Fiscal Policy, Labor Mobility, and Regional Development

- The case of Italy's South -

Gian Luca Clementi* Daniele Coen-Pirani†

February 14th, 2020
(preliminary and incomplete - do not cite)

Abstract

We study the aggregate implications of fiscal transfers across regions within a country, with a focus on Italy. Net fiscal transfers from the North to the South of Italy are large, corresponding to almost one quarter of Southern GDP. Results from a quantitative spatial model with endogenous labor supply suggest that reducing these transfers would have the effect of relocating population to the North, the most productive area, and raise aggregate employment. In turn, both factors would contribute to raising the country's GDP. Interestingly, the model tells us that labor input and value added would grow faster in the South, thereby reducing Italy's internal development disparities.

Keywords: Spatial development, fiscal federalism, local labor markets, misallocation.

*Stern School of Business, New York University and NBER. E-mail: clem@nyu.edu.
†University of Pittsburgh. E-mail: coen@pitt.edu.

1 Introduction

The literature on macro-development has mostly focused on the immediate determinants of *cross-country* differences in GDP per capita, such as total factor productivity, capital deepening, and human capital accumulation. While cross-country differences in GDP per capita are huge, many OECD countries also display sizeable *internal* differences in GDP per capita across regions. For example, Connecticut's nominal GDP per capita is twice as large as West Virginia's. Similarly, Northern's Italy GDP per capita is almost twice as large as that in the Southern part of the country.

In this paper we evaluate the contribution of a country's fiscal policies to these differences, with a special focus on Italy. National fiscal policies tend to redistribute resources towards a country's poorer regions, through redistributive social programs, the compensation of public sector employees, and governments' procurement choices. Such redistribution may discourage migration towards higher-productivity locations and discourage labor supply in the low-productivity region, thereby leading to lower economy-wide output.

Italy is a particularly interesting case to consider because the central government collects a relatively high share of aggregate tax revenues, about 85% in 2017. By contrast, in the same year, the Federal government in the U.S. collected 68% of aggregate tax revenues.[1] A higher share of tax collection by the central government creates the scope for more redistribution of tax revenue towards poorer regions. One way to illustrate this disparity in geographic redistribution of resources is to compute regional net fiscal transfers (FTR), defined as central government's spending (for transfers and purchases, including intergovernmental transfers to local governments) targeted towards a region, net of tax revenue collected by the central government in that region. For Italy's South, the FTR in 2017 represented about 23 percent of GDP, while the North had a negative FTR of 11 percent of its GDP.[2] By contrast, in 2013 in the U.S., the FTR to states in the bottom 10 percent of the cross-state distribution of GDP per capita amounted to 11 percent of their GDP, while states in the top 10 percent

[1] These two figures are reported in the OECD's Fiscal Decentralization database.

[2] Here and in what follows we use the term North to denote regions in the North and Center of the country. See Section 2 for more details on these definitions.

had a negative FTR of 1 percent. FTR play a role in sustaining Southern Italy persistent trade deficit, which in 2016 was 18 percent of its GDP against a surplus of 8 percent for the North.

Our analysis is based on a general equilibrium spatial model with heterogeneous locations and heterogeneous agents (Reddings and Rossi-Hansberg (2017)). A key innovation of our model, relative to the spatial economics literature, is to endogenize labor supply choices with the goal of understanding the large regional gap in employment rates between the South and the North of the country. Specifically, the employment rate in Italy's South is about 17 percentage points smaller than in the North, after controlling for workers' observable characteristics. By contrast, the average difference in hourly wages between employed workers with similar observable characteristics are relatively small. Conditional wages are only 9 percent lower in the South than in the North. This is especially striking as value added per hour worked is almost 30 percent lower in the former than in the latter. Explaining the co-existence of a relatively high non-employment rate in the South with relatively high wages and low productivity of those employed is a challenge for efforts to understand regional economic gaps in Italy. Boeri et al. (2020) explain these facts by arguing that wages in the South are kept above market clearing levels by nationwide wage bargaining agreements that don't take into account this region's lower productivity.

In the current version of our model we consider two alternative labor market settings, one in which Southern wages are rigid and one in which they are flexible. Fiscal policy in the model is represented by a linear income tax whose proceeds are rebated to all households in a lump-sum fashion. Since tax collection in the North is larger than in the South, due to higher average hours worked in the former, this policy induces a net redistribution of resources towards Southern regions.

We use the model to assess the aggregate and distributional effects of reducing the share of aggregate tax revenue collected and controlled by the central government. Addressing this research question has immediate policy relevance, given the current debate on the opportunity to increase the scope of fiscal federalism, made possible by the 2001 constitutional

reform.

No matter the extent of wage rigidity, we find that a reduction in the share of tax revenues controlled by the central government, by reducing the amount of geographic redistribution, reduces households' incentives to locate in the South – the least productive region. The same policy also attenuates the tax distortion on labor supply, leading to higher employment in both regions. Both factors contribute to raise the economy-wide GDP. Interestingly, labor input and value added grow faster in the South, reducing Italy's internal development disparities.

This paper is related to several literatures. Relative to the macro-development literature (Hanushek et al. (2017), Hendricks and Schoellman (2017), which seeks to decompose cross-country income gaps in an accounting sense, we are interested in the effect of policies on these gaps. Our paper belongs to a growing literature on the spatial distribution of economic activity, reviewed by Reddings and Rossi-Hansberg (2017). A particularly relevant strand of this literature focuses on the effect of taxes and tax progressivity on the spatial allocation of workers (Albouy (2009), Eeckout and Guner (2015), Colas and Hutchinson (2017), Fajgelbaum and Gaubert (2020)). As mentioned above, these papers abstract from workers' labor supply choices. In addition, while they focus on the U.S. economy, we analyze the case of Italy, a country characterized by different labor market institutions than the U.S., and higher central tax revenue as a proportion of GDP.[3] The focus on taxes and labor supply choices connects our paper to recent work by Bick et al. (2018) and Bick et al. (2019) on cross country and within–country variation in the relationship between hours worked, wages, and the tax-transfer system. In the development literature, Bryan and Morten (2019) consider a heterogeneous agent model of spatial misallocation of workers induced by high moving costs in Indonesia. Differently from this paper, we focus on policy counterfactuals rather than simply assessing the impact of moving costs.

Finally, our paper is also related to the literature on within-country spatial wage gaps.

[3]The geographic flexibility of wages is currently an important policy issue in Europe. For example, Spain's new left-wing government is considering rolling back a 2012 reform which increased the scope for company-level wage negotiations.

Heise and Porzio (2019) seek to explain how *real* wage differences between East and West Germany have persisted for decades after this country's unification. Boeri et al. (2020) contrast wage flexibility in Italy and Germany, showing empirically that in the latter country conditional wages are more highly correlated with average productivity across local labor markets. Hornbeck and Moretti (2019) study the impact of exogenous shocks to total factor productivity on nominal and real workers' earnings and housing prices across U.S. metropolitan areas.

The rest of the paper is organized as follows. In Section 2 we illustrate the main stylized facts concerning differences between the North and South of Italy. In Section 3 we present a simple illustrative model. The model's calibration is discussed in Section 4. Policy counterfactuals are undertaken in Sections 5 and 6.

2 Stylized facts

In this section we introduce and discuss some of the most important stylized facts pertaining to regional differences in economic outcomes between the South and the North of Italy.

In 1870, when Italy concluded its unification process with the annexation of Rome and the surrounding region, the heterogeneity across regions' economic outcomes was sizeable. According to widely agreed-upon estimates, the North-West and Center of the country exhibited levels of per-capita income far greater than those recorded in the North-East, the South, and the Islands.

As is well known, the next 150 years did not lead to full convergence. Thanks to a precocious industrialization, the average resident of the North-West was far better off than all its country-mates for most of the first century after unification. While Center and North-East of the country eventually caught up, the South and the Islands did not. See Brunetti et al. (2015) for a concise yet comprehensive account of Italian regions' economic development.

Since the early 1980s, the differential pattern of development can be effectively described by identifying two groups of contiguous regions – North and South, for brevity – characterized

by dramatically different levels of per-capita income and similar growth rates. The classification we use corresponds exactly to that used by ISTAT, Italy's Statics agency. North, which ISTAT refers to as Center-North, includes Lazio and all regions to its North. The South consists of Abruzzo and all regions to its South.

Figure 1 plots per-capita income in the two areas since 1995, the first year for which ISTAT provides comprehensive regional accounts. In 2016, the latest year for which we have data, per-capita GDP in the South was 55% of the value in the North.

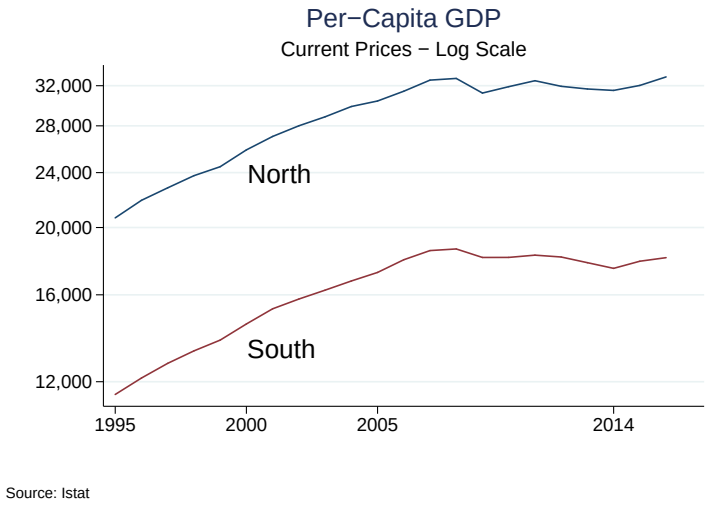

Figure 1: Per-capita GDP across macro areas.

Not surprisingly, such dramatic differences in per-capita income are associated with substantial differences in total factor productivity and in human capital. Estimates by Ciani et al. (2018) imply that in 2015 manufacturing's TFP in the South was at least 14% lower than in the North. When no effort is made to account for the gap in human capital, TFP in the South was found to be 33% lower than in the North.

The differences in human capital can be illustrated by considering the gap in educational attainment. In 2018, only 3.7% of 25-64 years-olds in the North had not gone beyond primary school. In the South, it was 9.4%. As a percentage of the same population, college graduates were 21.4% in the North and 15.3% in the South.

Table 1: South-North differences conditional on observables

	Hours	Employment	Wages	Rents
	(1)	(2)	(3)	(4)
Region=South	-0.0206***	-0.173***	-0.0886***	-0.399***
	(0.000838)	(0.000579)	(0.000898)	(0.00915)
Observations	1391872	3301162	849231	18171
Adjusted R^2	0.227	0.313	0.447	0.207

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

What is perhaps somewhat surprising is the large difference in labor input across the two areas, most of which associated with the extensive margin. Conditional on employment, the difference in average hours worked is minimal. When controlling for a very large set of workers' attributes, among which age, gender, tenure, experience, and education, full-time workers in the South spend only 2% less time on the job than their Northerner peers. See Column (1) in Table 1.

We find however a large difference in employment rates. After controlling for age, gender, and education, the difference in employment rates among 25-64 years old is 17.3 percentage points. See Column (2) in Table 1. This is a well-known fact, one that is lamented in the popular press every time ISTAT posts the latest labor market data. When looking for the reason of such phenomenon, observers invariably mention factors affecting labor supply and demand, respectively. One piece of information that suggests demand factor may be important is the limited cross-area variation in wages, in spite of the substantial difference in productivity. This feature of the data was recently emphasized by Boeri et al. (2020).

Controlling for a host of workers' individual characteristics that may affect their productivity, wages in the South are only 9% lower on average than in the North. See Column (2) in Table 1. Boeri et al. (2020) among others conjectured that the relatively small difference in nominal wages is largely driven by centralized wage negotiation. Most employer-employee relationships are disciplined by contracts negotiated by unions and employers' representatives at the national level. While the law allows for some of the provisions to change by locality and workplace, in practice all individuals employed in the same occupation in a given sector

are covered by the same contract.

Under the assumption that contractual nominal wages are designed to clear labor markets in the North, the same wages are likely to generate rationing of labor supply in the South, where the marginal product of labor is lower. That is, downward wage rigidity together with differential workers' productivity can account for the difference in employment rates.

The rich data made available by ISTAT allows us to investigate further the effects of the outcomes just described on the welfare of residents in the South. Let's start with the price level.

Every year, ISTAT conducts a National Consumption Expenditures Survey by interviewing 20,000 households, distributed across 500 municipalities. For our purposes, the survey gathers detailed information about housing, which in turn can be used to estimate rents across locations. Column (4) in Table 1 illustrates the results of regressing rents on a set of housing characteristics and on area-specific dummy variables. We find that rents are 40% lower in the South. This result is consistent with the findings of Cannari and Iuzzolino (2009), the only study to date to construct and compare price indexes across Italian localities.

Notice that according to the Consumption Expenditure Survey, housing accounts for 75% of non-tradable household consumption expenditures, and that the latter constitute 60% of households consumption. It is therefore not surprising that Cannari and Iuzzolino (2009) found the overall price level in the South to be 17% lower than in the North.

The price level being substantially lower in the South, one is led to conclude that simply comparing per-capita GDP at current prices does not yield a satisfactory representation of the differences in purchasing power.

Turning back to the regional accounts, one discovers another reason why the data on value added should be taken with caution when thinking of households welfare. In 2016, per-capita consumption in the South was about 67% of the value in the North. Households average disposable income was 65% of the value in the North. In contrast, per-capita GDP was only 55%. Figure 2 shows that the gap between value added and consumption has been a persistent feature of the data, at least since 1995. It was made possible by a consistently

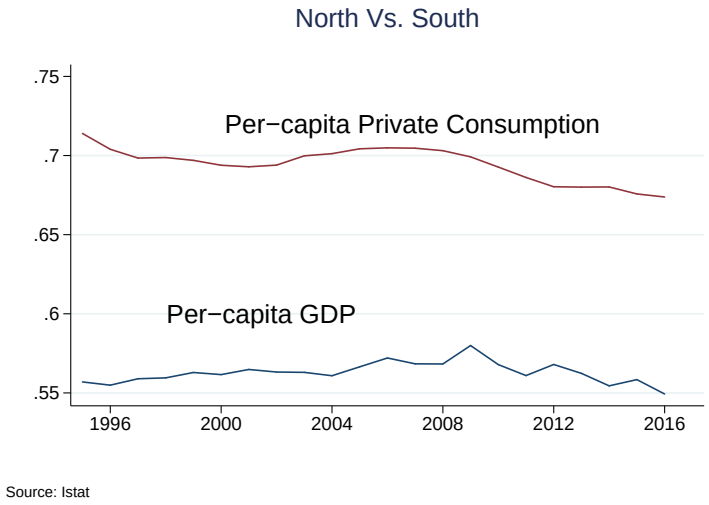

Figure 2: GDP and Consumption in the South as a fraction of the North.

large trade balance deficit, which peaked at 25% in 2010.

It is a national accounting identity that region j's current account balance – its increase in the net asset position on the rest of the world – equals the sum of trade balance, net factor income from abroad, net remittances, and net fiscal transfers:

$$CA_j \equiv NX_j + NY_j + R_j + FTR_j.$$

Unfortunately we do not have data about either remittances or net factor income. However, we can measure the net fiscal transfer, defined as the difference between central government's payments to the region – to finance purchases and transfers, respectively – and the region's payment to the government, in form of taxes:

$$FTR_j = G_j^F + TR_j^F - T_j^F.$$

Table 2 presents statistics on the components of FTR by region. In order to provide some perspective, we also present analogous statistics for the US. As mentioned in the Introduction, FTR for poorer regions are much larger in Italy than they are in the US. For Italy's South they approach one quarter of its GDP. We found that during the last decade,

the period for which we have detailed data from the Ministry of Finances, the FTR towards the South was roughly of the same magnitude as its net imports. See Figure 3. This implies that residents in the South were able to finance consumption well in excess of the valued added produced, without making recourse to asset decumulation or additional debt.

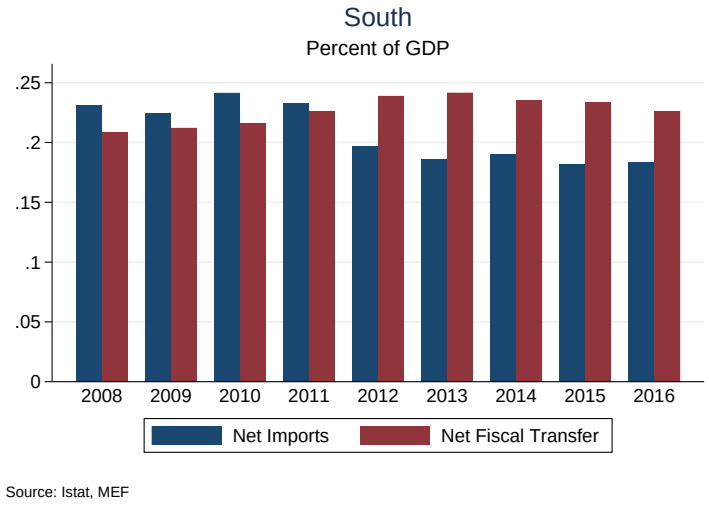

Figure 3: South: Net imports and net fiscal transfer from the North as pct of GDP.

3 The model

In this section we present a simple illustrative model of the effects of regional fiscal transfers on regional labor market outcomes and aggregate outcomes. In the benchmark version of the model we incorporate Boeri et al. (2020)'s assumption of rigid wages in the South. We relax this assumption in Section 6.

There is a unit mass of households split across two locations – North and South, respectively – with preferences defined over bundles of housing, leisure, and a tradable good. Let P_j denote the (endogenous) fraction residing in region $j = N, S$, with $P_S = 1 - P_N$.

Households' preferences are represented by the utility function

$$U(c_j, h_{hj}, l_j) = \alpha_T \log(c_j) + \alpha_H \log(h_{hj}) + \alpha_L \log(1 - l_j) + \xi_j + \sigma\varepsilon_j,$$

	Italy		U.S.	
	Center-North	South	High-GDP states	Low-GDP states
GDP per capita	33,878 €	18,660 €	63,857 $	40,076 $
Per-capita taxes	14,386 €	5,578 €	10,964 $	6,010 $
As percent of GDP	43.68	30.83	17.05	14.95
Per-capita transfers	6,929 €	5,627 €	7,806 $	8,318 $
As percent of GDP	21.04	31.10	12.26	20.82
Per-capita expenditures	3,945 €	4,043 €	2,358 $	2,131 $
As percent of GDP	11.98	22.35	3.32	5.33
Per-capita net transfers	-4,092 €	3,510 €	-799 $	4,438 $
As percent of GDP	-10.66	22.62	-1.47	11.21

Table 2: Fiscal Transfers across Italy's regions (2017) and US states (2013). Data sources: Ministero dell'Economia e delle Finanze for Italy and Internal Revenue Service and Pew Charitable Trusts (2014) for the US.

with $\alpha_T, \alpha_H, \alpha_L > 0$, $\alpha_L = 1 - \alpha_H - \alpha_T$, $\sigma > 0$ and where ε_j is distributed according to the Standard Gumbel distribution. We adopt c_j to denote the consumption of tradable good, h_{hj} for housing consumption, and l_j for the time allocated to work activities.

Tradable goods are produced by means of labor (L_j) and structures (H_{fj}) according to the production function

$$Y_j = A_{Tj} H_{fj}^{\gamma} L_j^{1-\gamma}.$$

with $A_{Tj} > 0$ and $\gamma \in (0, 1)$. Structures and housing are perfect substitutes and are produced by means of land (X_j) and tradable goods (Y_{Hj}), according to the production function

$$H_j = A_{Hj} X_j^{\theta} Y_{Hj}^{1-\theta},$$

with $A_{Hj} > 0$ and $\theta \in (0, 1)$.

We assume that each region is endowed with one unit of land, which is owned by absentee landowners and rented to producers at the rate p_j.

The markets for tradable goods (the numeraire) and housing are walrasian. Let the price of the latter be denoted by r_j.

Regarding the labor markets, following Boeri et al. (2020), we assume that wages are constant across regions and set at the level w the clears the market in the North. As indicated above, we will focus on equilibria characterized by supply rationing in the South. In Section 6 we evaluate the impact of relaxing this assumption.

We model fiscal policy by means of a simple tax and transfer scheme. The government levies a linear tax $\tau \geq 0$ on labor earnings and rebates its receipts T uniformly to residents, therefore balancing its budget

$$T = \tau w(P_S l_S + P_N l_N). \tag{1}$$

3.1 Households' optimization

Households in the North solve

$$\begin{aligned} \max_{c_N, h_{hN}, l_N} \ & \alpha_T \log(c_N) + \alpha_H \log(h_{hN}) + \alpha_L \log(1 - l_N) \\ \text{s.t.} \ & c_N = w l_N (1 - \tau) + T - r_N h_{hN}. \end{aligned} \tag{2}$$

We have stated above that we will focus on scenarios where labor supply by households residing in the South is rationed due to rigid wages.[4] For simplicity, we therefore write their optimization problem already incorporating this equilibrium feature. Households take labor supply l_S as given and solve

$$\begin{aligned} \max_{c_S, h_{hS}} \ & \alpha_T \log(c_S) + \alpha_H \log(h_{hS}) + \alpha_L \log(1 - l_S) \\ \text{s.t.} \ & c_S = w l_S (1 - \tau) + T - r_S h_{hS}. \end{aligned} \tag{3}$$

[4]Notice that, due to uniform wages, the wage w does not depend on j.

3.2 Firms' optimization problem

Firms in the tradable good sector solve

$$\max_{H_{fj},L_j} \; A_{Tj} H_{fj}^{\gamma} L_j^{1-\gamma} - r_j H_{fj} - w L_j. \tag{4}$$

Firms in the housing sector solve

$$\max_{X_j,Y_{Hj}} \; r_j A_{Hj} X_j^{\theta} Y_{Hj}^{1-\theta} - Y_{Hj} - p_j X_j.$$

Imposing land market clearing, i.e. $X_j = 1$ for all j, optimization leads to the following isoelastic housing supply function:

$$H_j = A_{Hj}^{\frac{1}{\theta}} r_j^{\frac{1-\theta}{\theta}} (1-\theta)^{\frac{1-\theta}{\theta}}. \tag{5}$$

3.3 Location choice

Let V_N and V_S denote the equilibrium values of programs (2) and (3), respectively. Then, the mass of individuals choosing to locate in the North equals the probability that overall utility from locating there is higher than the utility associated with the South, i.e.

$$P_N = \text{Prob}[V_N + \xi_N + \sigma\varepsilon_N \geq V_S + \xi_S + \sigma\varepsilon_S] = \left[1 + e^{\frac{(V_S - V_N) + (\xi_S - \xi_N)}{\sigma}}\right]^{-1}, \tag{6}$$

where the second equality follows from the distributional assumptions on the ε_j shocks.

3.4 Equilibrium with Labor Supply Rationing in the South

An equilibrium with labor supply rationing in the South consists of a population allocation P_N, indirect utilities V_j, prices $\{w, r_j\}$, households' consumption bundles $\{c_j, h_{hj}\}$, individual labor supply l_j, demand of labor L_j and structure H_{fj} and housing supply H_j such that:

- $V_j = \alpha_T \log(c_j) + \alpha_H \log(h_{hj}) + \alpha_L \log(1 - l_j)$

- Given $\{w, r_N\}$, $\{c_N, h_{hN}, l_N\}$ solve problem (2)
- Given $\{w, r_S, l_j\}$ $\{c_S, h_{hS}\}$ solve problem (3)
- Given $\{w, r_j\}$, $\{L_j, H_{fj}\}$ solve problems (4)
- Given r_j, H_j solves (5)
- The labor market in the North clears, i.e. $L_N = P_N l_N$
- Individual labor supplied in the South satisfies $l_S = L_S/P_S$
- Housing markets clear, i.e. $P_j h_{hj} + H_{fj} = H_j$
- The market for tradable clears, i.e. $\sum_{j=N,S} (P_j c_j + Y_{Hj}) = \sum_{j=N,S} Y_j$
- $\{P_N, V_S, V_N\}$ satisfy (6)
- The central government's budget (1) is satisfied

4 Calibration

We begin with the parameters of the utility function. The households' first-order conditions imply the following restrictions on the shares of housing expenditures in the household's budget:

$$\frac{r_S h_{hS}}{(1-\tau)wl_S + T} = \frac{r_N h_{hN}}{(1-\tau)wl_N + T} = \frac{\alpha_H}{\alpha_H + \alpha_T}.$$

Our own elaboration of ISTAT's consumer expenditure survey data yields a point estimate for this share of 0.45. Once we set $\alpha_L = 0.3$ (arbitrarily), this restriction together with the normalization $\alpha_T + \alpha_H + \alpha_L = 1$ yields $\alpha_H = 0.3$ and $\alpha_T = 0.4$.

We set $\gamma = 0.4$ to generate a labor share in the tradable sector equal to 0.6. Then, under nominal wage equalization, the first-order conditions for labor in the tradable sector yield

$$\frac{A_{TS}}{A_{TN}} \left(\frac{H_{fS/}L_S}{H_{fN/}L_N} \right)^{\gamma} = 1.$$

The first-order conditions for structures in the same sector imply

$$\frac{A_{TS}}{A_{TN}}\left(\frac{H_{fS/}L_S}{H_{fN/}L_N}\right)^{\gamma-1}=\left(\frac{r_S}{r_N}\right).$$

In turn, the two imply that the productivity differential in the tradable sector is pinned down by the ratio of housing prices, i.e.

$$\frac{A_{TS}}{A_{TN}}=\left(\frac{r_S}{r_N}\right)^{\gamma}. \tag{7}$$

Our own empirical estimates of conditional housing prices imply that $r_S/r_N \approx 0.6$. We therefore set $A_{TN}=1$ and $A_{TS}=0.8$.

Moving on to the housing sector, we notice that by equation (5), the elasticity of housing supply equals $(1-\theta)/\theta$. Recent work by Accetturo et al. (2018) estimate this elasticity at 0.12. Accordingly, we set $\theta=0.9$.

Equations (5) and (7) further imply that

$$\frac{H_S}{H_N}=\left(\frac{A_{HS}}{A_{HN}}\right)^{\frac{1}{\theta}}\left(\frac{A_{TS}}{A_{TN}}\right)^{\frac{1-\theta}{\gamma\theta}}$$

Given productivity levels in the tradable sector, a lower relative productivity in the South housing sector maps in a relatively lower availability of housing in the South. In turn, this will impact the distribution of population and value added. This motivates us to select A_{HS} and the difference $\xi_N-\xi_S$ in order to match the ratios of per capita GDP and population across the two areas.

GDP in region j is the sum of value added across the two production sectors. In the tradeables' sectors, it simply equals wL_j. Value added in the housing sector yields $p_j = r_jH_j - Y_{Hj}$, where $Y_{Hj}=r_j^{1/\theta}[A_{Hj}(1-\theta)]^{1/\theta}$ is the value of final goods used in the production of housing. It follows that

$$GDP_j=\theta(A_{Hj}r_j)^{1/\theta}(1-\theta)^{(1-\theta)/\theta}+wL_j.$$

5 The effect of tax policy on location choices and economic outcomes

In this section, we describe the effects of the tax-and-transfer system on the equilibrium allocation, by means of a comparative statics exercise with respect to the parameter τ. Specifically, we vary τ parametrically and for each value of the tax rate compute the equilibrium allocation generated by the model. The results are depicted in Figures 4, 5, and 6. Blue solid lines refer to the benchmark model with wage rigidity. Red dashed lines refer to an alternative version of the model, to be considered below, where even in the South wages are perfectly flexible.

An increase in the tax rate reduces the after-tax wage in both regions. Given that the government balances its budget by transferring resources to households uniformly, the net effects on disposable income will have opposite signs. With our parameter values, an increase in τ increases the net transfer of resources from the North to the South.

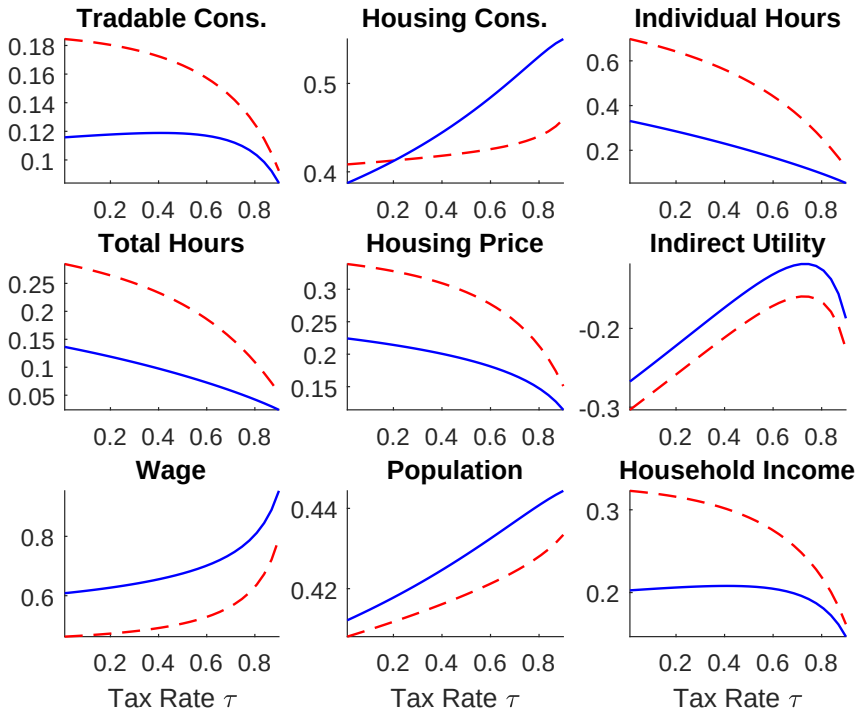

Figure 4: Outcomes in the South – Solid: Benchmark. Dashed: Flexible wages.

In the North, households' optimal labor supply decision is

$$l_N = 1 - \alpha_L - \alpha_L \frac{T}{w(1-\tau)}.$$

The unequivocal effect of an increase in τ is to lower individual labor supply. Everything else equal, the increase in net transfers to the South raises the utility from locating there. Both forces lead to lower aggregate labor supply in the North and higher wages.

The decline in after-tax wages has no direct effect on households' labor supply in the South, given that supply is rationed. Wages in the South rise because they are equated to the market-clearing level in the North.

In both regions, the rise in wages is associated with a decline in the equilibrium quantity of labor employed. However, the percent decline in labor input in the South is larger. As a result, the ratio L_S/L_N drops.

Given the increase in the wage rate, the constant-return-to-scale assumption in the production of non-tradeables implies that housing prices drop in both regions. As w increases, firms in the tradeable sector reduce their demand for both inputs, leading to a decline in the price of structures, r_j. Analytically, this is obvious once one rearranges the first-order conditions of the tradable goods sector to obtain

$$r_j = \gamma(1-\gamma)^{\frac{1-\gamma}{\gamma}} A_{Tj}^{\frac{1}{\gamma}} w^{\frac{\gamma-1}{\gamma}}.$$

It turns out that in our example the decline in equilibrium housing prices induced by higher taxes is associated with higher housing consumption in the South and lower housing consumption in the North. The reason for this difference is the increase in net transfer of resources from Northern to Southern households.

In summary, an increase in labor income taxes leading to a greater transfers of resources from the North to the South leads to an increase in the portion of the population residing in the least productive region and to a relatively large decline in GDP and employment in the same area. This is the sense in which, in the context of our simple model, a tax-and-transfer

policy may help in rationalizing some of the evidence described above.

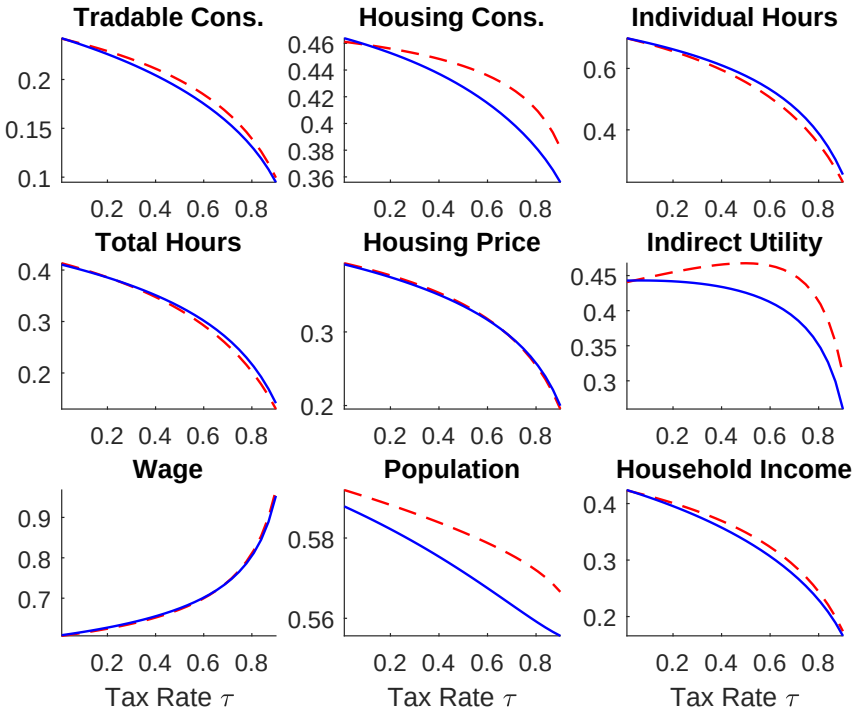

Figure 5: Outcomes in the North – Solid: Benchmark. Dashed: Flexible wages.

The location of a larger fraction of residents in the South, which is less productive, also reduces the country's overall GDP. Preliminary results indicate that raising the tax rate from 20% to 40% leads to a decline in aggregate GDP of about 8%.

When turning to welfare, the analysis is more nuanced. Conditional on residing in the South, households' utility is increasing in the tax rate. Conversely, conditional on residing in the North, households' utility is decreasing in the tax rate. The fraction of the population that optimally decides to locate in the South rather than in the North as τ increases, is ex-post worse-off, in the sense that its utility declines. This is the case because the utility associated with residing in the North, net of the realizations of the random variables ε_j, is greater than the utility deriving from residing in the South.

An alternative welfare criterion consists in computing expected utility before drawing values from the distributions of ε_j. Under our distributional assumption, the expected value

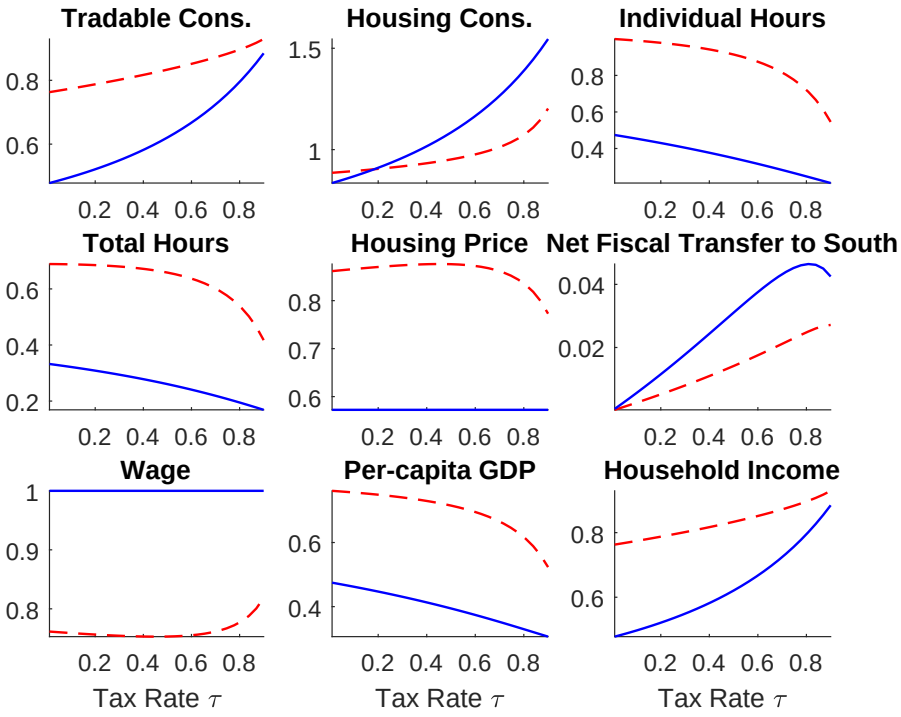

Figure 6: Ratios South/North – Solid: Benchmark. Dashed: Flexible wages.

is

$$E(U) = \sigma \left[\log \left(e^{\frac{V_N + \xi_N}{\sigma}} + e^{\frac{V_S + \xi_S}{\sigma}} \right) + \gamma_{ER} \right],$$

where γ_{ER} denotes the Euler-Mascheroni constant.

Notice that mean-preserving spreads in the utility levels associated with North and South, respectively, induce a decline in expected utility. That is, agents are risk-averse. This rationalizes why, as illustrated in Figure 7, expected utility is hump-shaped in the tax rate. A greater tax rate reduces overall consumption possibilities. However, by enhancing transfers from North to South, reduces the utility spread between locations.

6 The effect of relaxing wage rigidity

We now turn to comparing our benchmark with a scenario that only differs in that wages in the South, denoted by w_S and distinct from w_N, are left free to adjust downward to clear the labor market. Differently from the benchmark case, the labor supply decision of Southern

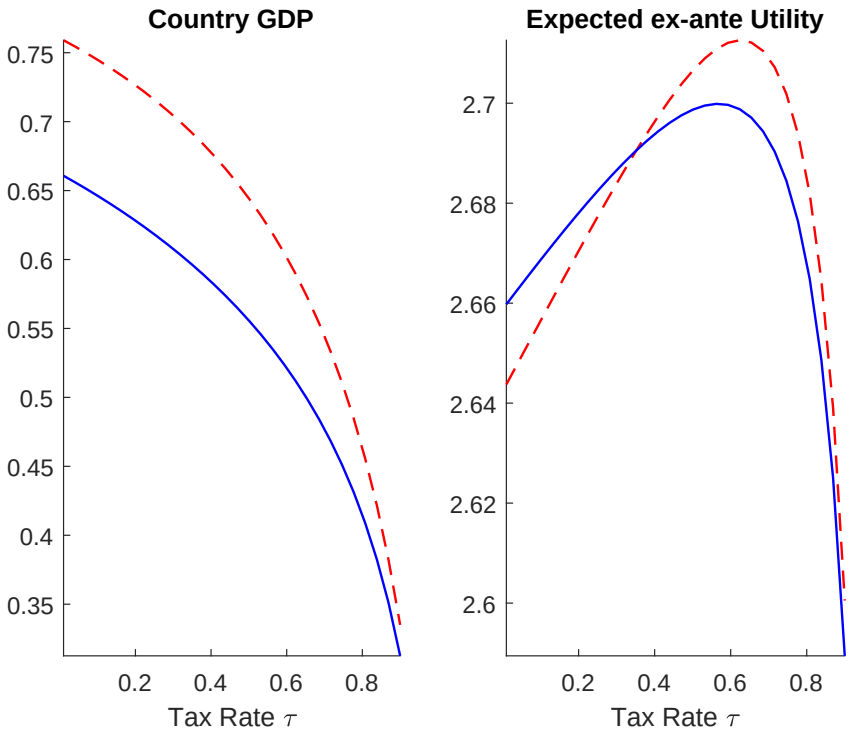

Figure 7: GDP and ex-ante welfare – Solid: Benchmark. Dashed: Flexible wages.

households is not rationed any longer and so their choice problem is formally similar to that of a Northern household.

For given tax rate, the equilibrium allocation features dramatically different outcomes in the South. In particular, the wage rate is lower, while employment and household income are higher. Indirect utility from locating in the South is lower because of higher work effort and lower incoming net transfers. In turn, this means that a grater fraction of agents opt to locate in the North.

Net transfers to the South are lower simply because the difference between labor income and tax revenue in the two areas is lower. In fact, net transfers received by a Southern households are $\tau P_N(w_N l_N - w_S l_S)$.

The allocation in the North is little impacted. It is worth noticing, though, that the only relevant effect on the indirect utility from locating there is due to tax policy, since housing prices and wages in the North are very close to their rigid-wage counterparts. With respect to the rigid-wage scenario, households in the North are less hurt by the tax-and-transfer

scheme. As a result, they enjoy higher consumption levels.

The effect of raising tax rates on location decisions is muted with respect to the rigid-wage case. The reason, once again, is that with flexible wages the respective tax bases are not as different. As a result, the same increase in the tax rate has a smaller effect on net income transfers across regions.

7 Conclusions

TBA.

References

Accetturo, A., A. Lamorgese, S. Mocetti, and D. Pellegrino (2018): "Housing supply elasticity and growth: Evidence from Italian cities," Working Paper, Bank of Italy.

Albouy, D. (2009): "The Unequal Geographic Burden of Federal Taxation," *Journal of Political Economy*, 117, 635–667.

Bick, A., N. Fuchs-Schundeln, and D. Lagakos (2018): "How Do Hours Worked Vary with Income? Cross-Country Evidence and Implications," *American Economic Review*, 108, 170–199.

Bick, A., N. Fuchs-Schundeln, D. Lagakos, and H. Tsujiyama (2019): "Explaining Hours Worked Across and Within Countries: Income Effects vs. Taxes and Transfers," Working Paper.

Boeri, T., A. Ichino, E. Moretti, and J. Posch (2020): "Wage Equalization and Regional Misallocation: Evidence from Italian and German Provinces," NBER Working Paper #25612.

Brunetti, A., E. Felice, and G. Vecchi (2015): "Reddito," in *In ricchezza e in poverta'*, ed. by G. Vecchi, il Mulino, 209–234.

Bryan, G. and M. Morten (2019): "The Aggregate Productivity Effects of Internal Migration: Evidence from Indonesia," *Journal of Political Economy*, 127, 2229–2268.

Cannari, L. and G. Iuzzolino (2009): "Le differenze nel livello dei prezzi al consumo tra Nord e Sud," Occasional Paper #49, July.

Ciani, E., A. Locatelli, and M. Pagnini (2018): "Evoluzione territoriale della TFP: analisi dei dati delle societa' dei capitali manifatturiere tra il 1995 e il 2015," Occasional Paper #438, June.

Colas, M. and K. Hutchinson (2017): "Heterogeneous Workers and Federal Income Taxes in a Spatial Equilibrium," Working Paper.

Eeckout, J. and N. Guner (2015): "Optimal Spatial Taxation: Are Big Cities Too Small?" IZA Discussion Paper No. 8781.

Fajgelbaum, P. and C. Gaubert (2020): "Optimal Spatial Policies, Geography and Sorting," *Quarterly Journal of Economics*, Forthcoming.

Hanushek, E., J. Ruhose, and L. Woessmann (2017): "Knoweldge Capital and Aggregate Income Differences: Development Accounting for US States," *American Economic Journal: Macroeconomics*, 9, 184–224.

Heise, S. and T. Porzio (2019): "Workers' Home Bias and Spatial Wage Gaps," Working paper.

Hendricks, L. and T. Schoellman (2017): "Human Capital and Development Accounting: New Evidence from Wage Gains at Migration," *Quarterly Journal of Economics*, 133, 665–700.

Hornbeck, R. and E. Moretti (2019): "Who Benefits From Productivity Growth? Direct and Indirect Effects of Local TFP Growth on Wages, Rents, and Inequality," NBER working paper #24661.

Reddings, S. and E. Rossi-Hansberg (2017): "Quantitative Spatial Economics," *Annual Review of Economics*, 9, 21–58.