the second ratio is the same in every state and aggregate government expenditure, state plus federal, equals 30 percent of GDP.

Endowments and preferences. We set the states' L_d to their observed population. We choose the mass of varieties $|J_{o,s}|$ so that the model matches GDP in every sector–state pair, with government wage bills counted as services value added. The preference weights α_p, α_{g_f}, and α_{g_s} are state-specific. We set them equal to the expenditure shares in (29), which the taxes are chosen to deliver, so that this composition is the one the household prefers. In words, this means that the taxes help the model match the size of governments and we pick the α's so that size is optimal. The federal share is the same in every state, 22.4 percent of GDP. The state share is the state-specific ratio reported in Section 2.1, and the private share is the residual. In California the state government accounts for 7.7 percent of GDP, so the weights are $\alpha_p = 0.699$, $\alpha_{g_f} = 0.224$, and $\alpha_{g_s} = 0.077$.

Public goods are fully rival, so $\chi_{g_f} = \chi_{g_s} = 1$. We choose the disutility of labor ψ_d in each state so that per capita labor supply h_d matches that state's employment-to-population ratio. The Frisch elasticity is $\eta = 1.5$.

Technology. We set the elasticity of substitution across origins to $\sigma_s = 4$ and the elasticity across firms within an origin–sector pair to $\gamma_s = 5$, in every sector. The Fréchet shape is $\phi_s = 10$, and the origin–sector productivity shifters are normalized to $\bar{z}_{o,s} = 1$. Differences in state–sector GDP are therefore absorbed by the mass of varieties (see above).

The state labor share $\zeta_d^{g_s}$ equals one minus observed procurement over state expenditure. The federal labor share ζ^{g_f} is common across states and is set so that aggregate procurement, state plus federal, equals 10 percent of GDP. Government sectoral shares $\theta_s^{g_s}$ and $\theta_s^{g_f}$ are the observed composition of procurement. Each government's wage bill is assigned to services, so its sectoral shares exhaust its budget. Private shares θ_s^p are the same in every state. They are the residual of aggregate sectoral GDP minus government demand.

Transportation costs. Iceberg trade costs are

$$\tau_{od,s} = \max\left\{1,\ \tau_{0s} \times dist_{od}^{\varepsilon_s}\right\} \qquad \text{for } o \neq d, \tag{30}$$

with $\tau_{dd,s} = 1$. We set $\varepsilon_s = (\sigma_s - 1)^{-1} = 1/3$, which makes the elasticity of trade flows with respect to distance equal to -1. The level τ_{0s} is sector-specific and common across state pairs and buyers. We choose it to match the aggregate local share of federal procurement in sector s.

7.2 Counterfactuals

The goal of this section is to quantify the effects of the U.S. state procurement war. Starting from the calibrated economy of Section 7.1, in which every state imposes the buy-local policies observed in the data, we run two sets of counterfactuals.

In the first, we remove each state's observed buy-local policies one state at a time, for the 18 states that have at least one $\kappa_{dd,s} < 1$. These are the states we were refering to as "pro-active" in the data section. For each of these reforming states d, we set $\kappa_{od,s} = 1$ for every origin o and every sector s. We consider two responses by the remaining states. In one, other states react in line with their current pattern of retaliation: any reciprocity-driven buy-local preference they apply against d is removed together with d's own policy. In the other, other states leave all of their buy-local policies unchanged. In the second counterfactual, we remove buy-local policies in every state at the same time, setting $\kappa_{od,s} = 1$ for all origins, destinations, and sectors.

7.2.1 Deviating from the observed equilibrium of buy local policies

Current pattern of retaliation. Figure 9 reports the welfare effect of this experiment for the 18 proactive states. For each of them we set $\kappa_{od,s} = 1$ for every origin and every sector, and we let other states follow the reciprocity rules observed in the data. Any penalty another state was applying against the reforming state because of that state's own policy is therefore removed as well.

Every one of these states gains. The consumption-equivalent welfare increase ranges from 0.01 percent to 0.37 percent in Kansas. The average gain is 0.16 percent and the median is 0.17 percent. The largest gains are 0.37 percent in Kansas, 0.31 percent in the District of Columbia, and 0.29 percent in Louisiana. At the other end, Massachusetts gains 0.04 percent and Virginia 0.01 percent.

These gains come largely from renewed access to large markets that impose no buy-local preference of their own but do retaliate through reciprocity. California and Texas are the leading cases. Once a smaller state drops its policy, those markets no longer apply a reciprocal penalty against its firms, so those firms sell more there.

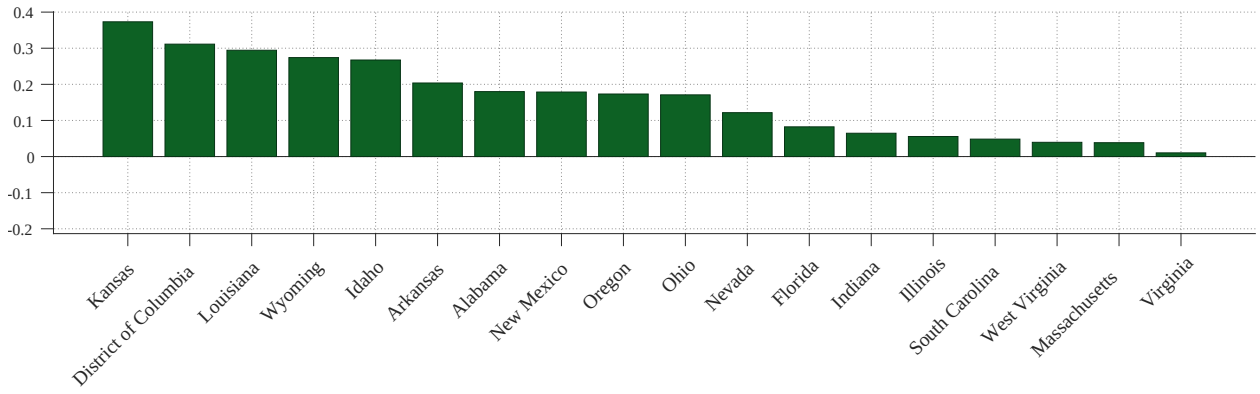


Figure 9. Unilateral removal, retaliation adjusts

Notes: The vertical axis is the consumption-equivalent welfare change, in percent, relative to the benchmark economy with the observed buy-local policies. Each bar sets one state's buy-local factor to one and lets other states update the penalties implied by their reciprocity rules.

States violating the current pattern of retaliation. Figure 10 reports the welfare effect of the same removal when other states do not follow the reciprocity rules. For each of the 18 proactive states we again set $\kappa_{od,s} = 1$ for every origin and every sector, but we hold every other state's buy-local penalty at its benchmark value. The penalties those states were applying against the reforming state therefore stay in place.

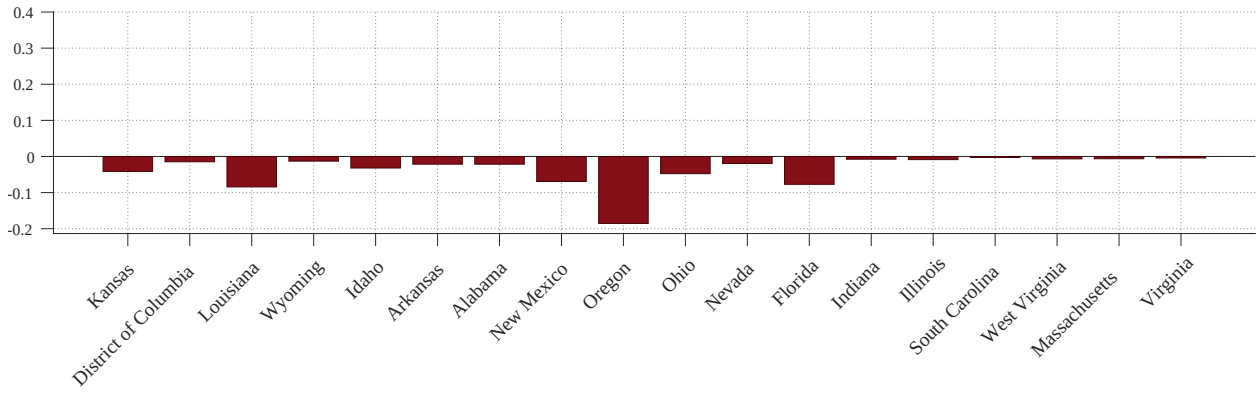


Figure 10. Unilateral removal, retaliation held fixed

Notes: The vertical axis is the consumption-equivalent welfare change, in percent, relative to the benchmark economy with the observed buy-local policies. Each bar sets one state's buy-local factor to one and holds other states' penalties at their benchmark values. The states and their order are the same as in Figure 9.

Every one of these states loses. The consumption-equivalent welfare decline ranges from 0.003 percent to 0.19 percent. The average loss is 0.04 percent and the median is 0.02 percent. The largest losses are 0.19 percent in Oregon, 0.08 percent in Louisiana, and 0.08 percent in Florida. At the other end, Virginia loses 0.004 percent and South Carolina 0.003 percent.

These losses arise because the reforming state gives up its own preference and does not regain access to the markets that retaliate against it. California and Texas are again the leading cases. They keep the reciprocal penalty on the reforming state's firms, so those firms do not sell more there, while the reforming state no longer shifts its own procurement toward local producers.

7.2.2 Removing all the state buy local policies in the U.S.

Figure 11 shows the welfare change from removing the observed buy-local policies in every state at the same time. We set $\kappa_{od,s} = 1$ for every origin, destination, and sector. This removes both the preference that proactive states apply at home and the reciprocity penalty that other states apply against them.

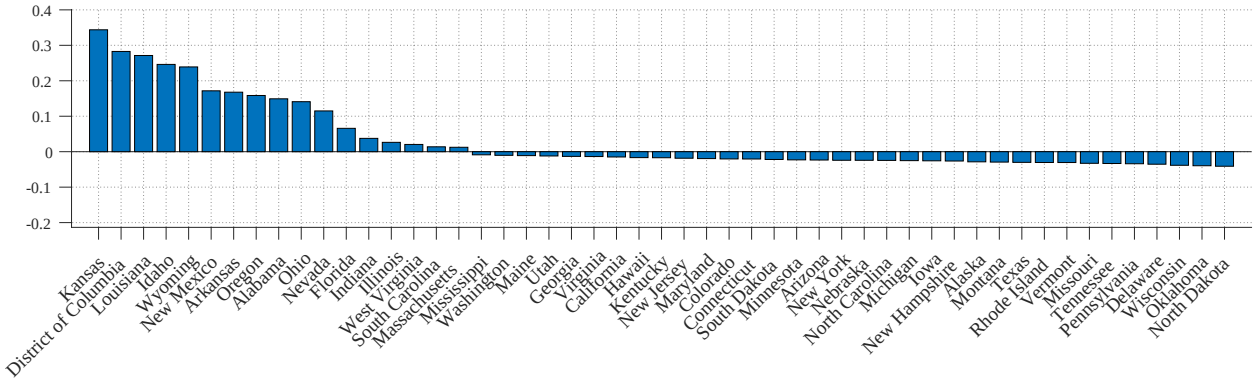


Figure 11. Removal in all states

Notes: The vertical axis is the consumption-equivalent welfare change, in percent, relative to the benchmark economy with the observed buy-local policies. Every state's buy-local factor is set to one at the same time. States are ordered by their welfare change.

The figure orders states by the welfare change. The states on the left are the proactive ones, and the gains are large where the observed preference is strong. Kansas gains 0.34 percent, the District of Columbia 0.28 percent, and Louisiana 0.27 percent. Moving to the right, the gains fall. Florida gains 0.07 percent and Massachusetts 0.01 percent. Seventeen states gain, and each of them has $\kappa_{dd,s} < 1$ in at least one sector. Virginia is the only proactive state that loses. Its preference is the mildest, and the loss is 0.01 percent. The states to the right of Virginia have no preference of their own, and they all lose. The losses are small and similar for large and small states. California loses 0.01 percent, New York 0.02 percent, and Texas 0.03 percent. Vermont and North Dakota lose 0.03 and 0.04 percent. The average across states is a gain of 0.03 percent, and the median state loses 0.02 percent. The states that gain account for about a quarter of U.S. GDP in 2022. Weighting states by 2022 GDP, welfare in the United States rises by 0.01 percent. The GDP-weighted gain among the states

that gain is 0.10 percent, and the GDP-weighted loss among the states that lose is 0.02 percent.

The reason is that the war diverts procurement toward the states that are not penalized. Reciprocity raises the cost of buying from a proactive state, so other governments shift their purchases toward the remaining states. When every policy is removed, that shift is undone and those states lose. The proactive states gain because their firms are no longer penalized in other states' procurement. Those gains are larger than the losses, which is why U.S. welfare rises.

Appendix A: Data

A.1 Cross-state data on U.S. state government finances

This appendix documents how we construct state procurement from the U.S. Census Bureau's Annual Survey of State Government Finances. Definitions follow the Census Bureau's *Government Finance and Employment Classification Manual* (2006 edition); the relevant discussion of expenditures is in Chapter 5 (beginning p. 122).[13]

Current operations and capital outlay. *Current operations* are direct expenditure for compensation of own officers and employees and for supplies, materials, and contractual services, except amounts classified as capital outlay (that is, except personal services or other objects used in contract construction or government-employee construction of permanent structures, and except acquisition of property and equipment). *Capital outlay* is direct expenditure for the purchase or construction—by contract or by government employees—of buildings and other improvements; for the purchase of land, equipment, and existing structures; and for payments on capital leases. Capital outlay can be disaggregated by item when needed (for example, equipment versus buildings).

From Census categories to procurement. Let CO_j denote the sum of current-operations items (E^*) for state j, CE_j the sum of capital-outlay items (F^*), and $Z00_j$ total salaries and wages. Our baseline measure is

$$\text{State procurement}_j = CO_j + CE_j - Z00_j.$$

Subtracting $Z00_j$ removes own-employee compensation recorded in current operations (and, where applicable, in capital outlay), so that the residual approximates purchases of goods

[13] Available at https://www2.census.gov/programs-surveys/state/technical-documentation/government-classification-manual/2006_classification_manual.pdf.

and services from outside the government. Because the measure is built only from current operations and capital outlay, it excludes Census categories classified separately as assistance and subsidies (cash transfers), as well as intergovernmental transfers.

Welfare vendor payments. One category within *current operations* that is conceptually closer to a transfer than to government consumption is *Public Welfare—Vendor Payments for Medical Care*: payments made directly to private vendors for medical assistance and hospital or health care, including Medicaid (Title XIX), plus mandatory state payments to the federal government to offset costs of prescription drugs under Medicare Part D. These payments must be made on behalf of low-income or means-tested beneficiaries (or other medically qualified persons). In the Classification Manual, this category corresponds to item $E74$ (and related item $E75$; see p. 184). Strictly speaking, such payments are not cash transfers to households, but they may behave more like transfers than like direct government consumption of goods and services. In practise, however, we do not use these categories because they do not appear in the raw data we downloaded: reported current-operations codes jump from $E66$ to $E77$.[14]

[14]The raw data correspond to Census table GS00STATEFIN03 (*State Government Finances Individual Unit Data: US and States*) and were downloaded from https://data.census.gov/table/GOVSSTATEFINTIMESERIES.GS00STATEFIN03.

A.2 Corporate and personal income taxes

This appendix documents the corporate and personal income-tax rates taken from the data in the calibration of Section 7.1. The rates follow the objects in Fajgelbaum et al. (2019), Online Appendix F.1, and are extended through 2022 with public sources. Each state-year panel covers the 50 states and the District of Columbia from 2000 to 2022. Federal rates are the same in every state. Table 6 summarizes the 2017 cross section, the last pre-TCJA year in which every series is available.

The four rates that enter the model, before the rescaling of labor income taxes in Section 7.1, are the top statutory state corporate rate, the average effective federal corporate rate, the average effective state personal rate, and the average effective federal personal rate.

State corporate income tax. The state corporate rate $t_d^{\pi,s}$ is the top statutory rate on corporate net income as of December 31, including surcharges. The source is the Institute on Taxation and Economic Policy, *Historical State Tax Rate Data*, version 2026.2.[15] This is the same concept as the statutory state corporate rate in Fajgelbaum et al. (2019), who take it from Suárez Serrato and Zidar (2016) and the *Book of the States*. Those sources stop in 2014. The ITEP series covers 2000–2022.

Gross-receipts and franchise levies that are not taxes on net income are coded as zero. This applies to the Texas margin tax, the Washington business-and-occupation tax, the Ohio commercial-activity tax, and the Nevada commerce tax. South Dakota and Wyoming have no corporate income tax. In 2017 the unweighted mean is 6.3 percent, six states are at zero, and the highest rate is 12 percent, in Iowa.

Firms in the model pay this statutory rate on profits earned in the state where they operate. The calibration does not split the rate into a sales-apportioned component and a payroll- or property-apportioned component.

Federal corporate income tax. The federal corporate rate $t^{\pi,f}$ is an average effective rate, common to every state,

$$t^{\pi,f} = \frac{\text{total income tax after credits}}{\text{net income (less deficit)}}.$$

The numerator is tax after credits because that choice reproduces the 18 percent rate for 2007 in Fajgelbaum et al. (2019), Table A.1. Tax after credits over net income less deficit is 18.04 percent in 2007. Tax before credits over the same denominator is 23.8 percent.

[15] Available at https://itep.org/historical-state-tax-rate-data/.

For 2000–2013 the ingredients come from IRS Statistics of Income Historical Table 13.[16] For 2014–2022 they come from IRS Publication 16, Table 1, for all industries, on the row for total returns of active corporations.[17] In that table the denominator is net income minus deficit. The top statutory federal rate, from the same ITEP workbook, is 35 percent through 2017 and 21 percent from 2018. The effective rate falls from 16.0 percent in 2017 to 7.2 percent in 2018.

State personal income tax. The state labor income rate $t_d^{h,s}$ is an average effective personal income tax. NBER TAXSIM runs a fixed sample of returns, the 1984 Statistics of Income sample inflated to the tax year, through each year's state law. The rate is average state income-tax liability divided by average adjusted gross income (Feenberg and Coutts, 1993).[18] The same income distribution is used in every state, so differences across states reflect tax law. The published tables cover 2000–2018. Years after 2018 are left missing, so a calibration year after 2018 cannot be filled in from this series.

The same ITEP workbook reports the top statutory rate on earned income. In 2017 that statutory rate is zero in Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming. ITEP also codes the New Hampshire and Tennessee taxes on interest and dividends as zero. The effective rate is zero in the seven states with no broad personal income tax. New Hampshire and Tennessee have effective rates of 0.3 and 0.2 percent, because the fixed sample includes interest and dividend income. The unweighted mean effective rate is 3.2 percent, against 5.3 percent for the statutory top. Across states the two series have a correlation of 0.87, while the ranking differs. California's statutory top is 13.3 percent and its effective rate is 3.9 percent. The District of Columbia has the highest effective rate, 5.9 percent, and Oregon's effective rate is 5.8 percent.

Federal personal income tax. The federal labor income rate $t^{h,f}$ is an average effective rate, common to every state,

$$t^{h,f} = \frac{\text{total income tax}}{\text{adjusted gross income (less deficit)}}.$$

For 2000–2016 the ingredients come from IRS Statistics of Income Historical Table 1, using all returns.[19] For 2017–2022 they come from IRS Publication 1304, Table 1.1, again for all

[16] Available at https://www.irs.gov/statistics/soi-tax-stats-historical-table-13.

[17] Available at https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-complete-report-publication-16.

[18] The series is `st_avg` in the fixed 1984 sample published at https://taxsim.nber.org/allyup/.

[19] Available at https://www.irs.gov/statistics/soi-tax-stats-historical-table-1.

returns.[20] In 2007 the ratio is 12.8 percent. Fajgelbaum et al. (2019) report a fixed-sample TAXSIM federal rate of 11.7 percent in that year. The top statutory federal rate in Table 6 is taken from the same ITEP workbook.

Table 6. Corporate and personal income-tax rates, 2017

	Mean	10th	50th	90th	Min	Max	At zero
State rates							
Corporate, top statutory†	6.3	0.0	6.5	9.0	0.0	12.0	6
Personal, top statutory	5.3	0.0	5.8	9.0	0.0	13.3	9
Personal, average effective†	3.2	0.0	3.7	4.9	0.0	5.9	7
Federal rates							
Corporate, average effective†	16.0	—	—	—	—	—	—
Corporate, top statutory	35.0	—	—	—	—	—	—
Personal, average effective†	14.6	—	—	—	—	—	—
Personal, top statutory	39.6	—	—	—	—	—	—

Notes: Entries are percents of the relevant tax base. State moments are unweighted across the 50 states and the District of Columbia. A dagger marks the series assigned to $t_d^{\pi,s}$, $t^{\pi,f}$, $t_d^{h,s}$, and $t^{h,f}$ before labor income taxes are rescaled. Six states have a corporate rate of zero: Nevada, Ohio, South Dakota, Texas, Washington, and Wyoming. Texas, Washington, Ohio, and Nevada levy gross-receipts or franchise taxes that are coded as zero because they are not taxes on net income. Nine states have a statutory personal rate of zero: Alaska, Florida, Nevada, New Hampshire, South Dakota, Tennessee, Texas, Washington, and Wyoming. The average effective personal rate is zero in Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming. New Hampshire and Tennessee have effective rates of 0.3 and 0.2 percent because the fixed TAXSIM sample includes interest and dividend income. Federal rates do not vary across states. For those rows the mean column is the national rate.

[20] Available at https://www.irs.gov/statistics/soi-tax-stats-individual-income-tax-returns-complete-report-publication-1304-basic-tables-part-1.

Appendix B: Model

B.1 Expressions for some of the price indexes

The *perceived* price index of the composite good from region o sold in region d in sector s used the state government in region d is given by (same as third item in Equation (18)):

$$\tilde{P}_{od,s}^{g_s} = \left[\int_{j \in J_{o,s}} \left(\kappa_{od,s} \, p_{od,s}^{g_s}(j) \right)^{1-\gamma_s} dj \right]^{\frac{1}{1-\gamma_s}}$$

Given the optimal $p_{od,s}^{g_s}(j)$ given by Equation (22) and factoring out the mass of firms producing:

$$\tilde{P}_{od,s}^{g_s} = \kappa_{od,s}^{g_s} \frac{\gamma_s}{\gamma_s - 1} \tau_{od,s} w_o \left(\underbrace{\int_{j \in J_{o,s}} \left(z_{o,s}(j) \right)^{-1+\gamma_s} dj}_{|J_{o,s}| \mathbb{E}\left[(z_{o,s}(j))^{\gamma_s - 1} \right]} \right)^{\frac{1}{1-\gamma_s}} = \kappa_{od,s}^{g_s} \frac{\gamma_s}{\gamma_s - 1} \tau_{od,s} w_o \left| J_{o,s} \right|^{\frac{-1}{\gamma_s - 1}} \left[\mathbb{E}\left((z_{o,s}(j))^{\gamma_s - 1} \right) \right]^{\frac{1}{1-\gamma_s}}$$

Property of Frechet distribution together with the fact that the set of firms operating remains constant (fixed entry)

$$\mathbb{E}\left((z_{o,s}(j))^{\gamma_s - 1} \right) = \Gamma\left(1 - \frac{\gamma_s - 1}{\varepsilon} \right) = \Gamma_s \tag{31}$$

Therefore,

$$\tilde{P}_{od,s}^{g_s} = \kappa_{od,s} \frac{\gamma_s}{\gamma_s - 1} \tau_{od,s} w_o \left| J_{o,s} \right|^{\frac{-1}{\gamma_s - 1}} \Gamma_s^{\frac{1}{1-\gamma_s}} \tag{32}$$

The *actual* price index of the composite good sold in region d in sector s used by state government in region d is given by:

$$P_{d,s}^{g_s} = \frac{E_{d,s}^{g_s}}{Y_{d,s}^{g_s}} = \left(Y_{d,s}^{g_s} \right)^{-1} \sum_o \int_{j \in J_{o,s}} p_{od,s}^{g_s}(j) q_{od,s}^{g_s}(j) dj \tag{33}$$

Using the third item from Equation (17) to substitute for $q_{od,s}^{g_s}(j)$:

$$P_{d,s}^{g_s} = \sum_o \frac{Y_{od,s}^{g_s}}{Y_{d,s}^{g_s}} \left(\tilde{P}_{od,s}^{g_s} \right)^{\gamma_s} \kappa_{od,s}^{-\gamma_s} \int_{j \in J_{o,s}} \left(p_{od,s}^{g_s}(j) \right)^{1-\gamma_s} dj \tag{34}$$

Using the second item from Equation (17) to substitute for $\frac{Y_{od,s}^{g_s}}{Y_{d,s}^{g_s}}$:

$$P_{d,s}^{g_s} = \sum_o \left(\tilde{P}_{d,s}^{g_s} \right)^{\sigma_s} \left(\tilde{P}_{od,s}^{g_s} \right)^{\gamma_s - \sigma_s} \kappa_{od,s}^{-\gamma_s} \int_{j \in J_{o,s}} \left(p_{od,s}^{g_s}(j) \right)^{1-\gamma_s} dj \tag{35}$$

Multiply and divide by $\kappa_{od,s}$

$$P_{d,s}^{g_s} = \sum_o \left(\tilde{P}_{d,s}^{g_s}\right)^{\sigma_s} \left(\tilde{P}_{od,s}^{g_s}\right)^{\gamma_s - \sigma_s} \kappa_{od,s}^{-1} \int_{j \in J_{o,s}} \left(\kappa_{od,s} p_{od,s}^{g_s}(j)\right)^{1-\gamma_s} dj \tag{36}$$

Using the third item in Equation (18):

$$P_{d,s}^{g_s} = \sum_o \left(\tilde{P}_{d,s}^{g_s}\right)^{\sigma_s} \left(\tilde{P}_{od,s}^{g_s}\right)^{\gamma_s - \sigma_s} \kappa_{od,s}^{-1} \left(\tilde{P}_{od,s}^{g_s}\right)^{1-\gamma_s} \tag{37}$$

Therefore:

$$P_{d,s}^{g_s} = \left(\tilde{P}_{d,s}^{g_s}\right)^{\sigma_s} \sum_o \left(\tilde{P}_{od,s}^{g_s}\right)^{1-\sigma_s} \kappa_{od,s}^{-1} \tag{38}$$

Combining Equation (38) with Equation (18):

$$P_{d,s}^{g_s} = \frac{\sum_o \left(\tilde{P}_{od,s}^{g_s}\right)^{1-\sigma_s} \kappa_{od,s}^{-1}}{\left[\sum_o \left(\tilde{P}_{od,s}^{g_s}\right)^{1-\sigma_s}\right]^{\frac{\sigma_s}{\sigma_s - 1}}} \tag{39}$$

B.2 Proof of Proposition 1

Proof of Proposition 1: Start from the expression for the actual unit cost derived in Appendix B.1, Equation (38),

$$P_{d,s}^{g_s} = \left(\tilde{P}_{d,s}^{g_s}\right)^{\sigma_s} \sum_o \left(\tilde{P}_{od,s}^{g_s}\right)^{1-\sigma_s} \kappa_{od,s}^{-1}.$$

Multiply and divide the right hand side by $\tilde{P}_{d,s}^{g_s}$:

$$P_{d,s}^{g_s} = \tilde{P}_{d,s}^{g_s} \sum_o \kappa_{od,s}^{-1} \omega_{od,s}^{g_s}, \qquad \omega_{od,s}^{g_s} \equiv \left(\frac{\tilde{P}_{od,s}^{g_s}}{\tilde{P}_{d,s}^{g_s}}\right)^{1-\sigma_s}, \tag{40}$$

where $\{\omega_{od,s}^{g_s}\}$ are the CES shares in the *perceived* price index and satisfy $\sum_o \omega_{od,s}^{g_s} = 1$.

Part (i). Suppose $\kappa_{od,s} = \kappa_{d,s}$ for every origin o. Equation (40) becomes:

$$P_{d,s}^{g_s} = \kappa_{d,s}^{-1} \tilde{P}_{d,s}^{g_s} \tag{41}$$

So the *actual* unit cost equals the *perceived* price index scaled down by the constant buy-local policy. Using Equation (32) and the CES aggregator across origins,

$$\tilde{P}_{d,s}^{g_s} = \kappa_{d,s} \underbrace{\left[\sum_o \left(\frac{\gamma_s}{\gamma_s - 1} \tau_{od,s} w_o \left|J_{o,s}\right|^{\frac{-1}{\gamma_s - 1}} \Gamma_s^{\frac{1}{1-\gamma_s}}\right)^{1-\sigma_s}\right]^{\frac{1}{1-\sigma_s}}}_{\equiv P_{d,s}^{g_s *}}, \tag{42}$$

and therefore

$$P_{d,s}^{g_s} = P_{d,s}^{g_s *}, \tag{43}$$

which is identical to the unit cost in an economy with $\kappa_{od,s} = 1$ for all origins.

The intuition is as follows. Buy-local policies affect how that budget is allocated across varieties of different origins. When the policy is constant across origins, the government perceives every variety as equally cheaper or equally more expensive: the overall perceived price index scales up or down, but relative perceived prices—and therefore expenditure shares—remain identical to those in an economy without buy-local policies. Because payments are made at posted prices and sourcing shares are unchanged, deflating the perceived index by the constant $\kappa_{d,s}$ recovers the same actual unit cost as under $\kappa_{od,s} = 1$ for all origins.

Part (ii). Suppose the hypothesis of part (i) holds in every sector s. Then $P_{d,s}^{g_s} = P_{d,s}^{g_s *}$ for all s. Substituting into the aggregate effective price index of procurement (16) yields

$$P_d^{g_s} = \prod_s \left(\frac{P_{d,s}^{g_s *}}{\theta_s^{g_s}}\right)^{\theta_s^{g_s}} = P_d^{g_s *}. \tag{44}$$

The wage component of the full unit cost of $Y_d^{g_s}$ is the same in the distorted and undistorted economies, since buy-local policy applies only to purchased varieties. Sectoral expenditure shares remain $E_{d,s}^{g_s} = \theta_s^{g_s} E_d^{g_s}$ regardless of $\{\kappa_{d,s}\}_s$, so origin-symmetric policies that differ across sectors do not distort the aggregate cost of procurement.

Part (iii). Let's make use again of the perceived price of varieties from origin o in Equation (32):

$$\tilde{P}_{od,s}^{g_s} = \kappa_{od,s} \underbrace{\frac{\gamma_s}{\gamma_s - 1} \tau_{od,s} w_o \left|J_{o,s}\right|^{\frac{-1}{\gamma_s - 1}} \Gamma_s^{\frac{1}{1-\gamma_s}}}_{\equiv A_{od,s}}$$

where $A_{od,s}$ is the CES index of *posted* prices from origin o (independent of κ), and let $A_{d,s} \equiv \left(\sum_o A_{od,s}^{1-\sigma_s}\right)^{\frac{1}{1-\sigma_s}}$ denote the corresponding CES index across origins (so $A_{d,s} = P_{d,s}^{g_s *}$). For any policy vector $\{\kappa_{od,s}\}_o$, the actual unit cost $P_{d,s}^{g_s}$ is then the expenditure-weighted average of $\{A_{od,s}\}_o$ under the sourcing shares induced by *perceived* prices. Those shares coincide with the cost-minimizing shares for posted prices if and only if $\{\kappa_{od,s}\}_o$ is constant across origins. By the definition of cost minimization, any other share vector yields higher unit cost. Therefore $P_{d,s}^{g_s}$ is minimized—and equals $A_{d,s}$—when $\kappa_{od,s}$ is constant across origins, and any dispersion in κ across origins strictly raises true procurement costs relative to that benchmark. ■

B.3 Proof of Proposition 2

Proof of Proposition 2:

Additional assumptions. As mentioned in the main text, we work in a simplified benchmark with one sector and two final goods—private consumption and state government consumption. Labor supply is exogenous. We characterize the optimal unilateral buy-local policy from the perspective of the active region d, taking region o as passive: o applies no buy-local policy and does not retaliate.

Objective. The objective is to write consumption allocations of region d, i.e., Y_d^p and Y_d^g as a function of fundamentals and some terms of trade notion. The idea is that the social planner at the region level will first choose the terms of trade that maximize region d's consumers utility.

Setting up the problem. Our terms of trade notion is the following

$$A \equiv \frac{P_{od}}{P_{dd}} \tag{45}$$

A is the relative price of imports to local goods *in the active region* d—equivalently, how many units of the domestic good d must give up to obtain one unit of the foreign good. Notice that A is *not* the terms of trade of d: the terms of trade are the relative price of d's exports to its imports, whereas A is the inverse of that relative price (up to iceberg costs).

We work with $P_{dd} = 1$ as the numeraire. We therefore get the following iceberg structure:

$$A = P_{od} \tag{46}$$

$$P_{do} = \tau_{do} \tag{47}$$

$$P_{oo} = \frac{A}{\tau_{od}} \tag{48}$$

Use *Trade balance* to express A as a function of fundamentals, τ_{do}, region d's imports, and region d's exports. The value of goods shipped out of each location equals the value of goods shipped in:

$$P_{od}\, Y_{od} = P_{do}\, Y_{do}. \tag{49}$$

Substituting the iceberg structure from above,

$$A\, Y_{od} = \tau_{do}\, Y_{do}, \qquad \Rightarrow \qquad A = \frac{\tau_{do}\, Y_{do}}{Y_{od}}, \tag{50}$$

where $Y_{do} \equiv Y_{do}^g + Y_{do}^p$ denotes exports of d (absorption of d-goods in o) and $Y_{od} \equiv Y_{od}^g + Y_{od}^p$ denotes imports of d (absorption of o-goods in d). Let's also define $Y_{oo} \equiv Y_{oo}^g + Y_{oo}^p$ and $Y_{dd} \equiv Y_{dd}^g + Y_{dd}^p$.

Market clearing. Define real output as

$$Q_o \equiv \frac{GDP_o}{P_{oo}}, \qquad Q_d \equiv \frac{GDP_d}{P_{dd}}. \tag{51}$$

Market clearing in each location requires that domestic production equals domestic absorption plus the physical units shipped abroad:

$$Q_o = Y_{oo}^g + Y_{oo}^p + \tau_{od}\left(Y_{od}^g + Y_{od}^p\right) = Y_{oo} + \tau_{od} Y_{od}, \tag{52}$$

$$Q_d = Y_{dd}^g + Y_{dd}^p + \tau_{do}\left(Y_{do}^g + Y_{do}^p\right) = Y_{dd} + \tau_{do} Y_{do}. \tag{53}$$

Market clearing at o implies implies $Y_{oo} = Q_o - \tau_{od} Y_{od}$.

Passive-region allocation. Region o does not apply buy-local policies, so its private and state buyers face the same relative prices and choose the same expenditure shares across origins. CES demand at destination o gives

$$\frac{Y_{do}^g}{Y_{oo}^g} = \left(\frac{P_{do}}{P_{oo}}\right)^{-\sigma}, \tag{54}$$

$$\frac{Y_{do}^p}{Y_{oo}^p} = \left(\frac{P_{do}}{P_{oo}}\right)^{-\sigma}. \tag{55}$$

With the iceberg structure from above,

$$\frac{P_{do}}{P_{oo}} = \frac{\tau_{od}\tau_{do}}{A}, \tag{56}$$

Adding up the two Equations (54) and (55):

$$\frac{Y_{do}}{Y_{oo}} = \left(\frac{\tau_{od}\tau_{do}}{A}\right)^{-\sigma}. \tag{57}$$

Export demand that d faces. Combining market clearing at o with (57) and (50),

$$Y_{do} = \left(\frac{\tau_{od}\tau_{do}}{A}\right)^{-\sigma}\left(Q_o - \tau_{od} Y_{od}\right), \qquad Y_{od} = \frac{\tau_{do}\, Y_{do}}{A}. \tag{58}$$

This is a system of two equations and two unknowns, $\{Y_{od}, Y_{do}\}$. Solving for imports and exports of d yields

$$Y_{od}(A) = \frac{Q_o\, A^{\sigma-1}}{\tau_{od}\left[A^{\sigma-1} + (\tau_{od}\tau_{do})^{\sigma-1}\right]}, \tag{59}$$

$$Y_{do}(A) = \frac{Q_o\, A^{\sigma}}{\tau_{do}\tau_{od}\left[A^{\sigma-1} + (\tau_{od}\tau_{do})^{\sigma-1}\right]}. \tag{60}$$

Equation (60) is (overall) export demand that the active region faces: purchases in passive o of goods produced in d, as a function of fundamentals and A only.

Active-region private allocation. Let β_d denote the share of region d's expenditure allocated to the state government, so private expenditure is $(1-\beta_d)Q_d$ when measured in units of the local good. Private buyers in d face undistorted CES prices, and $A = P_{od}/P_{dd} = P_{od}$ is exactly their relative import price. Hence

$$\frac{Y^p_{od}}{Y^p_{dd}} = A^{-\sigma}, \tag{61}$$

and the private budget constraint is

$$Y^p_{dd} + A\,Y^p_{od} = (1-\beta_d)\,Q_d. \tag{62}$$

Combining these yields

$$Y^p_{dd}(A) = \frac{(1-\beta_d)Q_d}{1+A^{1-\sigma}}, \qquad Y^p_{od}(A) = \frac{(1-\beta_d)Q_d\,A^{-\sigma}}{1+A^{1-\sigma}}, \tag{63}$$

The private composite is the CES aggregator of these two origin bundles,

$$Y^p_d = \left[\left(Y^p_{dd}\right)^{\frac{\sigma-1}{\sigma}} + \left(Y^p_{od}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}. \tag{64}$$

Substituting (63) and using $Y^p_{od}/Y^p_{dd} = A^{-\sigma}$,

$$Y^p_d = Y^p_{dd}\left[1+\left(\frac{Y^p_{od}}{Y^p_{dd}}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} = Y^p_{dd}\left(1+A^{1-\sigma}\right)^{\frac{\sigma}{\sigma-1}} = \frac{(1-\beta_d)Q_d}{1+A^{1-\sigma}}\left(1+A^{1-\sigma}\right)^{\frac{\sigma}{\sigma-1}},$$

which simplifies to

$$Y^p_d(A) = (1-\beta_d)Q_d\left(1+A^{1-\sigma}\right)^{\frac{1}{\sigma-1}}. \tag{65}$$

Thus private consumption in the active region depends on fundamentals and on A only. The government block is analogous, but the relative price that enters state demand is the *perceived* relative price, which embeds κ.

Active-region government allocation. Rather than writing state demand in terms of κ directly, we exploit the fact that total imports $Y_{od}(A)$ are already pinned down by external balance (Equation (59)). Private imports, already solved for above take $Y^p_{od}(A)$ of that total, so residual imports available for the state government are

$$Y^g_{od}(A) \equiv Y_{od}(A) - Y^p_{od}(A). \tag{66}$$

Government expenditure in units of the local good is $\beta_d Q_d$. Actual payments are made at posted prices, so

$$Y^g_{dd} + A\,Y^g_{od} = \beta_d Q_d, \tag{67}$$

and therefore domestic government purchases are the residual

$$Y_{dd}^g(A) = \beta_d Q_d - A\, Y_{od}^g(A). \tag{68}$$

An interior allocation requires $0 < Y_{od}^g(A) < \beta_d Q_d / A$. The implied sourcing ratio for the state government is

$$\frac{Y_{od}^g(A)}{Y_{dd}^g(A)} = \frac{Y_{od}^g(A)}{\beta_d Q_d - A\, Y_{od}^g(A)}. \tag{69}$$

The public composite is then the CES aggregator of these two origin bundles,

$$Y_d^g(A) = \left[\left(Y_{dd}^g(A)\right)^{\frac{\sigma-1}{\sigma}} + \left(Y_{od}^g(A)\right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}. \tag{70}$$

At this stage, both Y_d^p and Y_d^g are functions of A (and fundamentals) alone. The buy-local factor κ is not needed to evaluate welfare for a given A; it will be recovered afterwards as the policy that implements the optimal sourcing ratio (69).

Summary. The derivations above reduce full equilibrium to a single free variable, the terms-of-trade object $A \equiv P_{od}/P_{dd}$. Working with the numeraire $P_{dd} = 1$, we expressed all equilibrium allocations as explicit functions of A and fundamentals $\{Q_o, Q_d, \tau_{od}, \tau_{do}, \sigma, \beta_d\}$. The logical steps were as follows.

1. *Price normalization.* Setting $P_{dd} = 1$ pins down the full price system: $P_{od} = A$, $P_{do} = \tau_{do}$, and $P_{oo} = A/\tau_{od}$.

2. *Trade balance.* Value balance across the two regions gives $A = \tau_{do} Y_{do}/Y_{od}$, linking A to the import–export ratio of region d.

3. *Passive-region allocation.* Because region o applies no buy-local policy, private and government buyers there face the same relative prices and choose the same expenditure shares. CES demand at o delivers the ratio $Y_{do}/Y_{oo} = (\tau_{od}\tau_{do}/A)^{-\sigma}$.

4. *Export demand and import supply.* Combining the passive-region CES condition with market clearing at o and the trade-balance relation yields closed-form expressions for $Y_{od}(A)$ and $Y_{do}(A)$ (Equations (59)–(60)).

5. *Active-region private allocation.* Private buyers in d face undistorted prices, so their demand is standard CES. This gives $Y_{dd}^p(A)$ and $Y_{od}^p(A)$, and hence the private composite $Y_d^p(A)$.

6. *Active-region government allocation.* Total imports $Y_{od}(A)$ are pinned down by step 4. Subtracting private imports gives government imports $Y_{od}^g(A)$; the government budget constraint then delivers domestic government purchases $Y_{dd}^g(A)$ and the public composite $Y_d^g(A)$.

The full set of equilibrium allocations, all expressed as functions of A, is:

$$Y_{do}(A) = \frac{Q_o\, A^{\sigma}}{\tau_{do}\tau_{od}\left[A^{\sigma-1} + (\tau_{od}\tau_{do})^{\sigma-1}\right]} \qquad \text{Exports of } d \text{ (absorption of } d\text{-goods in } o)$$

$$Y_{od}(A) = \frac{Q_o\, A^{\sigma-1}}{\tau_{od}\left[A^{\sigma-1} + (\tau_{od}\tau_{do})^{\sigma-1}\right]} \qquad \text{Imports of } d \text{ (absorption of } o\text{-goods in } d)$$

$$Y^p_{dd}(A) = \frac{(1-\beta_d)Q_d}{1 + A^{1-\sigma}} \qquad \text{Private domestic purchases}$$

$$Y^p_{od}(A) = \frac{(1-\beta_d)Q_d\, A^{-\sigma}}{1 + A^{1-\sigma}} \qquad \text{Private imports}$$

$$Y^p_d(A) = (1-\beta_d)Q_d\left(1 + A^{1-\sigma}\right)^{\frac{1}{\sigma-1}} \qquad \text{Private composite}$$

$$Y^g_{od}(A) = Y_{od}(A) - Y^p_{od}(A) \qquad \text{Government imports (residual)}$$

$$Y^g_{dd}(A) = \beta_d Q_d - A\, Y^g_{od}(A) \qquad \text{Government domestic purchases}$$

$$Y^g_d(A) = \left[\left(Y^g_{dd}(A)\right)^{\frac{\sigma-1}{\sigma}} + \left(Y^g_{od}(A)\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \qquad \text{Public composite}$$

The planner's problem. Before stating the problem formally, it is useful to clarify the role of the utility function. The household's utility over private and public consumption determines the optimal expenditure share β_d that the government should allocate to public goods. Whatever the functional form of preferences, this intratemporal problem pins down β_d and commits amounts $(1-\beta_d)Q_d$ and $\beta_d Q_d$ to private and public composites respectively. Once β_d is fixed, the marginal utility of a dollar of private consumption equals the marginal utility of a dollar of public consumption at the optimum, so the planner's residual problem is simply to maximize the real value of total consumption. The utility function does not appear explicitly in what follows because it has already been used to determine β_d. This separability holds for any utility function that is separable in private and public consumption; different preferences imply different values of β_d, but the structure of the planner's problem and the form of the optimal policy κ^* are the same regardless. Note that this approach treats β_d as fixed when optimizing over procurement: the planner is choosing only how each budget is sourced across origins, not whether to reallocate between private and public spending.

The social planner for region d therefore chooses the terms-of-trade object A to maximize a weighted sum of the private composite and the public composite:

$$\max_A\; V\left(Y^p_d(A),\, Y^g_d(A)\right) \;=\; \max_A\; \left[\,(1-\beta_d)\,Y^p_d(A) \;+\; \beta_d\, Y^g_d(A)\,\right], \tag{71}$$

where β_d is the share of regional income spent by the state government. The weights reflect

the fact that both composite goods enter regional welfare symmetrically, with the government share β_d serving as the natural weight on public consumption.

First-order condition.
The first-order condition with respect to A is

$$(1-\beta_d)\,\frac{\partial Y_d^p}{\partial A} \;+\; \beta_d\,\frac{\partial Y_d^g}{\partial A} \;=\; 0. \tag{72}$$

We derive each derivative in turn.

Private side. From (65),

$$\frac{\partial Y_d^p}{\partial A} = (1-\beta_d)\,Q_d \cdot \frac{1}{\sigma-1}\big(1+A^{1-\sigma}\big)^{\frac{1}{\sigma-1}-1}\cdot(1-\sigma)\,A^{-\sigma} = -(1-\beta_d)\,Q_d\,A^{-\sigma}\big(1+A^{1-\sigma}\big)^{\frac{2-\sigma}{\sigma-1}}. \tag{73}$$

Government side. The public composite (70) depends on A through both $Y_{od}^g(A)$ and $Y_{dd}^g(A) = \beta_d Q_d - A\,Y_{od}^g(A)$. Applying the chain rule to the CES aggregator,

$$\frac{\partial Y_d^g}{\partial A} = \left(\frac{Y_{dd}^g}{Y_d^g}\right)^{-1/\sigma}\frac{\partial Y_{dd}^g}{\partial A} \;+\; \left(\frac{Y_{od}^g}{Y_d^g}\right)^{-1/\sigma}\frac{\partial Y_{od}^g}{\partial A}, \tag{74}$$

where

$$\frac{\partial Y_{dd}^g}{\partial A} = -Y_{od}^g(A) - A\,\frac{\partial Y_{od}^g}{\partial A}, \tag{75}$$

$$\frac{\partial Y_{od}^g}{\partial A} = \frac{\partial Y_{od}}{\partial A} - \frac{\partial Y_{od}^p}{\partial A}. \tag{76}$$

It remains to compute $\partial Y_{od}/\partial A$ and $\partial Y_{od}^p/\partial A$ explicitly.

Derivative of total imports. Let $\Delta \equiv A^{\sigma-1} + (\tau_{od}\tau_{do})^{\sigma-1}$ so that (59) reads $Y_{od} = Q_o A^{\sigma-1}/(\tau_{od}\Delta)$. Differentiating,

$$\frac{\partial Y_{od}}{\partial A} = \frac{Q_o}{\tau_{od}}\cdot\frac{(\sigma-1)A^{\sigma-2}\Delta - A^{\sigma-1}(\sigma-1)A^{\sigma-2}}{\Delta^2} = \frac{(\sigma-1)Q_o\,A^{\sigma-2}(\tau_{od}\tau_{do})^{\sigma-1}}{\tau_{od}\,\Delta^2}. \tag{77}$$

This is positive: a higher A (more expensive imports) raises the *quantity* of imports demanded at o because producers there can now sell more to d at better relative prices — the terms-of-trade effect dominates the substitution effect on the extensive margin.

Derivative of private imports. From (63), $Y_{od}^p = (1-\beta_d)Q_d A^{-\sigma}/(1+A^{1-\sigma})$. Differentiating,

$$\frac{\partial Y_{od}^p}{\partial A} \;=\; (1-\beta_d)Q_d\cdot\frac{-\sigma A^{-\sigma-1}(1+A^{1-\sigma}) - A^{-\sigma}(1-\sigma)A^{-\sigma}}{(1+A^{1-\sigma})^2} \tag{78}$$

$$\;=\; -(1-\beta_d)Q_d\,A^{-\sigma-1}\frac{\sigma + (2\sigma-1)A^{1-\sigma} - (1-\sigma)A^{2(1-\sigma)}}{(1+A^{1-\sigma})^2}. \tag{79}$$

Assembled FOC. Substituting (77)–(79) into (76) and (75), and then into (74), the full first-order condition (72) becomes

$$-(1-\beta_d)^2 Q_d\, A^{-\sigma}\left(1+A^{1-\sigma}\right)^{\frac{2-\sigma}{\sigma-1}} + \beta_d\left[\left(\frac{Y^g_{dd}}{Y^g_d}\right)^{-1/\sigma}\left(-Y^g_{od}-A\,\frac{\partial Y^g_{od}}{\partial A}\right)+\left(\frac{Y^g_{od}}{Y^g_d}\right)^{-1/\sigma}\frac{\partial Y^g_{od}}{\partial A}\right]=0, \tag{80}$$

where all quantities are evaluated at A and $\partial Y^g_{od}/\partial A = \partial Y_{od}/\partial A - \partial Y^p_{od}/\partial A$ is given by (77)–(79). Equation (80) implicitly defines the optimal A^*.

Closed-form optimal buy-local policy. We can obtain a closed-form expression for the optimal κ directly by simplifying the FOC. The key step is to rewrite the derivatives $\partial Y_{od}/\partial A$ and $\partial Y^p_{od}/\partial A$ in terms of observable expenditure shares, which eliminates A from the optimality condition.

Rewriting the derivatives in terms of shares. Define the following expenditure shares:

$$\lambda_{oo} \equiv \frac{Y_{oo}}{Q_o} \qquad \text{(domestic share in passive region } o\text{)},$$

$$\lambda^p_{od} \equiv \frac{A\,Y^p_{od}}{(1-\beta_d)Q_d} \qquad \text{(import share in private expenditure of } d\text{)},$$

$$\lambda^g_{od} \equiv \frac{A\,Y^g_{od}}{\beta_d Q_d} \qquad \text{(import share in government expenditure of } d\text{)}.$$

Using these, one can show that

$$\frac{\partial Y_{od}}{\partial A} = \frac{\sigma-1}{A}\,Y_{od}\,\lambda_{oo}, \tag{81}$$

$$\frac{\partial Y^p_{od}}{\partial A} = -\frac{\sigma}{A}\,Y^p_{od} + \frac{\sigma-1}{(1-\beta_d)Q_d}\,(Y^p_{od})^2. \tag{82}$$

Combining these with $\partial Y^g_{od}/\partial A = \partial Y_{od}/\partial A - \partial Y^p_{od}/\partial A$ gives

$$\frac{\partial Y^g_{od}}{\partial A} = \frac{\sigma-1}{A}\,Y_{od}\,\lambda_{oo} + \frac{\sigma}{A}\,Y^p_{od} - \frac{\sigma-1}{(1-\beta_d)Q_d}\,(Y^p_{od})^2. \tag{83}$$

Simplifying the CES marginal utility weights. Recall that the government's perceived relative price satisfies $(Y^g_{od}/Y^g_{dd})^{-1/\sigma} = \kappa/A$. Using this together with the definition of λ^g_{od},

$$\frac{Y^g_d}{\beta_d Q_d}\left(\frac{Y^g_{dd}}{Y^g_d}\right)^{1/\sigma} = 1+\left(\frac{1}{\kappa}-1\right)\lambda^g_{od}. \tag{84}$$

Assembling the closed-form FOC. We now specialize to Cobb-Douglas preferences over the private and public composites, as in Equation (2). In the simplified two-region setup, the relevant weights are $(1-\beta_d)$ on private consumption and β_d on state government consumption.

When expenditure shares are optimal—so that β_d matches the preference weight on public goods—the marginal utility ratio between private and public composites is unity. Substituting (81)–(84) into the FOC (80) and using this Cobb-Douglas structure, the first-order condition reduces directly to

$$\frac{1}{\kappa} - 1 = \frac{1}{(\sigma - 1)\,\lambda_{oo} + \dfrac{Y_{od}^{p}}{Y_{od}}\left[\sigma \lambda_{dd}^{p} + (\lambda_{dd}^{g} - \lambda_{dd}^{p})\right]}, \tag{85}$$

where $\lambda_{dd}^{p} \equiv 1 - \lambda_{od}^{p}$ and $\lambda_{dd}^{g} \equiv 1 - \lambda_{od}^{g}$ are the domestic expenditure shares of the private and government sectors respectively, and Y_{od}^{p}/Y_{od} is the share of private buyers in total imports.

■

B.4 Inefficiencies and restoring aggregate efficiency

Suppose that the following policy instruments are available: (i) sector-specific production subsidies, and (ii) non-distortionary (lump-sum) location-specific taxes. With these instruments, Equation (22) becomes:

$$p^i_{od,s}(j) = \frac{\gamma_s}{\gamma_s - 1}\frac{\tau_{od,s}}{\mathcal{S}_s}\frac{w_o}{z_{o,s}(j)}, \qquad i \in \{p, g_f, g_s\} \tag{86}$$

where $\mathcal{S}_s$ is the gross subsidy (so $\mathcal{S}_s \in (0,1)$ would be a tax). Similarly, Equation (32) becomes

$$P^i_{od,s} = \frac{\gamma_s}{\gamma_s - 1}\frac{\tau_{od,s}}{\mathcal{S}_s} w_o \left|J_{o,s}\right|^{\frac{-1}{\gamma_s - 1}} \Gamma_s^{\frac{1}{1-\gamma_s}}, \qquad i \in \{p, g_f\}, \tag{87}$$

$$\tilde{P}^{g_s}_{od,s} = \kappa_{od,s}\frac{\gamma_s}{\gamma_s - 1}\frac{\tau_{od,s}}{\mathcal{S}_s} w_o \left|J_{o,s}\right|^{\frac{-1}{\gamma_s - 1}} \Gamma_s^{\frac{1}{1-\gamma_s}}. \tag{88}$$

In the aggregates below we write $\kappa^i_{od,s} = 1$ for $i \in \{p, g_f\}$, and $\kappa^{g_s}_{od,s} = \kappa_{od,s}$.

As a result, we obtain the following aggregates.

Bundle of sector-s goods sourced from origin o (from Equations (7), (12), (17) and (87)):

$$Y^i_{od,s} = \Gamma_s^{\frac{-1}{1-\gamma_s}}\frac{\gamma_s - 1}{\gamma_s}\mathcal{S}_s \frac{\left(\kappa^i_{od,s}\tau_{od,s}w_o\left(\left|J_{o,s}\right|\right)^{\frac{1}{1-\gamma_s}}\right)^{-\sigma_s}}{\sum_{o'}\left(\kappa^i_{o'd,s}\tau_{o'd,s}w_{o'}\left(\left|J_{o',s}\right|\right)^{\frac{1}{1-\gamma_s}}\right)^{1-\sigma_s}}\theta^i_{d,s}\frac{\tilde{P}^i_{d,s}}{P^i_{d,s}}E^i_d \tag{89}$$

Note that the fraction $\frac{\tilde{P}^i_{d,s}}{P^i_{d,s}} = 1$ for $i \in \{p, g_f\}$, where $\tilde{P}^i_{d,s} \equiv P^i_{d,s}$, and $\frac{\tilde{P}^{g_s}_{d,s}}{P^{g_s}_{d,s}} = \kappa_{d,s}$ when $\kappa_{od,s}$ is constant across origins.

Sector-s composite:

$$Y^i_{d,s} = \Gamma_s^{\frac{-1}{1-\gamma_s}}\frac{\gamma_s - 1}{\gamma_s}\mathcal{S}_s\theta^i_{d,s}\frac{\tilde{P}^i_{d,s}}{P^i_{d,s}}E^i_d\left(\sum_o\left(\kappa^i_{od,s}\tau_{od,s}w_o\left(\left|J_{o,s}\right|\right)^{\frac{1}{1-\gamma_s}}\right)^{1-\sigma_s}\right)^{\frac{1}{\sigma_s - 1}} \tag{90}$$

Final good i produced in region d:

$$c^i_d = \frac{Y^i_d}{L^{\chi_i}_d} = \frac{1}{L^{\chi_i}_d}E^i_d\prod_s\left[\Gamma_s^{\frac{-1}{1-\gamma_s}}\frac{\gamma_s - 1}{\gamma_s}\mathcal{S}_s\theta^i_{d,s}\frac{\tilde{P}^i_{d,s}}{P^i_{d,s}}\right]^{\theta^i_{d,s}}\left(\sum_o\left(\kappa^i_{od,s}\tau_{od,s}w_o\left(\left|J_{o,s}\right|\right)^{\frac{1}{1-\gamma_s}}\right)^{1-\sigma_s}\right)^{\frac{\theta^i_{d,s}}{\sigma_s - 1}} \tag{91}$$

We now derive the efficiency conditions from the planner's problem, and then compare them to the decentralized economy (DE).

Planner's problem. An allocation is efficient if and only if it solves the following problem for a vector of weights $\{\beta_d\}_d$.

$$\begin{aligned}
\max_{h^i_{od,s}(j)} \quad & \sum_d \beta_d U_d \\
\text{s.t.} \quad & U_d = \left(\frac{Y^p_d}{L_d}\right)^{\alpha_p} \left(\frac{Y^{g_f}_d}{L^{\chi_{gf}}_d}\right)^{\alpha_{g_f}} \left(\frac{Y^{g_s}_d}{L^{\chi_{gs}}_d}\right)^{\alpha_{g_s}} - \psi \frac{h_d^{1+1/\eta}}{1+1/\eta} \\
& Y^i_d = \prod_s \left(Y^i_{d,s}\right)^{\theta^i_{d,s}} \\
& Y^i_{d,s} = \left(\sum_o \left(Y^i_{od,s}\right)^{\frac{\sigma_s-1}{\sigma_s}}\right)^{\frac{\sigma_s}{\sigma_s-1}} \\
& Y^i_{od,s} = \left(\int_{j\in J_{o,s}} \left(q^i_{od,s}(j)\right)^{\frac{\gamma_s-1}{\gamma_s}} dj\right)^{\frac{\gamma_s}{\gamma_s-1}} \\
& q^i_{od,s}(j) = \frac{z_{od,s}(j)}{\tau_{od,s}} h^i_{od,s}(j) L_o \\
& h_o = \sum_d \sum_i \int_{j\in J_{o,s}} h^i_{od,s}(j) dj
\end{aligned}$$

Essentially, the planner chooses how many hours the representative agent in o must work in firm j, sector s to supply the final good i in region d to maximize a weighted sum of utilities. The FOC w.r.t. an arbitrary $h^i_{od,s}(j)$ can be written as

$$\beta_o \psi h_o^{1/\eta} = \beta_d \alpha_i \frac{c_d}{c^i_d} \frac{1}{L^{\chi_i}_d} \theta^i_{d,s} \frac{Y^i_d}{Y^i_{d,s}} \left(Y^i_{d,s}\right)^{1/\sigma_s} \left(Y^i_{od,s}\right)^{\frac{-1}{\sigma_s}} \left(Y^i_{od,s}\right)^{1/\gamma_s} \left(q^i_{od,s}(j)\right)^{\frac{-1}{\gamma_s}} \frac{z_{od,s}(j)}{\tau_{od,s}} L_o$$

Rearranging

$$\left(q^i_{od,s}(j)\right)^{\frac{1}{\gamma_s}} = h_o^{-1/\eta} \frac{\beta_d}{\beta_o} \frac{\alpha_i}{\psi} c_d \theta^i_{d,s} \left(Y^i_{d,s}\right)^{1/\sigma_s - 1} \left(Y^i_{od,s}\right)^{\frac{1}{\gamma_s} - \frac{1}{\sigma_s}} \frac{z_{od,s}(j)}{\tau_{od,s}} L_o \tag{92}$$

This implies the following aggregates.

Bundle of sector-s goods sourced from origin o:

$$\begin{aligned}
Y^i_{od,s} &= \left[h_o^{-1/\eta} \frac{\beta_d}{\beta_o} \frac{\alpha_i}{\psi} c_d \theta^i_{d,s} \left(Y^i_{d,s}\right)^{1/\sigma_s - 1} \left(Y^i_{od,s}\right)^{\frac{1}{\gamma_s} - \frac{1}{\sigma_s}} \frac{L_o}{\tau_{od,s}}\right]^{\gamma_s} \left(\int_{j\in J_{o,s}} \left(z_{od,s}(j)\right)^{\gamma_s - 1} dj\right)^{\frac{\gamma_s}{\gamma_s - 1}} \\
&= \left[h_o^{-1/\eta} \frac{\beta_d}{\beta_o} \frac{\alpha_i}{\psi} c_d \theta^i_{d,s} \left(Y^i_{d,s}\right)^{1/\sigma_s - 1} \left(Y^i_{od,s}\right)^{\frac{1}{\gamma_s} - \frac{1}{\sigma_s}} \frac{L_o}{\tau_{od,s}}\right]^{\gamma_s} \left(|J_{o,s}|\, \Gamma_s\right)^{\frac{\gamma_s}{\gamma_s - 1}} \\
&= \left[h_o^{-1/\eta} \frac{\beta_d}{\beta_o} \frac{\alpha_i}{\psi} c_d \theta^i_{d,s} \left(Y^i_{d,s}\right)^{1/\sigma_s - 1} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s} \left(|J_{o,s}|\, \Gamma_s\right)^{\frac{\sigma_s}{\gamma_s - 1}}
\end{aligned} \tag{93}$$

Sector-s composite:

$$Y_{d,s}^i = \left[\beta_d \alpha_i c_d \theta_{d,s}^i \left(Y_{d,s}^i\right)^{1/\sigma_s - 1}\right]^{\sigma_s} (\Gamma_s)^{\frac{\sigma_s}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s - 1} (|J_{o,s}|)^{\frac{\sigma_s - 1}{\gamma_s - 1}}\right)^{\frac{\sigma_s}{\sigma_s - 1}}$$

$$= \beta_d \alpha_i c_d \theta_{d,s}^i \Gamma_s^{\frac{1}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s - 1} (|J_{o,s}|)^{\frac{\sigma_s - 1}{\gamma_s - 1}}\right)^{\frac{1}{\sigma_s - 1}} \tag{94}$$

MIQUEL → Soy partidario de mantener ψ location specific: ψ_o. 1. No creo que confunda al lector. 2. Actualmente lo usamos en la calibración para matchear $\frac{employment_o}{population_o}$.

Effective per capita consumption of final good i produced in region d:

$$c_d^i = \frac{Y_d^i}{L_d^{\chi_i}} = \frac{1}{L_d^{\chi_i}} \beta_d \alpha_i c_d \prod_s \left(\theta_{d,s}^i\right)^{\theta_{d,s}^i} (\Gamma_s)^{\frac{\theta_{d,s}^i}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s - 1} (|J_{o,s}|)^{\frac{\sigma_s - 1}{\gamma_s - 1}}\right)^{\frac{\theta_{d,s}^i}{\sigma_s - 1}} \tag{95}$$

Efficiency at the *odsi* level. In the DE, Equations (7), (12), (17) and (86) imply that the relative demand in d, i across two goods (j, j') from o, s is

$$\left(\frac{q_{od,s}^i(j)}{q_{od,s}^i(j')}\right)^{\frac{1}{\gamma_s}} = \frac{z_{od,s}(j)}{z_{od,s}(j')}$$

This condition also holds in the planner's problem (see Equation (92)).

Efficiency at the *dsi* level In the DE, Equation (89) implies that the relative demand across two origins (o, o') is

$$\frac{Y_{od,s}^i}{Y_{o'd,s}^i} = \frac{\left(\kappa_{od,s}^i \tau_{od,s} w_o \left(|J_{o,s}|\right)^{\frac{1}{1-\gamma_s}}\right)^{-\sigma_s}}{\left(\kappa_{o'd,s}^i \tau_{o'd,s} w_{o'} \left(|J_{o',s}|\right)^{\frac{1}{1-\gamma_s}}\right)^{-\sigma_s}}$$

Using Equation (93), the planner's problem implies

$$\frac{Y_{od,s}^i}{Y_{o'd,s}^i} = \frac{\left[h_o^{-1/\eta} \frac{1}{\beta_o \psi} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s} (|J_{o,s}|)^{\frac{\sigma_s}{\gamma_s - 1}}}{\left[h_{o'}^{-1/\eta} \frac{1}{\beta_{o'} \psi} \frac{L_{o'}}{\tau_{o'd,s}}\right]^{\sigma_s} (|J_{o',s}|)^{\frac{\sigma_s}{\gamma_s - 1}}}$$

There exists β such that they coincide if and only if $\kappa_{od,s}$ is constant across origins (recall Proposition 1), which we impose from now on. In particular, $\beta_o = h_o^{-1/\eta} \frac{L_o}{\psi} w_o$ (up to a positive constant). Therefore, the allocation across origins is efficient under no buy-local policies.

Efficiency at the di level In the DE, Equation (90) implies that the relative demand across two sectors (s, s') under constant $\kappa_{od,s}$ across origins is

$$\frac{Y^i_{d,s}}{Y^i_{d,s'}} = \frac{\Gamma_s^{\frac{-1}{1-\gamma_s}} \frac{\gamma_s - 1}{\gamma_s} \mathcal{S}_s \theta^i_{d,s} \left(\sum_o \left(\tau_{od,s} w_o \left(|J_{o,s}| \right)^{\frac{1}{1-\gamma_s}} \right)^{1-\sigma_s} \right)^{\frac{1}{\sigma_s - 1}}}{\Gamma_{s'}^{\frac{-1}{1-\gamma_{s'}}} \frac{\gamma_{s'} - 1}{\gamma_{s'}} \mathcal{S}_{s'} \theta^i_{d,s'} \left(\sum_o \left(\tau_{od,s'} w_o \left(|J_{o,s'}| \right)^{\frac{1}{1-\gamma_{s'}}} \right)^{1-\sigma_{s'}} \right)^{\frac{1}{\sigma_{s'} - 1}}}$$

Using Equation (94), the planner's problem implies

$$\frac{Y^i_{d,s}}{Y^i_{d,s'}} = \frac{\theta^i_{d,s} \Gamma_s^{\frac{1}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}} \right]^{\sigma_s - 1} \left(|J_{o,s}| \right)^{\frac{\sigma_s - 1}{\gamma_s - 1}} \right)^{\frac{1}{\sigma_s - 1}}}{\alpha^i_{d,s'} \Gamma_{s'}^{\frac{1}{\gamma_{s'} - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s'}} \right]^{\sigma_{s'} - 1} \left(|J_{o,s'}| \right)^{\frac{\sigma_{s'} - 1}{\gamma_{s'} - 1}} \right)^{\frac{1}{\sigma_{s'} - 1}}}$$

Using the previous β the two coincide if the sector-specific subsidy is proportional to $\frac{\gamma_s}{\gamma_s - 1}$. For simplicity, from now on we set $\mathcal{S}_s = \frac{\gamma_s}{\gamma_s - 1}$ (any other proportional subsidy would require an additional adjustment in the labor income tax). Also note that if γ_s is equalized across sectors, one can simply forgo production subsidies $\mathcal{S}_s = 1$ (which requires a negative labor income tax).

Efficiency at the d level In the DE, Equation (91) implies that the relative demand across two final goods (i, i') under constant $\kappa_{od,s}$ across origins and $\mathcal{S}_s = \frac{\gamma_s}{\gamma_s - 1}$ is

$$\frac{c^i_d}{c^{i'}_d} = L_d^{\chi_{i'} - \chi_i} \frac{E^i_d}{E^{i'}_d} \prod_s \frac{\left[\Gamma_s^{\frac{-1}{1-\gamma_s}} \theta^i_{d,s} \right]^{\theta^i_{d,s}} \left(\sum_o \left(\tau_{od,s} w_o \left(|J_{o,s}| \right)^{\frac{1}{1-\gamma_s}} \right)^{1-\sigma_s} \right)^{\frac{\theta^i_{d,s}}{\sigma_s - 1}}}{\left[\Gamma_s^{\frac{-1}{1-\gamma_s}} \theta^{i'}_{d,s} \right]^{\theta^{i'}_{d,s}} \left(\sum_o \left(\tau_{od,s} w_o \left(|J_{o,s}| \right)^{\frac{1}{1-\gamma_s}} \right)^{1-\sigma_s} \right)^{\frac{\theta^{i'}_{d,s}}{\sigma_s - 1}}}$$

Using Equation (95), the planner's problem implies

$$\frac{c^i_d}{c^{i'}_d} = L_d^{\chi_{i'} - \chi_i} \frac{\alpha_i}{\alpha_{i'}} \prod_s \frac{\left(\theta^i_{d,s} \right)^{\theta^i_{d,s}} \left(\Gamma_s \right)^{\frac{\theta^i_{d,s}}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}} \right]^{\sigma_s - 1} \left(|J_{o,s}| \right)^{\frac{\sigma_s - 1}{\gamma_s - 1}} \right)^{\frac{\theta^i_{d,s}}{\sigma_s - 1}}}{\left(\theta^{i'}_{d,s} \right)^{\theta^{i'}_{d,s}} \left(\Gamma_s \right)^{\frac{\theta^{i'}_{d,s}}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}} \right]^{\sigma_s - 1} \left(|J_{o,s}| \right)^{\frac{\sigma_s - 1}{\gamma_s - 1}} \right)^{\frac{\theta^{i'}_{d,s}}{\sigma_s - 1}}}$$

Using the previous β, the two coincide if E^i_d is proportional to α_i, so $E^i_d = \alpha_i \mathcal{E}_d$ where $\mathcal{E}_d > 0$ is an arbitrary constant.

Taxes can always be engineered to obtain optimal expenditure allocation across final goods.

Efficiency of consumption levels Efficiency requires $c_d^{i,FB} = c_d^{i,DE}$ (FB denotes the planner's allocation, DE refers to the decentralized equilibrium allocation) for all i, d.

Combining Equations (91) and (95), we have

$$\begin{aligned}\frac{c_d^{i,FB}}{c_d^{i,DE}} &= \frac{\beta_d \alpha_i c_d \prod_s \left(\theta_{d,s}^i\right)^{\theta_{d,s}^i} \left(\Gamma_s\right)^{\frac{\theta_{d,s}^i}{\gamma_s - 1}} \left(\sum_o \left[\frac{h_o^{-1/\eta}}{\beta_o \psi} \frac{L_o}{\tau_{od,s}}\right]^{\sigma_s - 1} \left(|J_{o,s}|\right)^{\frac{\sigma_s - 1}{\gamma_s - 1}}\right)^{\frac{\theta_{d,s}^i}{\sigma_s - 1}}}{\alpha_i \mathcal{E}_d \prod_s \left[\Gamma_s^{\frac{-1}{1-\gamma_s}} \theta_{d,s}^i\right]^{\theta_{d,s}^i} \left(\sum_o \left(\tau_{od,s} w_o \left(|J_{o,s}|\right)^{\frac{1}{1-\gamma_s}}\right)^{1-\sigma_s}\right)^{\frac{\theta_{d,s}^i}{\sigma_s - 1}}} \\ &= \beta_d c_d \mathcal{E}_d^{-1}\end{aligned}$$

Efficiency requires

$$\mathcal{E}_d = \beta_d c_d \tag{96}$$

Efficiency of employment In the DE, we can use Equations (7) and (86) to rewrite the labor supply (Equation (5)) as:[21]

$$\psi \, h_d^{1/\eta} = \alpha_p \frac{c_d}{c_d^p} \left(1 - t_d^{h,s} - t^{h,f}\right) w_d \frac{Y_d^p}{Y_{d,s}^p} \theta_s^p \left(\frac{Y_{dd,s}^p}{Y_{d,s}^p}\right)^{-1/\sigma_s} \left(\frac{q_{dd,s}^p(j)}{Y_{dd,s}^p}\right)^{-1/\gamma_s} \frac{z_{d,s}(j)}{\tau_{dd,s} w_d}$$

The labor supply in the planner's problem can be obtanied from Equation (92) for $i = p$, $o = d$:

$$\psi h_d^{1/\eta} = \alpha_p c_d \theta_{d,s}^p \left(Y_{d,s}^p\right)^{1/\sigma_s - 1} \left(Y_{dd,s}^p\right)^{\frac{1}{\gamma_s} - \frac{1}{\sigma_s}} \left(q_{dd,s}^p(j)\right)^{\frac{-1}{\gamma_s}} \frac{z_{dd,s}(j)}{\tau_{dd,s}} L_d$$

We know that if labor supply coincides, then all bundles also coincide.[22] To reach the efficient level of labor we need $t_d^{h,s} + t^{h,f} = 0$. That is, the consolidated labor income tax rate must be zero. The natural way to achieve this is to remove the two distortionary taxes, $t_d^{h,s} = t^{h,f} = 0$.

[21] In particular, we replace P_d^p with

$$\begin{aligned}P_d^i &= \frac{Y_{d,s}^i}{Y_d^i} \frac{P_{d,s}^i}{\theta_s^i} = \frac{Y_{d,s}^i}{Y_d^i} \frac{1}{\theta_s^i} \left(\frac{Y_{od,s}^i}{Y_{d,s}^i}\right)^{1/\sigma_s} P_{od,s}^i = \frac{Y_{d,s}^i}{Y_d^i} \frac{1}{\theta_s^i} \left(\frac{Y_{od,s}^i}{Y_{d,s}^i}\right)^{1/\sigma_s} \left(\frac{q_{od,s}^i(j)}{Y_{od,s}^i}\right)^{1/\gamma_s} p_{od,s}^i(j) \\ &= \frac{Y_{d,s}^i}{Y_d^i} \frac{1}{\theta_s^i} \left(\frac{Y_{od,s}^i}{Y_{d,s}^i}\right)^{1/\sigma_s} \left(\frac{q_{od,s}^i(j)}{Y_{od,s}^i}\right)^{1/\gamma_s} \frac{\gamma_s}{\gamma_s - 1} \frac{\tau_{od,s}}{\mathcal{S}_s} \frac{w_o}{z_{o,s}(j)}\end{aligned}$$

for $o = d$.

[22] This is because all relative magnitudes are efficient, $\left[\frac{q_{od,s}^i(j)}{q_{od,s}^i(j')}\right]_{FB} = \left[\frac{q_{od,s}^i(j)}{q_{od}^i(j')}\right]_{DE}$.

Importantly, this optimal subsidy immediately delivers optimal consumption. Recall that, from Equation (96), optimal consumption requires $\mathcal{E}_d = \beta_d c_d$. We have:

$$\begin{aligned}
\beta_d &= h_d^{-1/\eta} \frac{L_d}{\psi} w_d \\
&= L_d \frac{1}{\alpha_p} \frac{c_d^p}{c_d} \frac{P_d^p}{1 - t_d^{h,s} - t^{h,f}} \\
&= \frac{1}{\alpha_p} \frac{1}{c_d} \frac{E_d^p}{1 - t_d^{h,s} - t^{h,f}} \\
&= \frac{1}{c_d} \mathcal{E}_d
\end{aligned}$$

The second line uses the labor supply (eq. (5)). The third line uses $P_d^p c_d^p = \frac{P_d^p Y_d^p}{L_d} = \frac{E_d^p}{L_d}$. The fourth line uses $E_d^i = \alpha_i \mathcal{E}_d$ and $t_d^{h,s} + t^{h,f} = 0$. The fifth line uses $\mathcal{S}_d = 1 - \iota_d$.

We have shown that any $\mathcal{E}_d$ leads to efficiency (provided that subsidies and taxes are optimal). In particular, this implies that the DE without transfers across states is efficient. In equilibrium, the set of $\mathcal{E}_d$ is pinned down by the consolidated budget constraints. Specifically, without transfers across states, expenditure equals GDP.

B.5 Microfounded approach to government demand

In this section, we show that the way we model government demand in the presence of buy-local policies can be microfounded employing a discrete choice setting.

Proposition 3 *The expenditure shares* $\left\{\frac{E_{od,s}^{g_s}}{E_{d,s}^{g_s}}\right\}_{o,d,s}$ *and ideal price indices* $\left\{\left\{P_{d,s}^{g_s}\right\}_s, P_d^{g_s}\right\}_d$ *of the government in the baseline model are equivalent to those derived from a discrete choice procurement setting, provided that the Fréchet dispersion parameter is* $\eta_s = \sigma_s - 1$ *and the scale parameter is* $\Psi_{o,s} = \Gamma_s^{\eta}$.

Proof: There is a continuum of procurement projects in each sector, $\omega_s \in [0,1]$. The size of any project is fixed in real terms and given by $y_{d,s}^{g_s}$. In total, the government provides $Y_{d,s}^{g_s} = \int_0^1 y_{d,s}^{g_s} d\omega_s = y_{d,s}^{g_s}$ units of the sector-s public good.[23] There is a representative bidder in each location. The goal of the agency is to choose the (quality-adjusted) cheapest provider, subject to procurement laws. In particular, as explained in Section 3, procurement officials are mandated to act as if the price of varieties from o were $\kappa_{od,s}$ times the true price. Hence, the agency that is in charge of procuring project ω_s solves:

$$\min_o \kappa_{od,s} \frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)} \tag{97}$$

The agency needs to take three things into account when evaluating the bid from o. First, the offered price, $p_{od,s}$. Second, the quality of the product for that specific project, $\upsilon_{od,s}(\omega_s)$. Third, the buy-local policy, $\kappa_{od,s}$. We assume that the representative bidder from o in sector s cannot distinguish between projects, so the bidding price is equalized across ω_s in market d. We assume that the quality term $\upsilon_{od,s}(\omega_s)$ is independently distributed across projects and is drawn from a Fréchet distribution with cumulative distribution $F_\upsilon(\upsilon_{od,s}) = \exp\left(-\Psi_{o,s}\,\upsilon_{od,s}^{-\eta_s}\right)$, $\upsilon_{od,s} > 0$.

Using standard properties of the Fréchet distribution, the probability that the agency located in d chooses bidder o for project ω_s is given by

$$\mathbb{P}_{od,s}(\omega_s) = \frac{\Psi_{o,s}\left(\kappa_{od,s} p_{od,s}\right)^{-\eta_s}}{\sum_{o'} \Psi_{o',s}\left(\kappa_{o'd,s} p_{o'd,s}\right)^{-\eta_s}} \tag{98}$$

To compute the ideal price index ($P_{d,s}^{g_s} \equiv E_{d,s}^{g_s}/Y_{d,s}^{g_s}$) we need to know the distribution of quality-adjusted prices $\left(\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}\right)$ conditional on winning the contract:

$$\mathbb{P}\left[\left(\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}\right)^{-1} < x \;\middle|\; \kappa_{od,s}\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)} = \arg\min_{o'} \kappa_{o'd,s}\frac{p_{o'd,s}}{\upsilon_{o'd,s}(\omega_s)}\right]$$
$$= \mathbb{P}\left[\upsilon_{od,s}(\omega_s) < x p_{od,s} \;\middle|\; \kappa_{od,s}^{-1} p_{od,s}^{-1} \upsilon_{od,s}(\omega_s) = \arg\max_{o'} \kappa_{o'd,s}^{-1} p_{o'd,s}^{-1} \upsilon_{o'd,s}(\omega_s)\right]$$

[23] The size $Y_{d,s}^{g_s}$ is endogenous, as it depends on total government expenditure and how expensive procurement is (i.e., the corresponding ideal price index).

Note that the relevant price is $\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}$, which includes the quality draw and excludes the buy-local distortion. One thing is real and affects how much the agency gets out of 1\$ spend in that project. The other is not: if the agency spends 1\$ on that project –conditional on the choice of provider– κ has no real effect. It only matters through $\kappa_{od,s}\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}$, which is the value that determines the winner.

We can now invoke Lemma 1 to show that, conditional on o being the winner, $\left(\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}\right)^{-1}$ is Fréchet with shape η_s and scale $S_{od,s} \coloneqq \kappa_{od,s}\left(\sum_{o'}\Psi_{o',s}\kappa_{o'd,s}^{-\eta_s}p_{o'd,s}^{-\eta_s}\right)^{1/\eta_s}$. In particular, we have

$$\begin{aligned}
&\mathbb{P}\left[\upsilon_{od,s}(\omega_s) < x p_{od,s} \;\middle|\; \kappa_{od,s}^{-1}p_{od,s}^{-1}\upsilon_{od,s}(\omega_s) = \arg\max_{o'}\kappa_{o'd,s}^{-1}p_{o'd,s}^{-1}\upsilon_{o'd,s}(\omega_s)\right] \\
&= \exp\left(-\frac{S_{od,s}}{\kappa_{od,s}^{-\eta_s}p_{od,s}^{-\eta_s}}\left(x p_{od,s}\right)^{-\eta_s}\right) = \exp\left(-\kappa_{od,s}^{\eta_s}S_{od,s}\,x^{-\eta_s}\right)
\end{aligned}$$

Aggregating across projects, total expenditure on o is equal to:

$$\begin{aligned}
E_{od,s}^{g_s} &= Y_{d,s}^{g_s}\times\mathbb{P}_{od,s}\times\mathbb{E}\left[\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}\;\middle|\;\kappa_{od,s}\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)} = \arg\min_{o'}\kappa_{o'd,s}\frac{p_{o'd,s}}{\upsilon_{o'd,s}(\omega_s)}\right] \\
&= Y_{d,s}^{g_s}\frac{\Psi_{o,s}\left(\kappa_{od,s}p_{od,s}\right)^{-\eta_s}}{\sum_{o'}\Psi_{o',s}\left(\kappa_{o'd,s}p_{o'd,s}\right)^{-\eta_s}}S_{od,s}^{-1}\Gamma_s \\
&= \Gamma_s Y_{d,s}^{g_s}\frac{\Psi_{o,s}\left(\kappa_{od,s}p_{od,s}\right)^{-\eta_s}}{\sum_{o'}\Psi_{o',s}\left(\kappa_{o'd,s}p_{o'd,s}\right)^{-\eta_s}}\kappa_{od,s}^{-1}\left(\sum_{o'}\Psi_{o',s}\kappa_{o'd,s}^{-\eta_s}p_{o'd,s}^{-\eta_s}\right)^{-1/\eta_s} \\
&= \Gamma_s Y_{d,s}^{g_s}\frac{\Psi_{o,s}\kappa_{od,s}^{-(\eta_s+1)}p_{od,s}^{-\eta_s}}{\left(\sum_{o'}\Psi_{o',s}\kappa_{o'd,s}^{-\eta_s}p_{o'd,s}^{-\eta_s}\right)^{1+1/\eta_s}}
\end{aligned}$$

where $\Gamma_s = \Gamma\left(1+\frac{1}{\eta_s}\right)$. The first line uses the fact that, conditional on sourcing from o, expected expenditure is $Y_{d,s}^{g_s}$ times the expected (quality-adjusted) price. The second line uses Equation (98) and the fact that $\mathbb{E}\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)} = \mathbb{E}\left[\left(\left(\frac{p_{od,s}}{\upsilon_{od,s}(\omega_s)}\right)^{-1}\right)^{-1}\right]$, which is immediately computed using standard Fréchet properties. Therefore, the expenditure share is given by

$$\frac{E_{od,s}^{g_s}}{E_{d,s}^{g_s}} = \frac{\Psi_{o,s}\kappa_{od,s}^{-(\eta_s+1)}p_{od,s}^{-\eta_s}}{\sum_{o'}\Psi_{o',s}\kappa_{o'd,s}^{-(\eta_s+1)}p_{o'd,s}^{-\eta_s}} \tag{99}$$

We now show that this is equivalent to the baseline model. To make the connection with the baseline model as transparent as possible, we define the price of the representative firm in the baseline model as $p_{od,s}^{g_s} \equiv \left[\int_{j\in J_{o,s}}\left(p_{od,s}^{g_s}(j)\right)^{1-\gamma_s}dj\right]^{\frac{1}{1-\gamma_s}}$. Using Equation (18) we get $p_{od,s}^{g_s} = \kappa_{od,s}^{-1}\tilde{P}_{od,s}^{g_s}$.

We can then compute expenditure shares using Equation (17) as follows:

$$\frac{E_{od,s}^{g_s}}{E_{d,s}^{g_s}} = \frac{\kappa_{od,s}^{-1}\tilde{P}_{od,s}^{g_s}Y_{od,s}^{g_s}}{\sum_{o'}\kappa_{o'd,s}^{-1}\tilde{P}_{o'd,s}^{g_s}Y_{o'd,s}^{g_s}} = \frac{\kappa_{od,s}^{-1}\left(\tilde{P}_{od,s}^{g_s}\right)^{1-\sigma_s}}{\sum_{o'}\kappa_{o'd,s}^{-1}\left(\tilde{P}_{o'd,s}^{g_s}\right)^{1-\sigma_s}} = \frac{\kappa_{od,s}^{-\sigma_s}\left(p_{od,s}^{g_s}\right)^{1-\sigma_s}}{\sum_{o'}\kappa_{o'd,s}^{-\sigma_s}\left(p_{o'd,s}^{g_s}\right)^{1-\sigma_s}} \tag{100}$$

We can now see that, by setting $\eta_s = \sigma_s - 1$ and $\Psi_{o,s}$ equal across o, Equations (99) and (100) are identical.

We can also show that the effective cost of procurement in every sector is the same by choosing an appropriate constant for $\Psi_{o,s}$. The ideal price index ($P_{d,s}^{g_s} \equiv E_{d,s}^{g_s}/Y_{d,s}^{g_s}$) in the discrete choice version is equal to:

$$P_{d,s}^{g_s} = \frac{\sum_o E_{od,s}^{g_s}}{Y_{d,s}^{g_s}} = \Gamma_s \frac{\sum_o \Psi_{o,s} \kappa_{od,s}^{-(\eta_s+1)} p_{od,s}^{-\eta_s}}{\left(\sum_{o'} \Psi_{o',s} \kappa_{o'd,s}^{-\eta_s} p_{o'd,s}^{-\eta_s}\right)^{1+1/\eta_s}} \tag{101}$$

Using Equation (39), the ideal price index in the baseline model is

$$P_{d,s}^{g_s} = \frac{\sum_o \left(p_{od,s}^{g_s}\right)^{1-\sigma_s} \kappa_{od,s}^{-\sigma_s}}{\left[\sum_o \left(\kappa_{od,s} p_{od,s}^{g_s}\right)^{1-\sigma_s}\right]^{\frac{\sigma_s}{\sigma_s - 1}}} \tag{102}$$

Which again coincides if we set $\eta_s = \sigma_s - 1$ and $\Psi_{o,s} = \Gamma_s^{\eta}$. Since sector-level expenditure $E_{d,s}^{g_s}$ is predetermined, this implies that $Y_{d,s}^{g_s}$ is identical in both settings. Lastly, since the aggregate ideal price index of the government is given by $P_d^{g_s} = \prod_s \left(\frac{P_{d,s}^{g_s}}{\theta_s^{g_s}}\right)^{\theta_s^{g_s}}$ in both cases, it immediately follows that it coincides. ■

Lemma 1 *Consider N independent Fréchet random variables $\{v_i\}_{i=1}^N$, such that their cumulative density functions are given by*

$$\mathbb{P}(v_i \leq v) = \exp(-\Psi_i v^{-\eta})$$

with $\Psi_i > 0$, $\eta > 0$.

Let

$$E_i \equiv \left\{a_i v_i = \arg\max_{i'} a_{i'} v_{i'}\right\} = \bigcap_{j \neq i} \{a_i v_i \geq a_j v_j\}$$

And define $S \equiv \sum_k \Psi_k a_k^{\eta}$.

Then,

$$\Pr(v_i < x_i \mid E_i) = \exp\left(-\frac{S}{a_i^{\eta}} x_i^{-\eta}\right), \qquad x_i > 0.$$

Proof: Conditioning on $v_i = v$, the probability of E_i is

$$\Pr(E_i \mid v_i = v) = \prod_{j \neq i} \Pr\left(v_j \leq \frac{a_i}{a_j} v\right) = \prod_{j \neq i} \exp\left(-\Psi_j \left(\frac{a_i}{a_j} v\right)^{-\eta}\right) = \exp\left(-\frac{\sum_{j \neq i} \Psi_j a_j^{\eta}}{a_i^{\eta}} v^{-\eta}\right).$$

Hence

$$\begin{aligned}\Pr(v_i < x_i,\ E_i) &= \int_0^{x_i} f_i(v)\Pr(E_i \mid v_i = v)\,dv \\ &= \int_0^{x_i} \Psi_i \eta v^{-\eta-1}\exp\left(-\frac{S}{a_i^\eta}v^{-\eta}\right)dv \\ &= \Psi_i \frac{a_i^\eta}{S}\exp\left(-\frac{S}{a_i^\eta}x_i^{-\eta}\right),\end{aligned}$$

where we used $f_i(v) = \Psi_i \eta v^{-\eta-1}\exp(-\Psi_i\, v^{-\eta})$ in the second equality, and the substitution $t = \frac{S}{a_i^\eta}v^{-\eta}$ in the last step.

This implies that,

$$\Pr(E_i) = \int_0^{\infty} f_i(v)\Pr(E_i \mid v_i = v)\,dv = \Psi_i \frac{a_i^\eta}{S}$$

Therefore,

$$\Pr(v_i < x_i \mid E_i) = \exp\left(-\frac{S}{a_i^\eta}\,x_i^{-\eta}\right), \qquad x_i > 0.$$

■

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